For Information:

The attached document was delivered to the Point Beach NRC Resident Inspector Office on July 10, 2013, by Point Beach licensee personnel and provides information on heights of components and potential performance impacts from design basis flood waters. The document is considered as additional information to that provided in Point Beach's "Response to Inspection Report 05000266/2013011 and 05000301/2013011, Preliminary Yellow Finding," dated June 28,
2013. (ADAMS Ascension number ML13179A333).

JER 7/11/13

REVIEW OF FLOODING VULNERABILITY REPORT FOR POSSIBLE CLB ENCROACHMENT

Purpose

A report from Enercon Services, Inc. dated October 26, 2012 and titled "Flooding Vulnerability Report NEE-05-PR-003 Rev. 0" (FVR; copy attached) contains information that suggests there are components needed for safe shutdown that are physically located below the current license basis maximum Lake Michigan wave run-up elevation of 8.42 feet (5" above the 8' floor elevation) on a vertical structure. Initial walk-downs of the equipment in question found the information to be superficial, incomplete, and in some cases in error. This evaluation will formally document a thorough review of components listed in the report.

Additionally, in preparation of a list of all important equipment that would be affected by flooding to an elevation of +10.0 feet (2 feet above the Turbine/Control Building bottom floors), all equipment listed below +10.0 feet in PRA 7.1 "Internal Flooding Notebook," Revision 0, was re-evaluated for flooding impact. The equipment determined to be unnecessary for safe shutdown or not available during a loss of offsite power was excluded from re-examination. All other equipment was walked-down and measured, if applicable. The results of these walk-downs are documented herein.

Conduct of Walk-Downs

The primary challenges encountered in this and previous walk-downs came from two different sources:

1) Inaccessibility of the equipment, and
2) Unfamiliarity with equipment & potential failure modes of concern.

Inaccessibility was due to many potentially vulnerable components being located inside panels, cubicles, or other enclosures that contained energized equipment and/or sensitive equipment. Concerns for safe plant operation and personnel safety significantly complicated the opening and inspecting of these enclosures. Even when opened and visually accessible, the same safety concerns precluded reaching into the cabinets with measuring tools to obtain direct measurements.

Personnel unfamiliarity challenges arose due to the cross-discipline nature of the equipment of concern. Personnel fully knowledgeable in electrical component design and function were not familiar with the operation of mechanical components such as drain traps and air relay valves. This led to the inclusion of several components that were not subject to failure due to wetting in the FVR or in PRA 7.1. The reverse also occurred, with mechanically-specialized personnel recording overly conservative measurements of electrical components.

Additionally, unfamiliarity with the overall design of specific components caused certain vulnerable equipment to be omitted from the FVR or PRA 7.1. An example were battery chargers that, while they did not have any electrical components that may be wetted located close to floor level, were susceptible

to having the required cooling air inlets submerged by relatively low flood levels. This could lead to a loss of function due to overheating under loaded conditions.

To address these potential failings, re-verification walk-downs were conducted with two primary criteria:

1. Each measurement was to be recorded by photograph with a measuring device in the frame.
2. Each measurement was independently reviewed by personnel familiar with the device, the application, and the system design to ensure that more complex interactions were considered.

Beyond these two primary criteria, additional measures were taken to ensure repeatability within the margin of error inherent with using fractional inch measuring devices (i.e. tape measures and stick rules) registered against the existing floor slab:

Parallax was addressed by having the camera lens as close as reasonably achievable to level with the potentially wetted component. In cases where there is a significant stand-off distance between the component of concern and the measuring device, multiple photographs were taken to provide a relative perspective (e.g. Service Water pump motors).

The resulting measurements are considered accurate within ½", and those recorded have been rounded down to the next closest ½" based on review of the photographic evidence. The accuracy is therefore +0.5" / -0.0". The photographs are being archived for future records retrieval purposes in EC 279398.

Review

The following sections address each of the components individually, or, when there are two or more components that are substantially identical in form, fit, function, and vertical elevation, they will be grouped together.

For equipment found to be potentially vulnerable due to wetting (i.e. electrical components with bare or potentially bare conductors at or below the 8'-6" elevation), only verifiable evidence in the form of photographs with dimensional references (measuring tape or stick, or items of known verifiable dimension in the view), or controlled drawings will be accepted as proof of acceptability.

Based on the dimensions in the FVR, it is apparent that the various electrical cabinets were not opened and examined for potentially vulnerable components. Instead, the levels reported appear to be based only on the exterior dimensions of the enclosures, cabinets, switchgear, etc.

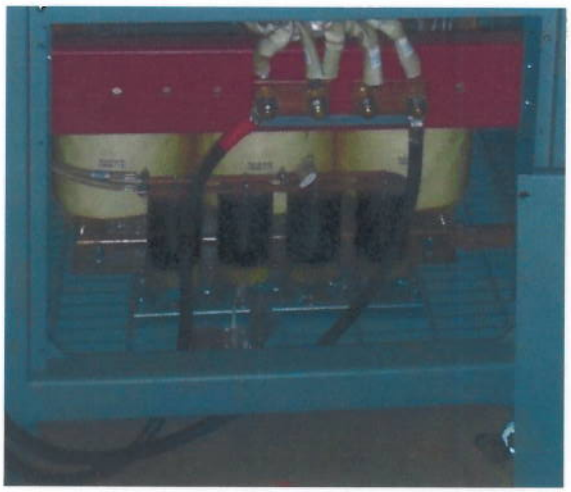
D-07, -08, -09

These components are battery chargers located in the vital switchgear room of the control building. The D-07 and D-08 battery chargers maintain the D-05 and D-06 station service batteries in a charged state. The D-09 charger is a "swing" charger that can, through the use of various cross-ties, supply any of the other vital DC buses in the station.

These battery chargers are identical in configuration, and are air cooled. Air enters open grillwork at the bottom of the enclosures, and is drawn out the open grillwork top of the enclosure by two fans. During

the walkdown, none of the fans on the three chargers were operating, suggesting that they are thermostatically controlled, and that the chargers were not warm enough to require forced air cooling.

However, while electrical components that may be wetted reside higher in the cabinet than the bottom grill (~6-7" above the floor), water level high enough to cut off the air to the cabinet could cause eventual overheating and loss of the charger.



The above photo is the Ametek battery charger in the training building high bay. It is identical to D-07, D-08, and D-09. The bottom front panel has been removed to reveal the construction of the bottom grillwork, and the transformers and capacitors resting on top of the grill. Note the formed steel front rail that is approximately the same height as the grill.

The above photo is a close-up of the base of the D-08 charger (the other two charger installations are dimensionally the same). The bottom of the air inlet grill is at approximately 4.5" above the floor, with the bottom of the electrical components at approximately 6.5" above the floor. Therefore, while

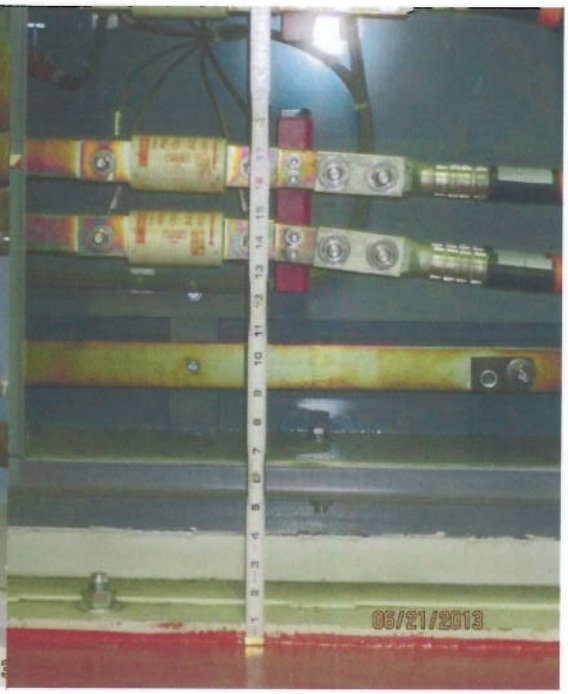
wetting is not an issue, loss of cooling air is a potential problem. This condition was documented in AR 01881477 on 6/11/13 for further evaluation.

D-01/D-02 Vital DC Distribution Panels

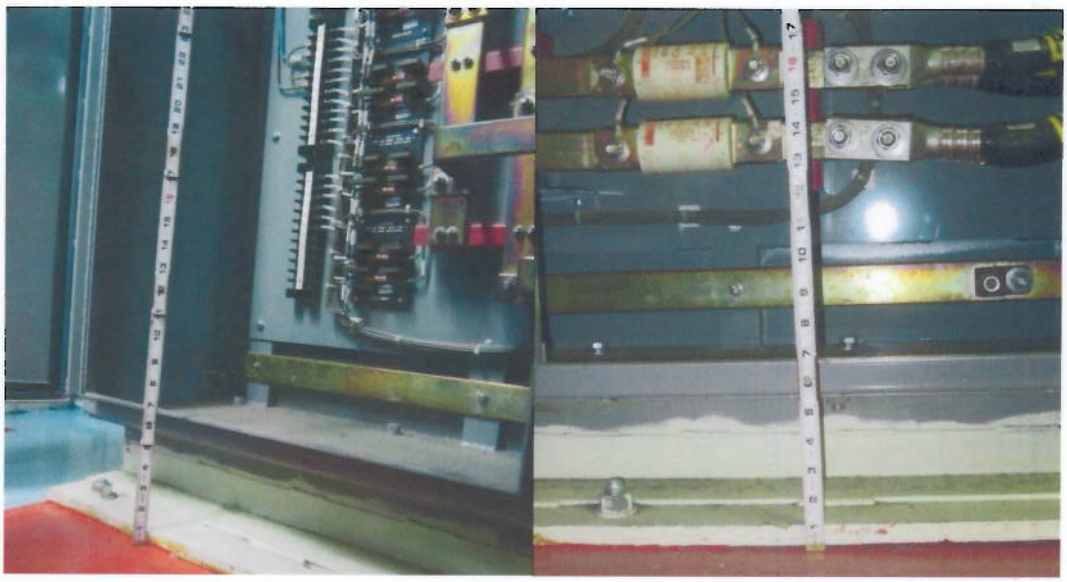
These panels rest on the 8' elevation floor inside the vital switchgear room. The front covers of the panels were removed and measurements taken to establish the lowest wettable energized components. All were confirmed to be more than 12"above the floor.

In the photographs on the following page, the bus bar running across the bottom of the cabinets at approximately 9" above the floor is the ground bus, and is already connected electrically directly to the cabinet.

Interior of D-01 cabinet^



Interior of D-02 cabinet v



D-63 & D-64 125 V DC Distribution Panels

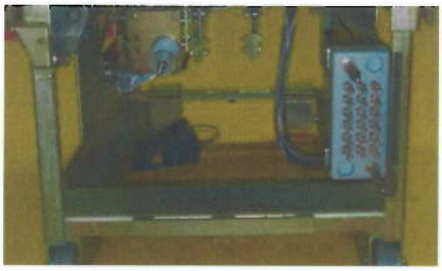
These two panels were modified under ECN 261586 and 260911, respectively, to install insulating end-caps on the exposed bus bar ends to prevent wetting to 18" above the 8' floor elevation.

1-A05, 2-A05

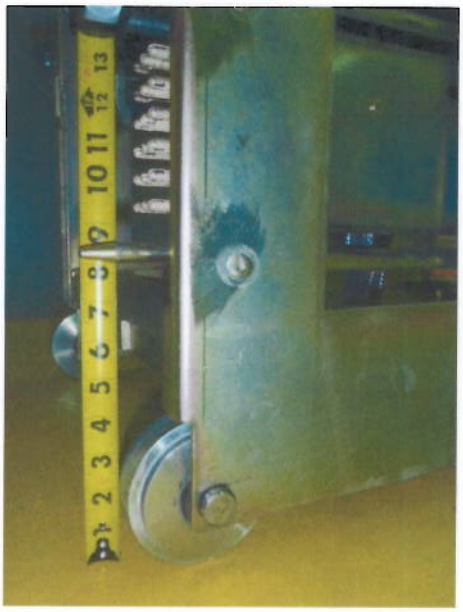
These are the two "A" train Safety Related 4 kV switchgear, one per unit. They are located in the vital switchgear room, and have identical cabinets for each breaker. The 4 kV stabs are located relatively high in the cabinet, with no high voltage components located low down. There is, however, a contact block for making up low voltage stabs that carry control and indication signals to and from the breaker assembly mounted close to the bottom of each enclosure.

The FVR indicated an elevation of 4" for these switchgear.

While the front doors of the switchgear can be opened with a breaker in place, the contact block is obscured from view. The auxiliary contact block is designed to mate with the breaker upon rolling it into the enclosure, and prior to it being "racked" (raised) up into the enclosure. Therefore, to obtain further information, the cover of a spare 4 kV breaker was removed for closer examination:



This is the bottom of the rear of the breaker. At the lower right of the photo is the auxiliary contact block with stabs that mate with the block fixed inside the cubicle. Note that there are no other electrical components below this elevation.



This is a close-up of the same auxiliary contact block showing the longer mechanical indexing pin at ~8.5" above the floor, and the auxiliary electrical stabs at ~9.5" and higher. Therefore, while the FVR lists an elevation of 4", there is no concern for loss of function from wetting by rising water until well above the license basis 5" elevation, and a flood vulnerability elevation of 9" above the 8' floor should be used.

1/2A-03/04 4kV Switchgear

This switchgear is of the same type as the A-05 vital switchgear and is located in the same room. This switchgear receives non-safety related 4kV power from offsite, and distributes it to non-safety related loads and to the safety related A-05 and A-06 switchgear.

Being the same as the A-05 switchgear, and located in the same room, it has the same flood vulnerability of 9" above the 8' elevation floor.

DA-06318A/B-S, DA-06319A/B-S

These are the starting air solenoid valves for emergency diesel generators G-01 and G-02. When energized, they port air to the air starting system and start the EDGs. There are two solenoid valves per EDG, either of which is sufficient to start the diesel. However, they are mounted at the same elevation, and are therefore both vulnerable to shorting/grounding from the same common flood elevation. These are listed in the FVR as being 14" above the 8' elevation floor, and this was confirmed:

EDG starting air solenoid valve (typical)

DA-3057A, B; DA-3058A, B

These are the "Starting Air Starters" for emergency diesel generators G-01 and G-02. One is located underneath each elevated walking platform on each side of each EDG. These are piloted air valves with no external moving parts and no electrical connections or subcomponents. These valves are normally closed, and open to pass starting air to the air start motors when air pressure is applied to the pilot port on the valve.

Therefore, while the components are located at approximately 6" above the floor as indicated in the FVR, they are not subject to failure if wetted or submerged.

C-034, C-035

These are the G-01 and G-02 EDG Alarm & Electrical Panels located in the respective EDG rooms in the control building. They are listed in the FVR as being 5" above the floor elevation. The photographs below show the interior of cabinet C-034 (G-01 EDG Alarm & Electrical Panel). The cabinets rest on raised concrete pads that are ~4.5" inches high.

A review of existing photographs of the back of the cabinets found that they contain potential and current transformers, and that the components are higher than those in the front of the cabinets.

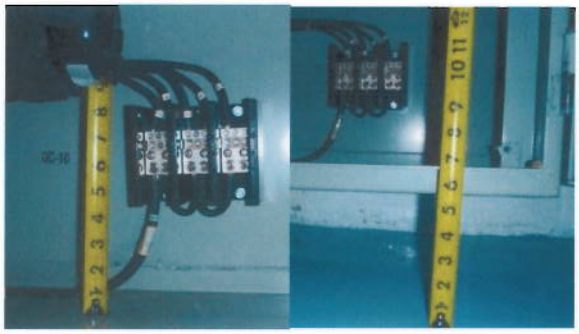
The lowest components vulnerable to wetting by rising water are located approximately 8" above the floor elevation, above the 5" indicated in the FVR, and above the design basis flood level.

C-078, C-079

These are the DC Power Transfer Control Panels for emergency diesel generators G-01 and G-02. These cabinets are simply DC breaker enclosures that house the breakers used to align DC control power to the EDGs. As reported in the FVR, the bottoms of the enclosures are 6" and 4" respectively above the 8' floor elevation.

These breaker enclosures are tall and house 10 breakers each (some are spares). The bottom ~14 inches of the enclosure are covered by a blank panel, with the lowest breaker centered at ~22.5" above the floor. All cabling enters and exits the panels from top penetrations.

Upon removing the bottom panel of C-078, two terminal blocks were identified behind the panel. The lugs on the blocks are approximately 5" from the bottom of the panel, and the bottom of the panel is approximately 5.5" above the floor. Therefore, the lowest vulnerable components in this cabinet are more than 10" above the floor, above the 6" reported in the FVR, and comfortably above the design basis flood level of 5".

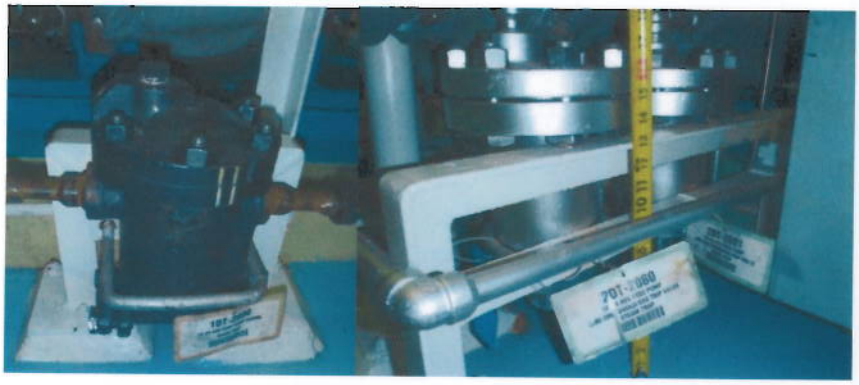


Cabinet C-079 is mounted ~2" lower than C-078, and it is therefore expected that the terminal blocks would be correspondingly lower. However, this still places them ~8" above the floor and 3" above the design basis flood level.

Drain Traps

Several steam traps (1&2DT-2030, 1&2DT-2080, 1&2DT-2081) are listed in the FVR as being 6" or less above the floor elevation. This is factual. However, these components are sealed mechanical devices with no external moving parts, and no electrical components. In functioning, they rely on the differential pressure between the upstream side of the trap and the downstream side. Since this will

remain positive, even under flooding conditions, they will continue to function even if wetted or submerged. Below are photos of three representative steam traps.



Standby Steam Generator Feed Pumps P-38A/B

The motors for these pumps were documented in calculation 2008-0024 as being 18" above the 8' floor slab elevation. Therefore, this evaluation did not revisit these components.

Unit 2 Turbine Driven AFW Pump 2P-29 Suction Pressure Control Panel

Calculation 2008-0024 documented that the gasketed, clamp down cover of this panel would prevent significant water intrusion over short durations (e.g. internal flooding transients), and that a flood vulnerability height of 18" is therefore appropriate for such hazards. However, the lowest terminal strip and other electronic components in the enclosure are 15" from the 8' floor elevation. Therefore, for evaluations of potential long-term flooding risk (e.g. external flood threats), this is the appropriate elevation to use.

VNDG-4151A, B, C, D, E, F

The FVR lists these components at an elevation of 1.5" above the floor grade. These are mechanical gravity dampers that open in response to a small dP across them to admit air to the EDG rooms. They are not subject to failure by wetting or immersion, and are listed only because they are ingress routes for flood waters in excess of 8'. Since water infiltration is presumed, these dampers are not a concern. The following photograph is a view of the dampers from inside one of the two rooms.

From the outside, most of the area of the lower louvers is blocked by concrete missile barriers. However, the lowest barrier is elevated off of the ground to permit free drainage of water from inside

the room to the outside. This same gap would permit free access of external flood water to the inside of the rooms:

G-01 and G-02 Emergency Diesel Generators

The preceding section demonstrated that external flood water has free access to the EDG rooms via the drain paths provided to relieve sources of internal flooding. Additionally, loss of the EDGs themselves can be assumed to occur when the water level reaches relays and terminal blocks located 8" above the room floors in cabinets C-034 and C-035.

Other documents have listed the flood vulnerability elevation of the EDGs themselves as 21" (FVR), 24" (PRA 7.1), and 12" (IPEEE). The bottom of the engine itself, resting on the skid tank, is approximately 24". However, as documented in a previous section of this evaluation, the starting solenoid valves are lower than 24". Additionally, the housing of the air cooled generator driven by the diesel extends lower than the engine. The ventilation openings in the lower arc of the generator housing are not directly accessible for accurate measurement. However, they appear to be ~15" above the floor.

Therefore, based on the above considerations, the EDGs should be assumed to be lost if water level in the rooms reaches 8" above the 8' elevation floor.

RHR Pumps 1/2P-10A/B

These pumps and their motors are located on the -19 foot elevation of the Primary Auxiliary Building (PAB). The FVR categorically omitted equipment located in the PAB. These pumps were also not walked down while preparing this evaluation. If flooding infiltrates the PAB, and if the installed sump pumps are unable to remove the water that collects at the -19' elevation, and if the flooding continues long enough to fill the central area between the four RHR pump cubicles, and then continues to overtop the RHR pump cubicle walls to submerge the pump motors, then these pumps may be lost.

The RHR pumps are not required to reach and maintain safe shutdown conditions (described in early plant licensing documents as equivalent to present day MODE 3). They are, however, required to maintain decay heat removal in MODE 4 (if AFW is not available), 5, 6, and during refueling if irradiated fuel is still in the reactor vessel. They would also be necessary to maintain decay heat removal in the long term containment sump recirculation mode following a loss of coolant accident (LOCA).

RHR Pump Suction Isolation MOVs 1/2-SI-851A/BAccording to the controlled plant equipment database and PRA 7.1, these motor operated valves (MOVs) are located ~108 inches below the 8' elevation in the PAB. The valves are normally closed, and must open to establish containment sump recirculation following a LOCA.

Functional loss of these valves would not occur until after the RHR pumps had already been submerged. As such, they were not walked down to establish a more precise elevation where they may become non-functional.

CC Supply to RHR HX MOVs 1/2-CC-738A/B

These valves (two per unit) are located in the 8' elevation pipeway, and are not readily accessible due to ALARA considerations. However, their elevations and locations are well documented in both the P- and M- series controlled drawings.

Drawings P-153 sheet 1 (unit 1) and M-78 (unit 2) call out the centerline elevation of the horizontal pipes with these valves as 6'-6" (unit 1) and 6' 5-5/8" (unit 2). This is possible because much of the "floor" in the location of these valves is actually diamond tread plate or bar grate suspended above the actual concrete floor elevation of 5'-8" (e.g. drawing M-78).

The valves are 10" class 150# cast steel, mounted with the stem vertical, and are fitted with Limitorque SMB-00 actuators (Velan drawing 83309). This drawing does not provide sufficient dimensioned detail to establish exactly how far the motor, electrical contacts, switches, and terminal box is located above the valve body. However, with the centerline of the valve located ~18" below the 8' elevation, it is apparent that the motor and other electrical components would be several inches above the 8' elevation.

PRA 7.1 lists the flooding vulnerability elevation of these MOVs as 10" above the 8' elevation. These valves must be repositioned from their normally closed position to the open position when transitioning onto RHR decay heat removal. If water had reached any significant height above the 8' elevation, then the RHR pumps would already be submerged by ~25 feet of water. Therefore, obtaining the exact flood submergence elevation for these valves is irrelevant, and the 10" listed in the PRA notebook is acceptable for continued use.

Charging Pumps 1/2-P2A/B/C

The three charging pumps in each unit, along with their driving motor, sit atop steel frames which in turn rest on an elevated concrete or grout pad. Because of this, PRA 7.1 lists the flood failure height as 20" above the 8' floor elevation. However, the variable speed controller cabinets for the charging pump motors rest directly on the floor. Examination of the interior of a variable frequency controller cabinet found three transformers with exposed taps that would be wetted by water accumulating to ~4" above the floor:

1/2B-32 Safety Related 480V Motor Control Centers

These MCCs are located on the 8' elevation of the PAB, and rest on bases that are ~12" high. To determine the flooding vulnerability, a spare breaker cubicle located on the bottom of the MCC was opened:

With a breaker receptacle ("bucket") installed, the lowest wettable electrical component would be >12" above the floor elevation. The bus bars at the back of the cubicle can be seen to extend downward no further than 19.5" above the floor. Therefore, these MCCs can be assumed to not be affected until rising water reaches more than 12". This is the same as the value listed in the PRA notebook on internal flooding.

B-33, B-34 Non-Safety Related 480V Motor Control Centers

These MCCs have are the same configuration as the SR MCCs, and are also located on the same elevation. Therefore, the PRA notebook listed value of >12" is appropriate. None of the components powered from these MCCs is needed for safe shutdown or long term containment sump recirculation.

Steam Generator Feed Pumps and Supporting Auxiliaries

PRA 7.1 lists flood vulnerability elevations for the steam generator feed pumps (SGFPs), their seal water injection pumps, and their AC lube oil pumps. The AC lube oil pumps were eliminated when new SGFPs were procured to support EPU. These components are not necessary for safe shutdown or long term containment sump recirculation. As such, they are not revisited by this evaluation.

Air Compressors

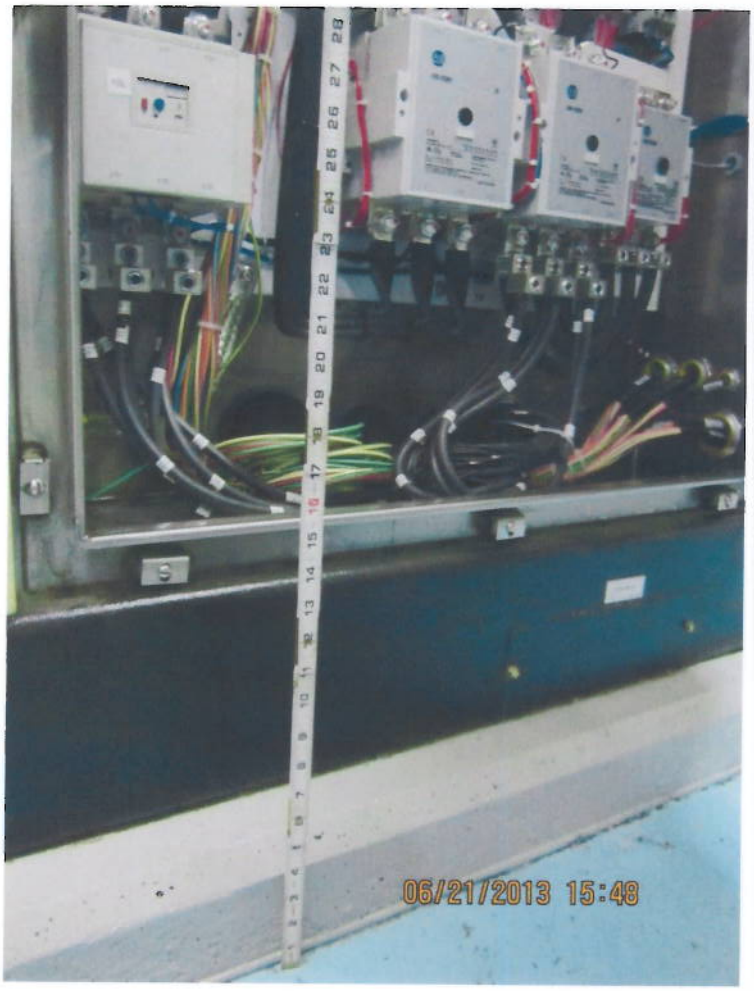
The availability of air compressors can have significant effect on PRA outcomes due to the ability to maintain long term automatic AFW operation, and to affect a primary feed-and-bleed if instrument air is available. Accordingly, these components were walked down to confirm the appropriate flood vulnerability elevations.

K-3B Service Air Compressor

This is the remaining original service air compressor, and it sits on an ~18" high concrete pedestal. However, there is a metal junction box mounted on the side of the pedestal that connects to the control panel. This box was opened, and it was confirmed that there are two terminal strips with numerous exposed terminated lugs as low as 12.5" above the floor:

K-3A Service Air Compressor

This is the new replacement service air compressor, and it is completely enclosed. The flood vulnerability elevation for this component is listed as 18" in the PRA internal flooding notebook. Panels on the enclosure were removed to examine the control components and to verify whether there are any potentially vulnerable exposed components within the enclosure. The examination concluded that all controls are insulated to above the 18" elevation, and that there are no potentially vulnerable electrical or mechanical subcomponents below 18".



Interior of K-3A control cabinet

K-2A, B Instrument Air Compressors

These two compressors are identical, and sit on elevated concrete pedestals that are ~12" tall. The lowest electrical portion of the compressors potentially vulnerable to wetting is the motor, with a lower end-bell tangent of 16". This is slightly lower than the 18" listed in the PRA internal flooding notebook. Absent any additional clarifying information, 16" is a more appropriate elevation to use.

P-35B Diesel Fire Pump

The diesel driven fire pump prime mover is located well above the 7' elevation floor slab in the pump house. The starting battery terminals were examined and found to be slightly less than 18" above the floor:

This is higher than the lowest un-insulated terminal strips in the DFP control panel (C-61), which are slightly more than 16" above the 7' floor:

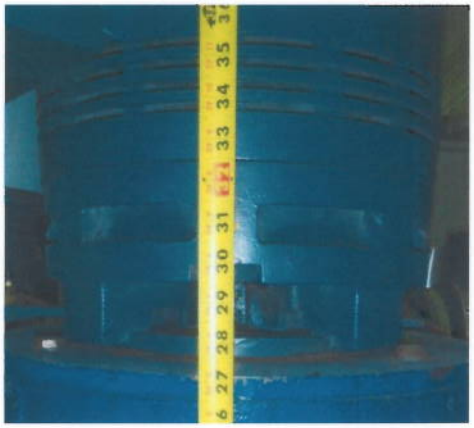
Therefore, a value of 16" should be used for flood risk assessments.

1/2P-25A, B Condensate Pumps

PRA 7.1 lists flood vulnerability elevations for the condensate pumps as 17". These components are not necessary for safe shutdown or long term containment sump recirculation. As such, they are not revisited by this evaluation.

P-32A, B, C, D, E, F Service Water Pump Motors

These six pumps are required for decay heat removal, regardless of plant mode. The vertical axis turbine pumps are located in the pump house, with the motors mounted on top of the pump discharge head. This places them relatively high above the floor slab. While the windings in these induction motors are insulated and would likely withstand wetting and submersion up to the point that the junction boxes at the motor mid-plane would be wetted, the bottom of the motor end bell housing where the windings end was used. As shown in the photo below, this was determined to be 29" above the 7' floor elevation (17" above the 8' elevation). Multiple photos were taken to obtain a parallax free view, and this was found to be the best photo for the purpose.



1D-202 125 V DC Distribution Panel

Located on the 8' elevation of the Unit 1 turbine building, this DC distribution panel is listed in PRA 7.1. MDB 3.2.12 lists the loads from this panel as being 6 spares, power to the maintenance electrical shop DC receptacle, power to the 4 kV breaker test station (both the 8' and the 26' elevations), and power to the Unit 1 air side seal oil backup pump (1P-59B). None of these loads are required or beneficial in reaching or maintaining safe shutdown, mitigating the consequences of accidents, or in minimizing the risk of core damage. Therefore, it was not examined further by this evaluation.

1/2P-29 Turbine Driven AFW Pumps

These pumps and their prime movers were documented as being 18" or more above the 8' elevation floor in calculation 2008-0024. Therefore, this evaluation did not examine them any further. It should be noted however, that the low suction pressure control panel for the unit 2 pump (2C-197) contains vulnerable components lower than 18". See previous discussion on 2C-197 for further details.

1/2P-14A/B Containment Spray Pumps

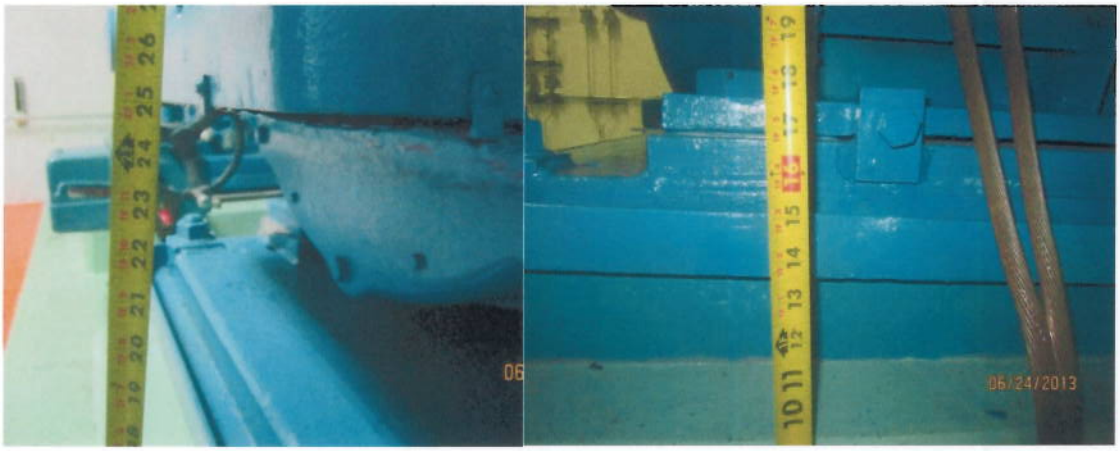
These components are mounted on skids on the 8' elevation of the PAB. PRA 7.1 lists their flood vulnerability elevation as 18" above the floor, and the IPEEE assumed that their function would be lost with 12" of water on the 8' elevation floor. However, they are not required to reach and maintain safe shutdown, to remove decay heat during long term containment sump recirculation, and they have no impact on core damage frequency (CDF) or large early release frequency (LERF). As such, this evaluation did not examine them further.

1/2P-15A/B Safety Injection Pumps

These pumps and their motors are mounted on skids on the 8' elevation of the PAB. In the absence of charging pumps (which are not credited) they are necessary to make up to the RCS for leakage and shrinkage, and are used to perform a primary feed-and-bleed in the event that a secondary heat sink is not available. As such, they are risk significant components.

The PRA notebook on internal flooding uses a flood vulnerability elevation of 24" for these components, while the IPEEE assumed 12" would result in a loss of their function. A walkdown of these pumps found that the lowest vulnerable subcomponent would be the motors. These air cooled components have ventilation openings located at both 19" and 24" above the 8' floor elevation. Therefore, the lower level of 19" is the appropriate flood elevation to use for these pumps.

The first photograph shows the end-bell of one of the HHSI pump motors. The downward facing screened opening is 24-25" above the floor, while the lower tangent of the motor casing is slightly above the 19" elevation. The second photo shows the lower ventilation opening on the side of the motor casing, slightly more than 19" above the 8' floor.

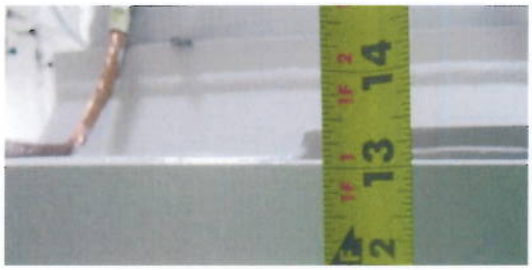


1/2P-53 Motor Driven AFW Pumps

These pumps and their motors are mounted on skids on the 8' elevation of the PAB. They were installed after the IPEEE was performed, and PRA 7.1 lists their flood vulnerability elevation as 20" above the 8' elevation floor.

Additional walk downs were performed to more closely examine the installation. The pump motors are air cooled, with lower ventilation openings 7" above the top of the mounting baseplate:

The top of the baseplate is 13" above the 8' elevation floor, for a total height of 20".



The 20" elevation is consistent with PRA 7.1.

P-35A Electric Driven Fire Pump

This component, located in the pump house, is a vertical shaft pump. It is not listed in any of the three previous documents concerned with flood elevation, and was walked down for completeness of information.

The ventilation openings at the bottom of the top mounted motor were found to be 22" above the 7' elevation floor (10" above the 8' elevation):

SW Pump Alternate Power Selector and Transfer Switches

(B854D, B311C-B854D, B334B-B854D)

These three manual switches are all located in the G-01 EDG room. Each switch enclosure has a corresponding pulling box located below it that permits splitting out the cables entering the enclosure from the large diameter conduits into three smaller knock-outs in the enclosure bottoms.

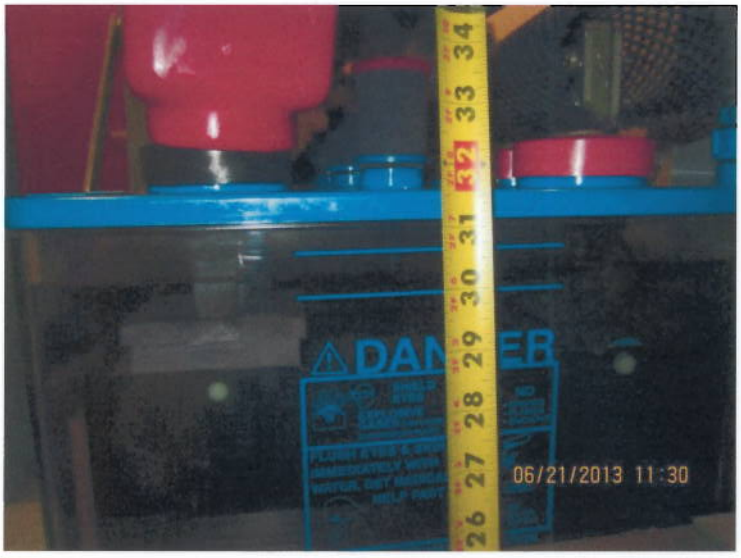
Due to safety considerations, the switch enclosures were not opened for closer inspection. The external bottoms of the switch enclosures were found to be 23" above the 8' elevation floor, consistent with the FVR. 480 V panel component spacing and cable bend radius requirements dictate that any terminations for the power cables entering the bottom of the enclosures would necessarily be considerably more than an inch above the bottom of the enclosures. Therefore, it is reasonable to use a vulnerable flood elevation greater than 24" above the 8' floor. This is higher than the vulnerable flood elevation of the motors supplied (P-32B/F), making the pump motors themselves the limiting components.

C-207 Alternate Shutdown Inverter A/B Instrument Panel

This component is listed only in the FVR. It is used only in the case of an event (such as a fire) that renders the control room uninhabitable and necessitates alternate shutdown from outside of the control room. A flooding event would not cause such a condition. Therefore, it was not examined further for this evaluation.

D-05 & D-06 Station Batteries

These lead acid batteries are contained in clear plastic jars mounted in seismic racks. The jars are inherently insulated, and the exposed terminals and bus bars are greater than 31.5" above the floor elevation:



Summary

The data developed above is included in the attached spreadsheet for ease of use when constructing risk models.

Prepared by: T.C. KENDALL / T.C. Kendall 7/9/13.

Verified by: Matt LeMay / Matthew E LeMay 7/9/13.

Approved by: Mike Ley / Mike Ley 7/9/13.

All heights listed are inches relative to the 8' elevation floor.

Component ID	Noun Name	Equipment Location	FVR	PRA 7.1	IPEEE	**Failure Height**	Basis	Notes
1/2P-10A,B	RHR Pumps	-19/PAB		-294	12	-294	PRA 7.1	Not required for safe shutdown
1/2SI-851A/B	RHR Pump Suction from Ctmt Sump B	-5/PAB/RHR pipway		-108		-108	PRA 7.1	RHR pumps would fail first.
1/2P-2A,B,C	Charging Pumps	8/PAB/CHG pump rm		20		4	Eng Eval EC 279398	Not required for safe shutdown. 1/2P-2A,B,C-Z Variable frequency drive cabinets are right on the floor, with a transformer in the bottom and an air vent in the cabinet door: failure at 4"
D-07/D-08/D-09	Station Battery Chargers	8/CB/VSG rm	6	7		4.5	Eng Eval EC 279398	Eng Eval 279398 identifies that cooling to the chargers would be lost at a water level of 4.5 inches above the floor.
G-01	Unit 1 A train EDG	8/CB/G-01 rm	21	24	12	8	C-34	W/D found lower tangent of air-cooled generator at approximately 15" above floor. Not relevant, since flooding to ~8" would result in loss of associated exciter / EDG control circuitry (6/11/13 w/d). 3-phase leads from generator to control cabinet may be submerged for at least 7 days without loss of functionality per system engineer.
G-02	Unit 2 A train EDG	8/CB/G-02 rm	21	24	12	8	C-35/C-79	W/D found lower tangent of air-cooled generator at approximately 15" above floor. Not relevant, since flooding to ~8" would result in loss of associated exciter / EDG control circuitry (6/11/13 w/d). 3-phase leads from generator to control cabinet may be submerged for at least 7 days without loss of functionality per system engineer.
C-34/C-35	G-01/G-02 EDG Alarm & Electrical Panels	8/CB/EDG rm	5			8	Eng Eval EC 279398	6-11-13 walkdown confirmed height of lowest relay and fuse block slightly more than 8" above floor. 3-phase leads from generator to control cabinet may be submerged without immediate loss of functionality. System engineer indicates minimum of 7 days until failure.

Component ID	Noun Name	Equipment Location	FVR	PRA 7.1	IPEEE	**Failure Height**	Basis	Notes
C-79	G-02 EDG DC Power Transfer Control Panel	8/CB/G-02 rm	4			8	Eng Eval EC 279398	6-11-13 walkdown confirmed terminal blocks with uninsulated lugs located below lowest breaker.
1/2A-03	4.16 kV Switchgear	8/CB/VSG rm		7		9	Eng Eval EC 279398	Not required for safe shutdown. Identical to A-05.
1/2A-04	4.16 kV Switchgear	8/CB/VSG rm		7		9	Eng Eval EC 279398	Not required for safe shutdown. Identical to A-05.
1/2A-05	4.16 KV Vital Switchgear (Train A)	8/CB/VSG rm	4	4	12	9	Eng Eval EC 279398	The lowest uninsulated electrical components (auxiliary contact block and associated stabs) are slightly higher than 9" above the floor.
1/2CC-738A,B	1/2HX-11A,B RHR HX Shell Side Inlet valves	8/PAB/pipeway 2/3		10		10	PRA 7.1	Not required for safe shutdown and RHR pumps would fail first.
C-78	G-01 EDG DC Power Transfer Control Panel	8/CB/G-01 rm	6			10	Eng Eval EC 279398	6-11-13 walkdown confirmed terminal blocks with uninsulated lugs located below lowest breaker.
P-35A	Electric Fire Pump	7/CWPH/SW bldg				10	Eng Eval EC 279398	Cooling air inlets are 22" above CWPH floor; 10" above 8' elevation.
B-33, B-43	Non-SR 480V MCCs	8/PAB/BA Evap area		12		12	PRA 7.1	Not required for safe shutdown
1/2P-99A,B	SGFP Seal Water Injection Pumps	8/TB		12		12	PRA 7.1	Not required for safe shutdown
1/2B-32	480V MCC PAB Safeguards	8/PAB/CHG pump area		>12		>12	Eng Eval EC 279398	Lowest energized buswork at 19.5"; bottom row of breakers may fail individually between 12" and 19.5"
D-01/D-02	125V DC Distribution Panels	8/CB/VSG rm	12	7		12.5	Eng Eval EC 279398	PRA Notebook indicates that a follow-on walkdown found the exposed wires inside the enclosure are ">~12 inches above floor."
K-3B	Service Air Compressor	8/CB/Air Comp rm		18		12.5	Eng Eval EC 279398	Motor at 21"; lowest contact in C-717, K-3B junction box, is 12.5"
DA-06318A,B-S	G-01 EDG Starting air solenoids	8/CB/G-01 rm	14			14	Eng Eval EC 279398	6-7-13 walkdown confirmed height ~14" above floor

Component ID	Noun Name	Equipment Location	FVR	PRA 7.1	IPEEE	**Failure Height**	Basis	Notes
DA-06319A,B-S	G-02 EDG Starting air solenoids	8/CB/G-02 rm	14			14	Eng Eval EC 279398	6-7-13 walkdown confirmed height ~14" above floor
1/2P-73A,B,C,D	SGFP AC Lube Oil Pumps	8/TB		14		14	PRA 7.1	No longer installed.
2C-197	2-P29 AFP Suction Pressure Control Panel	8/CB/AFP rm	14	12		15 / 18	Eng Eval EC 279398 / Calculation 2008-0024	A terminal strip and other components are at about 15" from the floor. The box is of clamp-down, gasketed design with no openings below 18", thus significant water intrusion is not expected from transient flooding, but may occur during long-term flooding.
K-2A,B	Instrument Air Compressors	8/CB/Air Comp rm		18		16	Eng Eval EC 279398	Walkdown photos show lower tangent of motor endbell at 16" above floor slab.
P-35B	Diesel Fire Pump	7/CWPH/SW bldg				>16	Eng Eval EC 279398	Lowest connections in the bottom portion of control panel C-61
1P-25A,B	Unit 1 Condensate Pumps	3/TB1		17		17	PRA 7.1	Not required for safe shutdown
P-32A,B,C,D,E,F	SW Pumps	7/CWPH/SW bldg	>12		12	17	Eng Eval EC 279398	The tops of the pumps are 25" above the 7' elevation (in the CWPH). The bottom 4" of the motors (stacked on top of the pumps) are structural and below the elevation of energized windings.
D-63	125V DC Distribution Panel	8/CB/AFP rm	9	11		18	ECN 261586	PRA Notebook indicates that a follow-on walkdown found the exposed wires inside the enclosure are ">~12 inches above floor." ECNs 261586 and 260911 added heat shrink end caps to the bottom of the bus bars, affording flood protection >18" for these panels.
D-64	125V DC Distribution Panel	8/CB/AFP rm	9	9.5		18	ECN 260911	PRA Notebook indicates that a follow-on walkdown found the exposed wires inside the enclosure are ">~12 inches above floor." ECNs 261586 and 260911 added heat shrink end caps to the bottom of the bus bars, affording flood protection >18" for these panels.

Component ID	Noun Name	Equipment Location	FVR	PRA 7.1	IPEEE	**Failure Height**	Basis	Notes
P-38A,B	MD SSGFPs	8/CB/AFP rm	20	18	12	18	Calculation 2008-0024	Motors are 18" above floor
1D-202	125V DC Distribution Panel	8/TB1		18		18	PRA 7.1	Not required for safe shutdown
1P-29	TD AFW Pump	8/CB/AFP rm		18		18	Calculation 2008-0024	Bottoms of pump components at 18" from floor.
2P-29	TD AFW Pump	8/CB/AFP rm		14		18	Calculation 2008-0024	Bottoms of pump components at 18" from floor.
K-3A	Service Air Compressor	8/CB/Air Comp rm		18		18	PRA 7.1	Verified by 6/21/13 WO Walkdown, which showed no vulnerable components below 18" in associated control panel, C-49, or within air compressor housing.
1/2P-14A,B	Containment Spray Pumps	8/PAB/spray pump area		18	12	18	PRA 7.1	Not required for safe shutdown
1/2P-15A,B	Safety Injection Pumps	8/PAB/SI Pump area		24	12	19	Eng Eval EC 279398	Side air vent openings
1/2P-53	Motor Driven AFW Pumps	8/PAB/AFP area		20		20	Eng Eval EC 279398	Bottoms of cooling air intake located 20" from floor
1/2P-28A,B	Steam Generator Feed Pumps	8/TB		24		24	PRA 7.1	Not required for safe shutdown
B854D	P-32B/F SW Pump Alt Pwr Selector Switch	8/CB/G-01 rm	23			>24	Eng Eval EC 279398	Enclosures are bottom-fed; Cable terminations are well above the bottom of the enclosures, more than 24" above the floor.
B311C-B854D	P-32B SW Pump Alt Pwr Transfer Switch	8/CB/G-01 rm	23			>24	Eng Eval EC 279398	Enclosures are bottom-fed; Cable terminations are well above the bottom of the enclosures, more than 24" above the floor.
B334B-B854D	P-32F SW Pump Alt Pwr Transfer Switch	8/CB/G-01 rm	23			>24	Eng Eval EC 279398	Enclosures are bottom-fed; Cable terminations are well above the bottom of the enclosures, more than 24" above the floor.

Component ID	Noun Name	Equipment Location	FVR	PRA 7.1	IPEEE	**Failure Height**	Basis	Notes
D-05/D-06	125V DC Train A Station Batteries	8/CB/Batt rms		36		31.5	Eng Eval EC 279398	Measured to just below the battery terminals.
DA-3057A,B	G-01 EDG Starting air starters	8/CB/G-01 rm	6			n/a	Eng Eval EC 279398	Air relay is an enclosed mechanical device not subject to failure by immersion
DA-3058A,B	G-02 EDG Starting air starters	8/CB/G-02 rm	6			n/a	Eng Eval EC 279398	Air relay is an enclosed mechanical device not subject to failure by immersion
C-207	Alternate shutdown inverter A/B inst. Pnl	8/CB/AFP rm	21			n/a	Eng Eval EC 279398	Only used for alternate safe shutdown (Appendix R events)
1DT-2030	1P-29 AFP turbine casing drain trap	8/CB/AFP rm	5			n/a	Eng Eval EC 279398	Drain traps are mechanical, not electric, devices. The moving parts are enclosed inside a sealed pressure vessel (i.e. a valve body). They are not subject to loss of function due to immersion. Pressure upstream of the trap will remain higher than the submergence backpressure and they will continue to operate as intended.
2DT-2030	2P-29 AFP turbine casing drain trap	8/CB/AFP rm	4			n/a	Eng Eval EC 279398	Drain traps are mechanical, not electric, devices. The moving parts are enclosed inside a sealed pressure vessel (i.e. a valve body). They are not subject to loss of function due to immersion. Pressure upstream of the trap will remain higher than the submergence backpressure and they will continue to operate as intended.
1/2DT-2080	1/2P-29 MS-2082 overspeed trip drain traps	8/CB/AFP rm	6			n/a	Eng Eval EC 279398	Drain traps are mechanical, not electric, devices. The moving parts are enclosed inside a sealed pressure vessel (i.e. a valve body). They are not subject to loss of function due to immersion. Pressure upstream of the trap will remain higher than the submergence backpressure and they will continue to operate as intended.

Component ID	Noun Name	Equipment Location	FVR	PRA 7.1	IPEEE	Failure Height	Basis	Notes
1DT-2081	1P-29 MS-2082 overspeed trip drain trap	8/CB/AFP rm	5			n/a	Eng Eval EC 279398	Drain traps are mechanical, not electric, devices. The moving parts are enclosed inside a sealed pressure vessel (i.e. a valve body). They are not subject to loss of function due to immersion. Pressure upstream of the trap will remain higher than the submergence backpressure and they will continue to operate as intended.
2DT-2081	2P-29 MS-2082 overspeed trip drain trap	8/CB/AFP rm	6			n/a	Eng Eval EC 279398	Drain traps are mechanical, not electric, devices. The moving parts are enclosed inside a sealed pressure vessel (i.e. a valve body). They are not subject to loss of function due to immersion. Pressure upstream of the trap will remain higher than the submergence backpressure and they will continue to operate as intended.
VNDG-4151A,B,C	G-01 EDG Room Outside Air Dampers	8/CB/G-01 rm	1.5			n/a	Eng Eval EC 279398	These mechanical dampers are not subject to loss of function by immersion. They were included in the FVR due to their being a potential in-leakage path.
VNDG-4151D,E,F	G-02 EDG Room Outside Air Dampers	8/CB/G-02 rm	1.5			n/a	Eng Eval EC 279398	These mechanical dampers are not subject to loss of function by immersion. They were included in the FVR due to their being a potential in-leakage path.

References

FVR: NEE05-PR-003 Rev 0, "Flooding Vulnerability Report" prepared for Point Beach by Enercon Services, Inc.

PRA 7.1: PRA 7.1 Rev 0, "Internal Flooding Notebook"

IPEEE: REP-0699-C "PBNP Individual Plant Examination of External Events for Severe Accident Vulnerabilities" Section 5.2 Floods