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Management Control Procedure

Development, Assessment, and Maintenance of Drawings

Idaho Cleanup Project

CH2M • WG Idaho, LLC is the Idaho Cleanup Project contractor for the U.S. Department of Energy

DEVELOPMENT, ASSESSMENT, AND MAINTENANCE OF DRAWINGS	Identifier: MCP-2377 Revision*: 21 Page: **1** of 44

Engineering	Management Control Procedure	For Additional Info: http://EDMS	Effective Date: 02/06/2014

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*The current revision can be verified on EDMS.

Substantive changes have been tracked

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1. INTRODUCTION

1.1 Purpose

ICP drawings and *design data sheets* (DDSs; see def.) are developed, assessed, and maintained to ensure they portray technically correct and approved design information in support of activities such as operations; maintenance; construction or fabrication; and decontamination and decommissioning (D&D).

1.2 Scope and Applicability

This process covers the preparation, review, and approval of drawings; continued maintenance of those drawings; revisions; and periodic assessment of drawing accuracy. This process also addresses designating and controlling *essential drawings* (see def.) and *master facility drawings* (see def.); preparing and controlling *engineering sketches* (see def.) and *information-only sketches* (see def.); managing non-company drawings (i.e., subcontractor- and vendor-supplied drawings); and developing DDSs.

Refer to MCP-1308, "Field Design Change," for drawing and DDS field changes.

This process applies to personnel who prepare, review, control, or approve drawings, sketches, and DDSs.

2. RESPONSIBILITIES

NOTE: *The performer designations called out in this procedure, except those for Quality Assurance performers, are based on function rather than organization. As such, performer responsibilities may be assigned to individuals with titles other than those specified below.*

Performer	Responsibility
Drawing Requester (usually an engineer)	Initiate new and revised drawings and sketches.
Design Engineer (DE)	Perform *design agent* (see def.) functions of initiating and providing design input into development and revision of drawings, sketches, and DDSs, including identifying applicable codes and standards, inspection criteria, and acceptance criteria. Resolve technical checker's comments, particularly those that have resulted in a design change.
Drafter	Prepare and revise drawings and sketches as requested.
Registered Professional Engineer (RPE)	Assume responsible charge of the assigned drawing and provide RPE approval.

Performer	Responsibility
System Engineer (SE)	Perform the following *design authority* (see def.) functions: 1. Approve new and revised drawings for operational structures, systems, and components (SSCs). 2. Assign drawing designations (essential, master facility, and general) using Appendix B as guidance and assign applicable assessments. 3. Ensure that the design authority is the owner of essential and master facility drawings. 4. Review drawings to determine that the technical information is accurately depicted. 5. If the drawing is for a *waste-acceptance-impacting* (WAI; see def.) item or activity, review and approve all aspects of the drawing related to DOE/RW-0333P Spent Nuclear Fuel (SNF) or High Level Waste (HLW) program WAI items. 6. *As-built* (see def.) drawings. 7. Suspend, cancel, or supersede drawings. 8. Coordinate preparation of non-company drawings.
Engineering Management (see def.)	Coordinate drawing development and revision until turnover to the facility design authority function. Assign technical checker. Control development and use of engineering and information-only sketches.
Drafting Checker	Independently review drawings and, as requested, engineering sketches. Authorize release of drawings.
Technical Checker	Review drawings, engineering sketches, and DDSs for technical accuracy. Verify that design engineer (DE) has identified applicable codes and standards, inspection criteria, and acceptance criteria.
QA Reviewer	If the drawing is for a WAI spent nuclear fuel or high-level waste SSC or activity, review and approve all aspects of the drawing as it relates to DOE/RW-0333P WAI items.

3. PREREQUISITES

None

4. INSTRUCTIONS

NOTE: *The following drawing status designations are used in the Electronic Document Management System (EDMS):*

A. ACTIVE: Drawing is current and approved for use.

B. CANCELLED: Drawing is no longer required and not authorized for use, will not be superseded by another controlled drawing, and is removed from controlled distribution (legacy status codes – Inactive, Expired, Removed, Deleted).

C. SUPERSEDED: Drawing has been replaced in its entirety by another controlled drawing, document, or other controlled information (legacy status codes – Inactive, Deleted, Removed)

D. SUSPENDED: Drawing is temporarily withdrawn from authorized use pending completion of required periodic reviews (legacy status code – RUPU).

E. TRANSFERRED: Drawing ownership has been transferred to another company.

4.1 Developing or Revising Drawings

NOTE: *A drawing should be revised if it becomes difficult to use due to the number or complexity of FDCs.*

4.1.1 Preparing Drawings

4.1.1.1 Drawing Requester: Initiate a new or revised drawing using the electronic Document Revision Form (DRF) process per MCP-135, "Document Management."

NOTE 1: *The technical checker is selected in Section 4.1.3, "Technical Check Drawing." However, if the identity of the technical checker is known at this time, that person can be identified as such in DRF Section 4A, "List of reviewers," by clicking "Edit" in the left column of the row where that person is identified and changing the discipline designation to "Technical Checker." This change can only be made before the DRF is submitted for formal review.*

NOTE 2: *Up until turnover to the facility, drawings are owned by* engineering management *(see def.), which can be either the* design agent *(see def.) or* design authority *(see def.) function. Once the drawing is turned over to the facility, the document owner is the design authority function.*

4.1.1.2 DE: Furnish the drafter with drawing preparation guidance through:

A. Preliminary descriptions

B. Layouts

C. Drawing markups

D. Field design changes (FDCs) posted against the drawing (for drawing revisions)

E. Information applicable to items depicted on the drawing and to be included in the drawing notes, such as;

- Codes and standards
- Inspection, test, and acceptance criteria
- Material traceability
- Cleanliness
- Foreign material exclusion requirements
- Welding procedure specification (WPS) number (see INL Weld Manual Volume 1, Table of Contents, TOC-802, for a WPS list)

NOTE: *The above WPS identification may apply where fabrication or installation will performed by ICP direct-hire craft personnel.*

F. Other information (such as technical and functional requirements [T&FRs]) and safety and essential feature boundaries necessary to prepare the drawing.

4.1.1.3 DE: If the drawing requires the seal of an RPE, request the drafter to place an electronic reproduction of the RPE's seal on the drawing (see MCP-3534, "Use of Registered Professional Engineers").

4.1.1.4 Drafter: Prepare the new or revised drawing.

4.1.1.4.1 Prepare the drawing in accordance with the information provided by the DE.

4.1.1.4.2 Follow the formatting instructions contained in STD-11, "Drawing Requirements Standard," and any program-, project-, or facility-specific requirements.

4.1.1.4.3 Place a "DRAFT — NOT APPROVED FOR CONSTRUCTION" statement on the drawing and leave the statement on the drawing until it is ready to be released.

4.1.1.5 Drafter: Submit drawing for *draft check* (see def.) and to the DE or engineering management for *technical check* (see def.).

NOTE: *Draft check and technical check are typically performed sequentially, but can also be performed concurrently.*

4.1.2 Draft Checking Drawings

4.1.2.1 Drafting Checker: Provide an independent check of the drawing.

4.1.2.1.1 Check the drawing for:

A. Clarity

B. Completeness

C. Accuracy and consistency of drawing information (such as accuracy of geometric dimensioning and consistency with applicable models)

D. Compliance with STD-11.

4.1.2.2 Drafting Checker: If this is a drawing revision, check the unrevised areas of the drawing to confirm there are no unintended changes to the drawing.

4.1.2.3 Drafting Checker: Resolve draft checking-related design or drafting issues with the DE and drafter.

4.1.3 Technical Checking Drawings

NOTE: *The technical check is optional for drawings that are being canceled or as-built without incorporating any design changes. For as-built drawings or other drawing revisions, technical check is optional when the as-built only incorporates field design changes (FDC) that were technical checked and approved per MCP-1308, "Field Design Change." If the as-built or drawing revision includes additional design changes, then technical check is required.*

4.1.3.1 Engineering Management: Select a technical checker who:

A. Is not involved in designing the engineered item depicted in the drawing(s)

B. Has demonstrated technical expertise relevant to the topic being reviewed or technical experience on similar work sufficient to assess the technical adequacy of the drawing and compliance with design inputs.

4.1.3.2 Engineering Management: If the drawing is for a WAI spent nuclear fuel or high-level waste structure, system, or component (SSC) or activity, ensure that:

A. Documentation exists to verify that the technical checker's education and experience are commensurate with the scope, complexity, and nature of the work

B. Supervisors of personnel directly involved in developing the design are not performing the technical check.

C. Reviewers include the organizations or technical disciplines affected by the drawing

D. The drawing is reviewed by a QA reviewer who does not have direct responsibility for performing the work.

4.1.3.3 DE: Identify the technical checker and any other reviewers on the DRF (see steps 4.1.3.1 and 4.1.3.2).

NOTE: *The person selected as technical checker can be identified as such in DRF Section 4A, "List of reviewers," by clicking "Edit" in the left column of the row where that person is identified and changing the discipline designation to "Technical Checker." This change can only be made before the DRF is submitted for formal review.*

4.1.3.4 DE or Engineering Management: Provide the technical checker with:

A. Design input documents, such as T&FRs

B. Drawing to be reviewed

C. Sufficient pertinent information and tools for the reviewer to perform the review (such as Form 431.52, "Design Review Checklist").

4.1.3.5 Technical Checker: Review the drawing and associated documents to determine:

A. Drawing is technically accurate (including accuracy of tolerance stack-up information)

B. Consistency with parametric information from applicable building information modeling (BIM) software models (such as Inventor software)

C. Drawing meets design input requirements

D. Design inputs were correctly selected and incorporated into the drawing (including inputs from design and analysis software)

E. Design output is reasonable compared to design inputs

F. Interfaces with related SSCs and drawings have been considered

G. DE has identified applicable codes and standards, inspection criteria, and acceptance criteria on the drawing or by reference to the applicable design specification.

H. Suitable materials, parts, processes, and testing criteria have been specified.

NOTE: *Review assistance may be solicited from other disciplines, and Form 431.52, "Design Review Checklist," may be used as needed.*

4.1.3.6 Technical Checker: Provide the DE with comments.

4.1.3.7 DE: Resolve technical checker's comments.

4.1.3.8 Technical Checker: Concur with the drawing change on the drawing or on the DRF.

4.1.3.9 QA Reviewer: If the drawing is for WAI items and activities, review the drawing to ensure the design implements DOE/RW-0333P requirements.

4.1.3.10 DE: Provide the drafter with a marked print or other clear identification of changes required as a result of the technical check.

4.1.3.11 Drafter: Incorporate the draft check and technical check changes, working with the checkers and DE to ensure accurate interpretation of the change information.

4.1.3.12 Drafting Checker: Perform a final check of the drawing to ensure that any changes made subsequent to the draft check are consistent with the direction contained in Section 4.1.1.

4.1.3.13 Drafting Checker: If unchecked new design information is shown on the drawing, ensure a subsequent drafting and technical check on the new design information has been performed before releasing the drawing for approval.

4.1.4 Approving Drawings

NOTE: *Drawings may be signed by hand or applied electronically, as determined by the drawing owner. Whichever method is selected, it must be consistently applied to all signatures on that drawing. STD-163, "Electronic Signatures on Engineering Documents," establishes the standards that must be met if electronic signatures are used and GDE-487, "Electronic Signatures on Engineering Documents," provides supporting guidance.*

4.1.4.1 DE, SE, or Engineering Management: If requiring information copies of a drawing or drawing revision prior to approval and release from EDMS, ensure that the "DRAFT — NOT APPROVED FOR CONSTRUCTION" statement is on the drawing.

4.1.4.2 DE: Complete the DRF in preparation for drawing approval.

4.1.4.3 Drafter: Complete the drawing title block or revision history block as applicable.

4.1.4.4 Drafter: If there are restrictions on the use of the drawing, add appropriate notes as directed by the DE or SE.

4.1.4.5 Drafter: Remove the "DRAFT — NOT APPROVED FOR CONSTRUCTION" statement from the drawing and add the drawing effective date established by the drafting checker.

4.1.4.6 Drafter: Prepare Portable Document Format (PDF) electronic file of the final drawing for electronic signatures or prepare a hardcopy plot (for handwritten signatures or initials), as needed.

4.1.4.7 Drafter, Technical Checker, and DE: Sign the drawing.

4.1.4.8 RPE: If the drawing requires an RPE seal, sign the seal placed on the drawing (see step 4.1.1.3).

NOTE: *For drawing revisions, the RPE is typically signing for the revised (clouded) areas of the drawing unless the entire drawing is revised.*

4.1.4.9 Engineering Management or SE: As the drawing owner, approve the drawing change on the drawing to signify the drawing accurately reflects customer requirements.

NOTE 1: *Approval can be provided through the DRF process (no comment or acceptance of comment resolutions), or by handwritten or electronic signature on the drawing.*

NOTE 2: *Up until turnover to the facility, drawings are owned by engineering management, which can be either the design agent or design authority function. Once the drawing is turned over to the facility, the document owner is the design authority function*.

NOTE 3: *For an as-built drawing, the design authority system engineer provides the approval to designate that the drawing accurately reflects the installed configuration.*

NOTE 4: *For an as-built drawing that is reference in a RCRA permit, the design authority system engineer provides the approval to designate that the drawing accurately reflects the installed configuration.*

4.1.4.10 Drafter: Provide the DRF (electronic or hardcopy) and, if required, a hardcopy plot or electronic file (normally, PDF) of the final drawing to the drafting checker for release authorization (see Section 4.1.5).

4.1.4.11 Drafting Checker: Ensure all approvals have been entered on the drawing and establish the desired drawing effective date.

NOTE: *For an as-built drawing, approvals include:*

A. For incorporation of FDCs only – drafter, drafting checker and design authority

B. For incorporation of other design changes (with or without FDCs) – drafter, drafting checker, technical checker, design engineer, and design authority.

4.1.4.12 Drafting Checker: As needed, consult with the A/PCE to determine the appropriate individual for design authority approval.

4.1.5 Authorizing Release of Drawings

4.1.5.1 Drafting Checker: Sign the drawing to indicate drawing approval.

4.1.5.2 Drafting Checker: Authorize drawing release and effective date on the DRF.

4.1.5.3 Drafting Checker: Provide document control with the completed DRF.

4.1.5.4 Drafter: Provide document control with the PDF record file of the approved drawing for release in EDMS.

4.2 As-Built Verifying Drawings

4.2.1 SE: Perform *as-built* (see def.) verification in accordance with Table 1 in Section 4.4. Refer to Appendix A, "As-Built Drawing Verification," for as-built verification guidance.

4.2.1.1 For first time as-built verification, use the Appendix A guidance to cover the full scope of the drawing, including all posted FDCs.

4.2.1.2 For previously *as-built drawings* (see def.), use the Appendix A guidance to cover the currently posted FDCs.

4.2.1.3 If as-built verification cannot be accomplished within the time limit specified in Table 1, request up to a 30-day extension with the documented, retrievable concurrence of A/PCE and Operations management.

4.2.2 SE: Determine the appropriate action to resolve any discrepancies between field conditions and the drawing.

NOTE: *For all discrepancies, consider whether the discrepancy may require documentation and disposition through a nonconformance report (NCR) per MCP-538, "Control of Non-Conforming Items."*

4.2.2.1 If the field condition discrepancy can be resolved by performing rework that will make the field conditions match the drawing, initiate a work request per MCP-101, "ICP Integrated Work Control Process."

4.2.2.2 If the field condition discrepancy is fully acceptable, initiate a revision or a change to the drawing to match the field conditions per the following applicable procedure(s):

A. MCP-2811, "Nuclear Facility Change"

B. MCP-3630, "Digital Instrumentation and Control System Management"

C. Revision per Section 4.1 of this procedure

D. Change per MCP-1308, "Field Design Change."

NOTE: *If the field condition is partially acceptable, the resolution may be a combination of a drawing revision or change and rework in the field to match the revision or change.*

4.2.3 SE: For as-built drawing revisions, provide the following written information to drafting:

A. Drawing number, revision number, and list of FDCs posted against the drawing

B. Markup of the drawing for discrepancies that are not covered on an approved FDC

C. Statement that as-built verification has been completed and that the drawing is requested to be as-built.

NOTE: *Where an instrument or component is installed but is not in service, the FDC or markup of the drawing should include notation that the instrument or component is "not in service."*

4.2.4 Drafting Checker, Technical Checker, DE, Drafter, and Engineering Management: For as-built drawing revisions, check, review, approve, and authorize the drawing for release per Section 4.1.

4.2.5 SE: After the as-built drawing is released in EDMS, update the "Assessed Date" field in EDMS to identify the date the drawing was as-built.

4.3 Assessing Drawings

4.3.1 SE: Perform initial as-built assessments of essential and master facility drawings within the time limits specified in Table 1 and per Section 4.2.

NOTE: *The following step applies to all essential and master facility drawings in a nuclear (Hazard Category 1, 2, or 3) facility.*

4.3.2 SE: Perform periodic assessments of essential and master facility drawings in a nuclear facility to ensure the drawings are maintained up to date.

4.3.2.1 Periodically assess drawings:

A. In conjunction with a technical baseline reevaluation and revalidation using Form 431.76, "Idaho Cleanup Project SSC Technical Baseline Verification and Validation," per MCP-1492, "Technical Baseline"

OR

B. In conjunction with a system health assessment using Form 431.71, "Structure, System, or Component Health Report," per MCP-1450, "Conduct of Engineering."

4.3.2.2 Determine when and how often to perform periodic assessments using the health report criteria in MCP-1450 or technical baseline criteria MCP-1492, as applicable.

4.3.3 SE: Perform periodic assessments of essential and master facility drawings in a nonnuclear (less-than-Hazard Category 3) facility to ensure the drawings are maintained up to date.

4.3.3.1 Periodically assess drawings that meet one or more of the following criteria:

A. SSC is mission critical

B. SSC supports life safety (such as fire protection systems)

C. Drawing is used to develop a lockout-tagout plan

D. SSC supports reliability of facility operations (such as a steam utility system)

E. SSC has undergone a major or significant change or has undergone a significant number of changes.

4.3.3.2 Periodically assess the selected drawings in conjunction with a system health assessment using Form 431.71, "Structure, System, or Component Health Report," per MCP-1450, "Conduct of Engineering."

4.3.3.3 Determine when and how often to perform periodic assessments using the system health criteria in MCP-1450.

4.3.4 SE: If essential or master facility drawing information doesn't match physical configuration, as-built the drawing per Section 4.2.

4.4 Managing Drawings

4.4.1 SE: Refer to Table 1 on the next page to manage drawings according to type of facility, type of drawing, and applicable change process.

4.4.2 Drawing Requester: Work with the SE as needed to designate the drawing into one of the following types using the guidance in Appendix B:

A. *Essential drawing* (see def.)

B. *Master facility drawing* (see def.)

C. *General drawing* (see def.).

4.4.3 SE: Suspend, cancel, or supersede drawings when necessary using the DRF process per MCP-135, "Document Management."

Table 1. Drawing requirements.

Type of Facility	Type of Drawing	Change Process	
		MCP-2811 Nuclear *Facility Change Form* (FCF; see def.)	MCP-1308 Field Design Change (FDC) without FCF
Hazard Category 1, 2, or 3	Essential	Drawing must be as-built prior to turnover (Form 431.37, Block 15 or 18).(1)	Change information may be communicated on FDC, but must be as-built before placing modification in operation.(1)
	Master	Drawing must be as-built within 45 days after turn-over of modification.	Change information may be communicated on FDC, but must be as-built within 45 days after turnover of the modification.
	General	Drawing will be as-built to incorporate completed changes at direction of EM only.	Change information may be communicated on FDC. Drawing will be as-built to incorporate completed changes at direction of EM only.
Less Than Hazard Category 3 or Industrial	Essential	MCP-2811 is not required, but may be used per direction of EM. Drawing must be as-built before placing modification in operation.(1)	Change information may be communicated on FDC, but must be as-built within 45 days after turnover of the modification.(1)
	Master	MCP-2811 is not required, but may be used per direction of EM. Drawing must be as-built within 45 days after turnover of modification.	Drawing must be as-built within 45 days after turnover of modification.
	General	Not required, but may be used per direction of EM.	Per EM direction.

(1) Time requirement to as-built drawing may be extended up to 30 days per Step 4.2.1.3.

4.4.4 SE: Reactivate existing, suspended, cancelled, or superseded drawings before use.

4.4.4.1 As-built the suspended, cancelled, or superseded drawing per Appendix A.

4.4.4.2 Revise the drawing as necessary to reflect current facility or equipment configuration using the DRF process.

4.4.4.3 Request that document control personnel change the status flag from suspended, cancelled, or superseded to “active” upon release of the drawing revision.

4.4.5 SE: If the drawing has been designated as essential or master facility, update drawing flags and establish as-built date by entering the date in the “Assessed Date” field of the drawing data entry screen in EDMS per Appendix C, “EDMS Drawing Data Entry Screen Guidance.”

4.4.6 SE: Maintain categorization of the essential and master facility drawing designations and make any needed corrections.

4.4.7 SE: As mission or scope changes (such as a revised or cancelled safety analysis report [SAR]), reclassify essential and master drawings to *general drawings* (see def.) or suspend, cancel, or supersede, drawings, as needed.

4.4.8 SE: If the drawing will be canceled or superseded with no revision required to the drawing, suspend, cancel, or supersede the drawing using a DRF per MCP-135, "Document Management."

4.4.9 SE: If the drawing needs to be revised before being suspended, canceled, or superseded, initiate the drawing revision process per Section 4.1.

4.5 Preparing Non-Company Drawings for Release

4.5.1 SE: If the company will be making changes to a non-company (subcontractor- or vendor-supplied drawing) or if the drawing affects facility configuration, deliver the drawing to the drafting organization.

NOTE: *Non-company drawings that are retained as provided by the vendor and not needed to maintain facility configuration are normally retained in EDMS as vendor data per MCP-3573, "Vendor Data Process."*

4.5.2 Drafter: Ensure proper format of non-company drawings provided by the SE.

4.5.2.1 If the drawings do not meet the electronic file structure requirements of STD-11, jointly determine with the SE the appropriate action to be taken prior to release and restructure the electronic files as needed

4.5.2.2 Add the company index codes, serial numbers, safety categories, and quality levels in accordance with STD-11.

4.5.3 Drafting Checker, Technical Checker, SE, Drafter, and Engineering Management: Prepare, check, review, approve, and authorize the subcontractor- or vendor-supplied drawing for release per Section 4.1.

4.6 Developing and Using Engineering Sketches

NOTE 1: Engineering sketches *(see def.) are not entered into the EDMS.*

NOTE 2: *Limited format standards for engineering sketches are provided in this section.*

NOTE 3: *The A/PCE may apply additional guidelines for engineering sketches (such as maintaining a project or area engineering sketch log and assigning engineering sketch numbers).*

NOTE 4: *Engineering sketches were previously used with FDCs as a means to change an approved design drawing per MCP-1308, "Field Design Change." MCP-1308 has been revised to refer to changes to an approved design drawing via the FDC process as "FDC markup drawings," which are fully covered in MCP-1308.*

4.6.1 Engineering Management: Use engineering sketches only for SSCs that meet one or more of the following conditions:

A. Quality level (QL)-4 SSCs, as designated per MCP-540, "Assigning Quality Levels"

B. QL-3 SSCs that have been permanently shut down and scheduled for D&D

C. QL-3 SSCs that will be used for temporary installations such as test rigs and lifting fixtures that have no configuration management requirements per MCP-1492, "Technical Baseline"

D. QL-3 SSCs where (1) the engineering sketch is used only to translate or clarify design information in a specification or other issued design document, (2) the information on the sketch does not alter the documented design, (3) the issued design document is not an essential drawing, and (4) the sketch refers back to the approved and issued design documentation

E. QL-3 SSCs where the engineering sketch is used to provide details in support of an NCR disposition developed in accordance with MCP-538, "Control of Non-Conforming Items"

F. QL-3 SSCs in D&D less than Hazard Category 1, 2, or 3 nuclear applications that are not and will not become part of a permanent ICP or INL facility.

NOTE: *This D&D QL-3 SSC category of engineering sketch applies to a short-term D&D process, treatment system, or structure.*

4.6.2 Drawing Requester: Furnish the DE, SE, and/or drafter with sketch information including the applicable quality level and QLD number.

4.6.3 DE, SE, and/or Drafter: Prepare the sketch in accordance with the information provided by the requester and apply the following format conventions and limitations.

4.6.3.1 Clearly denote "ENGINEERING SKETCH" and page number on each page of the sketch.

4.6.3.2 If a sketch number is assigned, identify the sketch number.

4.6.3.3 Identify the sketch revision number.

4.6.3.4 Identify sketch quality level and QLD number.

4.6.3.5 If the sketch is not associated with another document, provide signature blocks for Designed, Checked, and Approved.

4.6.3.6 If the engineering sketch is made using an existing company drawing, remove or clearly cross out the drawing title block.

4.6.3.7 When the engineering sketch will be attached to or used with another document (such as an FDC or WO), include the identifier of the associated document on the sketch.

NOTE: *As described in 4.6, Note 4, engineering sketches are not used with the FDC process to change an approved design drawing. However, an engineering sketch can be attached to an FDC to show design information, as allowed in step 4.6.1, to complement a change to an approved design drawing. For example, an FDC could change a P&ID to add a valve in a QL-4 system and an engineering sketch could be prepared and attached to the FDC to show design specifications and details for the added valve. Or rather than attaching the engineering sketch to the FDC, it could simply be referenced in the FDC.*

4.6.4 Technical Checker: Check the engineering sketch for technical accuracy. Sign and date the sketch or associated document.

4.6.5 Engineering Management: Authorize use of the engineering sketch by signing and dating the sketch or associated document.

4.6.6 DE, SE, and Technical checker: Control changes to the engineering sketch either by redline markup or revision.

NOTE: *FDCs are not used to change engineering sketches. FDCs are used to make changes to configuration-managed documents (such as drawings) issued through EDMS. Although engineering sketches may be attached to an FDC, the FDC process is not used to control changes to engineering sketches because they are not configuration-managed documents.*

4.6.6.1 DE or SE: Do NOT use the FDC process to make changes to engineering sketches.

4.6.6.2 DE or SE: Make redline markup changes to the engineering sketch as needed.

4.6.6.2.1 Mark up the sketch. Initial and date the change on the sketch.

4.6.6.2.2 Obtain a technical check.

4.6.6.3 Technical Checker: Check the markup for technical accuracy. Initial and date the change on the sketch.

4.6.6.4 DE or SE: Revise engineering sketches as needed per steps 4.6.3 through 4.6.5.

4.6.7 Engineering Management: If the engineering sketch will be attached to another document that will become a quality record (such as an FDC per MCP-1308; a work order per MCP-101, "ICP Integrated Work Control Process;" or a lift plan per MCP-6504, "Hoisting and Rigging Lift Determination and Lift Plan Preparation"), retain the sketch with the FDC, work order, lift plan, or other document.

4.6.8 Engineering Management: If the engineering sketch will NOT be attached to another document that will become a quality record and will be used in performing work, retain the sketch as a record with the project files (see MCP-557, "Records Management").

4.6.9 D&D Engineering Management: When an engineering sketch is used for QL-3 SSCs in D&D less-than-Hazard Category 3 applications, establish and assign responsibility for the following configuration control measures for the engineering sketches.

4.6.9.1 Establish and maintain an engineering sketch status log.

4.6.9.2 Establish and maintain a server location for approved engineering sketches.

4.6.9.3 Establish a distribution (electronic or hard copy) for the approved engineering sketches.

4.7 Developing and Revising Data Sheets and Design Data Sheets

NOTE 1: *Data sheets are contained in a specification and controlled per MCP-9359, "Specifications and Statements of Work."*

NOTE 2: Design data sheets *(DDSs; see def.) and* configuration data sheets *(CDSs; see def.) are stand-alone documents issued as directed in this procedure using Form 431.77, "Data Sheet Approvals." Multiple DDSs of the same quality level can be issued under a single DDS approval sheet.*

NOTE 3: *Recognized industry societies employ data sheets and DDSs in a variety of forms that may be suitable for use to procure items for ICP. The most common are those that provide information for a particular commodity. Industry sources, such as those listed below, have commercial examples of data sheets and DDSs that may be helpful:*

A. American Chemical Society (ACS)

B. Instrument Society of America (ISA)

C. American Society for Testing Materials (ASTM)

D. American National Standards Institute (ANSI)

E. Process Industry Practices (PIP).

4.7.1 Developing and Revising Data Sheets within Specifications

4.7.1.1 DE: If any of the following criteria apply, include the data sheet in a specification:

A. The data sheet requires an RPE seal

B. The item to be procured has multifaceted requirements (such as fabrication QA, supplier testing, or installation requirements) beyond simple identification of critical characteristics

C. As needed by the project.

4.7.1.2 DE: Develop the data sheet as required by the project.

4.7.1.3 DE: Include the data sheet as part of the specification and process it per MCP-9359.

4.7.1.4 DE: As needed, revise the data sheet as part of the specification per MCP-9359.

NOTE: *After project turnover, data sheets within specifications may be issued as standalone DDSs as directed by the SE (see Section 4.7.2).*

4.7.2 Developing and Revising Stand-Alone Design Data Sheets and Configuration Data Sheets

NOTE: *A configuration data sheet (CDS) is considered a DDS subtype and uses a DDS controlled document number.*

4.7.2.1 DE or SE: Develop the DDS or CDS as required by the project and using Form 431.77, "Data Sheet Approvals."

4.7.2.2 DE or SE: Include DDS number, revision number, and effective date on the DDS or CDS.

4.7.2.3 DE or SE: Obtain a *technical check* (see def.) of the DDS or CDS.

4.7.2.4 DE or SE: Obtain review of the DDS or CDS from other impacted disciplines.

4.7.2.5 Technical Checker: Check the DDS or CDS for technical accuracy and provide concurrence on the DDS approval sheet.

4.7.2.6 DE or SE: As DDS or CDS document owner, provide approval on the DDS approval sheet to release the DDS or CDS as a controlled document and include document effective date.

4.7.2.7 DE or SE: Submit the approved DDS or CDS to document control via DRF transmittal per MCP-135, "Document Management," for release in EDMS. Accomplish this by using the "minor change" provision of the DRF system. Include:

A. Completed, approved DDS or CDS

B. If the approved DDS or CDS has electronic approval signatures, confirmation that the signatures have been validated per GDE-487, "Electronic Signatures on Engineering Documents"

C. Native file of the DDS or CDS

D. Confirmation that the document owner has concurred with document release by evidence of owner approval signature on the DDS or CDS.

NOTE: *MCP-135, "Document Management," provides a "DRF Exclusion" in Appendix A (Exhibit 3 – Category B Documents) for engineering documents (such has EDFs) that have approval signature sheets. This exclusion applies to completion of all portions of the DRF except for signature validation and release (transmittal) to document control under the DRF minor change designation.*

4.7.2.8 DE or SE: Revise the DDS or CDS per this section or change it per MCP-1308, "Field Design Change."

4.7.2.9 DE or SE: If the DDS or CDS is subsequently incorporated into a specification, cancel the stand-alone DDS or CDS per MCP-135, "Document Management."

5. RECORDS

Released drawing master, electronic file of document, and associated case file contents (such as DRFs).

Released design or configuration data sheets with electronic file.

NOTE: *MCP-557, "Records Management," the INL Records Schedule Matrix, and associated record types list(s) provide current information on the storage, turnover, and retention requirements for these records.*

6. DEFINITIONS

as-built. See LST-199, "Quality Assurance Program Requirements Document Definitions."

as-built drawing. A drawing (such as piping and instrument diagrams and flow diagrams) verified by *walkdown* (see def.) as depicting the actual physical configuration and verified as consistent with the design basis engineering review. Drawings that are as-built will have the following words in the revision block of the drawing: "As-built as of (date)."

as-found. Information, often in the form of marked-up documents that reflects the actual physical configuration and identifies any discrepancies with currently approved facility documents.

configuration data sheet (CDS). A design engineering document type that summarizes the performance and other technical characteristics of a component, typically, an I&C system component (see MCP-3630, "Digital Instrumentation and Control System Management").

design agent. The function having the responsibility and authority for employing engineering concepts and principles to develop, analyze, and establish engineering design deliverables (such as drawings, specifications, calculations, and analyses) in compliance with technical, functional, and operational requirements; codes and standards; company requirements and procedures; and state and federal laws. This function is normally performed by a design engineer, engineering analyst, design lead, analyst lead, their direct management, or some combination of these positions depending on the scope and complexity of the engineering work.

design authority. The function having the responsibility and authority for establishing and maintaining the design requirements; ensuring design output documents accurately reflect the design basis; and approving the design bases, configuration, and changes thereto. This function is performed by a system engineer assigned by the area/project chief engineer as the design authority for assigned system(s).

design data sheet (DDS). A design engineering document type that summarizes the performance and other technical characteristics of a component.

Do-Check-Approve. The ICP engineering minimum application of best industry practice to ensure ICP engineering design products are:

A. Developed by competent personnel applying applicable design standards and executing consistent engineering processes

B. Reviewed by competent personnel who ensure the design meets customer needs and expectations and applicable design standards

C. Approved by personnel who are accountable for technical accuracy of the design.

draft check. An independent review of a drawing by a qualified drafter to verify its clarity, completeness, and compliance with STD-11, "Drawing Requirements Standard."

engineering. The application of scientific principles to solve issues related to the design, planning, construction, and maintenance of buildings, machines, and other manufactured items.

engineering management. Engineering staff assigned supervisory or managerial responsibility for the conduct of engineering work. Engineering management positions include, but are not limited to, design leads, engineering supervisors, engineering managers, and the ICP chief engineer.

engineering sketch. A diagram that is subjected to the engineering *Do-Check-Approve* (see def.) process and used to provide organizations and disciplines (such as maintenance planning) with the necessary engineering input to complete work. Engineering sketches are controlled by the responsible area or project outside of EDMS by being attached to another document that will become a quality record (such as an FDC or work order) or retained as a record with the project files.

essential drawing. An essential drawing is necessary for the safe operation (including abnormal and emergency operating modes) of facilities and SSCs. Typically, the drawing describes system-level information related to SSCs whose failure could have significant worker, public, or environmental consequences. An essential drawing reflects the actual configuration of the SSC when it is in operation, and is used for any of the following purposes:

A. Describes the critical operational characteristics, system interfaces, and control features of a system included in the authorization basis (safety class or safety significant SSCs; see the Safety SSC List). The authorization basis may include environmental protection regulatory permits and compliance agreements.

B. Included in materials maintained in the emergency response facility (such as the command post or emergency control center) and could be relied on for event response.

Some examples of essential drawings are Piping & Instrument Diagrams (P&IDs) and Single Line or One Line Diagrams in the Electrical Configuration Management Database that identify isolation points.

facility change form (FCF). The FCF is company Form 431.37. It is used to:

A. Describe the proposed facility engineering change

B. Document the activities associated with the design of a new or modified SSCs

C. Authorize the change

D. Identify required safety and environmental reviews

E. Record review of the change

F. Identifying documents affected by the change

G. Track the implementation of the change into all affected (such as red-lined) documents

H. Ensure affected documents and drawings are modified and released as approved documents and drawings

I. Ensure the project is signed off as completed.

facility documents. Those documents that support facility operations, configuration information (such as drawings and valve lists), the facility procedures for activities (such as operations, maintenance, and testing), and facility operational records (such as completed test, work requests, and radiation survey maps).

general drawing. All drawings that are not designated as essential or master facility drawings. As-built drawing verification is at the discretion of engineering management and changes are processed via field design changes.

information-only sketch. A drawing, photograph, or map that is used as part of another work control document, is not subjected to the engineering *Do-Check-Approve* (see def.) process, and is not used to perform engineering, but can be used to supplement or clarify an engineering design.

master facility drawing. A master facility drawing is necessary for the routine operation, maintenance, safety analysis, and engineering of the facility equipment and systems that depict the condition of a facility.

physical configuration. The actual physical location, arrangement, and material condition of structures, systems, and components within a facility.

technical check. A critical review by a qualified individual, through detailed examination of the engineering deliverable, that verifies the design is correct and complete, has an appropriate level of detail, reflects results of calculations, and meets applicable design inputs.

walkdown. A visual inspection of a facility SSC to identify the *as-found* (see def.) *physical configuration* (see def.) and any discrepancies with currently-approved *facility documents* (see def.).

Waste-Acceptance-Impacting (WAI). See LST-199, "Quality Assurance Program Requirements Document Definitions."

7. REFERENCES

10 CFR 830.122(d), "Criterion 4-Management/Documents and Records "

DOE/RW-0333, *Office of Civilian Radioactive Waste Management Quality Assurance Requirements and Description*

Form 431.37, "Facility Change Form"

Form 431.52, "Design Review Checklist"

Form 431.71, "Structure, System, or Component Health Report"

Form 431.76, "Idaho Cleanup Project SSC Technical Baseline Verification and Validation"

Form 431.77, "Data Sheet Approvals"

GDE-487, "Electronic Signatures on Engineering Documents"

LST-199, "Quality Assurance Program Requirements Document Definitions"

MCP-101, "ICP Integrated Work Control Process"

MCP-135, "Document Management"

MCP-538, "Control of Non-Conforming Items"

MCP-540, "Assigning Quality Levels"

MCP-557, "Records Management"

MCP-1308, "Field Design Change"

MCP-1450, "Conduct of Engineering"

MCP-1492, "Technical Baseline"

MCP-2811, "Nuclear Facility Change"

MCP-3534, "Use of Registered Professional Engineers"

MCP-3573, "Vendor Data Process"

MCP-3630, "Digital Instrumentation and Control System Management"

MCP-6504, "Hoisting and Rigging Lift Determination and Lift Plan Preparation"

MCP-9359, "Specifications and Statements of Work"

STD-11, "Drawing Requirements Standard"

STD-163, "Electronic Signatures on Engineering Documents"

TOC-802, "INL Weld Manual Volume 1, Procedure Specifications, Table of Contents"

8. APPENDICES

Appendix A, "As-Built Drawing Verification"

Appendix B, "Drawing Designation Selection Guidance"

Appendix C, "EDMS Drawing Data Entry Screen Guidance"

Appendix D, "MCP-2377 Procedure Basis"

Appendix A

As-Built Drawing Verification

I. GENERAL AS-BUILT PROCESS GUIDELINES

Accurate as-built drawing information is key to the effective performance of configuration management; emergency response; operations; maintenance; environment, safety, and health (ES&H); facilities management; and planning. The following defines the processes to generate verified as-built information to ensure that the depicted configuration agrees with the actual configuration found in the field and verified consistent with the design requirements. The success of an as-built program will, to a large degree, depend on the rigor applied to review, approval, implementation, and verification of changes throughout the life of the equipment or facility.

1. Graded Approach to As-Built Drawing Verification

A graded approach should be used for the generation of as-built information for systems important to safety, environment, and mission. Drawings to be as-built are generally identified as either essential or master facility. The system engineer or design authority for the equipment that is depicted on the drawing should determine the level of detail and accuracy and the methods used to develop as-built information. The level of detail and accuracy is dependent on specific systems within facilities, the use of a facility, the integrity of a structure, and system priorities. The method and level of verification also will depend on whether the drawing is identified as essential or master facility.

For essential drawings (such as P&IDs and electrical one lines), field verification should be conducted to the fullest extent possible. Suggested methods include walkdown, use of video cameras, close-range photogrammetry, peer or independently verified work package or inspection reports prepared by qualified personnel, and other means available. Because of the complexity or configuration of many facility systems, structures, and components, a 100% field verification is not always possible. Every reasonable attempt to field-verify SSCs should be made.

For master facility drawings, it may only be appropriate or necessary to verify specific areas or attributes depicted on the drawing. If no specific areas or attributes warrant verification, then incorporation of outstanding changes may be sufficient to establish the drawing as as-built.

2. Personnel Training and Qualification Necessary to Perform As-Built Drawing Verification

Those responsible for the as-built drawing verification effort should determine the training and minimum qualifications for personnel performing specific as-built verification functions (site and utility plans, architectural and structural plans, mechanical, electrical, and instrumentation), including:

A. Knowledge of site ES&H policies

B. Necessary combination of education and experience

C. Working knowledge of drawings and documentation

D. Functional knowledge and understanding of systems (such as mechanical, electrical, instrumentation and controls, civil and structural, industrial electronics, and under- and above-ground utilities) to be verified.

3. Identification of an As-Built Drawing

A drawing that has been as-built will have the words "As-built as of (date)" in the revision block of the drawing.

4. Information on a Drawing to be As-Built

A drawing may be a combination of different types of information such as equipment layout, block diagram, one-line diagram, wiring diagram, parts list, and fabrication information. Not all drawing information is necessary and clutter should be removed from configuration managed drawings. Because all information on all drawings cannot be field verified, those items not field verified should be annotated.

Drawings that are required to be as-built must be as-built in their entirety and have the "As-built as of (date)" noted in the revision block of the drawing. Once a drawing has been as-built, the next consecutive revision to the drawing does not require the entire drawing to be as-built, only those portions of the drawing that were revised. For example, an essential drawing must first be as-built in its entirety and the statement "As-built as of (date)" entered into the revision block of the drawing. If the next change to the drawing was the result of a modification, only that area of the drawing that was modified needs to be as-built. The remainder of the drawing is to be assessed per Section I.1 (even though the drawing may not be an essential drawing) and the statement "As-built as of (date)" entered into the revision block of the drawing. The drawing has now been maintained in the as-built condition. However, if the previous revision did not have the statement "As-built as of (date)," the entire drawing is to be as-built.

II. AS-BUILT VERIFICATION GUIDELINES FOR DRAWINGS

Information provided on a drawing may cross disciplines that would require using different as-built verification guidelines below for the drawing to be properly verified as-built.

1. Site and Utility Plans

Site and utility plans describe surface and subsurface information adjacent to facilities. This section is not intended as guidance for sitewide mapping efforts.

1.1 Site Plans

Suggested features include, but are not limited to:

A. Brass caps and other permanent survey monuments (survey control benchmarks used should be referenced in a note on the plan)

B. Building footprints with building numbers

C. Roads, parking lots, sidewalks, curbs, catch basins, culverts, permanent signs, and lighting

D. Fences (Use different symbols to depict industrial, security, three-strand barbed wire, and other types of fencing.)

E. Retaining walls and other non-utility structures

F. Contours with appropriate intervals

G. Surface drainage direction arrows and culverts, including culvert size and other applicable information, as necessary.

1.2 Utility Plans

All utilities on the Site should be shown to the building line in plan view. This section is not intended as guidance for sitewide mapping efforts. Suggested features include, but are not limited to:

A. Appropriate site information (refer to Section I.1 above)

B. Line sizes, services, and material types, where necessary

C. All utility features and locations (such as valves normally open or closed, manholes, lift stations, clean outs, pumper connections, fire hydrants, telephone boxes, poles, transformers, and high-voltage switch positioning normally open (NO) and normally closed (NC).

2. Architectural and Structural Plans

2.1 Floor Plans

Accurate floor plans are used for space and site planning, emergency response drawings, emergency evacuation and hazard maps, and as a base drawing for further as-built efforts (such as electrical and mechanical plans). Suggested features include, but are not limited to:

A. Wall width, construction materials, fire rating, and wall openings

B. Room numbers

C. Door and window locations, including fire ratings and door swings

D. Interior and exterior ramps, ladders, stairs, docks, and rails

E. Utility chases, elevator shafts, and wall louvers

F. Interior fence enclosures and associated doors

G. Columns and column tags

H. Concrete or hard-surfaced pads at exterior doorways

I. Exterior dimensions

J. Floor pits, grating, and trenches

K. Permanent utility fixtures and counters

L. Mezzanines

M. Vaults and screen rooms

N. Square footage (building gross and net, room, and utility chase)

O. Other features as necessary.

2.2 Structural Documentation (such as International Building Code and seismic)

At visible portions of the structure verify that the drawing reflects the original as-built features, correct errors to as-built, and verify dimensions of features and components affected by modifications. Note on the drawing that original dimensions were not verified by actual measurement during this as-built verification. Suggested features include, but are not limited to:

A. Connection details

B. Equipment bases

C. Floor loading

D. Snow loading

E. Other.

3. Mechanical Plans

3.1 Heating, Ventilating, and Air Conditioning (HVAC) Systems

As-built HVAC drawings may be in many forms, including one-line air flow diagrams, ducting plans, process flow diagrams, sequence of operations diagrams, isometrics, and/or scale drawings. Verify that flow, flow routing, components, component locations, and controls are accurately reflected. Correct errors and incorporate modification. For buried or imbedded ducting, verify identification and sizes at entrance and exit points. Note on the drawing that original dimensions were not verified to actual measurement.

3.1.1 **One-line airflow diagrams.** Suggested features to be included, but are not limited to:

A. Dampers, registers, grilles, and diffusers

B. HVAC equipment

C. Transitions with sizes called out

D. Flow rates and pressure differentials

E. Air flow arrows

F. Special equipment (such as fume hoods and high-efficiency particulate air [HEPA] filters).

3.1.2 **Ducting plans.** The suggested features to be included, but are not limited to:

A. HVAC equipment and dampers

B. Diffusers, registers, and grilles

C. Transitions with sizes noted

D. Ducting runs for supply, return, and exhaust air

E. Fume hoods and HEPA filters

F. Type of exhaust.

3.2 Piping Systems

As-built piping drawings may be in the form of piping and instrumentation diagrams, isometrics, and drawings.

3.2.1 **Underground or Imbedded Piping and Plumbing.** Verify by checking identification and lines sizes at entrance and exit points, at valve standpipes, and at manholes. Verify branch lines at any visible locations. Verify indicated service by line identification, flow, operational data, etc.

3.2.2 **Visible Piping and Plumbing.** Verify line sizes, line locations, and locations of components such as pumps, valves, flow orifices, and thermowells. Include branch piping and sample and impulse lines. Correct errors and incorporate modifications.

3.2.3 **Pipe labeling.** Pipe should be labeled in accordance with Conduct of Operations requirements.

3.2.4 **Gas and Liquid Systems** (such as for oils, acids, solvents, or water). Suggested features to be included, but are not limited to:

A. Tanks, compressors, valves, gages, drains, and vents

B. Type of gas or liquid (labeling)

C. Meters and pressure-reducing valves

D. Lines, including size, service, and material type.

3.2.5 **Water Systems** (such as domestic, non-potable, heating, or chilled). Suggested features to be included, but are not limited to:

A. Supply and return lines, including size, service, and material type

B. Flow measurement devices

C. Plumbing fixtures (such as sinks, lavatories, water coolers, and emergency showers)

D. Gauges, valves, and back-flow preventives

E. Boilers, chillers, and similar types of equipment

F. Flow direction arrows.

3.2.6 **Building Drain Systems** (such as for sanitary sewer, rain water, hazardous liquid waste, and radioactive liquid waste). As-built drain system drawings may be in forms such as schematic drawings, isometrics, plans, shop drawings, and database files. Suggested features to be included, but not limited to:

A. Line size, service, and material type

B. Manholes and cleanouts

C. Drainage system inputs (such as floor drains and sink drains)

D. Wyes, valves, tees, and elbows

E. Holding tanks, septic tanks, leach fields, and similar equipment.

3.3 Mechanical General

Ensure drawings correctly reflect critical dimensions and features, identify errors, and show corrections necessary for the drawing to match the as-built configuration. The cognizant engineering organization will identify critical dimensions and features on a case-by-case basis. Suggested features include, but are not limited to:

A. Remote handling equipment

B. Plant machinery and mechanical equipment

C. Storage and shipping equipment

D. Tools, gauges, special research, or analytical equipment

E. Piping systems, tanks, and vessels.

4. Electrical Systems

Electrical systems include power, lighting, alarms, and other specialized Site systems. Electrical as-built drawings may consist of one-line drawings, plan views, schedules, or other supporting details necessary to describe these systems. Accurate electrical drawings are required to facilitate lockout and tagout programs.

4.1 Power System One-Line Diagrams

An initial one-line diagram, starting at the incoming power supply and showing major system components, should be developed. Suggested features include, but are not limited to:

A. Power sources (voltage, capacity in volt-amperes, and short-circuit currents)

B. Incoming lines (number, gauge, type, and amperage limits)

C. In-plant generation

D. Incoming main fuses, sizes, potheads, cutouts, switches, main, and tie-breaker settings

E. Power transformers (rating, winding connections, impedance, and grounding means)

F. Feeder breaker settings and fuse switches (size)

G. Relays (function, use and type, and settings)

H. Potential transformers (size, type, and ratio)

I. Current transformers (size, type, and ratio)

J. Control transformers (size, type, and ratio)

K. Surge arresters (type and rating)

L. Capacitors (type and rating)

M. Automatic transfer switches.

Additional downstream one-line diagrams should be developed to represent all feeders. All significant loads and panelboards should be depicted down to, but not including, branch circuits. One-line diagrams should also be developed for emergency power, standby power, and uninterruptible power supply (UPS) systems where applicable. Circuit directories or panel schedules may be used in lieu of one-line diagrams for 480V and lower voltages if all information is included.

4.1.1 Items are to be correctly identified.

4.1.2 Items will be shown in the proper sequence.

4.1.3 Load capacities will be verified.

4.1.4 System accuracy will be determined by requesting operations to turn on and off (or vice versa) each system.

4.1.5 Identify motor starters and their sizes.

4.2 Equipment Location Plan

Suggested features include, but are not limited to:

A. Panelboards

B. Disconnects

C. Utilization devices (such as motors and chillers)

D. Conduit routing

E. Labeling with power sources.

4.3 Circuit Directories and Panel Schedule

Suggested features include, but are not limited to:

A. Breaker size and identification

B. Identification of each circuit

C. Panel and bus information (such as labeling, source, phase, and voltage).

4.4 Schematic Diagrams

4.4.1 Items are to be correctly identified.

4.4.2 Fuses, breakers, and other protective devices are identified as to size, type, and model if appropriate.

4.4.3 Items will be shown in the proper sequence.

4.4.4 When specific terminal points are identified on the drawing, verification of these points is required. A work order will be generated to control end-to-end checks when reasonable doubt exists as to the drawing accuracy or when the affected system does not operate properly. Engineering judgment will be used.

4.5 Supporting Documentation

Supporting documentation should be included as needed to accurately describe the power systems. Supporting information should be cross-referenced to the one-line or plan files for ease of retrieval and archiving. Suggested features include, but are not limited to:

A. Elevations

B. Details

C. Wiring schematics

D. Control diagrams

E. Schedules.

4.6 Lighting

4.6.1 **Indoor Lighting.** Suggested features to be included, but are not limited to:

A. Reflected ceiling plan and grid layout, where possible

B. Location of fixtures

C. Identification of fixtures (normal, emergency, and exit lighting)

D. Associated controls

E. Fixture labeling with source and controlling switch

F. Special fixture types and locations.

4.6.2 **Outdoor Lighting.** Suggested features to be included, but are not limited to:

A. Plan location (building perimeter, parking lot, and area lighting should be shown on a site or plot plan)

B. Location of fixtures

C. Identification of fixtures (such as normal or emergency)

D. Associated controls

E. Fixture labeling with source

F. Special fixtures types and location.

4.7 Alarms and Other Systems

These electrical systems may include public address, telephone, data, fire, security, cathodic protection, and lightning protection.

4.7.1 **One-Line Diagram.** Suggested features to be included, but are not limited to:

A. Primary system elements

B. Labeling, as applicable.

4.7.2 **Equipment Location Plan Drawings.** Suggested features to be included, but are not limited to:

A. Device location

B. Identification and labeling of devices

C. Identification of sources, as necessary.

4.7.3 **Supporting Documentation.** Supporting documentation should be included as needed to accurately describe the alarm and other systems. Supporting information should be cross-referenced to the one-line or plan files for ease of retrieval and archiving. Documentation may include, but is not limited to:

A. Elevations

B. Details

C. Wiring schematics

D. Control diagrams

E. Schedules

F. Sequence of operations.

5. Instrumentation and Controls

As-built drawings for instrumentation and control systems should consist of flow diagrams, sequence of operation sheets, schematics, and component location plans.

5.1 Instrumentation and Control Plans (such as pneumatic electric and electronic)

Suggested features include, but are not limited to:

A. Interconnection diagrams

B. Remote terminal units

C. HVAC equipment such as fans, pumps, chillers, boilers, control components (such as relays), thermostats, controllers, and sensors

D. Control dampers and control valves

E. Computerized control systems.

5.2 Process Piping and Instrumentation Diagrams (P&IDs)

5.2.1 All major components and piping will be shown.

5.2.2 Control elements, instrument tap points, sensors, etc., will be shown in their proper flow sequence.

5.2.3 Identity of instruments, valves, piping, tubing, and sensing elements will be verified as tagged.

5.2.4 Components will be shown in their relative locations to other hardware, but no dimensions, other than pipe sizes, will be shown.

5.2.5 Unused systems and the partial remainders of removed systems will be identified as out-of-service (OOS) and will be shown on the drawing.

5.2.6 Component nomenclature will be verified on item tags (such as valve and tubing line numbers).

5.2.7 Engineering judgment will be used in as-built drawing verification of inaccessible areas. Perform as-built verification only hardware that is accessible without altering any equipment or facilities for access.

5.2.8 Items that are not intended to be shown on drawings are to be addressed by note or reference.

5.3 Block Diagrams

5.3.1 Components are to be correctly identified.

5.3.2 Components will be shown in the proper sequence.

5.4 Wiring Diagrams

5.4.1 Terminal blocks, wiring, cables, relays, etc., will be correctly depicted on the drawings.

5.4.2 Fuses, breakers, and other protective devices will be identified as to size, type, and model.

5.4.3 Wire and cable tags will be checked for accuracy according to the tagging method used in the affected area.

5.4.4 End-to-end checks will be performed by work order when reasonable doubt exists as to the drawing accuracy or when the affected system does not operate properly. Engineering judgment will be used.

5.4.5 The size and location of underground and imbedded electrical wiring will be given.

Appendix B

Drawing Designation Selection Guidance

Typically, drawings used for the purposes given in the definitions of essential, master facility, and general drawings in Section 6 of this procedure are designated as the corresponding drawing type. Refer to the definitions of general drawings, essential drawings, and master facility drawings in Section 6 of this procedure.

The following table provides additional guidance to determine the designation of specific types of drawings. This guidance is not mandatory and should be determined based on many factors, including risks, cost effectiveness, life cycle and remaining mission life, quality level, etc.

Drawing Types	Essential	Master Facility	General
Plant Design			
Site Location Drawings		X	
General Arrangements			X
3D Model		X	
Equipment Locations		X	
Machine Design Drawings			X
Weld Details			X
Fire Protection Drawings		X	
Piping Isometrics			X
Area Piping Drawings		X	
Piping & Equipment Details			X
HVAC Layout Drawings			X
Jumper Design Drawings			X
Plumbing Drawings			X
Floor Drain Drawings			X
Sewer Drain Drawings			X
Roof Drain Drawings			X
General & Miscellaneous			X
Mechanical/Process			
Flow Diagrams		X	
Piping & Instrument Diagrams (P&ID) (used to respond to plant events and determine mitigation actions)	X		
Other P&IDs		X	
Fire Suppression System Design		X	
Dimensional Record Drawings			X

Drawing Types	Essential	Master Facility	General
Equipment Details			X
Piping Details			X
Piping Flexibility			X
General & Miscellaneous			X
Civil			
Site and Plot Plans			X
Survey Drawing		X	
Roads/Railroads Drawings			X
Erosion Control Drawings			X
Landscaping Drawing			X
Fencing/Parking/Laydown			X
Grading			X
Yard Utilities Drawings		X	
Wells			X
Sanitary/Storm Sewers Drawings		X	
Ductbanks		X	
Manholes			X
Shoring Drawings			X
Structural			
Structural Concrete Plans			X
Structural Concrete Sections & Details			X
Structural Masonry			X
Structural Steel Drawings			X
Fabrication Details			X
Miscellaneous Steel, Plans, Sections, Details			X
Miscellaneous Steel Grating, Handrails, Plate Drawings			X
Foundation Drawings		X	
Pipe Supports/Pipe Racks Drawings			X
Equipment Supports Drawings			X
Tray and Conduit Supports Drawings			X
Instrumentation Supports Drawings			X
HVAC Support Drawing			X

Drawing Types	Essential	Master Facility	General
Architectural			
Architectural Plans and Elevations			X
Architectural Renderings & Models			X
Architectural Sections			X
Architectural Schedules & Index			X
Architectural Details			X
Radiological Zone Drawings		X	
Fire Area Boundary Drawings, including drawings that depict fire walls, fire doors, and fire dampers		X	
Fencing & Site Security Drawings		X	
Penetration Seals			X
Electrical			
Single Line or One Line Diagrams (includes single Line or One Line Diagrams that are contained in the Electrical Configuration Management Database)	X		
Area Classification Drawings		X	
Raceway Layout Drawings			X
Schematic Diagrams		X	
Lighting Drawings			X
Grounding Drawings		X	
Cathodic Protection Drawings		X	
Underground Utilities Ductbanks/Manholes		X	
Cable Schedule			X
Conduit Schedule			X
Interconnection/Wiring Diagrams		X	
Communication Drawings		X	
Heat Tracing Drawings		X	
Fire Detection Drawings		X	
Demolition & Removal Drawings			X
Overhead Pole Line Drawings			X
Coordination Study Drawings		X	
Instrumentation & Controls			
Control Room Layout			X
System Block Diagram			X
Logic Diagram		X	

Drawing Types	Essential	Master Facility	General
Control Panel Layout			X
Instrument Diagrams		X	
Instrument Data Sheets		X	
Instrument Location Drawing			X
Instrument Index		X	
Input/Output Point Assignment Summary		X	
Instrument Installation Detail			X
Instrument Rack Drawing			X
Setpoint Index		X	
Loop Diagram		X	
General & Miscellaneous			X

Appendix C

EDMS Drawing Data Entry Screen Guidance

If a drawing has been designated as essential or master facility, use the following guidance to update the drawing flags and establish an assessed date in EDMS through the drawing data entry screen.

Complete the following steps to go to the drawing data entry screen:

NOTE: *EDMS instructions provide information for obtaining approval to use the drawing data entry screen.*

1. Click on the EDMS drawing tab (http://edms/icp_draw.html)
2. Click on "Update Essential / Master Facility Flags" (http://edms.inel.gov/docs/edc_251.html)
3. Enter “S number”
4. Enter drawing number.

Complete the following steps to enter data in the EDMS drawing data entry screen:

1. Click on the applicable designation, “Master Facility” or “Essential.”
2. Click on the “RCRA” designation if drawing is applicable to an environmental permit.
3. Add applicable Special Code(s) from the EDMS pick list “List of Available Special Codes” to the “Special Codes on this Drawing” window.
4. If essential drawing, enter the date the drawing was last as-built or assessed in the EDMS “Assessed Date” field.

Appendix D

MCP-2377 Procedure Basis

Step	Basis	Source	Citation
All	Design documents will adequately support facility design, fabrication, construction, and operation.	PRD-5074, "Design Control"	4.1.4.2
All	Design information transmitted across interfaces will be documented and controlled. They will identify the status of the design information or document provided and identify designs or portions of designs that require further development, analysis, review, or approval. Design efforts shall be coordinated among participating design organizations and across technical disciplines. Interface controls shall include the assignment of responsibility and the establishment of implementing documents among participating design organizations and technical disciplines for the review, approval, release, distribution, and revision of documents involving design interfaces to ensure that SSCs are compatible geometrically, functionally, and with processes and environment	PRD-5074	4.1.3.1 4.2.7.1 (High Level Waste [HLW] and Spent Nuclear Fuel [SNF] only)
All	Activities affecting quality will be prescribed by and performed in accordance with documented instructions, procedures, or drawings that include appropriate quantitative or qualitative acceptance criteria for determining that prescribed results have been satisfactorily attained.	PRD-5076, "Instructions, Procedures, and Drawings"	4.1.1.1
All	Activities affecting quality will be described to a level of detail commensurate with the complexity of the activity and the need to assure consistent and acceptable results.	PRD-5076	4.1.1.2
All	The need for and the level of detail in written procedures or instructions will be determined based on the complexity of the task, the significance or the item or activity, work environment, and worker proficiency and capability (i.e., education, training, and experience).	PRD-5076	4.1.1.3
All	The type of document to be used to perform work will be appropriate to the nature and circumstances of the work being performed.	PRD-5076	4.2.1.1 (HLW & SNF only)

Step	Basis	Source	Citation
All & related forms	Implementing documents will include the following information as appropriate to the work to be performed: A. Responsibilities and organizational interfaces. . . D. Quantitative and/or qualitative acceptance criteria… E. Identification of QA records. . .	PRD-5076	4.2.2.1 (HLW & SNF only)
2, 4.1.4, 4.4	They also must define "document owners" who are responsible for developing and revising the technical content of the documents and ensuring they are maintained current. Document owners will also establish the schedules for document revisions, distribution, and retrieval.	DOE-STD-1073-2003, "Configuration Management Program"	6.1
4.1.1.2, 4.1.3.5	Drawings. . .will contain appropriate inspection and testing acceptance criteria.	PRD-5074	3.1.Q,R,&S; 4.1.7.1.G
4.1.2, 4.1.3	Based on the results of the extent of condition review, assess MCP-2377…for improvement to instructions for drafting and technical checking where there are special circumstances due to design software.	ICARE deficiency report 107106	Corrective Action 60126
4.1.3	Design analyses will be planned, controlled, and documented. Design analyses will be sufficiently detailed such that a person technically qualified in the subject can review and understand the analyses and verify the adequacy of the results without recourse to the originator.	PRD-5074	4.1.5.1
4.1.3	The final design including drawings, specifications, and other design output documents will be relatable to the design input by documentation in sufficient detail to permit design verification.	PRD-5074	4.1.4.5.A
4.1.3, 4.1.4	Design reviews will be controlled and performed to ensure that: A. The design inputs were correctly selected. . . D. Appropriate design methods and computer programs were used. . . E. The design output is reasonable compared to design inputs. F. The necessary design inputs for interfacing organizations are specified. . . G. Suitable materials, parts, processes, and inspection and testing criteria have been specified.	PRD-5074	4.1.7.1
4.1.3, 4.1.4	Interface controls will include the integration of activities of organizations that can affect the approved configuration.	PRD-5074	4.1.11.5

Step	Basis	Source	Citation
4.1.3.1, 4.1.3.2	Design verification will be performed by any competent individual(s) or group(s) other than those who performed the original design, but who may be from the same organization… Design verification shall be performed by competent individuals or groups other than those who performed the original design, but may be from the same organization. If necessary, this verification may be performed by the originator's supervisor provided. . .	PRD-5074	4.1.6.6 4.2.4.3 (HLW & SNF only)
4.1.3.5	The final design including drawings. . .will: A. Be relatable to the design input. . . B. Specify required inspections and tests. . . C. Identify assemblies and/or components. . . .	PRD-5074	4.1.4.5
4.1.3.12, 4.1.3.13	If the design is modified to resolve verification findings, the modified design will be verified prior to release for use.	PRD-5074	4.1.6.5
4.1.3.2	Reviews are to be performed by personnel of the same disciplines who approved the original design, and typically only if their areas are affected by the change. When specified by controlling procedures, design drawings and specifications are reviewed by individuals or groups other than the one who generated the document that are trained and qualified in QA practices and concepts, to ensure that the documents are prepared, reviewed, and approved in accordance with applicable implementing procedures and contain the necessary QA requirements…	PRD-5074	4.1.10.2 4.2.2.1 (HLW/SNF only)
4.1.1.3 (STD-11), 4.1.4.8	The application of the licensee's seal and signature and the date shall constitute certification that the work thereon was done by him or under his responsible charge.	Idaho Code	Title 54-1215
4.1.4, 4.1.5	Contractors must incorporate approved changes into controlled documents in a timely manner.	DOE-STD-1073-2003	6.3.7
4.1.5, 4.4, 4.6.8	Contractors must control select documents to ensure that only the currently approved revisions of the documents are used. Contractors must track information on documents to ensure the current status of documents is reflected and information is available on pending changes.	DOE-STD-1073-2003	6.3
4.2, 4.3, 4.4	Critical facility documents, such as drawings and procedures needed for operation, must be updated prior to placing systems and components in operation.	DOE-STD-1073-2003	5.8.1 (These drawings are interpreted to be "essential drawings.")

Step	Basis	Source	Citation
4.1.5, 4.3, 4.4, 4.6.8, 4.6.9	The configuration of the facility will be documented in drawings, specifications, procedures, and other documents that reflect the operational status of the facility. The process utilized to control the current revision and issuance of these documents will take into account the use of the document and the need for revision to support operation.	PRD-5074	4.1.11.10
4.1.5, 4.6.8	Contractors should ensure that documents are retrieved (made available) in a timely manner upon request. The contractor should establish the maximum retrieval time for each document based upon priorities provided by the document owners and users.	DOE-STD-1073-2003	6.4
4.2, 4.3, 4.4	As-built verification expectations for general documents and Documentation Designation Selection Criteria table.	[1]Management direction	NA
4.2, 4.3	System assessments must include periodic review of system operability, reliability, and material condition. Reviews must assess the system for-- (a) ability to perform design and safety functions, (b) physical configuration as compared to system documentation, and (c) system and component performance in comparison to established performance criteria.	DOE O 420.1B, Chg 1, "Facility Safety"	Att. 2, Chapter V, 3.c(5)
4.2, 4.3	Corrective actions should include technical evaluations, based on system requirements, to determine whether the physical configuration or the documentation should be changed. For existing facilities, the corrective actions should include additional walkdowns to characterize the problem and to determine the extent of the problem. The end product of the resolution of configuration and documentation discrepancies is documentation that has been both field-verified and design-verified to be consistent with the "as-built" or actual physical configuration.	DOE-STD-1073-2003	7.3 7.3.2
4.2, 4.3	As-built documentation should be prepared at the completion of implementation of the physical changes. Revised documentation should be distributed to users of controlled documents. Maintenance of documents and records is required by the quality assurance requirements in 10 CFR 830.122(d).	DOE-STD-1073-2003	5.8.2

[1] Engineering Instruction Letter No. 1 – HWM-03-99, Herbert W. Mumford III

Step	Basis	Source	Citation
4.2, 4.3	Provisions to ensure that technical baseline documents (such as drawings), relied on to support safe facility operations, are identified and that the technical baseline is managed to ensure that the design requirements, physical configuration, and as built documentation are maintained in agreement	SAR-100, "ICP Standardized Safety Analysis Report"	17.5.2
5.	All records…designated in implementing documents as quality assurance records…will be controlled in accordance with PRD-5088, "Quality Assurance Records."	PRD-5074 PRD-5076	5.1 5.