

DESIGN CONTROL

1.0 SCOPE

The purpose of this procedure is to maintain a consistent format and approach to design for the Point Beach Nuclear Plant (PBNP). This procedure is applicable to designs which impact QA-scope systems, structures, components, and grounds which are under the jurisdiction of the Manager - PBNP. Where the design does not affect QA systems, structures or components, discretion is used by the group head for application of this procedure.

Design for PBNP can be initiated through, but is not limited to, processes such as NP 7.2.1, Modification Requests, NP 7.2.6, Engineering Change Process, and NP 7.3.1, Temporary Modifications. When performing design as a part of these processes, the requirements of this procedure shall supplement and then be incorporated into that process. Any revision to this procedure shall consider the requirements of Reference 2.15. This process is used in the implementation of the "Maintenance Rule" at PBNP. Changes to this procedure shall be reviewed by the Maintenance Rule Coordinator or appropriate system engineer.

2.0 REFERENCES

- 2.1 ANSI N45.2.11-1974, Quality Assurance Requirements for the Design of Nuclear Power Plants
- 2.2 PBNP Final Safety Analysis Report
- 2.3 INPO Guideline 90-009, Guidelines for the Conduct of Design Engineering
- 2.4 10 CFR 50.59, Changes, Tests, and Experiments
- 2.5 Fire Protection Evaluation Report (FPER)
- 2.6 NP 7.2.1, Modification Requests
- 2.7 NP 7.2.3, Engineering Change Requests
- 2.8 NP 9.2.1, Specification Preparation, Review, and Approval
- 2.9 NP 7.2.4, Calculation Preparation, Review, and Approval
- 2.10 NP 7.3.1, Temporary Modifications
- 2.11 NP 1.4.1, Working Drawing System
- 2.12 NP 7.3.7, I&C Calculation Control

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- 2.13 NP 7.4.1, Pressure Test Procedure
- 2.14 NP 10.3.1, Authorization of Changes, Tests, and Experiments (10 CFR 50.59 and 72.48 Reviews)
- 2.15 NP 7.2.6, Engineering Change Process
- 2.16 PBF-1583, Design Verification Notice
- 2.17 PBF-1584, Design Input Checklist
- 2.18 PBF-1585, Design Documentation
- 2.19 10 CFR 65, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- 2.20 NP 7.7.4, Scope and Risk Significant Determination for the Maintenance Rule
- 2.21 NP 1.2.2, Technical Procedure Classification, Review, and Approval

3.0 DEFINITIONS

The following definitions are provided to ensure a uniform understanding of select terms as they are used in this procedure.

- 3.1 **Design** - Technical and management processes which commence with identification of design input and which lead to and include the issuance of design output documents.
- 3.2 **Designer** - The Wisconsin Electric Power Co. (WE) employee assigned design responsibility.
- 3.3 **Design Input** - Those criteria, parameters, bases, or other design requirements upon which detailed final design is based.
- 3.4 **Design Output** - Documents such as drawings, specifications, and other documents defining technical requirements of structures, systems, and components.
- 3.5 **Final Design** - Approved design output documents and approved changes thereto.
- 3.6 **External Design Interface** - Relationship between design groups from different companies. Examples are the interfaces between the plant owner and the architect engineer or the plant owner and the NSSS supplier, or the architect engineer and the NSSS supplier.

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- 3.7 **Internal Design Interface** - Relationship between design groups or organizations within a company.
- 3.8 **Procedures** - A document that specifies or describes how an activity is to be performed. It may include methods to be employed, equipment or materials to be used and sequence of operations.

4.0 PROCEDURE

4.1 Responsibility

- 4.1.1 The NES manager is the design authority for the Nuclear Power Department.
- 4.1.2 Any Nuclear Power Department group may be assigned responsibility for performing design activities.
- 4.1.3 The cognizant group head shall ensure that identification of design inputs, design development, and design verification are documented in accordance with this procedure.
- 4.1.4 The cognizant group head shall ensure that personnel are sufficiently qualified to perform design or design reviews. In making this determination, the following elements of qualification and training shall be considered:
 - a. Design activities, including design reviews, shall be conducted by degreed engineers or degreed specialists. If design activities are conducted by non-degreed technicians, the basis for that individual's qualification to perform the specific activity shall be documented by the group head.
 - b. Personnel shall be trained prior to conducting design activities. This training shall include both familiarization with this design control procedure and either formal or on-the-job training directly related to the system, structure, or components which are the subject of the design activity. Familiarization with structures, systems, and components through on-the-job training is acceptable, but cannot be as readily documented.

In such cases, the decision regarding adequacy of training must involve the evaluation, judgment, and confidence of the cognizant group head that the individual is capable of performing the specific design activity.
 - c. For design activities performed by external organizations, the design shall be controlled by the WE designer assigned responsibility for the design.

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- 4.1.5 The designer shall prepare the design in accordance with the requirements of this procedure. The designer shall document the design in sufficient detail to allow the design inputs and outputs to be reviewed by a technically competent individual without needing to consult with the designer.
 - 4.1.6 The design reviewer shall perform the design verification in accordance with the requirements of this procedure. The design verification shall be a detailed technical review of the entire design to ensure that all applicable inputs have been considered and that the appropriate design outputs have been produced.
 - 4.1.7 Responsible user, regulatory, and maintenance groups shall support the responsible design group by providing input to the designer. This input shall be considered along with any other design inputs in the development of the design.
 - 4.1.8 In cases where designs are provided by organizations external to Wisconsin Electric, a Wisconsin Electric employee competent in the areas shall perform an independent review. The purpose of the review is to verify that all inputs, assumptions, and outputs are appropriate for PBNP. The Wisconsin Electric reviewer shall assure that all impacts on the operation, safety, licensing basis or design basis of PBNP are identified and resolved prior to approval of the design. This review shall be documented on the Design Verification form, PBF-1583. Other forms of documentation may be used as determined by the Final Design Group Head.
- 4.2 Upon assignment of design responsibility, the designer shall format and prepare the design using the following basic outline:

NOTE: *Design activities shall consider the needs of the responsible user (Operations/Chemistry/Radiation Protection) and Maintenance (Mechanical/Electrical/Instrumentation & Control) groups. The design group shall coordinate design efforts with personnel from these work groups.*

4.2.1 Design Package Identification:

The design package shall carry a unique identification which shall be defined in accordance with the applicable procedure controlling the design activity. (Example: Modification package no., MWR no., etc.)

4.2.2 Scope and Purpose:

Describe the scope and purpose of the design package. The scope shall be a concise description of all of the work covered by the design package.

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4.2.3 Design Inputs:

Applicable design inputs, such as design bases, regulatory requirements, codes and standards, shall be identified and documented. The design inputs shall include, but are not limited to the criteria listed in the Design Inputs Checklist, Form PBF-1584, of this procedure. The Design Inputs Checklist shall be completed for all safety-related and nonsafety-related plant modifications. All design inputs which are identified as applicable in the checklist shall be discussed in the design package. Deviations from specified design inputs, including the reasons for the changes, shall be identified and documented in the design. The design inputs shall be specified to the level of detail necessary to permit the design to be carried out correctly and to provide a consistent basis for making design decisions, accomplishing design verification measures, and evaluating design changes.

The design shall also consider the items identified in the engineering evaluation if one was performed for structures, systems, and components in the scope of the design.

4.2.4 Design Description and Analysis:

The design shall be described in sufficient detail to ensure that all appropriate design inputs were adequately considered and translated into the appropriate design output documents. The design output documents contents should be described to ensure that the design verification can account for all of the required design information. Design analyses shall be performed in accordance with applicable procedures. (Calculations in accordance with NP 7.2.4; I&C calculations in accordance with NP 7.3.7; pressure test pressure in accordance with NP 7.4.1; etc.). Design analyses shall include evaluation and documentation of the effect of the design on the results and/or conclusions of existing calculations which fall within the scope of NP 7.2.4. This evaluation shall be completed in accordance with the requirements of NP 7.2.4, should be completed prior to design approval, and shall be completed prior to closeout of the design change.

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4.2.5 Design Output:

All designs shall include, at a minimum, a list of each design output document (i.e., working drawings, specifications, etc.). Design output documents should be referenced by revision number. Design outputs shall be prepared in accordance with the applicable procedures. For example, calculations shall be prepared in accordance with NP 7.2.4; specifications shall be prepared in accordance with NP 9.2.1; working drawings shall be prepared in accordance with NP 1.4.1; installation work plans shall be prepared in accordance with NP 1.2.2 and the guidance of DG-G02 or the applicable PBNP Writer's Guide; safety evaluations shall be prepared in accordance with NP 10.3.1.

Repair and Replacement forms (PBF-1554, DG-M16) are to be attached as a part of the design package, when applicable.

4.3 Design Considerations

4.3.1 Design Interfaces:

It is the responsibility of the designer to interface with other organizations, both internal and external, that could affect the quality of design. Some interfaces are required by procedures; however, other organizations, as determined by the designer, should be contacted, depending on the specifics of the design task.

4.3.2 Field Inspection:

All designs shall include a field inspection of the design to ensure that the design accounts for the actual field conditions, to the extent practicable. This may be done by either the designer or the verifier.

4.4 Design Verification

Design verification shall be accomplished by one of or a combination of the following methods: (a) design review, (b) qualification testing, (c) alternative calculations.

Design verification shall be performed by a competent individual other than the originator or any other person with direct responsibility for that design. The group head shall indicate the reviewer who will perform the design verification. The reviewer shall determine and document the extent of the verification based upon the design's importance to safety, complexity, degree of standardization, the state-of-the-art, and the similarity with previously proven design. Design verification may vary from spot checking of calculations to actual tests in the field. The verification shall include a thorough review of the design inputs (using the design inputs checklist if utilized by the designer) and the design output documents to ensure all design inputs were correctly incorporated into the final design.

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For QA-scope designs, this verification may be performed by the designer's supervisor provided the supervisor did not specify a singular design approach, or rule out certain design considerations and did not establish the design inputs used in the design, or if the supervisor is the only individual in the organization competent to perform the verification. For non-QA scope design, the appropriate independency requirements will be determined by the group head.

4.4.1 Design Reviews:

Design verification method by design reviews shall be documented on the Design Verification Notice (DVN) (Form PBF-1583).

4.4.2 Alternative Calculations:

Design verification method by alternative calculations shall be documented on Form PBF-1583.

Where alternative calculations are performed to verify the correctness of the original calculations, a review shall also be performed of the original design package to address the appropriateness of assumptions, input data, and code or other calculation method used.

The alternate method used for comparison may be a more simplified approach or less rigorous, such as when a hand calculation is used to check a computer code output. Although the simplified or less rigorous method may not exactly check the original results calculation or analysis, it must provide results consistent with the original calculation or analyses. Alternative calculations shall be documented in the design package.

4.4.3 Qualification Testing:

Design verification method by qualification testing shall be documented on Form PBF-1583. Design verification for some designs or specific design features can be achieved by suitable qualification testing of prototype or initial production unit.

Testing shall demonstrate adequacy of performance under the most adverse design conditions that are obtainable. All pertinent operating modes shall be considered in determining these design conditions where it is intended that the test program confirm the adequacy of the overall design. Where the test is only intended to verify a specific design feature, the other features of the design shall be verified by other means.

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For example, it may be most effective to verify that an instrumentation cabinet is designed to withstand the maximum earthquake-caused vibratory motions. The shaker tests will not, however, verify that the circuitry is designed correctly, or that the component in the cabinet will perform its intended function. Other tests or verification means are required to confirm that the remaining design functions are adequately performed by the instrumentation and that those components perform the intended functions for the varying design conditions to which they are subjected.

Qualification testing shall be performed in accordance with written test procedures which incorporate or reference the requirements and acceptance limits contained in applicable design documents. The test procedures shall include provisions for assuring the prerequisites for the given test have been met, that adequate instrumentation of the required range and accuracy is available and used, and that necessary monitoring is performed. Prerequisites including such items are calibrated instrumentation, appropriate equipment, trained personnel, condition of test equipment and the item to be tested, suitable environmental conditions, and provisions for data acquisition. Test results shall be documented and evaluated by the originator to ensure that test requirements have been satisfied.

If testing indicates that modifications to the item are necessary to obtain acceptable performance, the modification shall be documented and the item modified and retested or otherwise verified to ensure satisfactory performance. When tests are being performed on models or mock-ups, scaling laws shall be established and verified. The test configuration shall be clearly defined and documented. The results of model test work shall be subject to error analysis, where applicable, prior to use in final design work.

4.5 Comment Resolution

Comments generated shall be forwarded to the designer for resolution. Upon successful resolution of the comments, the DVN shall be signed by the reviewer and the design package returned to the group head or his designee.

4.6 Design Approval

Upon completion of the design verification, the reviewer shall forward the design and the verification to the group head for approval. Note that approval sign-offs are not required on each sheet contained in the "design package." The approval signature verifies that the requirements of Section 4.1.4 have been met, and that the design and verification was done in an appropriate manner.

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4.7 Documentation/Records

Documentation produced by the design process shall be organized, legible, and be in a form suitable for reproduction, filing, and retrieving. The design documentation generated shall become records in accordance with the procedure governing the initiating document. Updates of drawings and other documentation shall be performed in a timely manner per the requirements of NP 7.2.1, Modification Requests.

4.8 Final Design Changes

Design changes shall be accomplished in accordance with NP 7.2.3, Engineering Change Requests (ECRs). Design changes shall be reviewed by the cognizant group head to determine if design conclusions will be affected by the change. When conclusions are affected, the changes shall be documented in accordance with NP 7.2.3.