HNF-14660
Revision 5

Offsite Subcontractor Instructions for Preparation and Control of Engineering Drawings

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-09RL14728

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(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) DA/TA Date
5 RS	Total rewrite to align with other Drafting & Design procedures and guides; MSC-PRO-ENG-709, HNF-64101, HNF-64102, and HNF-64103.	10/07/2020 Blake A. Christensen

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1.0 PURPOSE

This document provides mandatory directions for preparation and control of engineering drawings and associated Computer-Aided Design (CAD) files developed for Mission Support Alliance (MSA), hereinafter referred to as "Contractor," by a contracted design agent, hereinafter referred to as "SUBCONTRACTOR."

2.0 SCOPE

This instruction applies to the preparation and control of engineering drawings, intended for entry into the Document Management and Control System (DMCS), which are prepared by SUBCONTRACTOR. An engineering drawing depicts design, installation, and/or configuration of an enduring facility, system, or equipment.

2.1 Exemptions

Drawings used to provide temporary construction designs and approved by the appropriate Design Authority (DA), are exempt from these requirements.

Engineering vendor information (VI) (vendor-supplied items) specified in a specification, parts list, drawings depicting items that are not an enduring facility/system/equipment, and drawings depicting a level of detail not needed to operate the enduring facility/system/equipment (e.g. shop drawings, etc.) are to follow MSC-PRO-ENG-16406, *Vendor Information Process*.

Other depiction methods (e.g. sketches, figures, maps, etc.) are exempt from this instruction.

3.0 IMPLEMENTATION

This document is effective on publication.

4.0 REQUIREMENTS

This instruction implements the engineering drawing development and control process requirements described in MSC-RD-ENG-1819.

4.1 Standards and Content

Engineering drawings are designated as "H-Series" drawings and prepared in accordance with the following standards:

- HNF-64101, Preparation Standards for Engineering Drawings
- HNF-64102, Preparation Standards for Legacy Engineering Drawings
- HNF-64103, Preparation of Process Flow Diagrams and Piping and Instrumentation Diagrams

HNF-64101 shall be used for new engineering drawing package development in order to match industry drawing standards. HNF-64102 may be used alternately when matching the depiction style of new engineering drawings with that of an existing legacy set of drawings, in order to maintain continuity of style. The Drafting & Design Manager shall make the final determination which standard is used for new engineering drawing development. The chosen drafting standard shall be listed in the "REFERENCES" section of the drawing (see Figure 1).

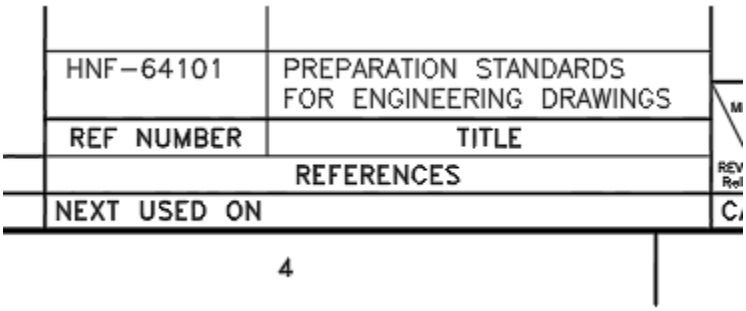

Figure 1

Existing engineering drawing shall be revised in a manner that matches the drafting standard under which the drawing was originally developed.

5.0 CONTROL OF ENGINEERING DRAWINGS AND CAD FILES

5.1 Computer Aided Drafting Software Program

SUBCONTRACTOR shall use the most current Contractor approved version of AutoCAD for preparing all engineering drawings.

5.2 Configuration Control

SUBCONTRACTOR is responsible for maintaining configuration control of approved engineering drawings and associated CAD sheet files prior to final turnover to Contractor. This includes managing and limiting access to approved drawing originals and CAD sheet files to ensure safekeeping of the latest approved revision. The CAD sheet file shall be controlled to ensure it has not been modified subsequent to being used to plot the respective revision of the drawing original.

While it is important to maintain in-process control of design versions of CAD model files, this standard does not address requirements or actions of in-process engineering drawing development. SUBCONTRACTOR shall manage these drawings and files per their company drafting and design program.

5.3 Engineering Drawing Processes

5.3.1 New Drawing Development

A new engineering drawing is required anytime a modification affects an active/operational enduring facility, system, or equipment and no drawing exists that depicts the facility, system, or equipment, or there is a significant change in the configuration to warrant a new drawing as determined by the DA. A change document is required to create a new engineering drawing for modifications affecting an active/operational enduring facility, system, or equipment.

Actionee	Step #	Action
Contractor project POC	1.	Provide SUBCONTRACTOR with project drawing setup files and drawing numbers from HDNS.
SUB. Discipline Engineer	2.	Provide the engineering criteria and direction for the needed design, including the necessary change document.
SUB. Designer / Drafter	3.	Develop the design into an engineering drawing in accordance with HNF-64101, Preparation Standards for Engineering Drawings HNF-64102, Preparation Standards for Legacy Engineering Drawings, HNF-64103, Preparation of Process Flow Diagrams and Piping and Instrumentation Diagrams, as appropriate.
SUB. Drafting Checker	4.	Check the drawing and CAD model for adherence with HNF-64101, Preparation Standards for Engineering Drawings HNF-64102, Preparation Standards for Legacy Engineering Drawings, HNF-64103, Preparation of Process Flow Diagrams and Piping and Instrumentation Diagrams. Check against applicable industry standards, and engineering discipline practices, as appropriate.
SUB. Engineering Checker(s)	5.	Check that the drawing is consistent with the design.
	6.	Check that the drawing complies with applicable engineering requirements, procedures, codes, standards, and accepted industry discipline practices.
SUB. Designer / Drafter	7.	Ensure that all the drafting checker and engineering checker comments are reflected into the final draft of the drawing.
SUB. Project Engineer	8.	If formal submittal is required, go to section 5.3.5 Contractor Formal Review Submittal. If formal review submittal is not required, go to section 5.3.6 Drawing Release.

5.3.2 Drawing Revision

Actionee	Step	Action
SUB. Engineer	1.	Identify that a drawing requires revision.
SUB. Designer / Drafter	2.	Obtain a copy of drawing CAD file from Contractor Drafting & Design Manager (if necessary). ***NOTE:*** *If the drawing is maintained as a manual drawing, go to section 5.3.3 Manual Drawing Control.*
	3.	Incorporate changes to the drawing in accordance with HNF-64101, *Preparation Standards for Engineering Drawings*, HNF-64102, *Preparation Standards for Legacy Engineering Drawings*, HNF-64103, *Preparation of Process Flow Diagrams and Piping and Instrumentation Diagrams*, as appropriate.
SUB. Drafting Checker	4.	Check that the revisions to the drawing and CAD model are adherent to the standards that were used in the preparation of the drawing, and applicable industry standards and discipline practices for the discipline depicted.
SUB. Engineering Checker(s)	5.	Check to ensure that the incorporated change reflects the direction of the change document.
SUB. Designer / Drafter	6.	Ensure that all the drafting check and engineering check comments are reflected into the final draft of the drawing.
SUB. Project Engineer	7.	If formal submittal is required, go to section 5.3.5 Contractor Formal Review Submittal. If formal review submittal is not required, go to section 5.3.6 Drawing Release.

5.3.3 Manual Drawing Control

Actionee	Step	Action
SUB. Designer / Drafter	1.	Determine that the drawing requiring revision is maintained as a manual drawing.

Actionee	Step	Action
	2.	Order the drawing from the Content and Records Management (CRM) manual drawing storage center.
CRM manual drawing retention center	3.	Ensure that the requestor is authorized to receive the manual drawing. ***NOTE:*** *If the requestor is not on the list to receive drawings for the designated facility, the requestor will be notified to contact the Drawing Administrator for authorization.*
	4.	Send the drawing to the authorized requestor.
SUB. Designer / Drafter	5.	Develop a raster image file generated via high quality scanning of the drawing and digitize the content of the drawing into a CAD file that will replace the manual drawing.
	6.	Contact CRM to retire the manual drawing.
	7.	If resultant file is a compound drawing, go to section 5.3.4, Compound Drawing Process If resultant file is not a compound drawing, go to section 5.3.2 Drawing Revision, step 3.

5.3.4 Compound Drawing Process

A Compound Drawing is a drawing developed from CAD data that is made up of both a raster entity and CAD vector entities that are blended together and maintained as a single CAD sheet file.

The compound drawing format shall not be used for Essential or Support drawings.

The following process provides the necessary direction for the development and use of compound drawings. This process is used in conjunction with sections 5.3.1 New Drawing Development; 5.3.2 Drawing Revision and 5.3.3, Manual Drawing Control.

Actionee	Step	Action
Designer / Drafter	1.	Review the task and determine if the existing manual drawing is viable for developing into a compound drawing: If “yes” go to step 2. If “no” create a new engineering drawing per section 5.3.1 New Drawing Development.

Actionee	Step	Action
	2.	Develop or retrieve a raster image file generated via high quality scanning of the drawing.
	3.	Review the file to ensure the final product will be legible when the drawing is complete.
	4.	Go to section 5.3.2 Drawing Revision, step 3.

5.3.5 Contractor Formal Review Submittal

Actionee	Step	Action
SUB. Designer / Drafter	1.	Fill in the revision block of the drawing with the appropriate description (e.g. "Rev. A, ISSUED FOR 30% Design Review").
	2.	Plot the drawing. ***NOTE**: The term "plot" is used to mean producing a hardcopy (paper) plot (or) producing an electronic (paperless) plot.*
SUB. Drafting Checker	3.	Review and approve the drawing.
SUB. Engineering Checker(s)	4.	Review and approve the drawing.
SUB. Engineer or designee	6.	Deliver the SUCONTRACTOR approved drawing to Contractor Project Document Control.
Contractor	7.	Receive and process submittal per MSC-PRO-SC-16405 *Submittal Management System.* Review and return comments Per MSC-PRO-QA-8635, *Review and Approval of Technical Documents.*

Actionee	Step	Action
SUB.	8.	If Contractor review comments require additional modification and resubmittal before release, go to section 5.3.2 Drawing Revision, step 3. If Contractor comments approve drawing release without resubmittal, Go to section 5.3.6 Drawing Release, step 1.

5.3.6 Drawing Release

Actionee	Step	Action
SUB. Designer / Drafter	1.	Create a CAD sheet file per section 5.4.1
	2.	Fill in the revision block of the drawing with the appropriate description (i.e. "Rev A, ISSUED FOR CONSTRUCTION PER DCN-L123-012345").
SUB. Designer / Drafter	3.	Plot the drawing. ***NOTE**: The term "plot" is used to mean producing a hardcopy (paper) plot (or) producing an electronic (paperless) plot.*
SUB. Engineering Checker	4.	Review and approve the drawing.
Contractor Design Authority	5.	Review and approve the drawing per MSC-PRO-QA-8635, Review and Approval of Technical Documents.
SUB. Engineer or designee	6.	Deliver the approved drawing and CAD sheet file to Contractor Project Document Control.
Contractor Project Document Control	7.	Review the drawing to ensure that the drawing contains the necessary data for release.

Actionee	Step	Action
	8.	Release the approved drawing and associated CAD sheet files as follows: • Process the approved drawing with necessary release stamps. • Release associated CAD sheet files into the archival database of DMCS. • Forward any drawing originals to the CRM drawing retention center for scanning and retention.

5.4 Final Turnover of Engineering Drawings and Related CAD Files

The SUBCONTRACTOR shall turnover all related approved engineering drawing originals, CAD sheet files and CAD model files to Contractor prior to delivering the design, facilities, systems and equipment to Contractor for use/operation.

Prior to SUBCONTRACTOR transmittal to Contractor, all drawings identified for final turnover shall have all outstanding approved changes incorporated and be approved by the Contractor DA.

5.4.1 CAD Sheet Files

A CAD sheet file is required to be produced for each revision of an H-Series drawing sheet. This resultant file shall be used to produce the plotted drawing that is subsequently approved and released. The CAD sheet file shall be controlled by SUCONTRACTOR to ensure it has not been modified subsequent to being used to plot the respective revision of the drawing original. The Contractor enters the drawing original and the CAD sheet file into the DMCS system for retention and future retrieval after submittal to Contractor.

The SUBCONTRACTOR shall follow the subsequent directions to create a CAD sheet file from the CAD model:

- Bind all AutoCAD X-Reference data.
- Insert, append and incorporate any other external information contained in support files utilized by the CAD model into one .DWG file.
- All “layers,” except the viewport layers shall be turned on and plotted; extraneous data shall be removed (e.g. entities used for development that do not appear in the approved depiction of the drawing, construction reference data, superfluous layers, etc.).
- Save in the AutoCAD .DWG file format version specified by Contractor.
- In order to be accepted by the Contractor, the resultant CAD sheet file shall be viable for use with standard AutoCAD, and shall display no errors or warnings when opened with the Contractor specified version. This includes errors and warnings resulting from .DWG files created by Autodesk vertical products (e.g. Civil 3D, REVIT, etc.) or third party applications.
- The CAD sheet file shall be controlled to ensure it has not been modified subsequent to being used to plot the respective revision of the drawing original.

6.0 DEFINITIONS

CAD model: The CAD data file set used for in-process development of the design and is used to produce the CAD sheet files. The CAD model (or may not) have XREFs, or other support files and interconnections that are beneficial for development and maintenance of the design model.

CAD sheet file: A single file created from the CAD model per section 5.4.1 *CAD sheet files*. The CAD sheet file is used to plot the drawing original and is the entered into the DMCS for retention and future retrieval.

CAD data files: See CAD model.

Change Document: The mechanism used to change the drawing per the configuration control process (e.g. FMP, DCN, ECR, etc.).

Configuration control: Managing engineering drawings by processing the drawing and maintaining the history of the latest revision to the drawing. Additionally, any changes to the drawing require a process to assure incorporation of the changes into the affected drawing.

Design Authority (DA): For the purpose of this instruction, this engineer is assigned overview responsibility for a specific facility, system or equipment.

Document control: For the purpose of this instruction, the function of managing the acceptance, routing, tracking and revision history of engineering documents that demonstrate the fabrication, construction and installation of facilities, systems and equipment on the Hanford Site.

Document Management and Control System (DMCS): The official database that tracks the current and historical status of all documents deemed important to both current and past operations of Mission Support Alliance. For example, all engineering documents (drawings, specifications, supporting data, vendor information data, and environmental data) released into the system and with all changes to the engineering documents identified, released, and tracked against the affected engineering document.

Drawing original: The plotted hardcopy (or) electronically signed .PDF drawing that is approved by signatures of authorized SUBCONTRACTOR company personnel and Contractor DA that attest to the accuracy and quality of the engineering contents of the drawing (for new drawings) or for the revision to an approved engineering drawing.

Engineering drawing: For the purpose of this instruction, an engineering drawing is an approved drawing that bears an H-Series drawing number assigned by HDNS and depicts by means of graphics, pictorial, and textual presentations, the form, fit, and function needs of an engineering approved facility, system or equipment. Also, see definition of drawing original and vendor information drawing.

H-Series drawing: Is the official engineering drawings assigned unique, non-duplicated drawing numbers starting with the letter H, followed by a dash and one to two numbers that correspond to area designators, then another dash and a non-significant

sequential number. These drawings require development with specific standards for releasing retrieving and maintaining the drawing for the life of the Hanford facilities they represent. H-Series drawing numbers are assigned by the HDNS.

HDNS: Hanford Document Numbering System. Controls the Document and Drawing number assignments.

Vendor (supplier) item: An item procured from an off-site manufacturer to a vendor's specification that has specific functional, physical features needing a depicted design; for example, valves, pumps, and condensers. The item has a specific part number identification assigned by the manufacturer.

7.0 FORMS

None

8.0 RECORD IDENTIFICATION

Records Capture Table

Name of Document	Submittal Responsibility	Retention Responsibility
Engineering Drawings	Design Organization/ MSA Projects' Design Authorities	DMCS/IDMS

9.0 SOURCES

9.1 Source Requirements

CRD

9.2 References

MSC-PRO-RM-10588, *Records Management Processes*
MSC-PRO-RM-32281, *Electronic Records Management*

9.3 Working References

HNF-64101, *Preparation Standards for Engineering Drawings,*
HNF-64102, *Preparation Standards for Legacy Engineering Drawings,*
HNF-64103, *Preparation of Process Flow Diagrams and Piping and Instrumentation Diagram*
MSC-PRO-ENG-20050, *MSC Engineering Configuration Management*
MSC-PRO-MS-589, *Mission Support Contract Management System Documents*
MSC-PRO-ENG-2001, *Facility Modification Package Process*
MSC-PRO-ENG-8016, *Design Change Notice Process*

MSC-PRO-ENG-440, *MSC Engineering Package Process*
MSC-PRO-ENG-8017, *As-Built and Validation Process*
MSC-PRO-ENG-16406, *Vendor Information Process*
MSC-PRO-SC-16405 *Submittal Management System*
MSC-PRO-QA-8635, *Review and Approval of Technical Documents*