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I. PURPOSE AND SCOPE

By providing a *transparent* (see glossary) record of information sources and analytical processes, the National Spent Nuclear Fuel Program (NSNFP) engineering documentation enables those who use NSNFP technical information to make an informed determination of its adequacy relative to a specific use.

This procedure applies to documentation of technical information collected or developed by the NSNFP that will be relied on to make key program decisions or to protect the safety of personnel or the environment.

II. SUMMARY

This procedure provides instructions for the preparation and review of engineering design files, technical reports, and scientific notebooks that document NSNFP engineering activities. Engineering design files are appropriate for preservation of various forms of documentation (i.e., vendor information, drawings, test results, analyses, and correspondence) that are needed to maintain a traceable history of engineering activities or results of checking. Scientific notebooks are useful and appropriate for documenting engineering activities that require a high degree of professional judgment or trial and error methods. Technical reports are used when technical information is to be formally presented or made available to external organizations. This procedure also provides instructions for the preparation and review of design input and interface documents and for documentation of engineering analyses.

Test plans and software life cycle plans are addressed in PSOs 11.01, Testing, and 19.01, Software Control, respectively.

III. PROCEDURE

A. All NSNFP Engineering Documentation

PSO Technical Staff

1. Ensure all engineering analyses (i.e., calculations, models) and tests have been prepared and checked in accordance with PSO 3.03, Engineering Analyses, and PSO 11.01, Testing, respectively.

2. Ensure analysis software is documented and checked in accordance with PSO 19.01. Use an engineering design file to document individual hand checks of calculations obtained through methods not subject to PSO 19.01.

3. Notify the Document Control Coordinator regarding the type of document being prepared (see Attachment A) and obtain a document control number.

PSO Technical Staff

4. Request the responsible technical lead to designate a qualified technical reviewer.

5. For scientific notebooks, GO TO Step III.B.

6. Prepare document by following the format and content criteria given in Attachment A and satisfying the review criteria given in Attachment B.

7. GO TO Step III.C.

B. Scientific Notebooks

PSO Technical Staff

1. Create and use scientific notebooks as prescribed below:

   a. Use a bound notebook with numbered pages.

   b. Reserve blank space as needed for the insertion of future information.

   c. Initial and date each entry, including corrections, as they are made. Note the date of any work documented if different from the date of the entry.

   d. Make any corrections to entries by drawing a single line through the incorrect information, insert the correction date, the initials of the individual making the correction, an explanation for the correction, or if needed due to space limitations, a reference to the location of such explanation.

   e. When using logs and notebooks to support a scientific notebook, reference them in the scientific notebook as supplemental records and submit them for review and control as part of the records package with the scientific notebook.

   f. Request responsible technical lead to specify:

      (1) Any hold points and any associated release criteria

      (2) An interval for interim reviews of scientific notebook.

2. Record an initial entry that includes the following:

   a. The document control number, title of the scientific notebook, and name of the responsible person.

   b. The work scope, objective, proposed approach, technical methods and tasks, and associated procedures or plans for the proposed activity or reference to an approved test plan containing this information.

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c. A listing of any computer programs, samples, or measuring and test equipment to be used along with associated calibration and configuration controls or reference to an approved test plan containing this information.

d. A list of personnel expected to contribute to the notebook along with examples of their signatures and initials.

3. In subsequent entries, document the following:

a. Engineering activities (i.e., tests, analyses, models)

b. Any deviations from planned actions or conditions, including changes to methods, personnel, or other information in the initial entry

c. Results, observations, and interim conclusions.

4. Request designated reviewer to perform interim reviews as requested by the responsible technical lead.

Designated Technical Reviewer

5. Review scientific notebook and any supplemental records to ensure the requirements of this procedure are being satisfied.

6. Document the review and any comments or suggestions by creating an entry in the reviewed scientific notebook.

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7. When notebook is full or activity is completed or terminated, perform the following:

a. Create a final notebook entry explaining the purpose for closing the notebook and, if the activity and notebook will be continued, the subsequent notebook identifier.

b. Draw a diagonal line through all blank space not consistent with the format of the notebook and initial and date the line.

C. Document Control

PSO Technical Staff

1. Place document under document control by processing in accordance with NSNFP procedure PMP 6.01.

2. Use Attachment B to determine the review criteria.

3. For scientific notebooks, use the guidance given in Section III.B in lieu of Attachment A for format and content review criteria.

IV. REFERENCES

None.

V. DEFINITIONS

Terms appearing in italics followed by the notation "see glossary" are defined in the NSNFP Documents Manual Introduction and Glossary.

VI. ATTACHMENTS

Attachment A, NSNFP Engineering Documentation Format and Content

Attachment B, NSNFP Engineering Documentation Review Criteria

VII. RECORDS

The following records generated as a result of this procedure require retention in accordance with the identified classification and NSNFP Program Management Procedure 17.01.

Lifetime

A. EDFs

B. Analyses Documentation (including Analysis Plan and documentation of validation of any models)

C. Design Input and Interface Documents

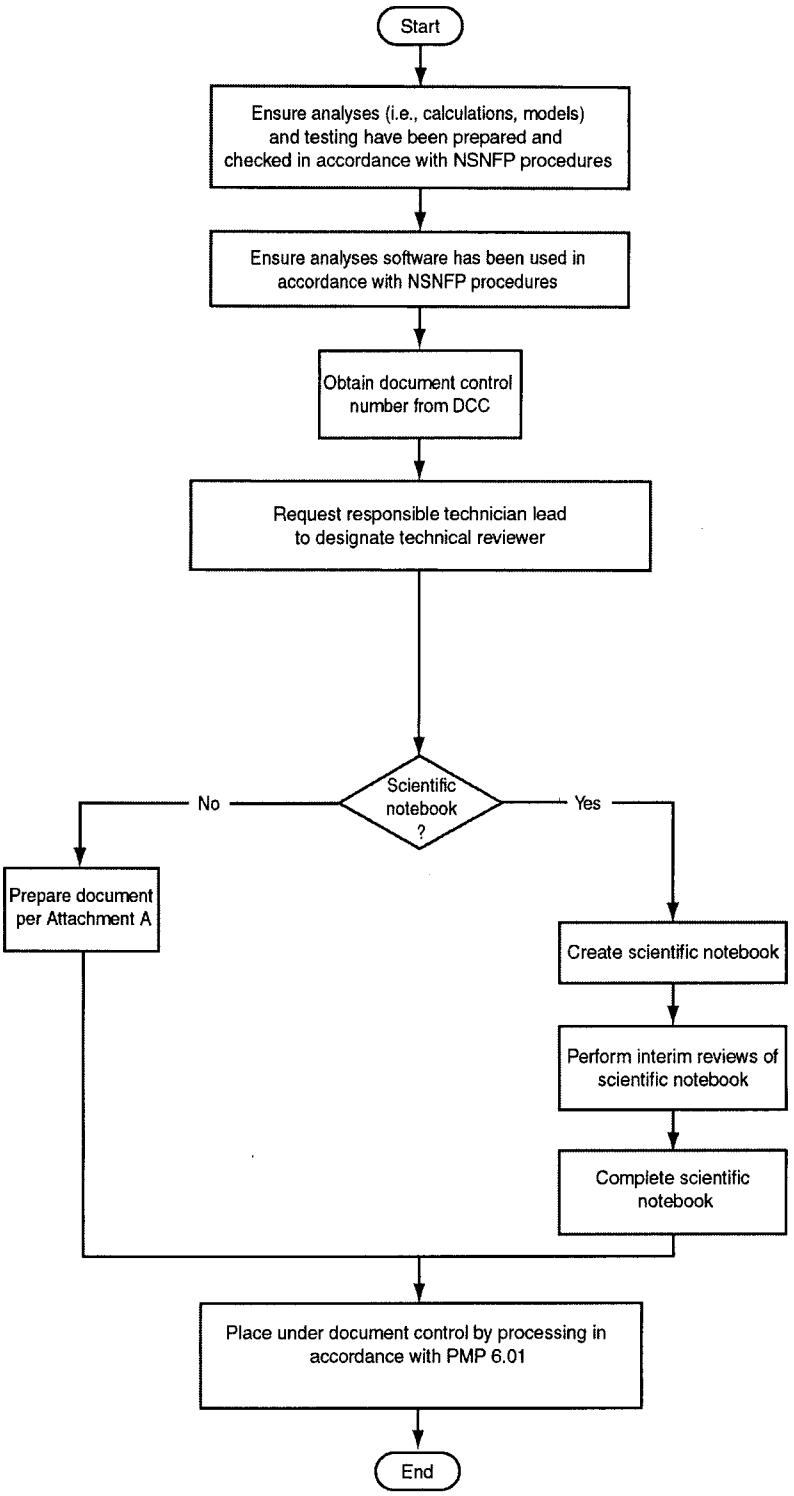
D. Technical Reports

E. Scientific Notebooks.

Nonpermanent

None.

VIII. PROCEDURE FLOW DIAGRAM



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Attachment A

NSNFP Engineering Documentation Format and Content

Although the content for NSNFP engineering documents contains the same basic elements, the format and level of detail may vary depending on its intended use and audience. Electronic copies of NSNFP document templates that include formats, sample documents, including report covers, title and signature pages, document headers, indexes, tables, and body text can be obtained from a NSNFP technical writer.

Table A-1 shows the sections that may be included in NSNFP engineering documents and identifies whether the section is mandatory or optional based on the type of document being prepared. For all documents, the sections included are to appear in the sequence shown. Table A-2 provides the content criteria to be included in each of the identified sections. The document format and content criteria are given for the following types of NSNFP engineering documentation.

Engineering Design File—Engineering design files (EDFs) are appropriate for preservation of various forms of documentation (i.e., vendor information, drawings, test results, analyses, correspondence) needed to maintain a traceable history of engineering activities or results of checking.

Engineering Analysis—Engineering analyses are used to document engineering processes and results for NSNFP use. The EDF format may also be used for this purpose. When NSNFP engineering analyses are to be used or disseminated externally, the analyses are documented in a technical report.

Technical Report—NSNFP technical reports may be used to provide formal documentation of a wide range of engineering activities. Technical reports are used when technical information is to be formally presented or made available to external organizations.

Design Input and Interface Document—Design input and interface documents (DIDs) are used to identify design requirements, inputs, and interfaces necessary to enable appropriate control of design activities.

Attachment A

Table A-1. Engineering document formats.

Section	EDF[a]	Engineering Analysis	Technical Report[a]	DID[a]
Cover Page	O	O	M	O
Title Page	O	O	M	O
Revision Log	O	O	M	O
Signature Page	O	O	M	O
Abstract	O	O	O	O
Summary	O	O	O	O
Foreword	O	O	O	O
Acknowledgments	O	O	O	O
Contents	O	O	O	O
Acronyms	O	O	O	O
Definitions	O	O	O	O
Body	M	M	M	M
Purpose	M	M	M	M
Quality Assurance	O	M	O	O
Requirements and Constraints	O	M	O	M
Design Interfaces	NA	NA	NA	M
Inputs	O	M	O	M
Analysis	O	M	O	O
Conclusions	O	M	O	O
References	O	O	O	O
Bibliography	O	O	O	O
Appendixes and Attachments	O	O	O	O

a. If used to document an engineering analysis, content criteria (Table A-2) for all mandatory sections of an engineering analysis document must be satisfied.

M=Mandatory

O=Optional

NA= not applicable

Attachment A

Table A-2. Content criteria for NSNFP engineering documents.

Section	Criteria for Content	Reviewer
Cover Page	For technical reports, the cover page from the NSNFP template, including the disclaimer on the back, is used without modification other than inserting the appropriate report title, date, and report and revision numbers in the header. The back of the cover page includes the following disclaimer, "This document was developed and is controlled in accordance with NSNFP procedures. Unless noted otherwise, information must be evaluated for adequacy relative to its specific use if relied on to support design or decisions important to safety or waste isolation." Electronic copies of the NSNFP report template including cover, title and signature pages, and document headers can be obtained from the NSNFP web page.	NSNFP Technical Writer
Title Page	For technical reports, the title page from the template is used without modification other than inserting titles and dates specific to the document. For technical reports, this is the first numbered page of the document.	NSNFP Technical Writer
Revision Log	The revision log contains areas for the revision number, DAR number, and issue date and is located on the back of the title page.	NSNFP Technical Writer
Signature Page	For technical reports, the signature page in the template is used without modification other than insertion of the report title, publication date, and the titles of those who must sign the document. The back of this page is blank.	NSNFP Technical Writer
Abstract	If used, the abstract is clear, contains approximately 500 words, and includes key words and phrases to facilitate finding the document in literature searches. For technical reports, it begins on page 5, and the back is blank.	NSNFP Technical Writer
Summary	The summary provides a linear condensation of the entire document including a brief but clear statement of the purpose and objectives, requirements and assumptions, the work performed, findings, recommendations, and conclusions. It should be limited to two pages or less. For technical reports, this begins on an odd-numbered page.	Designated Technical Reviewer
Foreword	Provides an introductory note covering the intent, background, or relationship to other works. For technical reports, this begins on an odd-numbered page.	Designated Technical Reviewer
Acknowledg-ments	Credit is given here to sources of nonreferenced material and/or those who assisted the author. For technical reports, this begins on an odd-numbered page.	Designated Technical Reviewer
Contents	A listing of the major headings, figures, tables, appendixes, and attachments along with the page numbers where they begin. For technical reports, this begins on an odd-numbered page.	NSNFP Technical Writer

Attachment A

Table A-2. (continued).

Section	Criteria for Content	Reviewer
Acronyms	An alphabetical listing of the acronyms used in the document. For technical reports, this begins on an odd-numbered page.	NSNFP Technical Writer
Definitions	An alphabetical listing of definitions of terms with unique usage within the report. For technical reports, this begins on an odd-numbered page.	NSNFP Technical Writer
Body	Information is organized to clearly present the document content. Note: The body of the document consists of sections, as determined by the writer, to best achieve the intent of the document. As a minimum, the sections below marked as mandatory are included. Sections and subsections are formatted and numbered as shown in the NSNFP document templates available on the NSNFP web site.	Designated Technical Reviewer
Purpose	Provide a clear explanation of the objective and intended use of the document and information presented along with a summary of applicable background information (i.e., conceptual designs, preliminary analyses or designs, and information derived from experience) and, if appropriate, the structure, system, or component to which the document applies along with any constraints, caveats, and limitations.	Designated Technical Reviewer
Quality Assurance	Procedures and any other management and quality assurance controls applicable to the activity are identified along with the basis for concluding that any uncertainties are acceptable relative to the intended use of the results.	NSNFP QE
Requirements and constraints	Applicable requirements (i.e., regulatory, functional), codes, standards, and criteria (design, test, and acceptance criteria) are specified along with references to their sources.	NSNFP QE
Design Interfaces	Organizations that will participate in the design activity are identified, and their respective responsibilities are defined. Implementing documents applicable to each of the participating organizations are identified. Processes are specified for ensuring transmittals of design information across interfaces are documented and for ensuring the status (i.e., requiring further development, review, analysis, approval) of information is identified.	Designated Technical Reviewer

Attachment A

Table A-2. (continued).

Section	Criteria for Content	Reviewer
Inputs	Inputs and assumptions relied on in the design or to reach the conclusions of the document are clearly identified and justified, adequately represent the intended properties, and are appropriate based on the intended use. Inputs include: – All conditions, assumptions, and other parameters explicitly or implicitly relied on in the design calculations and conclusions – Sufficient detail to form a consistent basis for design decisions, accomplishing design verification, and evaluating design changes. – Documentation includes sources and rationale along with any constraints, bounds, or limits on the inputs. Unconfirmed assumptions or inputs based on unconfirmed assumptions (i.e., or not adequately justified) are noted as requiring confirmation.	Designated Technical Reviewer
Analysis	Provides a description of systems, processes, or phenomena analyzed and the scientific, engineering, and mathematical concepts and principles on which the analyses are based. Discussion and references to applicable literature and background are provided along with a description of calculations, models, or other analytical processes used to translate the inputs into the outputs. Any outputs that rely on inputs requiring confirmation are identified. Justification is provided for the selection and use of any models; including parameter inputs, assumptions, idealizations, simplifications, initial and boundary conditions, and expected sources of uncertainty. As applicable, complete a detailed discussion of (a) the conceptual model; (b) the results of testing, sensitivities, and calibration; and (c) the model validation criteria and methods for conducting model validation, the specific tests conducted, and results of those tests (or alternative validation method) are included. Include a discussion of mathematical and numerical methods that are used in the model, including governing equations, formulas, and algorithms as well as their scientific and mathematical bases.	Designated Technical Reviewer
Conclusions	A summary is given of the analysis or modeling activity along with the conclusions and any decisions or recommendations, including uncertainties and any restrictions for subsequent use. The conclusion includes justification that the results and associated uncertainties are adequate relative to their intended use and addresses the implications of any unconfirmed assumptions and associated uncertainties. The conclusions and results are reasonable relative to the inputs and processes. Impact of the conclusions of the analyses on previous designs or decisions is discussed.	Designated Technical Reviewer

Attachment A

Table A-2. (continued).

Section	Criteria for Content	Reviewer
References	References relied on to support the conclusion are included either in a separate section at the end of the document or, for longer documents, at the end of each section. Draft documents and personal communications are listed as footnotes. References and other citations in the documentation include sufficient information to ensure traceability. When feasible, citations should include the specific page and/or the figure, table, or equation identifier.	Designated Technical Reviewer
Bibliography	References and other relevant documents not called out within the text of the document are included in a separate section.	Designated Technical Reviewer
Appendixes and Attachments	Self-contained supplementary information that is lengthy or cannot be conveniently included within the main text of the document such as vendor information, photographs, drawings, computer output, is placed at the end of the report. Appendixes and attachments are referred to within the body of the EDF and have their own title sheet and, if needed, their own contents, acronym list, and references.	NSNFP Technical Writer

Attachment B

NSNFP Engineering Documentation Review Criteria

Criteria for Content	Reviewer(s)
Objectives, scope, and applicability are appropriate for the activity. The applicable Work Breakdown Structure title and number are referenced.	Designated Technical Reviewer
Organizations and technical disciplines affected by the document have been identified and included in the review.	Designated Technical Reviewer
Sufficient detail is provided to ensure traceability and to enable a technically qualified individual to understand the document, to verify its adequacy, and to reproduce the processes and obtain comparable results without recourse to the originator.	Designated Technical Reviewer
Essential methods, materials, and equipment are identified.	Designated Technical Reviewer
For design documents, sufficient detail is provided to enable design, and fabrication to be properly performed; and appropriate test, inspection, and acceptance criteria are provided; and design verification has been performed in accordance with PSO 3.01, Design Control.	Designated Technical Reviewer
Title and document control number (or other identifying information) appear on every page of the document, and document is traceable to the structure, system, or component to which it applies.	NSNFP Quality Engineer
Models used are identified and validated commensurate with their use and importance within the analyses.	Designated Technical Reviewer
Content criteria for all mandatory document sections (see Tables A-1 and A-2 of this procedure) are satisfied.	Designated Technical Reviewer
Format is consistent with current NSNFP guidelines.	NSNFP Technical Writer
If software was used, ensure documentation: – Specifies the software (including version and release number) sufficiently to ensure traceability. – Confirms that the software used is the current controlled version. – Documents independent review and approval that software is suitable for the problem being solved and that its use is within its range of validation. – Documents that hardware and installation are consistent applicable user documentation.	Designated Technical Reviewer
Document is organized and formatted consistent with NSNFP standards.	NSNFP Technical Writer (Technical reports only)
The scientific approach and technical methods are appropriate for the problem, have been correctly applied, and associated calculations have been properly performed.	Designated Technical Reviewer
Documentation has been prepared in accordance with this procedure.	NSNFP Quality Engineer
The documents meets the format and content criteria in Attachment A for its document type	NSNFP Quality Engineer Designated Technical Reviewer
The extent and results of the checking is complete and documented as required by the analysis plan developed in accordance with PSO 3.03.	Designated Technical Reviewer