	<h2 style="margin: 0;">Calculation Signature Sheet</h2>
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Document Information

NSPM Calculation (Doc) No: ENG-ME-759		Revision: 0
Title: GOTHIC INTERNAL FLOODING CALCULATION FOR THE TURBINE BUILDING		
Facility: <input type="checkbox"/> MT <input checked="" type="checkbox"/> PI	Unit: <input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2	
Safety Class: <input checked="" type="checkbox"/> SR <input type="checkbox"/> Aug Q <input type="checkbox"/> Non SR		
Special Codes: <input type="checkbox"/> Safeguards <input type="checkbox"/> Proprietary		
Type: Calc Sub-Type:		

NOTE: Print and sign name in signature blocks, as required.

Major Revisions

EC Number: 15475	<input checked="" type="checkbox"/> Vendor Calc
Vendor Name or Code: MPR Associates	Vendor Doc No: 1067-0022-0011, Rev 1
Description of Revision: Initial Issue	
The following calculation and attachments have been reviewed and deemed acceptable as a legible QA record <input checked="" type="checkbox"/>	
Prepared by: <i>David J. Potter</i>	Date: 1/28/2010
Reviewed by: <i>Bill Scholberg</i>	Date: 1/28/2010
Type of Review: <input checked="" type="checkbox"/> Design Verification <input type="checkbox"/> Tech Review <input type="checkbox"/> Vendor Acceptance	
Method Used (For DV Only): <input checked="" type="checkbox"/> Review <input type="checkbox"/> Alternate Calc <input type="checkbox"/> Test	
Approved by: <i>Senja K. Myers</i>	Date: 1/28/2010

Minor Revisions

EC No:	<input type="checkbox"/> Vendor Calc:
Minor Rev. No:	
Description of Change:	
Pages Affected:	
The following calculation and attachments have been reviewed and deemed acceptable as a legible QA record <input type="checkbox"/>	
Prepared by:	Date:
Reviewed by:	Date:
Type of Review: <input type="checkbox"/> Design Verification <input type="checkbox"/> Tech Review <input type="checkbox"/> Vendor Acceptance	
Method Used (For DV Only): <input type="checkbox"/> Review <input type="checkbox"/> Alternate Calc <input type="checkbox"/> Test	
Approved by:	Date:

(Continued on next page)

Record Retention: Retain this form with the associated calculation for the life of the plant.



Calculation Signature Sheet

EC No:	<input type="checkbox"/> Vendor Calc:
Minor Rev. No:	
Description of Change:	
Pages Affected:	
The following calculation and attachments have been reviewed and deemed acceptable as a legible QA record	<input type="checkbox"/>
Prepared by:	Date:
Reviewed by:	Date:
Type of Review: <input type="checkbox"/> Design Verification <input type="checkbox"/> Tech Review <input type="checkbox"/> Vendor Acceptance	
Method Used (For DV Only): <input type="checkbox"/> Review <input type="checkbox"/> Alternate Calc <input type="checkbox"/> Test	
Approved by:	Date:

EC No:	<input type="checkbox"/> Vendor Calc:
Minor Rev. No:	
Description of Change:	
Pages Affected:	
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Prepared by:	Date:
Reviewed by:	Date:
Type of Review: <input type="checkbox"/> Design Verification <input type="checkbox"/> Tech Review <input type="checkbox"/> Vendor Acceptance	
Method Used (For DV Only): <input type="checkbox"/> Review <input type="checkbox"/> Alternate Calc <input type="checkbox"/> Test	
Approved by:	Date:

EC No:	<input type="checkbox"/> Vendor Calc:
Minor Rev. No:	
Description of Change:	
Pages Affected:	
The following calculation and attachments have been reviewed and deemed acceptable as a legible QA record	<input type="checkbox"/>
Prepared by:	Date:
Reviewed by:	Date:
Type of Review: <input type="checkbox"/> Design Verification <input type="checkbox"/> Tech Review <input type="checkbox"/> Vendor Acceptance	
Method Used (For DV Only): <input type="checkbox"/> Review <input type="checkbox"/> Alternate Calc <input type="checkbox"/> Test	
Approved by:	Date:

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Calculation Signature Sheet

NOTE: This reference table is used for data entry into the PassPort Controlled Documents Module reference tables (C012 Panel). It may also be used as the reference section of the calculation. The input documents, output documents and other references should all be listed here. Add additional lines as needed by using the "TAB" key and filling in the appropriate information in each column.

Reference Documents (PassPort C012 Panel from C020)

#	Controlled* Doc? + Type	Document Name	Document Number	Doc Rev	Ref Type
1	<input type="checkbox"/>	GOTHIC Containment Analysis Package User Manual Version 7.2.a (QA).			<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
2	<input checked="" type="checkbox"/> Calc	Turbine Compartment HELB Compartment Volumes.	ENG-CS-168	0	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
3	<input checked="" type="checkbox"/> Calc	Effects of Flooding in the AFW Pump Room from a Postulated Pipe Rupture	ENG-ME-586	0	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
4	<input checked="" type="checkbox"/> Draw	TURBINE SUPPORT CONCRETE OUTLINE UNIT 1	NF-38210-4	F	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
5	<input checked="" type="checkbox"/> Draw	TURBINE RM CONCRETE PLAN OF UNIT #1 BASE SLAB FLOOR DRAINS	NF-38212	F	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
6	<input checked="" type="checkbox"/> Draw	TURBINE RM CONC-PLAN OF BASE SLAB FL DR-CLASS#1 AR EA TURBINE ROOM-CONCR	NF-38213	G	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
7	<input checked="" type="checkbox"/> Draw	TURBINE RM CONC PLAN OF BASE SLAB FL DRAINS	NF-38214	E	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
8	<input checked="" type="checkbox"/> Draw	TURBINE RM CONCRETE FOUNDATION PLAN OF UNIT #1	NF-38215-1	D	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
9	<input checked="" type="checkbox"/> Draw	TURBINE RM CONC-FOUNDATION PLAN OF UNIT#2	NF-38215-3	76	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
10	<input checked="" type="checkbox"/> Draw	TURBINE RM CONC-FOUNDATION PLAN OF UNIT#1	NF-38215-14	J	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
11	<input checked="" type="checkbox"/> Draw	TURBINE RM CONC-FOUNDATION PLAN OF	NF-38215-19	C	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output

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Calculation Signature Sheet

12	<input checked="" type="checkbox"/> Draw	UNIT#2 TURBINE RM CONC-EQUIPMENT PLAN @ 679'-0" OF UNIT#1	NF-38221-1	76	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
13	<input checked="" type="checkbox"/> Draw	TURBINE RM CONC-EQUIPMENT PLAN @ 679'-0" OF UNIT#2	NF-38221-2	76	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
14	<input checked="" type="checkbox"/> Draw	TURBINE ROOM CONCRETE EQUIPMENT PLAN EL 695' -0" UN IT 1	NF-38221-3	S	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
15	<input checked="" type="checkbox"/> Draw	TURBINE RM CONC-EQUIPMENT PLAN @ 695'-0" OF UNITS# 1 & 2	NF-38221-4	76	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
16	<input checked="" type="checkbox"/> Draw	TURBINE ROOM CONCRETE EQUIPMENT PLAN EL 695' -0" UN IT 2	NF-38221-5	M	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
17	<input checked="" type="checkbox"/> Draw	TURBINE RM CONC-EQUIPMENT FNDN SECT & DTLS OF UNIT S#1 & 2	NF-38221-8	E	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
18	<input checked="" type="checkbox"/> Draw	TURBINE ROOM-CONCRETE BATTERY ROOM EQUIP-PLAN & SE C	NF-38221-10	J	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
19	<input checked="" type="checkbox"/> Draw	TURB RM EQUIP FDN SECTS & DETAILS UNIT 2	NF-38221-11	76	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
20	<input checked="" type="checkbox"/> Draw	ARCHITECTURAL GROUND FLR.PLAN @ EL. 695'-0"	NF-38500	T	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
21	<input checked="" type="checkbox"/> Draw	GENERAL ARRANGEMENT GROUND FLOOR- EAST	NF-39202	77	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
22	<input checked="" type="checkbox"/> Draw	GENERAL ARRANGEMENT GROUND FLOOR- WEST	NF-39203	76	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
23	<input checked="" type="checkbox"/> Draw	MISCELLANEOUS DRAIN & VENT PIPING-UNIT 1, GROUND F LOOR PLAN	NF-39303-1	L	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
24	<input checked="" type="checkbox"/> Draw	MISCELLANEOUS DRAIN & VENT PIPING UNIT 1, PLAN 695', DETAIL, ISOMETRIC	NF-39303-2	K	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
25	<input checked="" type="checkbox"/> Draw	AUX. BLDG. SLAB DRAIN PIPING UNIT 1 & 2	NF-39336-1	R	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
26	<input checked="" type="checkbox"/> Draw	D5/D6 BLDG CONCRETE BASEMENT FLOOR PLAN AT EL.687' -0"	NF-116982	A	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output
27	<input checked="" type="checkbox"/> Draw	D5/56 BUILDING CONCRETE GROUND FLOOR	NF-116983	0	<input checked="" type="checkbox"/> Input <input type="checkbox"/> Output

Record Retention: Retain this form with the associated calculation for the life of the plant.



Calculation Signature Sheet

		PLAN AT EL. 695' 0"						
28	<input checked="" type="checkbox"/> Draw	D5/D6 BLDG ARCHITECTURAL GROUND FLOOR PLAN E L. 695' -0"	NF-117017	A		<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	
29	<input checked="" type="checkbox"/> Draw	D5/D6 BLDG GEN ARRANGEMENT FUEL OIL STORAGE AND BASEMENT	NF-118219	A		<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	
30	<input checked="" type="checkbox"/> Draw	D5/D6 BLDG GEN ARRANGEMENT GROUND FLOOR EL.	NF-118220	C		<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	
31	<input checked="" type="checkbox"/> Draw	D5/D6 BLDG GEN ARRANGEMENT ELEVATION	NF-118225	A		<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	
32	<input checked="" type="checkbox"/> Draw	D5/D6 BLDG GEN ARRANGEMENT ELEVATION	NF-118226	A		<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	
33	<input checked="" type="checkbox"/> Draw	FLOOD PROTECTION KEY PLAN AND DETAILS	NF-173000	C		<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	
34	<input checked="" type="checkbox"/> Draw	TURBINE BUILDING COMPARTMENT PLAN - ELEVATION 695'	NH-172997-9	0		<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	
35	<input type="checkbox"/>	GOTHIC Analysis Software Installation	Computer Work Order CWO-8641,			<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	
36	<input type="checkbox"/>	"Flow of Fluid through Valves, Fittings, and Pipe," Crane Technical Paper No. 410,				<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	
37	<input type="checkbox"/>	Blevins, Robert D., "Applied Fluid Dynamics Handbook," 1984.				<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	
38	<input checked="" type="checkbox"/> Calc	Evaluation of HELB Target Flow Rates in the Turbine Building	ENG-ME-758			<input type="checkbox"/> Input	<input checked="" type="checkbox"/> Output	
39	<input type="checkbox"/>	EC13962, TURB BLDG INTERNAL FLOOD DUE TO RANDOM HELB EVAL				<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	
40	<input checked="" type="checkbox"/> Calc	BARRIER LEAKAGE CRITERIA	ENG-ME-529 Rev 0			<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	
41	<input checked="" type="checkbox"/> Calc	Effects of Flooding in the AFW Pump Room from a Postulated Pipe Rupture	ENG-ME-586, Rev. 0			<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output	

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Calculation Signature Sheet

42	<input type="checkbox"/>	Modification 93L407 "Install Check Valves In Sump Stand Pipes of D1 D2"	Mod 93L407	<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output
43	<input checked="" type="checkbox"/>	"D1, D2 Ventilation Analysis"	ENG-ME-026, Rev 3	<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output
44	<input type="checkbox"/>	OPR 01178236-04 Rev 3		<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output
45	<input type="checkbox"/>	TEMPORARY FLOOD CONTROL BARRIER FOR D1 AND D2 ROOMS	EC 15102	<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output
46	<input type="checkbox"/>	"(PRI-87) COMPENSATORY MEASURES FOR MITIGATION OF INTERNAL FLOODING	EC 14665	<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output
47	<input type="checkbox"/>	Temporary Flood Control Barrier for D5/ D6	EC15510	<input checked="" type="checkbox"/> Input	<input type="checkbox"/> Output

*Controlled Doc checkmark means the reference can be entered on the C012 panel in black. Unchecked lines will be yellow. If checked, also list the Doc Type, e.g., CALC, DRAW, VTM, PROC, etc.)

**Corresponds to these PassPort "Ref Type" codes: Inputs/Both = ICALC, Outputs = OCALC, Other/Unknown = blank

Other PassPort Data

Associated System (PassPort C011, first three columns) OR Equipment References (PassPort C025, all five columns):

Facility	Unit	System	Equipment Type	Equipment Number

Superseded Calculations (PassPort C019):

Facility	Calc Document Number	Title

Record Retention: Retain this form with the associated calculation for the life of the plant.



Calculation Signature Sheet

Description Codes - Optional (PassPort C018):

Code	Description (optional)	Code	Description (optional)

Notes (Nts) - Optional (PassPort X293 from C020):

Topic Notes	Text
<input type="checkbox"/> Calc Introduction	<input type="checkbox"/> Copy directly from the calculation Intro Paragraph or <input type="checkbox"/> See write-up below
<input type="checkbox"/> (Specify)	



Calculation Signature Sheet

Monticello Specific Information

- YES N/A Topic Code(s) (See MT Form 3805): _____
- YES N/A Structural Code(s) (See MT Form 3805): _____

Does the Calculation:

- YES No Require Fire Protection Review? (Using MT Form 3765, "Fire Protection Program Checklist", determine if a Fire Protection Review is required) If YES, document the engineering review in the EC. If NO, then attach completed MT Form 3765 to the associated EC.
- YES No Affect piping or supports? (If Yes, Attach MT Form 3544)
- YES No Affect IST Program Valve or Pump Reference Values, and/or Acceptance Criteria? (If Yes, inform IST Coordinator and provide copy of calculation).

Record Retention: Retain this form with the associated calculation for the life of the plant.

	<h2 style="margin: 0;">External Design Document Suitability Review Checklist</h2>
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External Design Document Being Reviewed:

Title: Internal Flooding Evaluation for the Turbine Building

Number: 1067-0022-001

Rev: 0

Date: 1/25/10

This design document was received from:

Organization Name: MPR Associates

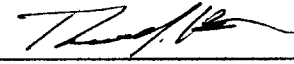
PO or DIA Reference: 00001761

The purpose of the suitability review is to ensure that a calculation, analysis or other design document provided by an External Design Organization complies with the conditions of the purchase order and/or Design Interface Agreement (DIA) and is appropriate for its intended use. The suitability review does not serve as an independent verification. Independent verification of the design document supplied by the External Design Organization should be evident in the document, if required.

The reviewer should use the criteria below as a guide to assess the overall quality, completeness and usefulness of the design document. The reviewer is not required to check calculations in detail.

REVIEW

	Reviewed	N/A
1. Design inputs correspond to those that were transmitted to the External Design Organization.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2. Assumptions are described and reasonable.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3. Applicable codes, standards and regulations are identified and met.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. Applicable construction and operating experience is considered.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5. Applicable structure(s), system(s), and component(s) are listed.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6. Formulae and equations are documented. Unusual symbols are defined.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7. Acceptance criteria are identified, adequate and satisfied.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8. Results are reasonable compared to inputs.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
9. Source documents are referenced.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10. The document is appropriate for its intended use.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
11. The document complies with the terms of the Purchase Order and/or DIA.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12. Inputs, assumptions, outputs, etc. which could affect plant operation are enforced by adequate procedural controls. List any affected procedures.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13. Plant impact has been identified and either implemented or controlled. (e.g., For piping analyses, the piping and support database is updated or a tracking item has been initiated.)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
14. Design and Operational Margin have been considered and documented.	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Completed by: David J. Potter  Date: 1/25/2010

PINGP Calculation

Number: ENG-ME-759	Revision: 0 Addendum: 0	Sheet No: 9 of 13
GOTHIC Internal Flooding Calculation for the Turbine Building		Date: 1/27/2010
		Completed By: DJP

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PINGP Calculation

Number: ENG-ME-759	Revision: 0 Addendum: 0	Sheet No: 10 of 13
GOTHIC Internal Flooding Calculation for the Turbine Building		Date: 1/27/2010
		Completed By: DJP

1.0 Purpose and Summary Result

Purpose

The purpose of this calculation is to evaluate the plant response to a Unit 1 and a Unit 2 Feedwater HELB with collateral damage to river water systems. Scenarios 1 and 3 do this by allowing river water systems to provide flow indefinitely without operator action. This evaluation includes engineering changes utilized as compensatory actions in OPR 01178236-4, Rev 3, and EC 15510 to demonstrate acceptable flooding levels. This is the initial issue of this calculation.

This calculation also acts as owner acceptance review of MPR Associates Calculation 1067-0022-001, Rev. 1, in accordance with FP-E-CAL-01.

The scenarios used within this calculation are:

- Scenario 1 - Demonstrates the plant's ability to meet its Unit 1 HELB-induced flooding licensing basis. This scenario includes modeling of the compensatory measures documented in OPR 01178236-4, Rev. 3 (Open turbine building roll-up doors and the flood barriers installed in the D1 and D2 rooms). Operator actions are not credited for break flow isolation.
- Scenario 3 - Demonstrates the plant's ability to meet its Unit 2 HELB-induced flooding licensing basis. This scenario includes modeling of the open turbine building roll-up doors and the flood barriers installed in the D5/D6 complex. Operator actions are not credited for break flow isolation.

Summary

- Scenario 1 establishes that the Unit 1 turbine building is capable of accommodating river water flooding sources of 31,193 GPM without flood heights reaching levels which would affect safety related equipment, as configured with EC 14665 and EC 15102 (open TB roll-up doors and the flood barriers installed in the D1 and D2 rooms).
- Scenario 3 establishes that the Unit 2 turbine building is capable of accommodating river water flooding sources of 22,000 GPM without flood heights reaching levels which would affect safety related equipment, as configured with EC 14665 and EC 15510 (open TB roll-up doors and the flood barriers installed in the D5/D6 complex).

PINGP Calculation

Number: ENG-ME-759	Revision: 0 Addendum: 0	Sheet No: 11 of 13
GOTHIC Internal Flooding Calculation for the Turbine Building		Date: 1/27/2010
		Completed By: DJP

2.0 Methodology

This calculation is performed using a GOTHIC computer model of the Prairie Island Unit 1 and Unit 2 695' elevation (and below) floor plans. The assumptions and method for the development of the model are within attachment 10.1 to this calculation. Once the model was established, flow rates were assumed and turbine building transient response was developed. The flow rates established in this calculation are used in Prairie Island Calculation ENG-ME-758 to determine if the various HELB damaged piping systems can deliver the assumed flow rates.

The GOTHIC computer model was developed by MPR Associates, Inc. in accordance with their Quality Assurance Program. The model is specific to Prairie Island response to turbine building internal flooding in Units 1 and 2. This model was developed as MPR Calculation 1067-0022-001, Rev 1, which is included as Attachment 10.1 to this calculation.

Attachment 10.1 only predicts the flooding response (i.e. flooding rates). Attachment 10.1 does not provide conclusions regarding the acceptability of the results. To determine the acceptability of the Attachment 10.1 results, comparisons are performed to the requirements for acceptable flooding heights within the body of this calculation.

3.0 Acceptance Criteria

- 3.1. The acceptable level of flood water in the Auxiliary Feedwater Pump Room is less than 9" (Design Input 5.1).
- 3.2. The acceptable level of flood water in the Battery Rooms is 6.625" (Design Input 5.2).
- 3.3. The acceptable level of flood water in the D1/D2 trenches is 0" (Assumption 4.1).
- 3.4. The acceptable level of flood water in the D5/D6 inverter rooms and vertical panel rooms is 0" (Assumption 4.2)
- 3.5. The acceptable level of flood water in the D5/D6 basements is 13" (Design Input 5.3)

4.0 Assumptions

Unvalidated Assumptions: None

Validated Assumptions:

- 4.1. The acceptable flood water level in the D1/D2 trench is assumed to be 0". Reference 9.4 (Modification 93L407), which installed check valves on the drainage standpipes within the D1/D2 trenches, indicates that particular attention was given to maintaining the existing overall standpipe height at 10". It is presumed that the standpipes' height was chosen to ensure that the heating and ventilation needs of the equipment would continue to be met with liquid overflowing into the standpipes. Calculation ENG-ME-026 has assumed room ventilation flow rates based upon in-plant testing. This calculation will demonstrate that turbine building flooding will not invalidate the flow rate assumptions demonstrated via the ventilation flow rate in-plant testing by not permitting any water to reach the trenches. The use of this assumption does not imply a new design requirement, rather a reflection of a low limiting value for that which could have been presumed in ENG-ME-026.
- 4.2. This calculation does not establish a new acceptable water level anywhere in the D5/D6 building. For the purposes of this calculation only, the acceptable flood water level in the D5/D6 inverter rooms and vertical panel rooms is assumed to be 0". This is a conservatively bounding assumption. This calculation demonstrates that after the planned future installation of flood barriers in the D5/D6 complex (EC 15510) the plant's licensing basis will be satisfied for HELB-induced internal flooding.

PINGP Calculation

Number: ENG-ME-759	Revision: 0 Addendum: 0	Sheet No: 12 of 13
GOTHIC Internal Flooding Calculation for the Turbine Building		Date: 1/27/2010
		Completed By: DJP

5.0 Design Inputs

- 5.1 The acceptable level of flood water in the Auxiliary Feedwater Pump Room is 9". Reference 9.3 indicates the 9" of water will not affect safe shutdown equipment in the AFW Pump Room.
- 5.2 The acceptable level of flood water in the Battery Room is 6.625". By previously performed field walkdown, it was determined that the multiple SCI inverters located in the battery rooms contain the lowest components that can be challenged by flooding. The inverter cabinets are raised on a 3" high concrete base. The cabinets, themselves, rise 3" more. Internal inspection shows that the lowest internal components are mounted another 7/8" higher, on top of floor grating. Conservatively subtracting 1/4" as a construction tolerance ($6-7/8" - 1/4" = 6-5/8"$), 6.625" of water in the room would still allow the battery room components to perform their design function.
- 5.3 The acceptable level of flood water in the D5/D6 basements is 13". ENG-ME-529 (Reference 9.2) indicates that the acceptable flooding height in the D5/D6 basement is 13". This is based upon measurement from the floor to the bottom of the fuel oil transfer pumps (two in each basement) and from the floor to the bottom of the fuel oil recirculation pump (located in the basement of the D6 compartment).

6.0 Analysis

Scenario 1: Unit 1 HELB - 31,193 gpm of River Water with No Operator Action

Location	Acceptance Criteria	Source	Calculated Value	Reference Page from Attachment 10.1
Battery Rooms	6.625"	Design Input 5.2	5.7"	Page 5
AFW Pump Room	9.0"	Design Input 5.1	8.3"	Page 5
EDG D1/D2	0.0"	Assumption 4.1	0.0"	Page 5
EDG D5/D6 Inverter Room	0.0"	Assumption 4.2	0.0"	Page 5
EDG D5/D6 Control Room	0.0"	Assumption 4.2	0.0"	Page 5
EDG D5/D6 Basement	13.0"	Design Input 5.3	0.0"	Page 5

All acceptance criteria met.

Scenario 3: Unit 2 HELB - 22,000 gpm with no operator action (with future D5/D6 Flood Walls)

Location	Acceptance Criteria	Source	Calculated Value	Reference Page from attachment 10.1
Battery Rooms	6.625"	Design Input 5.2	4.5"	Page 7
AFW Pump Room	9.0"	Design Input 5.1	1.2"	Page 7
EDG D1/D2	0.0"	Assumption 4.1	0.0"	Page 7
EDG D5/D6 Inverter Room	0.0"	Assumption 4.2	0.0"	Page 7
EDG D5/D6 Control Room	0.0"	Assumption 4.2	0.0"	Page 7
EDG Basement	13.0"	Design Input 5.3	0.0"	Page 7

All acceptance criteria met.

PINGP Calculation

Number: ENG-ME-759	Revision: 0 Addendum: 0	Sheet No: 13 of 13
GOTHIC Internal Flooding Calculation for the Turbine Building		Date: 1/27/2010
		Completed By: DJP

7.0 Summary

This calculation meets all the acceptance criteria. Scenarios 1 and 3 document, utilizing design basis assumptions, that flood heights do not exceed the acceptable levels of water for any compartment associated with the turbine building.

With the temporary modifications documented in EC 15102 (Reference 9.7) and EC 14665 (Reference 9.8), the Unit 1 Turbine Building meets the acceptance criteria with no operator action.

With the temporary modifications documented in EC 15510 (Reference 9.9) and EC 14665 (Reference 9.8), the Unit 2 Turbine Building will meet the acceptance criteria with no operator action.

8.0 Plant Impact/ Future Needs

- 8.1. Complete installation of EC 15510. Installation of EC 15510 is one of many actions being used to close action OBN 01178236-01.

9.0 References

- 9.1. EC 13962, Rev. 0, "Turb Bldg Internal Flood due to Random HELB Eval"
- 9.2. ENG-ME-529, Rev. 0, "Flood Barrier Leakage Criteria"
- 9.3. ENG-ME-586, Rev. 0, "Effects of Flooding in the AFW Pump Room from a Postulated Pipe Rupture"
- 9.4. PINGP Modification 93L407, Rev. 1, "Install Check Valves in Sump Stand Pipes of D1 D2"
- 9.5. ENG-ME-026, Rev. 3, "D1, D2 Ventilation Analysis"
- 9.6. OPR 01178236-04, Rev. 3
- 9.7. EC 15102, Rev. 0, "Temporary Flood Control Barrier for D1 and D2 Rooms"
- 9.8. EC 14665, Rev. 2, "(PRI-87) Compensatory Measures for Mitigation of Internal Flooding"
- 9.9. EC 15510, Rev 0 "Temporary Flood Control Barrier for D5/D6"

10.0 Attachments

- 10.1. MPR Associates Calculation No. 1067-0022-001, "Internal Flooding Analysis of the PINGP Turbine Building", Rev. 1, Dated 1/27/2010