CPCCo Central Plateau Cleanup Company

One Focus · One Mission · One Hanford

Standards

CPCC-STD-EN-40279

PRC-STD-EN-40279

Engineering Drawing Standards

Revision 0, Change 1

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  Excluded from USQ
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- 100 K Facility :
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- Plutonium Finishing Plant :
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  Exclusion Reason:
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- Transportation :
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- 324 Facility :
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Change Summary

Description of Change

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1.0 INTRODUCTION

1.1 Purpose

This standard establishes the requirements applicable to engineering drawings prepared and revised in support of Central Plateau Cleanup Company (CPCCo) engineering design activities.

1.2 Scope

This standard identifies the Computer Aided Drafting (CAD), Title Block, drawing layout, and drawing attributes required for formal Hanford drawings prepared for CPCCo work scope. This standard identifies specific attributes of these drawings and is used in close conjunction with the ANSI/ASME Y14*, Drafting Practices*.

1.3 Applicability

This standard applies to engineering drawings intended to be released and issued into the Document Management and Control System (DMCS) for configuration control and the Integrated Document Management System (IDMS) as records.

This standard also applies to existing drawings controlled in DMCS which are undergoing revision. Revised portions of drawings shall comply with this standard. Unrevised portions do not have to comply.

Drawings previously released into DMCS are accepted as is and do not require revision to comply with this standard, except when undergoing revision as stated above.

1.4 Implementation

This standard is effective upon publication.

2.0 STANDARD

2.1 National and Industry Codes and Standards

This standard is used in conjunction with ANSI/ASME Y14, *Drafting Practices*. Drafting practices not covered by this standard should comply with the ANSI/ASME Y14 series of drafting standards. Other nationally accepted standards and industry practices may also be used when application of ANSI/ASME Y14 is not appropriate.

Piping and Instrumentation Diagrams (P&ID) shall comply with the Process Industry Practices (PIP), PIP PIC001, *Piping and Instrumentation Diagram Documentation Criteria*. Additional information for PFDs is available in Appendix D, Process Flow Diagram (PFD) Standards. Additional information for P&IDs is available in Appendix E, Piping and Instrumentation Diagram (P&ID) Standards. Where there is conflict between this standard and PIP PIC001 or other industry standard practices, this standard takes precedence.

2.2 CAD Standards

Use of Computer Aided Drafting (CAD) software is the preferred method for producing and revising engineering drawings for CPCCo work scope. It is recommended that existing manual drawings needing to be revised be converted into Compound Drawings during the revision process to take advantage of CAD capabilities. Refer to CPCC-PRO-EN-440, *Engineering Documentation Preparation and Control* for information regarding Compound Drawings.

2.2.1 CAD Software

AutoCAD 2008 is the standard Computer Aided Drafting software application used at the Hanford Site.

CAD data files are maintained and configuration controlled in the DMCS.

Third-party software used in the development of AutoCAD-based drawings shall not require access of the third-party software to view or revise the drawing.

2.2.2 Layering

CAD drawings shall utilize layers arranged by engineering discipline as shown in Table 1. Layers shall comply with the naming convention described in Section 2.2.2.1 and naming and line standards described in Appendix A, Layer Standards.

Designating layers by color and line type is the preferred method. Layers can also be assigned on an entity basis.

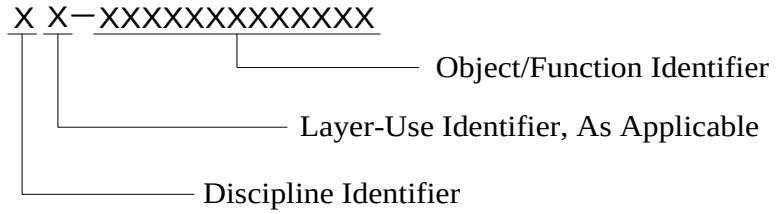
CAD Drawing Setup Files (see section 2.2.7) may be used to establish specific discipline layers for routine use.

NOTE: *Maps and mapping related drawings shall use Autodesk Map with Mapping Application Extension (MapMax) layering.*

2.2.2.1 Layer Naming

Layers shall be named using the following naming convention consisting of a combination of Discipline Identifier, Layer-Use Identifier, and Object/Function Identifier. Figure 1 shows the layer-naming convention for Hanford AutoCAD-developed drawings.

Figure 1 – Layer Naming Convention



Note: *A dash is used to separate the first characters from the Object/Function Identifier*

Discipline Identifier -- Identifies the specific discipline shown on a layer. This identifier enables users to quickly distinguish discipline layers within a drawing file by discipline and provides a logical separation of discipline information. Table 1 lists the identifier and discipline standard used for Hanford CAD drawings.

Table 1 – Discipline Identifiers

Identifier	***Discipline***
A	Architectural
C	Civil
E	Electrical
F	Fire Protection
G	General (non-specific applications)
H	HVAC
I	Control Systems
M	Mechanical/Machine
P	Piping
S	Structural

Layer-Use Identifier -- Identifies what the layer depicts (e.g., primary objects, existing equipment, hidden objects, or text). The Layer-Use identifier is used when a single line type and color is assigned to an individual layer. Table 2 lists the standard Layer-Use Identifiers used in Hanford CAD drawings. This identifier is not normally used for entity-based layers.

Table 2 – Layer-Use Identifiers

Identifier	*Layer Use*	*Line Type*
O	New or main object, visible lines, primary line work	Continuous
E	Existing equipment - For A/E use to depict existing facility/equipment	Phantom
F	Future items - For A/E use to depict future items	Dashed
D	Demolition - For A/E use to depict demolition information	Dashed
T	Text	Continuous
M	Dimensioning	Continuous
C	Center lines	Center
H	Hidden items/lines	Hidden
X	Hatching	Continuous
P	Mechanical details depicting repeated details (e.g., spring and screw thread details or alternate positioning of absent parts)	Phantom
V	Viewing and Cutting Planes	Varies

Certain conditions may make it desirable to link layer data together but still keep the data separate. For example, if a piping modification called for installation of new equipment after removal of old equipment, the Layer-Use identifier could be used to separate data as follows:

- PE-PIPING - Existing piping.
- PD-PIPING - Piping to be removed (demolition).
- PO-PIPING - New piping to be installed.
- PF-PIPING - Piping to be considered for future installation.

Object/Function Identifier -- Provides a semi-descriptive name of layer contents or function. The identifier may be as many as 28 characters in length and may contain letters, numerals, and special characters, such as $ (dollar), - (hyphen), and _ (underscore). Appendix A,- Layer Standards, provides examples of commonly used names/identifiers.

Abbreviations used in Object/Function Identifiers should comply with ANSI/ASME Y14.38, Abbreviations and Acronyms when possible.

2.2.3 Fonts

CAD drawings shall use upper case Gothic lettering as defined in ANSI/ASME Y14.2, *Line Conventions and Lettering*. AutoCAD's supplied fonts ROMANS and ROMAND are considered to be in compliance with ANSI/ASME Y14.2.

2.2.4 Model Space

Drawings shall be developed in Model Space including text and dimensions. Exceptions are made for drawings developed in full scale (one-to-one) (e.g., PFDs, P&IDs, or plotted drawings used as templates in fabrication).

2.2.5 Paper Space

Place *the* following data in the Paper Space layout area, as appropriate:

- Title block,
- View Port Layer
- Drawing status information including:
  - Approved for Design stamp
  - Approved for Construction stamp
  - Electronic PE stamps

2.2.6 X-References

Every AutoCAD "DWG" file in DMCS shall be a standalone file. CAD data files submitted into DMCS shall have all X-Reference files bound to the submitted file.

2.2.7 HANTIP (HANford Title block Insertion Program)

HANTIP is available to AutoCAD workstations connected to the HLAN network. HANTIP is a program which runs within AutoCAD and provides the following functions:

- Setup a new CAD or Compound drawing
- Insert Standard Hanford Title Block
- Insert Revision Block
- Update Title and Revision Block information
- Insert a PlotID Block
- Insert Building and Index list block
- Insert or reset standard layers

The Standard Hanford Title Blocks are created with specific attributes used by the DMCS to automate tracking and control of engineering drawings.

HANTIP allows the user to enter or change Title Block and Revision Block information and add additional building and index numbers to a Title Block. If a CAD drawing does not contain blocks with the proper attributes, HANTIP allows the user to add them to the drawing. If a CAD drawing already contains blocks with the proper attributes, HANTIP displays the HTP Dialog which allows the user to view and change block information.

HANTIP is accessed by entering "HANTIP" or "HTP" into the AutoCAD command line.

2.2.8 CAD Drawing Setup Files

New CAD drawings can be setup using available CAD Drawing Setup Files (i.e., AutoCAD Template Drawings). The CAD Drawing Setup Files (sometimes referred to as discipline specific 'Start files') are predefined templates using the layering convention Appendix A, Layer Standards. The setup files do not provide an all-inclusive list of layers. Additional layers may be added as needed for specific drawing needs. The Layer Naming convention specified in section 2.2.2.1 of this standard shall be used when developing additional layers.

2.2.9 Metadata

CAD drawing metadata may be placed on a separate layer titled "METADATA." Set this layer to the non-plot setting in the layer control box to prevent this information from plotting. This metadata does not include AutoCAD attribute data (refer to AutoCAD attribute functions in AutoCAD documentation for additional information).

2.3 Hanford Drawing Standards

2.3.1 Drawing Number

New drawing numbers are obtained using the Hanford Document Numbering System (HDNS). Hanford Engineering Drawings are assigned unique H-series drawing numbers.

Drawing numbers have prefixes assigned corresponding to the Hanford Site area the drawing represents. To obtain the correct drawing number, determine the area the drawing will represent and select the appropriate drawing prefix as shown Table 3.

Table 3 – Hanford Drawing Prefix for Hanford Areas

Drawing Prefix	*Area*
H-1	100 Area
H-2	200 Area
H-3	300 Area
H-4	400 Area; Fast Flux Test Facility (FFTF)
H-5	Unassigned except for electrical drawings not specifically applicable to other areas
H-6	General area, not included in other defined areas, usually civil drawings and maps
H-7	700 Area and City of Richland (RCHN, RCHC, and RCHS)
H-8	800 Area, Exploratory Shaft Site
H-9	Specification Control Drawings
H-10	NOT USED
H-11	1100 Area
H-12	3000 Area
H-13	General mapping of the Hanford Site
H-14	Waste Tank Farm (200 East, 200 West, transfer lines, and associated electrical and instrumentation)

2.3.2 Multi-sheet drawings

Multi-sheet (continuation sheet) drawings shall meet the following requirements:

- Each sheet shall have the same drawing number. Only the sheet number shall be different.
- All sheets shall have the exact same first two lines of the title. The third line can be different if needed.
- Sheets shall be numbered in sequence beginning with '1'.

2.3.3 Drawing Size

Drawings are sized in accordance with ANSI/ASME Y14.1, Decimal Inch Drawing Sheet Size and Format, or ANSI/ASME Y14.1M, Metric Drawing Sheet Size and Format, as applicable. Use of the International Standards Organization (ISO) standard paper sizes is optional.

The preferred drawing sizes for official Hanford drawings are as shown in Table 4. Other ANSI/ASME Y14.1 or Y14.1M size drawings may be used with the authorization of the Design Authority. In general, ANSI "F" is preferred over ANSI "D" for decimal inch drawings at Hanford.

Table 4 – Hanford Preferred Drawing Size

System	***Size Designation***	***Size***
Decimal Inch	ANSI "D"	22" x 34"
	ANSI "F"	28" x 40"
Metric	ISO "A1"	594 mm x 841 mm

2.3.4 Drawing Orientation

North is oriented to the top or left side of the sheet. Exceptions are made when revising drawings where the orientation is different or where industry practices dictate (e.g., civil drawings showing plan view strips with corresponding profiles). All plans on a given set of drawings shall be oriented the same and match the existing plant drawing orientation. Place a north arrow on all maps, plans, layouts, and other drawings as applicable.

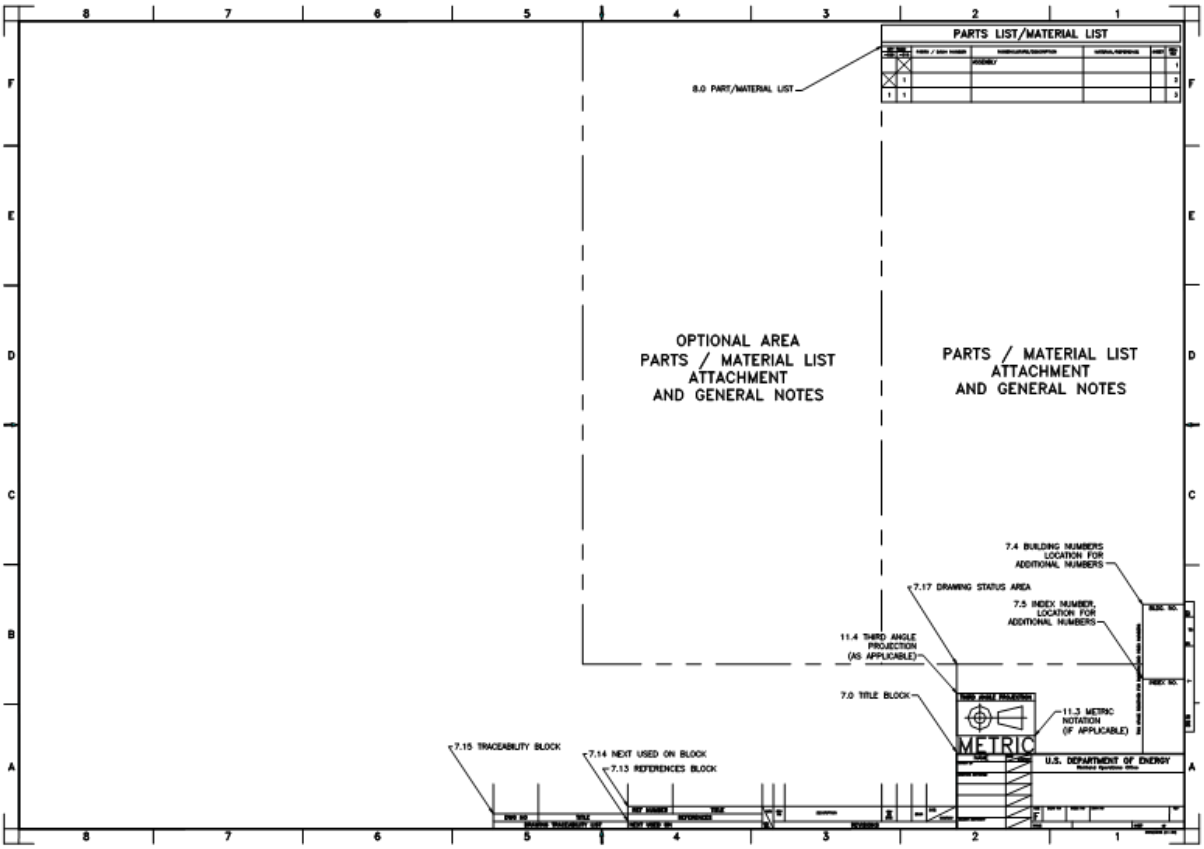
2.3.5 Drawing Plot Material

CAD drawings are plotted on a minimum 20 lb opaque bond paper.

2.3.6 Drawing Arrangement

The general drawing arrangement shall conform to ANSI/ASME Y14.1 or ANSI/ASME Y14.1M except for the location of the Parts/Materials List and the REVISIONS Block. General drawing arrangement is as shown in Figure 2 and as defined in this standard.

Figure 2 – General Drawing Arrangement

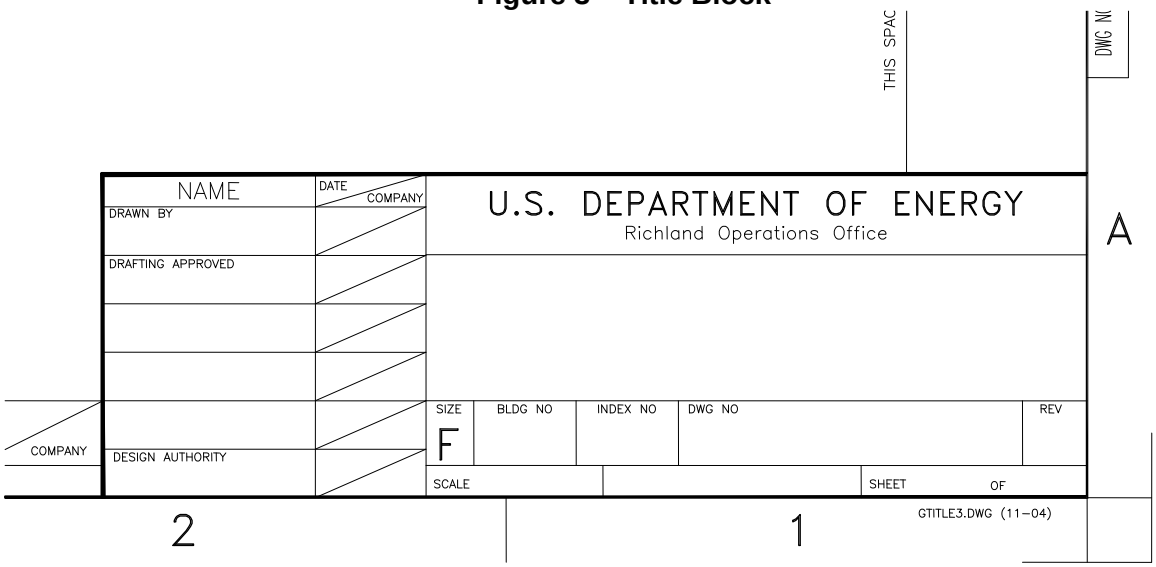


2.3.7 Title Block

The Title Block conforms to ANSI/SME Y14.1 or ANSI Y14.1M except as modified by this standard. Additional spaces in the Title Block are reserved for unique items. The Title Block format is used on each drawing sheet; the continuation sheet format described in ANSI/ASME Y14.1 is not used. The standard title block is modified for the Hanford Site as shown in Figure 3. The title block may be inserted in Model Space or Paper Space, but only one title block shall exist in a data file.

New drawings, including drawings being redrawn in CAD, are required to use the latest version of the Title Block. The latest Title Block version as shown in Figure 3 is available through HANTIP.

Figure 3 – Title Block



The Title Block contains a number of blocks which require specific information described in the following sections. Each block shall be completed as described in the following sections:

2.3.7.1 Company Name. Company Name is U.S. Department of Energy, Richland Operations Office. For drawings prepared by Architectural/Engineering (A/E) firms, the name of the A/E firm may be placed above the title block.

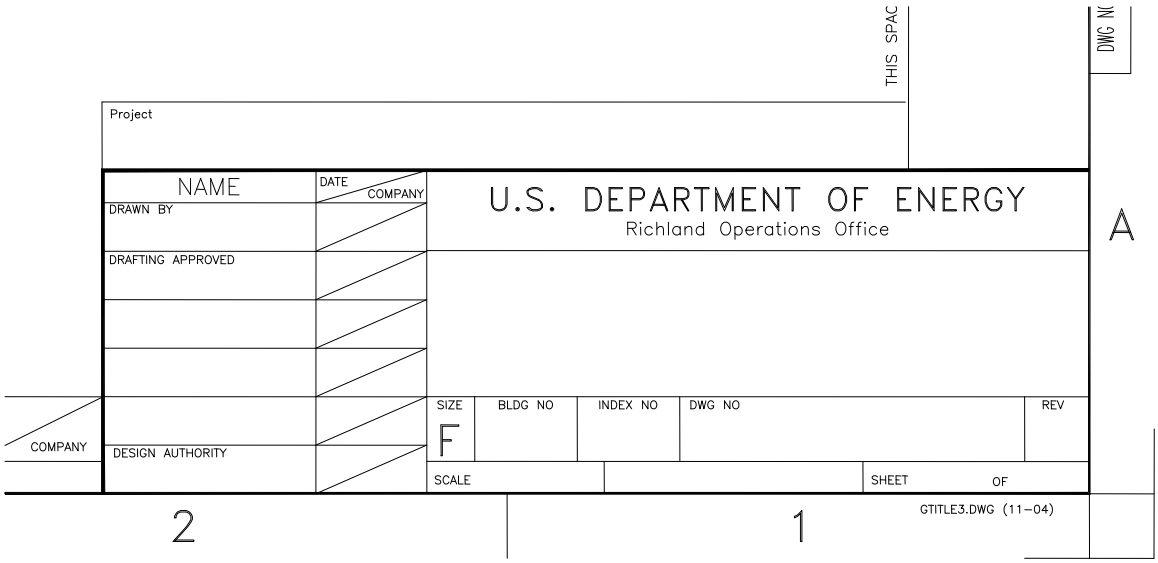
2.3.7.2 Drawing Title. Titles are arranged in one, two, or three lines centered within the title block. The first two lines of the Title Block of a multiple-sheet drawing shall be the same. The third line may be changed to provide additional information for the sheet.

The drawing title shall have the following characteristics:

- The title shall clearly identify the subject of the drawing.
- The first and second lines title shall identify the system/project, subsystem/subproject, and/or component, as appropriate.
- The second line of a two line drawing title or third line of a three line drawing title shall identify the drawing type.
- The title shall not include Formal Project numbers or building numbers (e.g., W-120).
- The Hanford Area number (100, 200, etc.) shall be included in the title only for area-wide presentations.
- The total number of characters, including spaces, shall not exceed 60.
- Height of the lettering in the title shall be a minimum of 6 mm (.24") for ISO A1 and ANSI D and F size drawings and 3 mm (.12") for all other drawings.

For Formal Projects, the Project Number and Project Title shall be entered in a supplemental block above the Title Block as shown in Figure 4.

Figure 4 – Project Identification Block



2.3.7.3 SIZE (Drawing Size). Identify the size of the drawings using the ANSI drawing size designator. Refer to section 2.3.3 for more information on drawing sizes.

2.3.7.4 BLDG NO (Building Number). Identify the building(s) associated with the drawing. If additional space is needed for building numbers, list the additional building number(s) above the Title Block in the Building Numbers Listbox provided by HANTIP and reference the Building Numbers Listbox in this block.

2.3.7.5 INDEX NO (Index Number). Identify the Index Number(s) associated with the drawing. Index Numbers shall be in accordance with Appendix B. Multiple Index Numbers may be assigned to a single drawing. If additional space is needed for index numbers, list the additional index number(s) above the Title Block in the Index Numbers Listbox provided by HANTIP and reference the Index Numbers Listbox in this block.

2.3.7.6 DWG NO (Drawing Number). Enter the drawing number determined and obtained as described in section 2.3.1. The drawing number shall be 6 mm to 8 mm (.24" to .35") high.

2.3.7.7 REV (Revision Number). Numeric revision numbers shall be used. Zero (0) is normally used for the initial release.

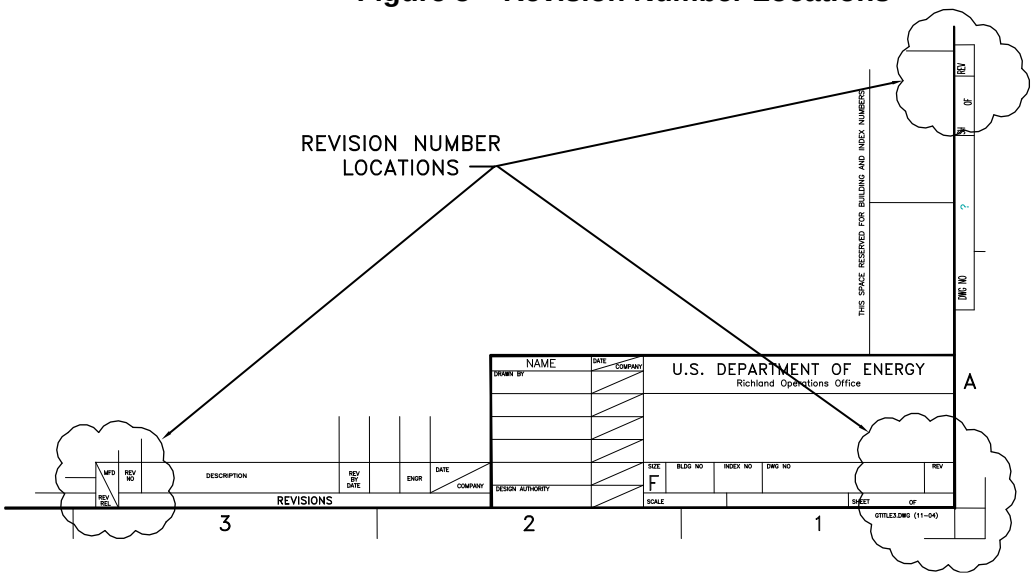
The current revision number is noted in the Title Block, the Auxiliary Block (located outside the right side drawing border), and in the Revisions Block (see section 2.3.11) as shown in Figure 5.

During drawing development (i.e., the design phase of a project) alpha characters are used to indicate the version of a drawing. Alpha characters shall start with the letter ‘A’ and advance through the alphabet. For released Hanford drawings placed into “Project Status” the alpha character is placed behind the formal revision number (e.g., 3A, 3B, etc.). Alpha characters identify and control the version of a drawing that was reviewed (typically for formal design

review) during drawing development. Upon approval and release, the correct numeric revision number shall replace the alpha designator.

Drawing revisions are placed on the drawing using HANTIP. HANTIP automatically updates the revision number in the Title Block and Auxiliary Block located on the right side of the drawing outside the border (see Figure 5).

Figure 5 – Revision Number Locations



2.3.7.8 SCALE. Enter predominant scale of the drawing or if the predominant scale of the drawing cannot be determined, enter “SHOWN” and identify the scale under each graphic. Enter “NONE” when no scale is used.

2.3.7.9 EDT (or Blank) Block. *(NOTE: Some Title blocks may not have EDT in this block).* This block is used to identify the initial (Revision 0) release authorizing document for the drawing (e.g., Facility Modification Package (FMP) or Design Change Notice (DCN)). Enter the number of the FMP or DCN. If there is insufficient space for entering the FMP/DCN, enter “SEE REV 0” and in the Revision Block description enter “INITIAL RELEASE PER [FMP/DCN]. In the Revision Block, add “0” to the REV NO block and “X” out the signature area blocks. All signatures shall be entered in the Approval Block of the Title Block for revision 0 per Section 2.3.8, Approval Block.

2.3.7.10 SHEET _ OF _ (Sheet Number). For single sheet drawings, a “1” is entered in the SHEET Block. For multiple-sheet drawings, sheets are numbered in sequence starting with 1. The total number of sheets is entered in the OF block on Sheet 1 only. Each subsequent sheet only shows the next sequential sheet number in the SHEET Block; the OF Block is left blank.

2.3.8 Approval Block (NAME)

The Approval Block is located adjacent to the Title Block and identifies the originator of the drawing along with the original Drafting Approver (Checker), Design Authority, and other approvers. Only the original approval signatures are placed in the Approval Block (i.e., approvals for Revision 0 of the drawing).

2.3.8.1 DRAWN BY. Print the initials and surname of the drawing originator.

2.2.8.2 DRAFTING APPROVED. Print the initials and surname of the individual checking the drawing for compliance with this standard (Drafting Checker). The Drafting Checkers signature and approval date is placed next to or below the printed name. The Drafting Checker shall be an individual other than the drawing originator.

2.3.8.3 Engineer. Print the initials and surname of the Engineer responsible for the technical content of the drawing. The Engineers signature and approval date is placed next to or below the printed name.

2.3.8.4 DESIGN AUTHORITY. Print the initials and surname of the Design Authority responsible for the overall drawing and technical baseline of the depicted SSC. The Design Authorities' signature and approval date is placed next to or below the printed name.

2.3.8.5 Other Approvals. Obtain other approvals as needed. Refer to CPCC-PRO-EN-440, *Engineering Documentation Preparation and Control*, for information regarding required approvals. Print the initials and surname of the required Approver. The Approvers signature and approval date is placed next to or below the printed name.

2.3.8.6 DATE/COMPANY. For each entry in the Approval Block, provide the date of approval and acronym of the company or contractor.

2.3.9 Drawing Status Area

The Drawings Status Area is a reserved area approximately 75 mm (3") high above the Title Block. This area is for recording additional Title Block information and/or application of stamps according to individual contractor procedures. When required, Professional Engineer (PE) stamps are placed in the Drawing Status Area.

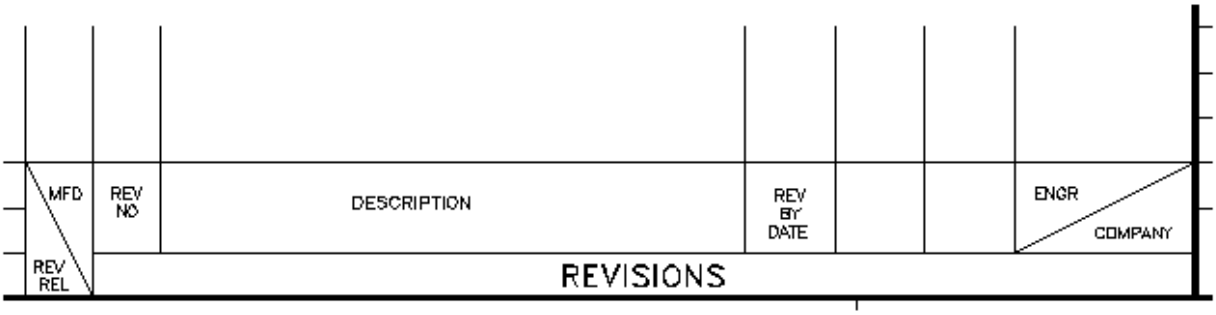
2.3.10 Auxiliary Block

The Auxiliary Block is located outside the right side border of the drawing and contains the Drawing Number, Sheet Number, and Revision Number of the drawing.

2.3.11 Revisions Block

The Revision Block is sized according to ANSI/ASME Y14.1 and configured as shown in Figure 6. The block is located as shown in Figure 2. Revision 1 and higher information and approval signatures or initials are placed in the Revision Block. Revision 0 approval signatures are placed in the Approval Block of the Title Block; no signatures are placed in the Revision Block of a drawing being released at Revision 0.

Figure 6 – Revisions Block



2.3.11.1 REV REL (Revision Release). This block is reserved for the revision release stamp provided by the IRM Release station when the revised drawing is released.

2.3.11.2 MFD. (Reserved)

2.3.11.3 REV NO (Revision Number). Identify the new revision number. The new revision number shall be the next sequential number. When revising multiple-sheet drawings, each sheet is considered a separate drawing. Revision numbers are advanced only on the sheet or sheets being affected by the change. The Revision Number in all three revision blocks identified in Figure 5 shall be changed to reflect the new revision number.

2.3.11.4 DESCRIPTION. Identify the engineering change document (e.g., REVISED PER FMP [number]).FMP) authorizing the revision. A short description can be included but conservation of space is essential. ANSI abbreviations are allowed.

2.3.11.5 REV BY DATE. Enter the initials and date of the individual revising the drawing.

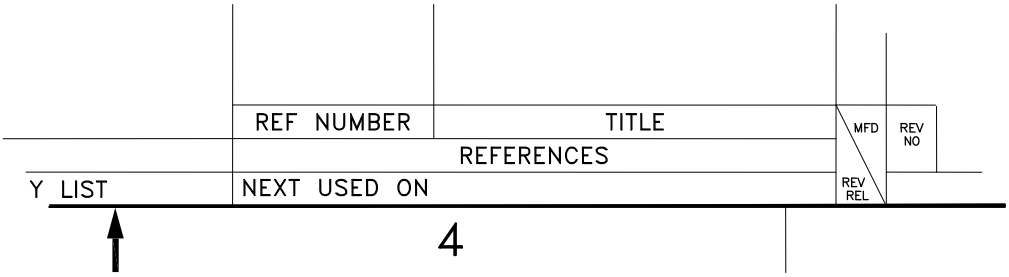
2.3.11.6 Blank Blocks. Use for other approvals (e.g., Drafting Checker, QA, etc.). Enter the initials and date of individuals approving the revision

2.3.11.7 ENGR/COMPANY. Enter the initials, date, and company of the Engineer approving the revision.

2.3.12 References Block

The References Block (see Figure 7) lists drawings or documents referenced on the drawing or which provide additional information (e.g., Legend Drawing). National codes and standards are not listed here.

Figure 7 – Reference / Next Used On Block



2.3.12.1 REF NUMBER. Enter the document or drawing number of the reference.

2.3.12.2 TITLE. Enter the title associated with the referenced document number. Abbreviate the Title as needed.

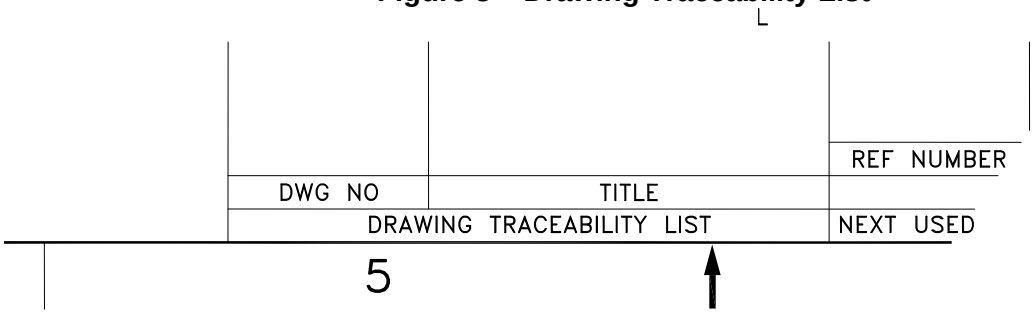
2.3.13 Next Used On Block

The Next Used On Block (see Figure 7) is used to provide traceability to drawings that are linked together (e.g., a subassembly, assembly, or installation drawing). These drawings are linked by referencing the next higher level or generation drawing (e.g., a subassembly drawing lists the drawing number of the assembly or the installation drawing). If the drawing is the top drawing, the words “END ITEM” are entered.

2.3.14 Drawing Traceability List

The Drawing Traceability List Block (see Figure 8) identifies existing drawings affected by changes in design. All affected drawings shall be shown. Drawings identified in the References Block shall not be duplicated here. All drawings need to provide two-way traceability.

Figure 8 – Drawing Traceability List



2.3.14.1 DWG NO (Drawing Number). Provide the drawing number.

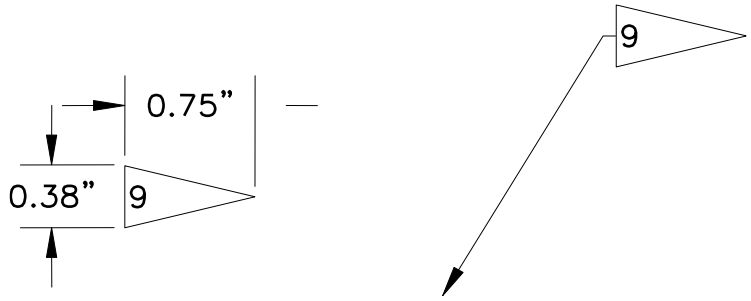
2.3.14.2 TITLE. Provide the title associated with the referenced drawing. Abbreviate the Title as needed.

2.3.15 General Notes

The preferred location for General Notes is above the Title Block. Other locations may be used when additional space is needed. On multiple-sheet drawings, General Notes shall start on sheet 1, but may continue on subsequent sheets as necessary.

When a reference back to the General Notes is required, a “Flag Note” or notation (e.g., “SEE GENERAL NOTE 5”) is placed in the body of the drawing near the affected area. Leader lines from the flag note or notation is used when clarification of the reference is required. If a flag note symbol is used, it is sized and configured as shown in Figure 9. A flag note symbol is also placed in the General Notes to indicate that a General Note is flagged in the body of the drawing.

Figure 9 – Flag Note Size and Configuration



2.3.15.1 Applied Material. Applied material needed for fabrication, assembly, or installation, shall be identified in the General Notes unless covered by a separate specification. Include application instructions as required.

2.3.15.2 Optional/Alternate Parts/Materials. The phrase "or equal" shall not be used for parts or material substitution on drawings. Optional or alternate materials may be identified on engineering drawings in the following manner:

- Reference multiple brands or materials in the Parts List and/or in the field of the drawing, as applicable.
- Provide specific instructions for optional or alternate items in the General Notes.

2.3.16 Parts/Material List

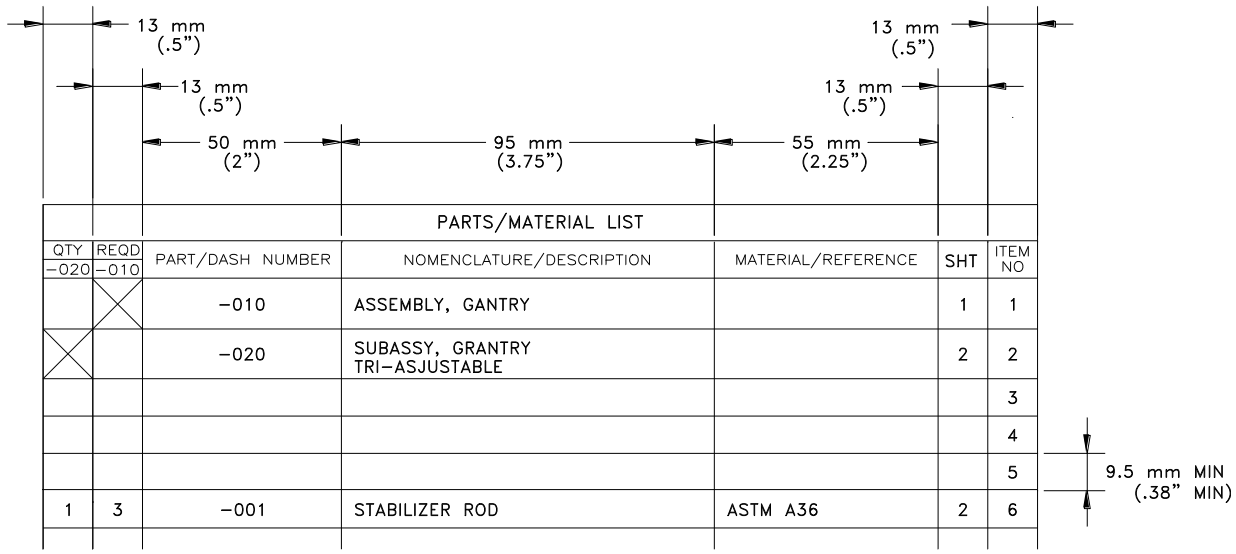
When required, a Parts/Material List is located, or started, in the upper right-hand corner on the first sheet of the drawing as shown in Figure 2. Parts/Material Lists are used on fabrication and assembly drawings, but not project construction drawings where separate specifications describe and control materials (see Table 5 - Material and Parts - Drawing Types and Classifications). Figure 10 – Parts/Materials List identifies the general attributes of a Parts/Materials list. For additional guidance on developing a Parts/Material List see Appendix C, Parts/Material Lists.

Table 5 – Material and Parts for Drawing Type and Classification

Engineering Drawing Type	***Parts/Material List***	***Material Call-Out On Drawing***
Architectural	No	Yes
Civil	No	Yes
Structural	Yes [1]	Yes [5]
Electrical	Yes [1,4]	Yes [5]
Piping	Yes [1,2,3]	Yes [5]
Instrumentation	Yes [1,4,5]	Yes [5]
Heating, Ventilation, and Air Conditioning	Yes [1,2,6]	Yes [5]
Mechanical	Yes [1]	Yes [5]
Drawing Classification		
Fabrication	Yes	No
Construction	Yes [4]	Yes [5]
Altered Item	Yes [1]	Yes [5]
Specification Control	No	Yes
Maps, Layouts, Arrangements, Diagrams, Schematics, etc.)	No	No

Code Key
1. Fabrication or shop-oriented drawings.
2. In Parts/Material List description column, enter all pipe elbows, tees, etc., as “size of pipe and miscellaneous fittings”.
3. Prefabricated.
4. Electrical, instrumentation, and HVAC disciplines (non-project).
5. Project construction type drawings.
6. Process hood systems (supply and exhaust) and process exhaust systems drawings only.

Figure 10 – Parts/Material List



2.3.17 Part Callouts

Items listed in the Parts/Materials List (assemblies, subassemblies, detailed items, commercial items, and material items) should be identified/located on the field of the drawing by part number as shown in Figure 11. Using this symbol allows the part number to be located in the Parts List and ensures that unique part numbering is maintained.

The part number is placed in a nominal 13 mm (.50") diameter circle with a radial leader pointing to the depicted item as shown Figure 11a.

Figure 11 – Part Callout Symbols

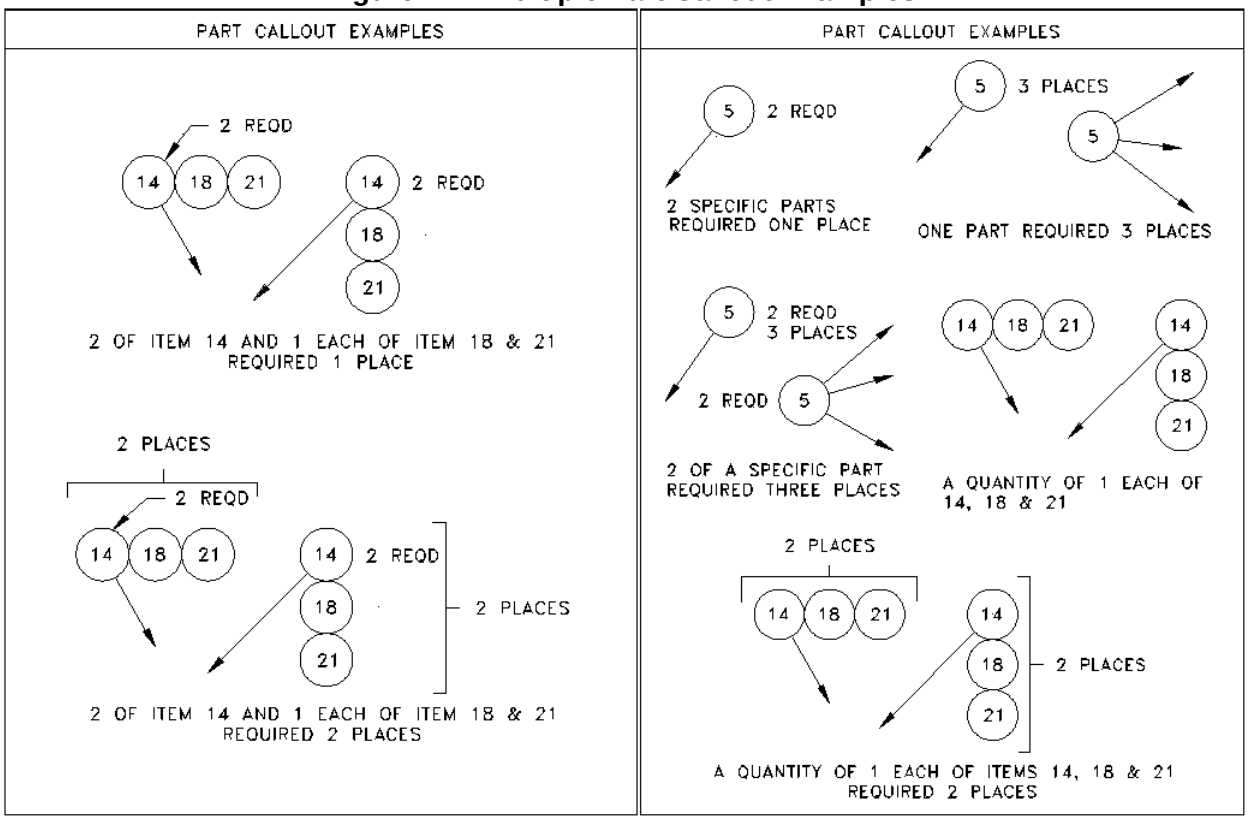
Figure 11a Figure 11b

Views detailing parts or assemblies should always have the item number centered below the primary view in a nominal 16 mm (.63") circle. The nomenclature/description shown in the Parts List should always be used. The lettering height should be 6 mm (.24") high and underlined. See Figure 11b.

All associated items are to be located on the primary view where possible. Duplicate item number callouts needed for clarification may be used but held to a minimum and identified as reference callouts by adding "REF" beside the circle.

Where more than one item is called out at one location, circled item numbers connected to one leader line may be stacked and quantities indicated as shown in Figure 12.

Figure 12 – Multiple Part Callout Examples



2.3.18 Legend

Each drawing shall have a legend on the drawing itself or reference another drawing containing the appropriate legend.

2.3.19 Drawing List

A drawing list shall be placed on the first drawing for a set of project drawings. The drawing list may be placed on a separate or title sheet. The list contains, as a minimum, the following information:

- Drawing numbers
- Drawing index number
- Building numbers (if more than one building is involved in the project)
- Title of each drawing
- Vendor information (VI) lists
- Specifications

For multiple-sheet drawings, the number of sheets may be shown without repeating the rest of the information (e.g., H-1-12345, SH 6), provided all the information is identical. When listing a specification or vendor information, the Hanford document number shall also be listed next to the title.

2.3.20 Legibility

Drawings shall be prepared so prints are legible when reduced on microfilm and then re-enlarged. As an example, parallel lines have at least 1.5 mm (.06") spacing on the hard copy drawing to maintain distinction. The final released drawing has to be capable of passing a Fifth-Generation Copy Test.

2.3.20.1 Fifth-Generation Copy Test. A test used to determine drawing legibility. The test consists of making a full size copy (first-generation copy) from the original document using a high quality copier. Then use the first-generation copy to make a second copy (the second-generation copy); then use the second-generation copy to make a third-generation copy), etc. until the fifth-generation copy is produced. The graphics and text of the fifth-generation copy shall be clearly legible without magnification, special lenses, or editing.

2.3.21 Lettering

CAD drawings shall use upper case Gothic lettering as defined in ANSI/ASME Y14.2, Line Conventions and Lettering. AutoCAD's supplied fonts ROMANS and ROMAND are considered to be in compliance with ANSI/ASME Y14.2. Minimum letter height shall be 3 mm (0.12 in) except where lower case letters or metric symbols are used. Lower case letters and symbols are to be proportional. A minimum height of 2.5 mm (0.1 in) is allowed in cases where smaller letter height is needed (e.g., mapping, drawing revisions on a crowded drawing) but shall not be used on new engineering drawings.

2.3.22 Abbreviations and Acronyms

Abbreviations shall conform to the latest edition of ASME Y14.38, *Abbreviations and Acronyms* except where commonly accepted industry or specific discipline usage dictate. PFDs and P&IDs shall comply with the abbreviations and acronyms listed on drawing H-9-006015 (see section 2.3.24).

Abbreviations are used only when space does not permit the word(s) to be spelled out, such as in the drawing title, parts list, or a reference drawing list. Industry-accepted abbreviations, such as DIA, SCH, and REF are used to the fullest extent. The face of the drawing should be planned and drafted to provide ample space so that abbreviations can be held to a minimum, for clarity and interpretation.

Non-industry-accepted acronyms should be avoided. However, if repeated use of a word in text (e.g., General Notes) makes the use of an acronym an obvious advantage, the acronym may be created. Hanford site-specific acronyms are clearly defined by spelling out the acronym in the LEGEND or by using a General Note.

2.3.22.1 Punctuation. Punctuation marks, except the slant (/) and the hyphen (-), are not used with abbreviations used on drawings. A period (.) is added to an abbreviation only if its context does not obviously represent an abbreviation (e.g., ADD indicates addition or addendum). Duplicate abbreviations are specified in the latest edition of ASME Y14.38. Before such abbreviations are used, care should be exercised to ensure the proper meaning is correctly interpreted.

2.3.22.2 Industrial and Professional Society Abbreviations. The use of acronyms for industrial and professional societies (e.g., ASME, ANSI, AWS, and IEEE) is acceptable. These professional societies' acronyms are used at all times in text and in the field of the drawing.

2.3.23 Line Width and Color

Line widths and line colors shall comply with Table 6. Users should ensure the selected color/line width produces the desired line width on the final drawing plot. The color and line width in Table 6 provides optimum contrast between lines. Also, refer to Appendix A, Layer Standards, for line weights of specific line types.

Plotters are configured to produce line widths based on colors using a color dependent plot style table (CTB file) or assigned line widths through AutoCAD.

Plotting by a polyline width is allowed when there is a justified need that cannot be done otherwise. A specific line weight generated by the plotter minimizes the need to plot by polyline width within a drawing. Setting the variable plinewid to 0 and setting global with to 0 on existing polylines limits the minimum polyline width to the plotter line width established by the line color.

Table 6 – Line Width and Line Color Assignments

Line Width	*Color Assignment*	
	Primary	*Optional*
0.25 mm (0.010 in)	8 (8)	X3 (e.g., 13, 53, 123, 243)
0.35 mm (0.014 in)	5 (Blue) 6 (Magenta) 7 (White)	X2 (e.g., 12, 32, 152, 222)
0.50 mm (0.020 in)	4 (Cyan)	X1 (e.g., 11, 71, 181, 241)
0.70 mm (0.028 in)	2 (Yellow) 3 (Green)	X0 (e.g., 10, 90, 100, 230) X5, X6, X7, X8, X9
0.90 mm (0.035 in)	1 (Red)	X4 (e.g., 14, 64, 134, 214)

2.3.24 Symbols

Standard Hanford Symbols shall be used in the development or revision of drawings. Standard symbols include Mandatory Symbols as described in section 2.3.24.1 and Optional Symbols as described in section 2.3.24.2. Criticality symbols are described in section 2.3.24.3.

Standard Hanford Symbols are available using AutoCAD's DesignCenter, the ToolBox function (TB), or by accessing drawings containing the standard symbols. The DesignCenter is available within AutoCAD's Tools:Pallettes:DesignCenter submenu. The ToolBox function (TB) is an LMSI developed tool. The Master Hanford Symbology Legend Drawings and Drawing Aid (Blocks) Drawings are available at the server location specified in sections 2.3.24.1 and 2.3.24.2 below. These symbol drawing files are also available in DMCS.

Symbols used on a drawing shall be identified on a LEGEND traceable to the drawing. The LEGEND is located either on the drawing or a separate legend drawing as part of a drawing set. When revising an existing drawing, utilize the existing drawing or drawing set legend with new additions as required. Do not identify or reference metric system symbols (for example, mm, Pa) in the drawing LEGEND.

2.3.24.1 Mandatory Symbols. New PFDs, P&IDs, Electrical Elementary and One-Line, and Electrical Plan drawings generated for use at the Hanford Site shall use the symbols specified on the drawings listed in Table 7 or as specified by the Engineer or Design Authority. These drawings form the set of Master Hanford Symbols for PFDs, P&IDs, Elementary and One-Line diagrams, and Electrical Plan drawings.

These drawings are not to be used or referenced as legends for other drawings. Each new drawing is to contain a legend or reference another drawing containing the appropriate legend.

These drawings are available in DMCS and the following server location:

\\hanford\data\Sitedata\acad\library\DesignCenter\PHMC\Mandatory Symbols and Abbreviations\Master Hanford Symbology

Table 7 – Master Hanford Symbols

Symbology Set	***Symbology Set Title***	***Associated Drawing***
Abbreviations	Master Abbreviations Legend Drawing-Sht 1-Rev 0.DWG	H-9-006015,Sht 1
Electrical Elementary And One-Line	Master Elec Elem and One-Line Legend Dwg-Sht 1-Rev 0.dwg	H-9-006020,Sht 1
Electrical Plan	Master Electrical Plan Legend Drawing-Sht 1-Rev 0.DWG	H-9-006021,Sht 1
General	Master PFD And P&ID Legend Drawing-Sht 1-Rev 0-General.DWG	H-9-006010,Sht 1
Piping	Master PFD And P&ID Legend Drawing-Sht 1-Rev 0-Piping.DWG	H-9-006010,Sht 2
Equipment	Master PFD And P&ID Legend Drawing-Sht 1-Rev 0-Equipment.DWG	H-9-006010,Sht 3
Instrumentation Identification	Master PFD And P&ID Legend Drawing-Sht 1-Rev 0-INST ID.DWG	H-9-006010,Sht 4
Instrumentation	Master PFD And P&ID Legend Drawing-Sht 1-Rev 0-Inst.dwg	H-9-006010,Sht 5
HVAC	Master PFD And P&ID Legend Drawing-Sht 1-Rev 0-HVAC.DWG	H-9-006010,Sht 6

2.3.24.2 Optional Symbols. The symbols contained in the drawings listed in Table 8 are optional. They are provided as a drafting aid to increase efficiency in drawing production. They are not used for new PFD or P&ID drawing legends.

These drawings are available in DMCS and the following server location:

\\hanford\data\Sitedata\acad\library\DesignCenter\PHMC\Drawing Aids (Blocks)

Table 8 – Drawing Aids (Blocks)

Symbol Set	***Symbol Set Title***	***Associated Drawing***
General	General-Sht 1-Rev 0.DWG	H-6-14982,Sht 1
Civil	Civil-Sht 1-Rev 0.DWG	H-6-14983,Sht 1
Structural	Structural-Sht 1-Rev 0.DWG	H-6-14984,Sht 1
Architectural	Architectural-Sht 1-Rev 0.DWG	H-6-14985,Sht 1
Machine	Machine-Sht 1-Rev 0.DWG Machine-Sht 2-Rev 0.DWG	H-6-14986,Sht 1 H-6-14986,Sht 2
HVAC	HVAC-Sht 1-Rev 0.DWG	H-6-14987,Sht 1
Fire Protection	Fire Protection-Sht 1-Rev 0.DWG	H-6-14988,Sht 1
Control Systems	Control Systems-Sht 1-Rev 0.DWG	H-6-14989,Sht 1
Electrical	Electrical-Sht 1-Rev 0.DWG Electrical-Sht 2-Rev 0.DWG	H-6-14990,Sht 1 H-6-14990,Sht 2
Piping	Piping-Sht 1-Rev 0.DWG Piping-Sht 2-Rev 0.DWG	H-6-14991,Sht 1 H-6-14991,Sht 2

2.3.24.3 Criticality Prevention Limit (CPL) Symbols. Criticality Safety is responsible for critical dimensioning practices and determines the need for placement of Criticality Prevention Limit (CPL) dimensions on a drawing. CPLs are identified on a drawing using a CPL Symbol along with the CPL dimension as shown in Figure 13. The CPL symbol is placed immediately after the CPL dimension. Each CPL dimension shall include its own tolerance (e.g., 3' -7" + 1/8" or 7" + 1/16".

Figure 13 – CPL Symbol

When a CPL Symbol is used on a drawing, the following General Note shall be added:

THE CRITICALITY PREVENTION LIMIT DIMENSIONS (CPL) IDENTIFIED IN THE DOUBLE BOX SYMBOL ARE CRITICAL DIMENSIONS AND NEED VERIFICATION AND DOCUMENTATION IN THE WORK PACKAGE AND AT FABRICATION OR INSTALLATION BY QUALITY ASSURANCE INSPECTION.

2.3.25 Dimensioning and Tolerencing

Dimensioning and Tolerancing shall be in accordance with ANSI/ASME Y14.5M, *Dimensioning and Tolerancing*.

2.3.26 Coordinate System/Geodetic Elevation

For new drawings, the following Coordinate and Elevation systems shall be used:

- Coordinates – The Washington Coordinate System of 1983, South Zone (1991) (WCS83S [1991]).
- Elevations -- The North American Vertical Datum of 1988 (NAVD88).

2.3.27 Metric Measurement System

Designs specifying the metric system of measurement shall use hard metric measurements to the fullest extent. Metric measurements are used directly rather than converted from the inch/pound system (see “Hard Metric Conversion” and “Soft Metric Conversion” in Appendix D, Glossary).

Metric designations (e.g., mm) are considered symbols and are used to the fullest extent possible. See the metric system (SI) symbology in the latest edition of ANSI/IEEE 268, *Standard Metric Practice*.

Modifications to drawings containing English units may continue to use the English system unless otherwise specified by the Design Authority.

2.3.27.1 Metric Dimensioning. The following conventions shall be used on drawings using the metric system of measurement:

Linear dimensions shall be shown in millimeters except on large site plans and civil drawings. Large site plans and civil drawings shall show linear dimensions in meters carried to one, two, or three decimal places.

Commas shall not be used in metric system numbers. Spaces shall be used to separate digits into groups of three (e.g., 1 500 000 mm). Four-digit numbers are not separated by a space (e.g., 5000 m). A space shall be used to separate the numeric value from the measurement unit, but the number and the unit are never separated between the lines of text.

Metric dimensions and unit symbols shall always be in upright type (i.e., vertical lettering), even when the surrounding text is in italics.

When area is being specified, square meters or sub-multiples are used (e.g., m2, cm2, and mm2).

Fluid volumes are specified in liters (symbol is upper case L), except large volumes may be expressed in cubic meters (m3) (e.g., 1000 L = 1 m3).

Dual dimensioning (both inch/pound and metric shown for the same dimension) should be avoided. In cases where dual dimensioning is needed, the following shall apply:

Metric dimensions are shown first with the inch/pound equivalent shown in parentheses.

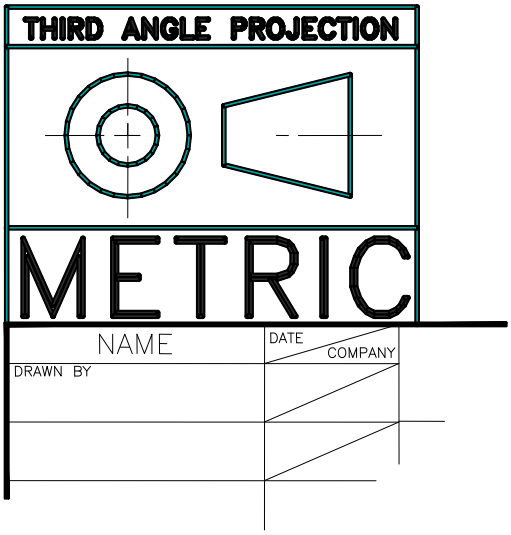
A General Note shall be added to the drawing stating the inch/pound dimensions shown in parentheses are equivalent to the metric dimensions they follow.

Tolerances for the inch/pound dimension, where necessary, are shown at each occurrence.

2.3.27.2 Metric Notation. Drawings delineated in the metric system have the word “METRIC” placed directly above the Title Block in 6 mm bold gothic lettering (see Figure 11 and Figure 14).

2.3.27.3 Third Angle Projection. All drawings developed using the multi-view system of orthographic presentation as specified in ASME Y14.3, Multiview and Sectional View Drawings, use the third angle projection method. On metric drawings, the international projection symbol and the words “THIRD ANGLE PROJECTION” is placed directly above the metric notation (see Figure 2 and Figure 14).

Figure 14 – International Projection Symbol



2.3.27.4 Converted Metric Designations. Converted metric designations are material and parts designations converted from the inch/pound system to the metric system (e.g., 2" pipe converted to DN 50 pipe; 2x4 lumber stud converted to 50 x 100 mm lumber stud). These conversions are made where items can be equivalently identified by metric designation.

Many industrial products have been given metric designations by the appropriate industry organizations. In cases where designations lose their proper meaning, inch or metric equivalents are not shown (e.g., 1/4-20 thread loses its proper meaning if designated as 6.35 mm-20 thread; conversely, a 6 mm-20 thread loses its proper meaning if designated as a .236-20 thread).

2.4 Drawing Life Cycle

2.4.1 New Drawings

New drawings intended to be released into the DMCS for configuration control and the IDMS as records shall comply with the following:

- New drawings shall be assigned unique Hanford H-series drawing numbers.
- New drawings shall be prepared in accordance with this standard and CPCC-PRO-EN-440, *Engineering Documentation Preparation and Control*.
- New drawings shall be developed using the CAD software standards identified in section 2.2.
- New drawings shall be authorized for release via a Facility Modification Package (FMP) in accordance with CPCC-PRO-EN-2001, *Facility Modification Package Process*. The releasing FMP is identified in the Title Block as described in section 2.3.7.9.
- New drawings prepared for formal projects which are intended to be released into DMCS upon turnover to operations shall be prepared in accordance with this standard. These drawings are “issued for construction” via a DCN in accordance with CPCC-PRO-EN-8016, *Design Change Notice Process*, with the initial issuing DCN identified in the Title Block as described in section 2.3.7.9.

2.4.2 Revised Drawings

Revisions to released drawings shall be made in accordance with this standard. Drawing revisions shall comply with the following:

- Authorization to revise a drawing shall be provided using an FMP in accordance with CPCC-PRO-EN-2001, *Facility Modification Package Process*.
- Drawings created and issued for formal projects may be revised using a Design Change Notice (DCN) in accordance with CPCC-PRO-EN-8016, *Design Change Notice Process* until such time as they are officially released into DMCS.
- The change authorizing document (i.e., FMP or DCN) shall be identified in the Revisions Block as described in section 2.3.11.
- Revision numbers are numeric. When a drawing is revised, the revision number will advance to the next sequential number. The revision number shall be shown and match in all Revision Blocks contained on a drawings (see section 2.3.7.7 and Figure 5).
- A Revised Drawing shall be released before any subsequent revisions are made.
- Each Individual sheet of a Multi-Sheet drawing has its own revision number. Revision numbers are advanced only on the sheet or sheets being affected by the revision.
- Additional sheet(s) added to a drawing during a revision are released as Revision 0. The FMP/DCN number being incorporated is identified in the Title Block of the additional sheet as described in section 2.3.7.9.

- CAD drawings do not need to have the approval signatures from previous revisions printed in the Title or Revisions Blocks. A reference to see the applicable revision may be placed in the approval block (e.g., See Revision 0, or See Revision 5).
- Previous revision information contained in the Revisions Block may be removed from a drawing being revised as needed to provide additional space.

The following non-technical changes require a revision of the drawing:

- Index Number Change -- Addition, deletion, or change of Index Numbers on an approved drawing.
- Building Number Change -- Add, deletion, or change of Building Numbers on an approved drawing.
- Drawing Title Change – Any change to the title of an approved drawing.
- The following non-technical changes may be made during drawing revisions and do not require change or revision to the authorizing FMP:
- Addition of extra sheet(s) to a drawing to incorporate the authorized changes.
- Correction of misspelled words.
- Adding or revising related/referenced arrangements, views, sections, details, and/or tables to accurately delineate the authorized changes.
- Delineating the change information on a subsequent sheet(s) of an affected drawing when there is insufficient space available to depict the change. If performed, add a statement describing the variance from the authorizing FMP to the Revision Description Block to document the change. Examples include:
    - Incorporated FMP (number), was sheet 3 of 4,
    - Incorporated FMP (number), moved Detail X,
    - Incorporated FMP (number), added Detail X due to insufficient space on sheet X,
    - Incorporated FMP (number), added new sheet X.
- Adding or removing the words "ESSENTIAL" or "SUPPORT" from the face of the drawing.

2.4.3 Superseded Drawings

Developing or revising a drawing that replaces a structure, system, or component that is documented on an existing drawing requires the old drawing be superseded. The new and existing drawings are revised to provide two-way traceability to the current and old drawing configurations.

2.4.3.1 Superseding a Drawing with a Different Drawing Number. This action requires the following actions:

On the Superseded Drawing: Revise the drawing by placing a note stating "SUPERSEDED BY DWG [number] REV. [number]" near the Title Block in 6 mm (.24") high lettering.

On the New Drawing: Revise the drawing by placing a note stating "SUPERSEDES DWG [number] REV. [number]" near the Title Block in 6 mm (.24") high lettering.

2.4.3.2 Superseding an Approved Drawing with a Drawing of the Same Drawing Number (Redraw). Revision of a CAD .DWG file is not a redraw. Development of a new CAD .DWG file from an existing released drawing is a redraw and requires the following actions:

- On the New Revised Drawing:
  - Show the authorizing FMP number in the REVISIONS Block (e.g., REVISED PER FMP [number]).
  - Use the original drawing number for the new drawing. All original signatures and dates are printed in the Title Block or a reference is added referring to previous drawing revisions for original signatures.
  - Delete all previous revisions listed in the REVISION Block. The revision states the reason for the redraw (e.g., REDRAWN, GENERAL CHANGE OF DELINEATION, or REDRAWN DUE TO CONDITION OF ORIGINAL).
- On the Old Drawing:
  - Do not advance the Revision Number on the old drawing.
  - Place a note stating, "SUPERSEDED BY DRAWING OF THE SAME NUMBER REV [number]," near the Title Block in 6 mm (.24") high lettering. If the old drawing is a manual drawing, return it to the vault in Hanford Central Files.

2.4.4 Voided Drawings

A drawing is voided in DMCS through identification of “Void” action on an FMP. Voided drawings are flagged as “Void” in DMCS by the IRM Release Station. Drawings placed into a void status shall not be revised, referenced or used for any activity and are maintained for historical purposes only.

2.5 Specialty Drawings

2.5.1 Process Flow Diagrams (PFD)

Process Flow Diagrams (PFD) provide simplified schematic description of a process that includes the following data:

- Basic equipment and stream flows necessary to define the process
- Temperatures, pressures, flow rates, and duties that define normal operation
- Material balances that define the quantities of raw materials and products and the physical and thermal condition of every major stream in the process
- Instrumentation sufficient to illustrate the basic process control concept.
- PFDs provide an overview of the process and enhance understanding of its operation. PFDs provide the following benefits:
- Serves as a starting point for defining the process
- Establishes the interrelationship between equipment and controls
- Establishes material and energy balances and process conditions
- Provides a basis for equipment lists and datasheets, line sizing, modes of control, instrument datasheets, P&IDs, safety evaluations, and material selection
- Provides a check for overall process continuity and integrity
- Provides a means to develop and review operating procedures
- Provides a basis for a proposal

PFDs serve as a basis for other engineering design activities and documentation including the following:

- Operating and design conditions
- Materials selection, Materials Selection Diagram
- Line sizing
- Temperature and pressure profiles
- Safety and isolation
- Process Control philosophy
- Control and non-control instrumentation
- Winterization and insulation
- Environmental emissions diagram
- Preliminary safety review

2.5.1.1 PFD Format and Arrangement. PFDs shall be arranged in accordance with the following:

- Process flow on the drawing is generally from left to right
- PFDs must be arranged to allow for future revisions
- Limit detail to a level appropriate for the overall design. Avoid excessive detail on a PFD. Details are picked up on P&IDs.
- An overall PFD may be made for a design with multiple processes. Subsequent PFDs may be prepared to detail the individual processes.
- Only major equipment and flows are shown. Startup, bypass, and minor lines with unspecified flow rates are not included in the PFD.
- PFDs should be presented on only one sheet, if possible. A Block Flow Diagram (BFD) may be appropriate and serve the intended purpose in place of a PFD.

2.5.1.2 PFD Symbols and Legends. PFDs shall comply with the symbol requirements specified in section 2.3.24.

2.5.1.3 PFD Material Balance. The material balance for normal operating conditions or batch operation is shown as a table in the lower left portion of the drawing. If additional space is needed to show the table, it is placed on a continuation sheet of the PFD. Table 9 provides an example of a Material Balance table.

Table 9 – Material Balance Table Example

Component	Stream Number	1		8	
		Benzene Feed		Reactor Product	
	MW	Mol/hr	Lb/hr*	Mol/hr	Lb/hr*
Hydrogen	2.0				
Methane	16.0				
Nitrogen	28.0				
Benzene	78.1				
Heavies	200.0				
Total					
Total (lb/hr)*					
Square Cubic Feet Per Minute (SCFM)					
Gallons per Minute (GPM), at operating conditions					
Density at operating conditions, (lb/ft^3)					
Viscosity, Centipoise (cP)					
Pressure, pounds per square inch gage (psig)					
Operating Temperature, Degrees F					
* Component mass flow listing is optional. If not listed, show the total mass flow on a separate line.					

The following data are typically provided on a PFD material balance table:

- Component molecular weight
- Component molar flow (moles per hr to nearest 100th)
- Component mass flow (optional, lb per hr to nearest lb)
- Total mass flow, pounds per hour
- Total volumetric flow
- Gases, Standard cubic feet per minute (scfm)
- Liquids, gallons per minute (gpm) at operating conditions
- Stream density (substituting specific gravity for liquids is optional)
- Stream viscosity, cP
- Operating pressure, psig or Pounds per square inch absolute (psia)

The order of components in the table should be from the lowest to the highest molecular weight (from top to bottom of the material balance). If a component is not present on a sheet (even if it is on others), it may be deleted from the material balance if space is needed.

Stream numbers should increase from left to right on the material balance. Identical numbers and descriptions should be maintained on any stream shown on more than one sheet.

Utility flows are not shown in the material balance table, unless they become part of a process stream. Utility flows are sometimes shown on the utility line.

Batch processes should utilize batch quantities and cycle times in the Material Balance Table (refer to the Operating Temperature, Degrees F, block in the Material Balance Format table above).

2.5.1.4 PFD Equipment. Major process equipment is shown and arranged on the PFD using the normal sequence of flow. For visual understanding, relative equipment elevations should be used, particularly where gravity flow is involved.

- Relative equipment sizes are shown.
- Major internals of equipment are shown only if needed.
- Detail items such as vortex breakers, flanges, or man ways are not shown.
- Decanting baffles, strategic trays (top, bottom, and feed), and demisters are shown. Trays are numbered from bottom to top.
- Tube side flow through exchangers is identified.
- Control valves and seal legs may be shown to clarify operation and control scheme.
- Pumps, compressors, and blowers are located where convenient. The preference is to locate pumps slightly below their suction vessels.
- Limit the number of equipment items on a drawing so that adequate space remains for future revisions. Do not crowd the diagram.

- If more than one frame is required for the process, equipment and frames should be grouped into logical sections (e.g., reaction and product recovery).
- Equipment numbers should be shown within the outline of the equipment or next to the item.
- Equipment numbers and names are generally shown at the top of the drawing and above the equipment except for pumps, compressors, and exchangers. Other information may be added if it is necessary for understanding the process.
- Designations must match the equipment list, equipment datasheets, and P&IDs.
- Operating pressures and temperatures should be shown within equipment outlines.
- Only one of multiple identical train units and spare equipment should be shown. The equipment number will indicate the other trains or spares.

Items typically not shown on PFDs include:

- utility systems (for example, refrigeration, cooling water, tempered water, and hot oil)
- Chemical feed systems. These may require a separate PFD(s) if sufficiently complicated or if considered necessary
- Packaged units are shown as boxes unless they are important to understanding the process. If important, the essential details may be shown enclosed by dotted lines or by appropriate labeling.
- Drives are not normally shown on PFDs unless they are part of a control loop. An exception may be made when a drive is part of a standard equipment symbol.
- Equipment design conditions with material of construction are sometimes shown on separate PFDs.

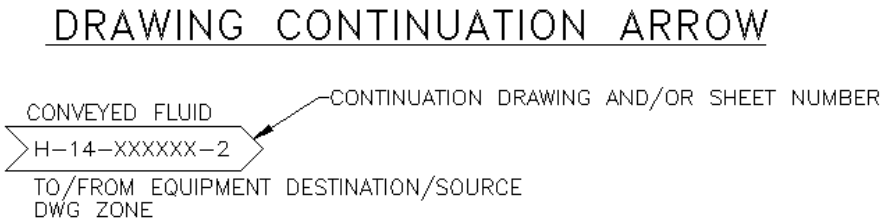
2.5.1.5 PFD Instrumentation. Only the loops and instruments required to understand normal process operation and control shall be shown on the PFD.

- No alarms, safety instrumentation, or indicators are shown unless required to understand normal process operations.
- Instrument control lines are shown as dashed lines regardless of signal type (e.g., pneumatic, electronic).
- Controller type is not shown (e.g., indicating or recording, local or panel, hardware or software) unless important for understanding the basic control philosophy.
- Continuous online analyzers are shown according to Instrument Society of America (ISA) standards.
- Type of flow measurement device is not shown.
- The location of instrumentation on trayed columns must be clearly shown as to which tray it is on.

2.5.1.6 PFD Process Lines. Main process streams are shown in heavy (Thick). Minor lines such as intermittent flows, startup lines, shutdown lines, and blowdowns are generally not shown. The following conventions should be used:

- Lines designated by stream numbers, should also have the pressure and temperature information shown at that point.
- Utility lines are pigtailed to indicate tie points and type of utility only and are not carried to the edge of the drawing. Indicate the appropriate utility abbreviation symbol next to the pigtail. Steam lines shall be identified with pressure in psig.
- Minimize crossing of lines. Process lines have priority over utility lines and utility lines have priority over instrument lines. Utility lines are broken when they cross process lines, and instrument lines are broken when they cross process or utility lines. Otherwise, vertical lines are broken when they cross horizontal lines.
- Flow arrows are used liberally to indicate flow direction. As a minimum, arrows are located at the end of a line and when the line changes direction.
- The following lines should not be shown:
    - Startup and shutdown
    - Decommissioning
    - Sewers
    - Vents and drains
- Lines showing transition to and from multiple trains are shown on the PFD. Lines entering and leaving the drawing are identified by the commodity, source or destination, equipment name and number, and drawing number as shown in Figure 15.

Figure 15 – Drawing Continuation Arrow



- Process tie-ins should extend to and from the edge of the drawing.
- Normal operating temperatures are indicated on inlet and outlet process streams associated with heat exchangers.
- Valves (except control valves) are generally shown as gate valves

2.5.2 Piping and Instrumentation Diagrams (P&ID)

Process and Instrument Diagrams (P&ID) contain the greatest amount of detail of any type of flow diagram. With few exceptions, all equipment, piping, and instrumentation are shown in schematic representation on P&IDs.

2.5.2.1 P&ID Format and Arrangement. P&IDs shall be arranged in accordance with the following:

- The final drawing shall have an appearance of uniform density. Components shall be arranged so the P&IDs are clear and uncluttered.
- The process should read from left to right across the page. Feed stock should enter on the left and product should exit on the right. There should be continuity of the process stream flow from sheet to sheet.
- Primary process lines shall be kept as direct and uninterrupted as possible. Primary process line paths take priority over secondary process lines (e.g., bypasses, jump-overs) and utility lines. Piping arrangement should take priority over instrumentation configuration.
- Space shall be allocated for equipment titles, notes, details, and other necessary textual information.
- The P&ID shall be arranged giving consideration for the addition of equipment/streams identified later in the development process.
- Line continuations shall match those on adjacent drawings.

2.5.2.2 P&ID Symbols and Legends. P&IDs shall comply with the symbol requirements specified in section 2.3.24.

2.5.2.3 P&ID Equipment. Equipment and associated data shall be shown on the P&ID. Equipment depictions on P&IDs shall include the following information:

- Specific component information (shown at the top of the diagram above or adjacent to the equipment outline):
  - Equipment Number (underlined)
  - Equipment Title (underlined)
  - Design Conditions
- Additional pertinent information depending on the type of equipment:
  - Design Capacity/Duty
  - Design Rating
  - Design Pressure and Temperature
  - Dimensions (envelope or overall)
  - Power Requirements
  - Material of Construction
  - Insulation

Equipment information shall ensure the following:

- Equipment Titles are identical to those on the equipment list.
- Design information (e.g., dimensions, design pressure, and temperature, insulation requirements) is consistent with the Equipment Datasheet.
- Materials shown are consistent with the Material Selection Diagram and/or the Equipment Datasheet.
- Critical dimensions or elevations between equipment required for process (e.g., elevation of vessels required for gravity flow) are shown.

In addition to the required information identified above, Table 10 provides additional information which may be required for various equipment types.

Table 10 – P&ID Representation and Information for Various Equipment Types

Equipment Type	*P&ID Representation*	*Additional Information*
Vessels/Columns	• Relative size in elevation view • Lines, Instrumentation, and sample connections. • Internals (shown in dashed line) including packing, demisters, vortex breakers, trays, coils, baffles, etc. • Nozzles in proper orientation. • Nozzle connection type. • Valves. • Access ways and hand holes • Height above grade (to bottom tangent line for vertical vessels; to bottom for horizontal vessels. • Agitator (shown as a solid line).	• Size including Inside Diameter (ID) and length. • Number of Trays. • Number of packed beds, bed height, type, and size of packing. • Nozzle size and designation. • Agitator type, speed, horsepower, material.
Air Coolers	• Only one bay need be shown for multiple bays. • Multiple bays requiring symmetrical inlet and outlet piping shall show actual piping scheme. • Louvers, heating coils, etc. required for winterization.	• Multiple bays shall note the actual number of bays required and instrument tag numbers tabulated in a table. • Add not highlighting requirement for symmetrical inlet and outlet piping if required.

Equipment Type	*P&ID Representation*	*Additional Information*
Shell and Tube Exchanger	• TEMA symbol for type of exchanger (see section 2.5.2.2). • Number of shells or sections. • Flow arrangement. • Elevation view. • End view of double pipe exchangers to show correct piping hook-up of multiple units, if required. • Height of the exchanger above grade or other appropriate reference (as needed per process requirements). • Flow scheme through the shell side of the exchangers (for stacked configuration) and all necessary trim valves, vents, and drains.	• Shell Design Pressure/Temperature. • Tube Design Pressure/Temperature. • Pressure level of steam and condensate system for steam-heated reboilers.
Pumps	• Pump type and Driver symbol (see section 2.5.2.2). • Identification of spare pumps. • Size of suction and discharge flanges • Heating fluid details and piping (for Jacketed Pumps). • External relief protection.	• Pump impeller type • Cooling requirements • Flushing requirements.
Compressors, Blowers, Fans	• Component type symbol (see section 2.5.2.2). • For multistage reciprocating equipment, show each stage separately with only one driver. • Include pulsation dampeners, intercoolers, etc. as required. • auxiliary systems on a separate auxiliary P&ID (e.g., lube oil, seal oil)	• Number of stages. • Compressor stage number for multistage compressors.
Tanks	• Tank type symbol (see section 2.5.2.2).	• Inside diameter and height. • Net capacity.
Miscellaneous Equipment	• Correct equipment symbol (see section 2.5.2.2). • Packaged equipment shall be enclosed by a dashed.	• Packaged equipment shall be identified with the words "Provided by Supplier" and Vendor Information Number. • Envelope or overall dimensions. • Micron Size

2.5.2.4 P&ID Instrumentation. The P&ID shall depict the basic system control scheme and/or process conditions measured by instrumentation. The P&ID shall detail the principal piping, valve sequencing, location necessary to accomplish the required control and/or measurements, and instrumentation details.

All instrument and control design and symbology shall be consistent with the appropriate standards of the Instrument Society of America (ISA) and Institute of Electrical and Electronic Engineers (IEEE).

Instrumentation shall depict the following (as appropriate):

- Unique identification of all instruments shown on the P&ID
- Proper location of all sampling points, particularly for analyzing instruments
- All flushing and purge connections for instruments. Detail of the connections shall be shown on the right-hand side of the flow diagram
- All alarms, solenoid valves, timers
- All detail logic (e.g., pump shutdown on low liquid level)
- For complex logic, a logic table for the location of the equipment or logic diagram
- For complex control systems, provide "first-out" indication to aid operators in determining what first caused the problem
- For Distributed Control Systems (DCS), show points that manipulate the process, receive information from the process, or are essential to understanding the functional operation of the controls.

Control Valves shall indicate size and action (fail close, open, or last position). Control Valve stations shall show the block and by-pass valves. By-Pass Valve sizes shall be shown.

Relief Valves and/or Pressure Safety Valve (PSV) shall show valve size with orifice designation, valve number, and set pressure. Tag block valves on the P&ID that are locked or sealed open. Identify the tagged valves as full port valves. Show Drain Valves or a plugged drain between the block and PSV.

2.5.2.5 P&ID Process Lines. Process and Utility lines shall be shown of the P&ID. Each process line and utility line shall be identified by a line number.

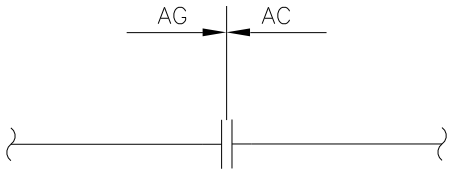
Lines entering and leaving the flow sheet are identified by the commodity, source or destination, equipment name and number, and drawing number as shown in Figure 15. For lines routed outside of the process unit's boundary, use a general name and associated equipment number for a source or destination. Use the Equipment Number for the source or destination if the line is routed within the same process unit or system.

The following shall be depicted on the P&ID:

- Line numbers above a horizontal line or to the left of the vertical line.
- Notes beneath a horizontal line or to the right of a vertical line

- Control and bypass valve sizes. Line size valves need not have their size indicated at the valve
- Line size reductions for continuous drawn lines. Reducer symbols are not required for stub-ins
- Corrosion allowance, which is beyond the normal allowance (as indicated in the individual line class).
- Identification of piping components not identified by Instrument or Mechanical Equipment Numbers or not included in the Piping Material Specification. Assign an Item Code Number with identification symbol using standard symbols (see section 2.5.2.2).
- Packaged equipment or modules shown by a dashed line or cloud surrounding the package.
- Designations to indicate the juncture between Contractor and Supplier provided piping.
- Flange breaks only when needed for clarification
- Tracing or jacketing on equipment, instruments, or piping
- High point vents and drains only when they connect to a closed system or are required for process or safety reasons.
- All startup and shutdown lines
- Sloped lines with the slope symbol as shown below:

Clearly indicate where line specification changes occur. Line specification changes require a new line number. The following example shows a specification change at a flange:



Identify where the Limits of Safety Class (SC) Components and Limits of Safety Significant (SS) Components occur as shown below. This will also require a new line number.

Pump piping shall depict the following:

- Show temporary and permanent screens or strainers as required.
- Show block valves, check valves, and pressure gauge connections in the discharge line as required.

Utility lines originate and terminate adjacent to the equipment involved. Only the length of line necessary for valving, instrumentation, and line numbering is shown. Utility line origin and terminus is indicated by descriptive title only. Main utility headers are not shown on the unit P&ID; they are shown on the utility P&ID for that process area. Compressor utility piping may be shown when minor in scope; otherwise it is shown on a compressor auxiliary P&ID.

2.5.3 Altered-Item Drawings

An Altered-Item Drawing is an engineering drawing used to control and detail alterations to a commercially purchased item. An Altered-Item Drawing reflects only the change(s) made to the Vendor drawing and is not intended to show complete fabrication details.

Altered-Item Drawings are developed from vendor drawings included in Engineering Vendor Information (VI) Files and are official Hanford drawings. When a vendor provided SSC needs alteration as part of a design or modification, and Altered-Item Drawing shall prepared from the vendors drawing.

Required Altered-Item Drawing Elements:

- A new H-series drawing number shall be assigned or the item shall be documented on an existing H-Series drawing.
- The words “ALTERED ITEM” shall be the first two words of the drawing title.

The following information shall be added to the Parts List on the Altered-Item Drawings as appropriate (See Figure 16):

- If the item is assigned (or will be assigned) a VI File Number, the VI File Number shall be identified in the Material/Reference column of the Parts List.
- If a manufacture's drawing is available for reference, the drawings reference shall be placed in the Material/Reference column.
- "ALTERED FROM (manufacturer's part number)" shall be added to the Description column.
- A new part/assembly number shall be assigned.

Detailing the alteration:

- Reference features (features not needing alteration) are limited to orientation for describing where designated alterations are being made. These reference features are shown by phantom lines as depicted in ANSI/ASME Y14.2*, Line Conventions and Lettering*.
- Dimensional information needed for orientation only to identify where the alteration will be made is shown in (parenthesis).

- The alteration is detailed by visible lines in accordance with ANSI/ASME Y14.2, *Line Conventions and Lettering*.
- Notes, tolerances and dimensions are applied to detail the alteration.

Figure 16 – Documenting an Altered Item in the Parts List

2 1

PARTS LIST/MATERIAL LIST

QTY REQD −020	QTY REQD −010	PARTS / DASH NUMBER	NOMENCLATURE/DESCRIPTION	MATERIAL/REFERENCE	SHEET	ITEM NO
	X	−010	ASSEMBLY – ALTERED FROM PART 241, PUMP LID CLOSURE ASSY, BY NEWBEE ENTERPRISES	VI FILE: 50235, DWG 12099−241		1

F

3.0 FORMS

None

4.0 RECORD IDENTIFICATION

All records are required to be managed in accordance with CPCC-PRO-IRM-10588, *Records Management Processes*. OCRWM records are also managed in accordance with CPCC-PRO-QA-19579, *OCRWM Records Management*.

Records Capture Table

Name of Record	Submittal Responsibility	Retention Responsibility
Drawing	Preparer/ Design Authority	DMCS/IDMS
Drawing (OCRWM)	Preparer/ Design Authority	OCRWM Records Coordinator

5.0 SOURCES

5.1 Requirements

CPCC-RD-EN-1819, *Engineering Requirements*

5.2 References

ANSI/ASME Y14 Series, *Drafting Practices*
ANSI/ASME Y14.1, *Decimal Inch Drawing Sheet Size and Format*
ANSI/ASME Y14.1M, *Metric Drawing Sheet Size and Format*
ANSI/ASME Y14.2, *Line Conventions and Lettering*
ANSI/ASME Y14.3, *Multiview and Sectional View Drawings*
ANSI/ASME Y14.5M, *Dimensioning and Tolerancing*
ANSI/ASME Y14.38, *Abbreviations and Acronyms for Use on Drawings and Related Documents*
ANSI/IEEE 268, *Standard Metric Practice*
CPCC-PRO-EN-440, *Engineering Documentation Preparation and Control*
CPCC-PRO-EN-2001, *Facility Modification Package Process*
CPCC-PRO-EN-8016, *Design Change Notice Process*
CPCC-PRO-IRM-10588, *Records Management Processes*
CPCC-PRO-QA-19579*, OCRWM Records Management*
PIP PIC001, *Piping and Instrumentation Diagram Documentation Criteria*

Appendix A - Layer Standards

The following tables describe the standard layers used for Hanford CAD drawings:

Table A1, *General Layering for All Disciplines*

Table A2, *Architectural Drawings*

Table A3*, Civil/Structural/Environmental Drawings*

Table A4, *Electrical Drawings*

Table A5, *Fire Protection Drawings*

Table A6, *HVAC Drawings*

Table A7, *Instrumentation & Control (I&C) Drawings*

Table A8, *Mechanical Drawings*

Table A9, *Piping Drawings*

Appendix A (Cont.)

Table A1 – General Layering For All Disciplines

NOTE: ***Selected layers from the general layering for all disciplines are added to the drawing setup models as determined appropriate and necessary to define and separate drawing data.***

Layer Name	Description	Line Color	Line Type	Line Weight
Autocad Program				
0	AutoCAD generated. Not for project drawings; used for symbol creation	White	Continuous	0.35mm / 0.014”
DEFPOINTS	AutoCAD generated; associative dimensioning definition points automatically on this layer; used for display, only, as AutoCAD does not print this layer.	White	Continuous	0.35mm / 0.014”
General Layers				
*?O-BRD	Title block , associated blocks, and drawing border	132	Continuous	0.35mm / 0.014”
*?M-DIM	Dimensioning	253	Continuous	0.25mm / 0.010”
*?T-TXT	Text, General associated with a specific layer	White	Continuous	0.35mm / 0.014”
*?T-BTXT	Text, Bold	Yellow	Continuous	0.70mm / 0.028”
*?T-REF	Reference items and notes that aid CAD uses during construction of the drawing	213	Continuous	0.25mm / 0.010”
*?T-CHK	Checker's marks (informal only)	11	Continuous	0.50mm / 0.020”
*?O-VPT	Paper space Viewport border	White	Continuous	0.35mm / 0.014”
*?O-CLD	Clouded areas for Hold, FMP/ECN, and revision	White	Continuous	0.35mm / 0.014”
*?E-EXST	Anything existing to remain	8	Phantom	0.25mm / 0.010”
*?D-DEMO	Existing items /equipment required to be removed or demolished	Cyan	HiddenX2	0.50mm / 0.020”
*?C-CLINE	Center line	Blue	Center	0.35mm / 0.014”
*?X-HATCH	Cross-section lines	Blue	Continuous	0.35mm / 0.014”
*?H-HIDL	Hidden lines	Blue	Hidden	0.35mm / 0.014”
*?V-MLN	Matchlines	Red	Phantom	0.90mm / 0.350”

*** The "?" in the layer name is replaced with the correct Discipline Identifier. See Section 4.3**

Appendix A (Cont.)

Table A2 – Architectural Drawings

NOTE: *When additional layers are created to specify discipline information, other than architectural, the object/function identifier from the appropriate discipline table should be used to define the drawing data. As appropriate, the architectural discipline identifier should be used.*

Layer Name	Description	Line Color	Line Type	Line Weight
General Layers				
AO-BRD	Title block, associated blocks, and drawing border	132	Continuous	0.35mm / 0.014”
AM-DIM	Dimensioning	253	Continuous	0.25mm / 0.010”
AT-TXT	Text, General associated with a specific layer	White	Continuous	0.35mm / 0.014”
AT-BTXT	Text, Bold	Yellow	Continuous	0.70mm / 0.028”
AT-REF	Reference items and notes that aid CAD users during construction of the drawing	213	Continuous	0.25mm / 0.010”
AO-VPT	Paper space Viewport border	White	Continuous	0.35mm / 0.014”
AO-CLD	Clouded areas for Hold, FMP/ECN, and revision	White	Continuous	0.35mm / 0.014”
AE-EXST	Anything existing to remain	8	Phantom	0.25mm / 0.010”
AD-DEMO	Existing items /equipment required to be removed or demolished	Cyan	HiddenX2	0.50mm / 0.020”
AX-HATCH	Cross-section lines	Blue	Continuous	0.35mm / 0.014”
AV-MLN	Matchlines	Red	Phantom	0.90mm / 0.35”
Specific Layers				
AO-ACCESSORY	Accessory items - including furniture, HVAC equipment, plumbing fixtures, people, trees, vehicles, etc.	White	Continuous	0.35mm / 0.014”
AO-CEILING	Ceiling - SATC, hanger wires, etc.	White	Continuous	0.35mm / 0.014”
AC-COLUMN	Building column lines	White	Center	0.35mm / 0.014”
AO-DOOR	Interior and exterior	Magenta	Continuous	0.35mm / 0.014”
AO-DOORSPEC	Door tag (Architectural Steering Group users only)	White	Continuous	0.35mm / 0.014”
AO-FLOOR	Floor plan and background	8	Continuous	0.25mm / 0.010”
AO-HEADER	Door header (use with ceiling plan)	White	Continuous	0.35mm / 0.014”
AO-SCHEDULE	Room, door, finish, and window	Cyan	Continuous	0.50mm / 0.020”
AO-STAIR	Interior and exterior	White	Continuous	0.35mm / 0.014”
AO-TAG	Tags for miscellaneous equipment, windows, etc.	White	Continuous	0.35mm / 0.014”

Appendix A (Cont.)

Table A2 – Architectural Drawings

NOTE: *When additional layers are created to specify discipline information, other than architectural, the object/function identifier from the appropriate discipline table should be used to define the drawing data. As appropriate, the architectural discipline identifier should be used.*

Layer Name	Description	Line Color	Line Type	Line Weight
AO-WALLS	Interior and exterior	Cyan	Continuous	0.50mm / 0.020”
AO-WINDOWS	Interior and exterior	White	Continuous	0.35mm / 0.014”

Appendix A (Cont.)

Table A3 – Civil/Structural/Environmental Drawings

NOTE: *When civil and structural items exist in the same drawing, use both layer naming as applicable.*

Layer Name	Description	Line Color	Line Type	Line Weignt
General Layers				
*?O-BRD	Title block, associated blocks, and drawing border	132	Continuous	0.35mm / 0.014”
*?T-TXT	Text, General associated with a specific layer	White	Continuous	0.35mm / 0.014”
*?T-REF	Reference items and notes that aid CAD users during construction of the drawing	213	Continuous	0.25mm / 0.010”
*?O-VPT	Paper space Viewport border	White	Continuous	0.35mm / 0.014”
*?V-MLN	Matchlines	Red	Phantom	0.90mm / 0.35”
* Specified general layers are used in both the civil and structural drawings. The "?" is replaced with the correct Discipline Identifier. See Section 4.3				
Civil Drawing Specific Layers				
CO-GRID	Site Grids, Profile Grids, etc.	253	Continuous	0.25mm / 0.010”
CO-SITE	Property lines, boundaries, fences, etc.	60	Continuous	0.70mm / 0.028”
CO-ROAD	Roads, trails, parking, etc.	10	Continuous	0.70mm / 0.028”
CO-STRL	Structural work	210	Continuous	0.70mm / 0.028”
CO-GND	Contours, grade breaks, etc.	Green	Continuous	0.70mm / 0.028”
CO-PIPE	Pipelines and piping	Yellow	Continuous	0.70mm / 0.028”
Structural Drawing Specific Layers				
SC-GRID	Building column grid	253	Center	0.25mm / 0.010”
SO-GND	Grade or earth shown on sections	Green	Continuous	0.70mm / 0.028”
SO-CONC	Concrete	Yellow	Continuous	0.70mm / 0.028”
SO-FRWK	Framework	Cyan	Continuous	0.50mm / 0.020”
SO-RBR	Rebar	130	Continuous	0.70mm / 0.28”
SO-MECH	Piping or other mechanical	11	Continuous	0.50mm / 0.020”
SO-EMBED	Embedments	131	Continuous	0.50mm / 0.020”
SO-STL	Steel	130	Continuous	0.70mm / 0.028”

Appendix A (Cont.)

Table A4 – Electrical Drawings

Layer Name	Description	Line Color	Line Type	Line Weight
General Layers				
*EO-BRD	Title block, associated blocks, and drawing border	132	Continuous	0.35mm / 0.014”
EM-DIM	Dimensioning	253	Continuous	0.25mm / 0.010”
ET-TXT	Text, General associated with a specific layer	White	Continuous	0.35mm / 0.014”
ET-BTXT	Text, Bold text	Yellow	Continuous	0.70mm / 0.028”
* Specified general layers are used in both the LGT/SITE and DIAG/SCHED drawings.				
Lighting/Site Drawing Specific Layers				
EE-BKG	Background	8	Phantom2	0.25mm / 0.010”
EO-BLD	Building	171	Continuous	0.50mm / 0.020”
EO-CND	Conduit, cable, raceway, boxes, ductbanks	51	Continuous	0.50mm / 0.020”
EO-CPT	Cathodic protection	11	Continuous	0.50mm / 0.020”
EO-EQP	Equipment	211	Continuous	0.50mm / 0.020”
EO-LTG	Lighting	Cyan	Continuous	0.50mm / 0.020”
EO-MS1	Electric miscellaneous 1	32	Continuous	0.35mm / 0.014”
EO-MS2	Electric miscellaneous 2	51	Continuous	0.50mm / 0.020”
EO-OHD	Overhead lines	11	Continuous	0.50mm / 0.020”
EO-RCP	Receptacles, (120, 208, 480V)	Cyan	Continuous	0.50mm / 0.020”
EO-SGD	Signaling devices	211	Continuous	0.50mm / 0.020”
EO-UGD	Underground lines (hidden)	13	Hidden	0.25mm / 0.010”
Diagram/Schedule Drawing Specific Layers				
EO-DIA	Diagrams, one-line, elementary, etc.	91	Continuous	0.50mm / 0.020”
EO-MS1	Electric miscellaneous 1	32	Continuous	0.35mm / 0.014”
EO-MS2	Electric miscellaneous 2	51	Continuous	0.50mm / 0.020”

Appendix A (Cont.)

Table A5 – Fire Protection Drawings

Layer Name	Description	Line Color	Line Type	Line Weight
***General Layers**				
FO-BRD	Title block, associated blocks, and drawing border	132	Continuous	0.35mm / 0.014”
*FM-DIM	Dimensioning	253	Continuous	0.25mm / 0.010””
FT-TXT	Text, General associated with a specific layer	White	Continuous	0.35mm / 0.014”
FT-BTXT	Text, Bold	Yellow	Continuous	0.70mm / 0.028”
FE-EXST	Anything existing to remain	8	Phantom	0.25mm / 0.010”
FD-DEMO	Existing items /equipment required to be removed or demolished	Cyan	HiddenX2	0.50mm / 0.020”
**FC-CLINE	Center line	Blue	Center	0.35mm / 0.014”
FV-MLN	Matchlines	Red	Phantom	0.90mm / 0.35”
Fire Detection Drawing Specific Layers				
FO-AD	Alarm and detection system	211	Continuous	0.50mm / 0.020”
FO-FW	Fire water underground	211	Hidden	0.50mm / 0.020”
Sprinkler Drawing Specific Layers				
FO-FW	Fire water underground	211	Hidden	0.50mm / 0.020”
FO-SS	Sprinkler system	211	Continuous	0.50mm / 0.020”
FO-HS-1	Standpipe hose system	211	Continuous	0.50mm / 0.020”

* Specified general layers are used in both the fire detection and sprinkler drawings, except as noted.
** Sprinkler drawing only.

Appendix A (Cont.)

Table A6 – HVAC Drawings

Layer Name	Description	Line Color	Line Type	Line Weight
***General Layers**				
HO-BRD	Title block, associated blocks, and drawing border	132	Continuous	0.35mm / 0.014”
HM-DIM	Dimensioning	253	Continuous	0.25mm / 0.010”
HT-TXT	Text, General associated with a specific layer	White	Continuous	0.35mm / 0.014”
HT-BTXT	Text, Bold	Yellow	Continuous	0.70mm / 0.028”
*HT-REF	Reference items and notes that aid CAD users during construction of the drawing	213	Continuous	0.25mm / 0.010”
**HO-VPT	Paper space Viewport border	White	Continuous	0.35mm / 0.014”
HV-MLN	Matchlines	Red	Phantom	0.90mm / 0.35”
* Specified general layers are used in both the HVAC and HVAC/Instrumentation Drawings, except as noted. ** HVAC drawing only.				
HVAC Drawing Specific Layers				
HO-EQP	HVAC or piping equipment	51	Continuous	0.50mm / 0.020”
HO-EXH	HVAC exhaust system	171	Continuous	0.50mm / 0.020”
HO-PIP	Piping and piping fixtures and hardware	51	Continuous	0.50mm / 0.020”
HO-PLM	Plumbing and plumbing fixtures and hardware	201	Continuous	0.50mm / 0.020”
HO-RTN	HVAC return system	Cyan	Continuous	0.50mm / 0.020”
HO-SUP	HVAC supply system	51	Continuous	0.50mm / 0.020”
HVAC/Instrumentation Drawing Specific Layers				
IO-ELEC	Electrical equipment	71	Continuous	0.50mm / 0.020”
IO-DCS	Distributed control system instruments	Cyan	Continuous	0.50mm / 0.020”
IO-ELINE	Electrical signal lines	42	Hidden	0.35mm / 0.014”
IO-ILINE	Instrument lines, such as pneumatic	Magenta	Continuous	0.35mm / 0.014”
IO-CVAL	Control valves	Cyan	Continuous	0.50mm / 0.020”
IO-SLINE	Software link line	Magenta	Continuous	0.35mm / 0.014”

Appendix A (Cont.)

Table A7 – Instrumentation & Control (I&C) Drawings

NOTE: *When creating additional layers to specify existing and future layers, the preferred color is 8.*

Layer Name	Description	Line Color	Line Type	Line Weight
***General Layers**				
IO-BRD	Title block, associated blocks, and drawing border	132	Continuous	0.35mm / 0.014”
**IM-DIM	Dimensioning	253	Continuous	0.25mm / 0.010”
IT-TXT	Text, General associated with a specific layer	White	Continuous	0.35mm / 0.014”
IT-BTXT	Text, Bold	Yellow	Continuous	0.70mm / 0.028”
IT-REF	Reference items and notes that aid CAD users during construction of the drawing	213	Continuous	0.25mm / 0.010”
IT-CHK	Checker's marks (informal only)	11	Continuous	0.50mm / 0.020”
IO-VPT	Paper space Viewport border	White	Continuous	0.35mm / 0.014”
IO-CLD	Clouded areas for Hold, FMP/ECN, and revision	White	Continuous	0.35mm / 0.014”
IE-EXST	Anything existing to remain	8	Phantom	0.25mm / 0.010”
ID-DEMO	Existing items /equipment required to be removed or demolished	Cyan	HiddenX2	0.50mm / 0.020”
IC-CLINE	Center line	Blue	Center	0.35mm / 0.014”
IX-HATCH	Cross section lines	Blue	Continuous	0.35mm / 0.014”
IH-HIDL	Hidden lines	Blue	Hidden	0.35mm / 0.014”
IV-MLN	Matchlines	Red	Phantom	0.90mm / 0.350”
* Applicable to all instrumentation and control drawings, except as noted. ** Plans, Elevations, Details, and Assembly drawing only.				
P&ID Drawing Specific Layers				
IO-ELEC	Electrical equipment	71	Continuous	0.50mm / 0.020”
IO-INS	Instruments	211	Continuous	0.50mm / 0.020”
IO-DCS	Distributed control system instruments	Cyan	Continuous	0.50mm / 0.020”
IO-ELINE	Electrical signal lines	42	Hidden	0.35mm / 0.014”
IO-ILINE	Instrument lines, such as pneumatic	Magenta	Continuous	0.35mm / 0.014”
IO-CVAL	Control valves	Cyan	Continuous	0.50mm / 0.020”
IO-SLINE	Software link line	Magenta	Continuous	0.35mm / 0.014”
IO-EQP	Equipment	141	Continuous	0.50mm / 0.020”
IO-MAJ	Major process lines	Red	Continuous	0.90mm / 0.350”
IO-MIN	Minor process lines	Yellow	Continuous	0.70mm / 0.028”
IO-PROC	Process line	152	Continuous	0.35mm / 0.014”
IO-PIP	Piping valves and fittings	121	Continuous	0.50mm / 0.020”
Plans, Elevations, Details, and Assembly Drawing Specific Layers				
IO-TUBE	Tubing	52	Continuous	0.35mm / 0.014”
IO-BGND	Background	8	Continuous	0.25mm / 0.010”
IO-PIPE	Piping	12	Continuous	0.35mm / 0.014”
IO-BLDG	Building	8	Continuous	0.25mm / 0.010”
IO-EQP	Equipment	143	Continuous	0.25mm / 0.010”
IO-INS	Instruments	210	Continuous	0.70mm / 0.028”
IO-FRM	Panels, racks, cabinets	32	Continuous	0.35mm / 0.014”
IO-WRG	Wiring	92	Continuous	0.35mm / 0.014”
IO-CVAL	Control valve	130	Continuous	0.70mm / 0.028”

Appendix A (Cont.)

Table A7 – Instrumentation & Control (I&C) Drawings

NOTE: *When creating additional layers to specify existing and future layers, the preferred color is 8.*

Layer Name	Description	Line Color	Line Type	Line Weight
Wiring/Tubing Diagram Drawing Specific Layers				
IO-WRG	Wiring	Green	Continuous	0.70mm / 0.028”
IO-INS	Instruments	Magenta	Continuous	0.35mm / 0.014”
IO-DCS	Distributed control system instruments	132	Continuous	0.35mm / 0.014”
IO-TBLK	Terminal blocks	152	Continuous	0.35mm / 0.014”
IO-SLINE	Software lines	12	Continuous	0.35mm / 0.014”
IO-TUBE	Tubing	Yellow	Continuous	0.70mm / 0.028”
Logic/Block Diagram Drawing Specific Layers				
IO-GATE	Logic gate/memory latch	Green	Continuous	0.70mm / 0.028”
IO-SPATH	Software signal path	12	Continuous	0.35mm / 0.014”
IO-HPATH	Hardware signal path	152	Continuous	0.35mm / 0.014”
IO-INS	Instruments	211	Continuous	0.50mm / 0.020”
IO-DCS	Distributed control system instruments	Cyan	Continuous	0.50mm / 0.020”

Appendix A (Cont.)

Table A8 – Mechanical Drawings

Layer Name	Description	Line Color	Line Type	Line Weight
General Layers				
MO-BRD	Title block, associated blocks, and drawing border	132	Continuous	0.35mm / 0.014”
MM-DIM	Dimensioning	253	Continuous	0.25mm / 0.010”
MT-TXT	Text, General associated with a specific layer	White	Continuous	0.35mm / 0.014”
MT-BTXT	Text, Bold	Yellow	Continuous	0.70mm / 0.028”
MT-CHK	Checker's marks (informal only)	11	Continuous	0.50mm / 0.020”
MO-VPT	Paper space Viewport border	White	Continuous	0.35mm / 0.014”
MC-CLINE	Center line	Blue	Center	0.35mm / 0.014”
MX-HATCH	Cross-section lines	Blue	Continuous	0.35mm / 0.014”
MH-HIDL	Hidden lines	Blue	Hidden	0.35mm / 0.014”
MV-MLN	Matchlines	Red	Phantom	0.90mm / 0.35”
Specific Layers				
*MO-1DET	Detail	Yellow	Continuous	0.70mm / 0.028”
MO-2DET	Detail	Green	Continuous	0.70mm / 0.028”
MO-FAST	Fasteners	Cyan	Continuous	0.50mm / 0.020”
MO-VEND	Vendor information	8	Continuous	0.25mm / 0.010”
MP-PHANT	Moving parts, alternate positions, simplified drafting techniques, e.g., screw threads, springs	8	Phantom	0.25mm / 0.010”
MO-LAYOUT	Layout and/or construction lines	Magenta	Continuous	0.35mm / 0.014”
* Add auxiliary details as needed. Example: 3DET, etc.				

Appendix A (Cont.)

Table A9 – Piping Drawings

Layer Name	Description	Line Color	Line Type	Line Weight
Piping Drawing, Jumper Assembly 1 Drawing, Jumper Assembly 2 Drawing, and Jumper Assembly 3 Drawing General Layers				
PO-BRD	Title block, associated blocks, and drawing border	132	Continuous	0.35mm / 0.014”
PM-DIM	Dimensioning	253	Continuous	0.25mm / 0.010”
PT-TXT	Text, General associated with a specific layer	White	Continuous	0.35mm / 0.014”
PT-BTXT	Text, Bold	Yellow	Continuous	0.70mm / 0.028”
PT-REF	Reference items and notes that aid CAD users during construction of the drawing	213	Continuous	0.25mm / 0.010”
PO-VPT	Paper space Viewport border	White	Continuous	0.35mm / 0.014”
PO-CLD	Clouded areas for Hold, FMP/ECN, and revision	White	Continuous	0.35mm / 0.014”
PE-EXST	Anything existing to remain	8	Phantom	0.25mm / 0.010”
PD-DEMO	Existing items /equipment required to be removed or demolished	Cyan	HiddenX2	0.50mm / 0.020”
PC-CLINE	Center line	Blue	Center	0.35mm / 0.014”
PX-HATCH	Cross-section lines	Blue	Continuous	0.35mm / 0.014”
PH-HIDL	Hidden lines	Blue	Hidden	0.35mm / 0.014”
PV-MLN	Matchlines	Red	Phantom	0.90mm / 0.350”
Specific Layers				
PO-PIPINGS	Single-line pipe, valves and fittings	Yellow	Continuous	0.70mm / 0.028”
PO-PIPINGD	Double-line pipe, valves and fitting	52	Continuous	0.35mm / 0.014”
PO-EQP	Pumps, vessels, etc.	Magenta	Continuous	0.35mm / 0.014”
PO-GND	Grade	8	Continuous	0.25mm / 0.010”
PO-CONC	Concrete	8	Continuous	0.25mm / 0.010”
PO-STRUCT	New structures	8	Continuous	0.25mm / 0.010”
PO-PSUPT	Supports	White	Continuous	0.35mm / 0.014”

Appendix B - Index Numbers

Index numbers are a key element for searching engineering drawings for specific engineering data.

A complete index number is comprised of either four or six numerical digits as follows:

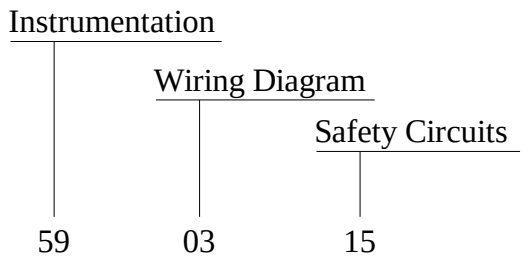
The first two digits identify the primary subject (i.e., 49 for *Mechanical*, 59 for *Instrumentation and Controls*).

The next two digits identify the sub-category or secondary information (i.e., 4901 for Mechanical: Fuel Element Production-Cleaning and Preparation, 5903 for Instrumentation and Controls: Wiring Diagrams).

The last two digits cover a further breakdown, if needed, of the information or tertiary subject (i.e., 490102 for *Mechanical: Fuel Element Production-Cleaning and Preparation: Core Preparation-Pickle Machine-Etch Machine, Nickel Plating*, 590315 for *Instrumentation and Controls: Wiring Diagrams: Safety Circuits*.

An index number has a minimum of four digits (e.g., 0804 for *Architectural-Equipment Locations*) or, if the subject needs further breakdown, the index number may be six digits (e.g., 590315 for *Instrumentation and Controls, Wiring Diagrams, Safety Circuits*). Figure 13 shows a typical six digit Index number with Primary, Secondary, and Tertiary Subject numbers.

Figure 17 – Index Number Format



Primary Subjects: The Primary Subjects are identified by the first two numbers of the Index Number. The Primary Subjects and associated numbers are listed in Table B1.

Table B1 – Primary Subject Numbers

Index Numbers	***Primary Subject***
00	Listing or Index
01 through 07	Civil
08 through 14	Architectural and Structural
15 through 58	Mechanical
59 through 64	Instrumentation and Controls
65	Electronics
70	Flow Diagrams

Appendix B (Cont.)

Index Numbers	*Primary Subject*
71 through 81	Electrical
82	Insulation and Heat Tracing
83	Future
84 through 88	Piping
89	Heating, Ventilating, and Exhaust
90	Air Conditioning Systems
91 through 98	Future
99	Miscellaneous Equipment not Identifiable or Related to Assembled Equipment

Secondary Subjects: The Index Numbers are further divided into more specialized subjects by adding two more numbers to the Primary Subjects. Secondary Subjects (e.g., 0804, Architectural Equipment Locations, or 7005, Piping and Instrument Diagram Closed Loop System [CLS]. The 04 and 05 digits are added to denote the details).

Tertiary Subjects: Tertiary Subjects comprise the last two digits of a six digit Index Number and provide additional information for a drawing. Tertiary Subjects are used only in conjunction with the Primary 49, 50, 59, 60, 85, and 99 to indicate the type of drawing. The complete six-digit index number for a drawing showing a wiring diagram for safety circuits would be number 590315 as shown in Figure 13.

Table B2 – Alphabetical Listing of Index Numbers

Subject	*Index Number*
- A -	
Accelerator - Instruments	60xx50
Acidity - Instruments	6016
Acids, Steam, Air, Gas, Outside Lines - Civil	0308
Acids, Steam Air, Gas Overhead Lines, Piping - Civil	0300
Acids, Steam, Air, Gas, Underground Lines - Civil	0306
Air Conditioning Systems-Plans, Sections, Details - Air Conditioning	9000
Airport Runways, Roads, Walks, Parking Areas, Fences-Details and Profiles - Civil	0200
Alarm - Instrumentation	60xx43
All Facilities Built into Pile for Testing Purposes - Mechanical	2301
All Test Equipment Where Operation of Pile is Essential to Operation of Test - Mechanical	2300
Alpha - Instrumentation	60xx51
Aluminum Component Preparation Caps and Can Cleaning Machine, Methanol Still, DetrexTrichlor Still, Trays, Baskets, Racks - Mechanical	490104

Appendix B (Cont.)

Subject	*Index Number*
Aluminum Uranium Fuel Elements and Related Components-Caps, Spires, Cans, Sleeves, Cores, Hollow Pieces, or Perfs, Dummies, Spaces, Wafers, Self-Support - Mechanical	490010
Amplifier - Instrumentation	60xx52
Analyzer - Instrumentation	60xx53
Aqueous Make-Up - Instrumentation	59xx21
Architectural Doors-Shielding-Windows - Architectural	0803
Architectural Equipment Locations - Architectural	0804
Architectural-Evaluations, Section and Details-Miscellaneous Steel for Stairs, Railing, etc. - Architectural	0801
Architectural-Other (includes schedules, architectural equipment details, such as bins, signs, cabinets, laboratory equipment, etc.) - Architectural	0802
Architectural-Plans-May Include Other	0800
Category - Architectural	0800
Area Electrical Key Maps - Civil	0102
Argon Systems - Instrumentation	59xx46
- B -	
Baskets, Tubes, Containers, and Component Parts - Mechanical	500304
Billet Core Preparation - Mechanical	490110
Biological and Thermal Shield T/C System - Instrumentation	59xx16
Block Outs, Sleeves, Plans, and Details - Electrical	7101
Boring, Rock - Civil	0600
Burial Grounds Sodium Disposal Area - Civil	0404
- C -	
Cable Schedulers - Instrumentation	5904
Calculator - Instrumentation	60xx54
Calculator-Power - Instrumentation	59xx14
Calibrator - Instrumentation	60xx55
Camera - Instrumentation	60xx56
Canning Cycle Control, Flex-O-Timer, Valves, etc. - Mechanical	490206
Canning Furnace and Equipment-Canning Jacks, Canning Baskets, Tongs, Shields, Tools - Mechanical	490204

Appendix B (Cont.)

Subject	*Index Number*
Capsule, Storage for Cesium - Mechanical	4921
Capsule, Storage for Strontium - Mechanical	4902
Cathodic Protection-Junction Pull Boxes, Ducts - Electrical	7806
Cathodic Protection-Plans, Elevations, Sections, and Details - Electrical	7801
Cathodic Protection-Wiring Diagrams (elementary, connection and inter-connection) Block Diagrams - Electrical	7802
Cell Equipment Fastened to Cell for Mounting Vessels, Nozzles, Dunnage, Y Pads, etc. - Mechanical	2800
Ceramic Fuel Elements and Related Components - Mechanical	490030
Chambers - Instrumentation	60xx57
Charging Machines - Mechanical	2400
Checkers - Instrumentation	60xx58
Chemical Storage - Instrumentation	59xx30
Chemical Tanks and Piping - Mechanical	490118
Conductivity - Instrumentation	6008
Co-extrusion Component and Billet Assembly - Mechanical	490220
Columns, Tanks, Dissolvers, Heat Exchangers, Vessels (no moving parts) - Mechanical	2500
Communication-Junction Pull Boxes, Ducts (this series includes sound-powered telephone and central station system telephones) - Electrical	7606
Communications-Panel Schedules, Equipment, and Devices - Electrical	7604
Communications-Plans, Elevations, Sections, and Details - Electrical	7601
Communications-Station Schedules - Electrical	7607
Communications-Wire Run Lists, Conduit, Wire Schedules, Cables - Electrical	7605
Communications-Wiring Diagrams (elementary, connections and inter-connections) Block Diagrams - Electrical	7602
Component Electronic or Ultrasonic Testing-Transformation Tests, Sort Tester, etc. - Mechanical	490304
Component Mechanical Inspection-Pickle Inspection Statistical Sampling, Recovered Core Inspection, Gauges - Mechanical	490302
Component of a Mixture - Instrumentation	6020
Composite-Overhead and underground Piping - Civil	0305

Appendix B (Cont.)

Subject	***Index Number***
Concrete Structural-Demolition - Architectural	0905
Concrete Structural-Elevations, Sections and Details - Architectural	0901
Concrete Structural-Penetrations, Embedment Schedules - Architectural	0904
Concrete Structural-Penetrations, Sleeve and Blockout - Architectural	0903
Concrete Structural-Plans - Architectural	0900
Concrete Structural-Shop, Reinforcing and Pour Drawings - Architectural	0902
Containers for Disposal of Contaminated Equipment (does not include metal handling buckets and shipping casks) - Mechanical	2302
Control Rod, Absorber, Drive, and Disconnect - Mechanical	1907
Control Rods-Assembly Tooling and Handling Equipment - Mechanical	1906
Control Rods - Mechanical	1905
Control Room and Miscellaneous Instrumentation - Instrumentation	59xx44
Control System-Horizontal Rods - Mechanical	1900
Control System-Poison - Mechanical	1902
Control System-Vertical Rods - Mechanical	1901
Controller - Instrumentation	60xx41
Core Preparation-Pickle Machine-Etch Machine, Nickel Plating - Mechanical	490102
Counters - Instrumentation	60xx59
Cranes (all Types) - Mechanical	3900
Crane Doors, Shielded, Non-Shielded	3903
Criticality Monitoring Systems - Electrical	7900
- D -	
Density - Instrumentation	6005
Differential Pressure - Instrumentation	6015
Digital Data Handling and Display, System 91 - Instrumentation	59xx61
Discharging and Manipulator for Rear Face Work - Mechanical	2401
Dissolver Cells - Instrumentation	59xx19
Dissolvers, Heat Exchangers, Vessels, Columns, Tanks (no moving parts) - Mechanical	2500
Drawing List - Civil	0000

Appendix B (Cont.)

Subject	*Index Number*
Duplex Furnace and Equipment-Ajax Induction Furnaces, Duplex Agitators, Agitator Baskets, Loader Shields, Tools - Mechanical	490202
- E -	
Electrical Control-Control Panel Arrangements, Signal Plans, Elevations, Section, and Details - Electrical	7501
Electrical Control-Control Equipment and Devices -Electrical	7508
Electrical Control-Junction Pull Boxes, Ducts (this series includes remote signaling door bells, buzzers, annunciators) - Electrical	7506
Electrical Control-Panel Schedules - Electrical	7504
Electrical Control-Relay and Switch Schedules - Electrical	7507
Electrical Control-Timing Charts - Electrical	7503
Electrical Control-Wire Run Lists, Conduit, Cable and Wire Schedules - Electrical	7505
Electrical Control-Wiring Diagrams (elementary, connection and inter-connection) Block Diagrams - Electrical	7502
Electrical-General, Wiring Requirements -Electrical	7100
Electrical-Maps, Plot Plans, Plans and Profiles, Plans, Elevations, Sections, and Details (includes substation structures) - Electrical	8001
Electrical - Miscellaneous	9902
Electrical Only-Cable Schedules - Electrical	8005
Electrical Only-Pole Line Details, Sag Curves - Electrical	8003
Electrical Only-Pole Schedules - Electrical	8004
Electrical Only-Transformer schedules (this series includes all electrical maps other than the "Civil" map series) - Electrical	8009
Electrical Only-Wiring Diagrams (elementary, connection and inter-connection) Area One-Line Diagram - Electrical	8002
Electrical-Outside Lines - Civil	0107
Electrical Utilities Transmission and Distribution Operating Drawings - Electrical	8000
Electronics-Drill and Trim - Electronics	6505
Electronics-General - Electronics	6500
Elevators - Mechanical	3901
Emergency Power-Generation Equipment (mechanical) - Mechanical	4050
Engineering Diagrams - Flow Diagrams	7001

Appendix B (Cont.)

Subject	***Index Number***
Equipment Arrangements - Instrumentation	5907
Equipment Located in Hoods, Caves, Enclosure Where Operation is Remote - Mechanical	4705
Equipment Outline and Interface Requirement - Mechanical	1575
Equipment Outline and Interface Requirement - Instrumentation	5975
Equipment Outline and Interface Requirement - Electrical	7575
Equipment Outline and Interface Requirement - Piping	8575
Equipment Requirements - Instrumentation	5906
Equipment Support, Storage Racks, Hand Trucks, Tables, etc. - Mechanical	500306
Essential Drawings - Air (piping)	8606
Essential Drawings - Evacuation	0703
Essential Drawings - Fire Protection (piping)	8602
Essential Drawings - Fire Walls	0702
Essential Drawings - Gas (piping)	8604
Essential Drawings - Safety Showers/Eye Washes	8603
Essential Drawings - Simplified	0701
Essential Drawings - Steam (piping)	8605
Essential Drawings - Waste (piping)	8608
Essential Drawings - Water (piping)	8601
Essential Drawings - Vacuum (piping)	8607
Excavation and Finishing Grading - Civil	0111
Experimental Test Facilities Excluding Fuel Specimens - Mechanical	2303
Extractors - Instrumentation	59xx34
Extrusion Presses, Containers, Dies, and Tools - Mechanical	490222
Ex-Vessel Irradiated Fuel Handling Equipment - Mechanical	2452
- F -	
Fences, Airport Runways, Roads, Walks, Parking Areas-Details and Profiles - Civil	0200
Fire Alarm and Telephone-Outside Lines - Civil	0108
Fire Alarm-Junction Pull Boxes, Ducts - Electrical	7706
Fire Alarm-Panel Schedules - Electrical	7704

Appendix B (Cont.)

Subject	***Index Number***
Fire Alarm-Plans, Elevations, Sections and Details - Electrical	7701
Fire Alarm-Wire Run Lists, Conduit, Cable and Wire Schedules - Electrical	7705
Fire Alarm-Wiring Diagrams (elementary, connection, and inter-connection) Block Diagrams - Electrical	7702
Fire Protection, Fire Barrier Walls	1201
Fire Protection Sodium Systems - Mechanical	3000
Flow and Temperature Monitor Data Logging System - Instrumentation	59xx40
Flow - Instrumentation	6002
Flux Monitor, System 95 - Instrumentation	59xx78
Fuel Closed-Loop In-Reactor Assembly - Mechanical	4925
Fuel Driver Assembly - Mechanical	4922
Fuel Element Inspection-Radiography Inspection, Final Inspection Station, Weld Inspection, Length, Braze and Contour Inspection, Film Developing Equipment - Mechanical	490306
Fuel Element Production-Cleaning and Preparation - Mechanical	4901
Fuel Element Production-Component Salvage and Recover: Scrap Recovery - Mechanical	4904
Fuel Element Production-Component Salvage and Recover: Scrap Recovery - Mechanical	4905
Fuel Element Production-Component Supporting Facilities (not for new drawings) - Mechanical	4906
Fuel Element Production-Fuel Element Assembly Equipment - Mechanical	4902
Fuel Element Production-General - Mechanical	4900
Fuel Element Production-Special Items-Stampers, Tables, Bins Mechanical Counters - Mechanical	4907
Fuel Element Production-Testing and Inspection - Mechanical	4903
Fuel Element Testing, Bond and Pen Tester, Autoclave Test, Bubble Tester - Mechanical	490308
Fuel Failure Monitoring, System 94 - Instrumentation	59xx77
Fuel Handling-Irradiated (transfer, etc.) - Mechanical	2450
Fuel Material Open Test Assembly - Mechanical	4931
Fuel Monitor - Instrumentation	59xx07
Fuel Oil Storage and Lines - Civil	0307

Appendix B (Cont.)

Subject	*Index Number*
Fuel Open Test Assembly - Mechanical	4934
Fuel Special-Purpose Assembly - Mechanical	4929
Fuels Development - Mechanical	5003
- G -	
Gas, Acids, Steam, Air Outside Lines - Civil	0308
Gas, Acids, Steam, Air, Overhead Lines-Piping - Civil	0300
Gas, Acids, Steam, Air Underground Lines - Civil	0306
Gas Seal Tools - Mechanical	2901
Gas Storage Tanks - Mechanical	2504
Gases and Water-Outside Lines - Civil	0104
General - Instrumentation	60xx39
General-Maps - Civil	0109
Guard Vessel-Exterior Shields and other Cavity Components - Mechanical	1553
- H -	
Heat Exchanger, Vessels, Columns, Tanks, Dissolves, (no moving parts) - Mechanical	2500
Heating and Ventilating Equipment Location - Heating, Venting, Exhaust	8901
Heating and Ventilating Schedules, Notes - Heating, Venting, Exhaust	8902
Helium Systems - Instrumentation	59xx47
Hoods, Caves, Enclosures (remote operated equipment) - Mechanical	4700
Humidity - Instrumentation	6006
- I -	
Impact Wrenches - Mechanical	4500
Indicator - Instrumentation	60xx42
Indicator Controller Alarm - Instrumentation	60xx45
Indices - Electrical	7109
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Instrumentation Radioactive Waste, System SDD No. 24 - Instrumentation	59xx50
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In-Vessel Fuel-Handling Equipment - Mechanical	2451
- J -	
Junction Pull Boxes, Ducts - Electrical	7906
- K -	
Key Area Maps - Civil	0101
- L -	
Laboratory Apparatus - Mechanical	4800
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- M -	
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Maps-Project Key - Civil	0100
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- N -	
Nose and Cutoff Preparation - Mechanical	490114
- O -	
Off-Gas Treatment - Instrumentation	59xx33
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Open Test Assembly-Post Irradiation - Mechanical	4933
Open Test Assembly-Tooling - Mechanical	4935
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Other, Including Triple-Dip, Hot-Press, Heat-Treatment, Hydraulic-Press, Heavy-Duty Resistance Furnaces - Mechanical	490224
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Outside Lines-Electrical - Civil	0107
Outside Lines-Sewers and Piping - Civil	0105
Outside Lines-Steam, Air, Gas, and Acids - Civil	0308
Outside Lines-Telephone and Fire Alarm - Civil	0108
Outside Lines-Water and Gases - Civil	0104
Overhead and Underground Piping Composite - Civil	0305
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Personnel Radiation Monitor - Instrumentation	59xx05
Pile Motion - Instrumentation	59xx13
Piping-Acids and Chemicals - Piping	8503
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Piping and Instrument Diagram - Flow Diagrams	7004
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Piping-Heating and Cooling Water - Piping	8516
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Piping-NA Closed Loop - Piping	8553
Piping-NA Piping Components, Traps, Cold, Freeze and Vapor - Piping	8556
Piping-NA Receiving and Processing - Piping	8552
Piping-NA Reactor Secondary - Piping	8551
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Piping-Process-All Others to Include: Buried or Exposed Inside Piping, Wash Down, Fog Spray, Solvent Blend, Slug Storage, Hot Shop, Utility Outlets Relative to Process Piping: Also Jets, Valves, Miscellaneous Process Piping - Piping	8407
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Piping-Reference Drawings - Piping	8576
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Piping-Water Drains and Waste (non-contaminated) - Piping	8408
Piping-Water-Other than Process - Piping	8500
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Plutonium Decontamination - Instrumentation	59xx26
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Power-Lighting Protection - Electrical	7309
Power-Motor and Control Station Schedules - Electrical	7307
Power-Motor Control Centers, Switchgear, Transformers and Control Panels - Electrical	7303
Power-Panel Schedules - Electrical	7304
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Power-Wire Run Lists, Conduit, Cable, Wire Schedules - Electrical	7305
Power-Wiring Diagrams (elementary, connection and inter-connection) - Electrical	7302
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Process Monitoring and Control Aux. Liquid Metal, System 93-10 - Instrumentation	59xx71
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Process Monitoring and Control Containment, System 93-1 - Instrumentation	59xx63
Process Monitoring and Control Fire Protection, System 93-7 - Instrumentation	59xx69
Process Monitoring and Control Heat Transport, System 93-2 - Instrumentation	59xx64
Process Monitoring and Control Heating and Vent, System 93-6 - Instrumentation	59xx68
Process Monitoring and Control Inert Gas Receiving and Process, System 93-8 - Instrumentation	59xx70
Process Monitoring and Control Leak-Detection, System 93-13 - Instrumentation	59xx74
Process Monitoring and Control Maintenance, System 93-12 - Instrumentation	59xx73
Process Monitoring and Control Piping and Equipment Electrical Heating, System 93-15 - Instrumentation	59xx76
Process Monitoring and Control Radioactive Waste, System 93-5 - Instrumentation	59xx67
Process Monitoring and Control Refueling, System 93-11 - Instrumentation	59xx72
Process Monitoring and Control Service Piping, System 93-4 - Instrumentation	59xx66
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Process Water Monitor and Sampling - Instrumentation	59xx10
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Products of Combustion Detectors - Instrumentation	59xx48
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- Q -	
Quench Machines, Tanks, and Equipment - Mechanical	490208
- R -	
Radiation Dose Rates - Mechanical	1802
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Railroad Structures and Details - Civil	0202
Railroads-Plans, Details, and Profiles - Civil	0201
Reactor and Vessel Instrumentation, System 92 - Instrumentation	59xx62
Reactor Capsules-Metallurgical Tests - Mechanical	4706
Reactor Control Rod and Drive Mechanism - Mechanical	1504
Reactor Core Restraints - Mechanical	1506
Reactor Ex-Vessel Fuel Handling Equipment - Mechanical	1510
Reactor Fuel Transfer - Mechanical	1502
Reactor Gas Seal, Including Boots, Strips, etc. - Mechanical	2900
Reactor Inner Shield - Mechanical	1509
Reactor Instrument Tree and Drive Mechanism - Mechanical	1503
Reactor In-Vessel Handling and Drive Mechanism - Mechanical	1505
Reactor In-Vessel Storage Module - Mechanical	1507
Reactor Outer Shield - Mechanical	1508
Reactor Vessels-Arrangement Plans, Elevations., and Sections - Mechanical	1550
Recorder-Controller Alarm - Instrumentation	60xx44
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Recovered Acid Storage - Instrumentation	59xx28
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Sewer Lines-Process - Civil	0304
Sewer Lines-Sanitary - Civil	0303
Shielding-Biological - Mechanical	1800
Shielding-Thermal - Mechanical	1801
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Sleeve Preparation-Sleeve Cleaning Machine, Baskets - Mechanical	490108
Sodium Disposal Area Burial Grounds - Civil	0404
Sodium Processing Tanks - Mechanical	2505
Sodium Storage Tanks - Mechanical	2501
Sodium Systems - Instrumentation	59xx39
Solvent Treatment - Instrumentation	59xx22
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Special Tools - Miscellaneous	99xx03
Special Tools, Wrenches, etc., - Mechanical	500303
Specific Gravity - Instrumentation	6012
Speed - Instrumentation	5009
Stack Sampling - Instrumentation	59xx35
Steam, Air, Gas, and Acids Outside Lines - Civil	0308
Steam, Air, Gas, and Acids Overhead Lines Piping - Civil	0306
Steel Structural-Other Stop Logs, Underwater Doors, Trap Gates, Special Non-shield Doors, Allowable Floor Load Data - Architectural	1100
Steel Structural-Bench Marks and Control - Architectural	1101

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Steel Structural-Penetrations - Architectural	1002
Steel Structural-Plans, Details, Schedules, Equipment Supports, Platforms - Architectural	1000
Steel Structural-Shop or Fabrication Drawings - Architectural	1001
Studies-General - Electrical	7107
- T -	
Tank Farms - Instrumentation	59xx32
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Telephone and Fire Alarm Outside Lines -Civil	0108
Temperature - Instrumentation General	6001
Temperature - Instrumentation System	59xx09
Test Hole Facilities - Instrumentation	59xx36
Test or Special-Purpose Reactor - Mechanical	1500
Testing Equipment-Destructive - Mechanical	4703
Testing Equipment, Nondestructive - Mechanical	4704
Third Safety System-Ball 3X - Mechanical	2100
Tools and Equipment for Decontamination - Mechanical	2204
Tools and Equipment for Horizontal Control Rods and Vertical Safety Rod Renovation - Mechanical	1903
Tools and Equipment for Over Boring Program - Mechanical	2205
Tools and Equipment for Process Tube Growth Correction - Mechanical	2202
Tools and Equipment Includes Tool Dolly - Mechanical	2201
Tools and Equipment Necessary to Operate Equipment in Hoods, Caves, and Enclosures - Mechanical	4701
Topography - Civil	0103
Transmitters - Instrumentation	60xx48
Tubing Run List - Instrumentation	5905
- U -	
Underground and Overhead Piping-Composite - Civil	0305
Underground Lines, Steam, Air, Gas, and Acids - Civil	0306
Underground Process Water-Piping - Civil	0302

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Subject	*Index Number*
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UNH Storage - Instrumentation	59xx29
Uranium Decontamination - Instrumentation	59xx27
- V -	
Vacuum Chambers and Component Parts and Equipment - Mechanical	500305
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Ventilation Controls - Instrumentation	59xx17
Ventilation Exhaust and Heating System-Plans, Section, Details - Heating, Venting, Exhaust	8900
Vessels, Columns, Tanks, Dissolves, Heat Exchanger (no moving parts) - Mechanical	2500
Vibration - Instrumentation	6018
Viewing Windows and Ports - Mechanical	5001
Viscosity - Instrumentation	6010
- W -	
Walks, Parking Areas, Fences, and Airport Runways, Roads-Details and Profiles - Civil	0200
Waste Disposal Systems-Sanitary: Septic Tanks, Tile Fields, Sewage Disposal Plant, Open Ditches, and Surface Drainage and Storm Drainage - Civil	0400
Waste Disposal Systems and Burial Grounds-Process: Dribs, Scavenging Impounding Areas, and Waste Facility Maps - Civil	0401
Waste Line Encasements -Diversion Boxes and Related Components - Civil	0403
Waste Storage-Tank Farms (including all drawings, except electrical and instrumentation and jumpers) - Civil	0402
Waste Storage-Tank Farms (including all drawings, except electrical and instrumentation and jumpers) - Civil	0405
Waste Storage Tanks, Contaminated Waste - Mechanical	2502
Waste Treatment - Instrumentation	59xx23
Water and Gases Outside Lines - Civil	0104
Weight Factor - Instrumentation	6013
Weight - Instrumentation	6011
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Wells, Well Fields-Irrigation Ditches and Water Supply - Civil	0500
Wire Run Lists, Conduit, Cable and Wire Schedules - Electrical	7905
Wiring Diagrams-Connections and Inter-Connections Elementary - Instrumentation	5903
Wiring Diagrams Elementary Connection and Inter-Connection Block Diagrams - Electrical	7902
- Z -	
Zircaloy Component Preparation - Mechanical	490112
Zircaloy Uranium Fuel Elements, Billets, and Related Components-Cores, Copper or Zircaloy Components, End Caps or Plates, Brazing Rings, Self-Supports, Mixers, Perf, Dummies - Mechanical	490020

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Table B3 – Numerical Listing of Index Numbers

Index Number	*Tertiary Number Sub-Subject*	*Subject*
Listing or Index		
0000		Drawing List
Civil		
0100		Project Key Map
0101		Area Key Maps
0102		Area Electrical Key Maps
0103		Topography
0104		Outside Lines-Water and Gases
0105		Outside Lines-Sewers and Piping
0106		Overhead Piping, Steam Condensate, Air and Chemicals
0107		Outside Lines-Electrical
0108		Outside Lines-Telephone and Fire Alarm
0109		General Maps
0110		Layout or Plot Plans-General Facility
0111		Excavation and Finishing Grading
0200		Roads, Walks, Parking Areas, Fences, and Airport Runways-Details and Profiles
0201		Railroads-Plans, Details, and Profiles
0202		Railroad Structures and Details
0300		Overhead Lines-Piping-Including Steam, Air, Gas, and Acids
0301		Underground Sanitary Water-Piping
0302		Underground Process Water-Piping
0303		Sewer Lines-Sanitary
0304		Sewer Lines-Process
0305		Composite of Overhead and Underground Piping
0306		Underground Lines, Steam, Air, Gas, and Acids
0307		Fuel Oil Storage and Lines
0308		Outside Lines-Steam, Air, Gas, and Acids

Appendix B (Cont.)

Index Number	***Tertiary Number Sub-Subject***	***Subject***
0400		Waste Disposal System-Sanitary: Septic Tanks, Tile Fields, Sewage Disposal Plant, Open Ditches, and Surface Drainage and Storm Drainage
0401		Waste Disposal Systems and Burial Grounds-Process: Cribs, Scavenging Impounding Areas and Waste Facility Maps
0402		Waste Storage-Tank Farms (including all drawings, except electrical and instrumentation and jumpers)
0403		Waste Line Encasements-Diversion Boxes and Related Components
0404		Sodium Disposal Area-Burial Grounds
0405		Waste Storage Process Underground Tanks
0500		Wells, Well Fields-Irrigation Ditches and Water Supply
0501		Miscellaneous Survey Data-Columbia River Data, Civil Data
0600		Rock Boring
0701		Essential Drawings - Simplified
0702		Essential Drawings - Fire Walls
0703		Essential Drawings – Evacuation
Architectural and Structural		
0800		Architectural-Plans-May include other 0800 Category
0801		Architectural-Elevations, Section and Details-Miscellaneous Steel for Stairs, Railing, etc
0802		Architectural-Other (includes schedules, architectural equipment details, such as bins, signs, cabinets, laboratory equipment, etc.)
0803		Architectural Doors-Shielding-Windows
0804		Architectural-Equipment Locations
0900		Concrete Structural-Plans
0901		Concrete Structural-Elevations, Sections, and Details
0902		Concrete Structural-Shop, Reinforcing and Pour Drawings
0903		Concrete Structural-Penetrations, Sleeve and Block out
0904		Concrete Structural-Penetrations Embedment Schedules
0905		Concrete Structural-Demolition
1000		Steel Structural-Plans, Details, Schedules, Equipment Supports, Platforms

Appendix B (Cont.)

Index Number	*Tertiary Number Sub-Subject*	*Subject*
1001		Steel Structural-Shop or Fabrication Drawings
1002		Steel Structural-Penetrations
1100		Steel Structural-Other Stop Logs, Underwater Doors, Trap Gates, Special Non-shield Doors, Allowable Floor Load Data
1101		Steel Structural-Bench Marks and Control
1201		Fire Protection, Fire Barrier Walls
Mechanical		
1500		Test or Special Purpose Reactor
1501		Production or Power Reactor
1502		Reactor Fuel Transfer
1507		Reactor In-Vessel Storage Model
1503		Reactor Instrument Tree and Drive Mechanism
1504		Reactor Control Rod and Drive Mechanism
1505		Reactor In-Vessel Handling and Drive Mechanism
1506		Reactor Core Restraints
1508		Reactor Out Shield
1509		Reactor Inner Shield
1510		Reactor Ex-Vessel Fuel Handling Equipment
1550		Reactor Vessels-Arrangements Plans, Elevations, and Sections
1551		Internal Structural Component Including Reactor Head
1552		Internals, Nonstructural Items Excluding Controls and Fuel Associated Equipment
1553		Guard Vessel-Exterior Shields and Other Cavity Components
1575		Equipment Outline and Interface Requirement
1600		Moderator-Other than Graphite
1601		Moderator-Graphite
1800		Shielding-Biological
1801		Shielding-Thermal
1802		Radiation Dose Rates
1900		Control Systems-Horizontal Rods
1901		Control System-Vertical Rods

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Index Number	*Tertiary Number Sub-Subject*	*Subject*
1902		Control System-Poison
1903		Tools and Equipment for Horizontal Control Rods and Vertical Safety Rods Renovation
1905		Control Rods
1906		Control Rods, Assembly Tooling and Handling Equipment
1907		Control Rod, Absorber, Drive, Disconnect
1909		Rods Safety (SR)
1911		Rods Scram (CR)
2100		Third Safety System-Ball 3X
2200		Process Tubes (This covers all phases or process tubes from entry of water from common header to exit of water to common discharge header also tubes from point charging machine connects to the point that fuel is discharged.)
2201		Tools and Equipment (necessary for installation or removal of process tubes and their associated parts. Includes tool dolly)
2202		Tools and Equipment for Process Tube Growth Correction
2204		Tools and Equipment for Decontamination
2205		Tools and Equipment for Over Boring Program
2250		Poison Column and Associated Items
2300		All Test Equipment Where Operation of Pile is Essential to Operation of Test
2301		All Facilities Build into Pile for Testing Purposes
2302		Containers for Disposal of Contaminated Equipment (does not include metal handling buckets and shipping casks)
2303		Experimental Test Facilities, Excluding Fuel Specimens
2400		Charging Machines
2401		Discharging and Manipulator for Rear Face Work
2450		Fuel Handling-Irradiated (transfer, etc.)
2452		Ex-Vessel Irradiated Fuel Handling Equipment
2451		In-Vessel Fuel Handling Equipment
2500		Vessels, Columns, Tanks, Dissolvers, Heat Exchangers (no moving parts)
2501		Sodium Storage Tanks

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Index Number	*Tertiary Number Sub-Subject*	*Subject*
2502		Waste Storage Tanks (contaminated waste)
2504		Gas Storage Tanks
2505		Sodium Processing Tanks
2600		Machines-Process: Agitators, Pumps, Scales, Pulse Generators (moving parts)
2700		Machines and Equipment (non-contaminated zones) Shop or General Purpose
2800		Cell Equipment Fastened to Cell for Mounting Vessels, Nozzles, Dunnage, Y Pads, etc.
2900		Reactor Gas Seal, Including Boots Strips, etc.
2901		Gas Seal Tools
3000		Fire Protection Sodium Systems
3900		Cranes (all types)
3901		Elevators
3902		Material Handling Equipment such as Conveyors, Pallets, Monorail Systems, Casks, Buckets
3903		Crane Doors, Shielded, Non-Shielded
4000		Power House Equipment (associated with steam generation)
4050		Emergency Power Generation Equipment (mechanical)
4100		Railroad Equipment and Rolling Stock (including cask car)
4101		Motor Vehicles and Modifications
4300		Mechanical Equipment for Treatment of Water (other than piping)
4500		Impact Wrenches
4501		Remotely Operated Connectors
4600		Samplers (process, air, stack, gas, etc.)
4700		Hoods, Caves, Enclosures (remotely operated equipment)
4701		Tools and Equipment Necessary to Operate Equipment in Hoods, Caves, and Enclosures
4702		Manipulators
4703		Testing Equipment-Destructive
4704		Testing Equipment-Nondestructive

Appendix B (Cont.)

Index Number	*Tertiary Number Sub-Subject*	*Subject*
4705		Equipment Located in Hoods, Caves, Enclosure where Operation is Remote
4706		Reactor Capsules-Metallurgical Tests
4727		Metallurgical Test Materials, Destructive and
4750		Machines and Equipment-Contaminated Zones
4800		Laboratory Apparatus
4900		Fuel Element Production-General
490010		Aluminum Uranium Fuel Elements and Related Components-Caps, Spires, Cans, Sleeves, Cores, Hollow Pieces, or Perfs, Dummies, Spaces, Wafers, Self-Supports
490020		Zircaloy-Uranium Fuel Elements, Billets, and Related Components-Cores, Copper or Zircaloy Components, End Caps or Plates, Brazing Rings, Self-Supports, Mixers, Perfs, Dummies
490030		Ceramic Fuel Elements and Related Components
490040		Plutonium Fuel Elements and Related Components
490050		Other Fuel Elements, as Cluster
4901		Fuel Element Production-Cleaning and Preparation
490102		Core Preparation-Pickle Machine-Etch Machine, Nickel Plating
490104		Aluminum Component Preparation-Caps and Can Cleaning Machine, Methanol Still, Detrex Trichlor Still, Trays, Baskets, Racks
490106		Sleeve Preparation-Sleeve Cleaning Machine, Baskets
490108		Penetration, Loader, Baskets
490110		Billet Core Preparation
490112		Zircaloy Component Preparation
490114		Nose and Cutoff Preparation
490116		Other
490118		Chemical Tanks and Piping
4902		Fuel Element Production-Fuel Element Assembly Equipment
490202		Duplex Furnace and Equipment-Ajax Induction Furnaces, Duplex Agitators, Agitator Baskets, Loader Shields, Tools
490204		Canning Furnace and Equipment-Canning Jacks, Canning Baskets, Tongs, Shields, Tools

Appendix B (Cont.)

Index Number	*Tertiary Number Sub-Subject*	*Subject*
490206		Canning Cycle Control, Flex-O-Timer, Valves, etc
490208		Quench Machines, Tanks, and Equipment
490210		Machining, Forming, Including Tooling-Acme Gridley Cut-Off Lathes: Monarch Lathe
490212		Welders, Buffers, Controls, Collets, and Vacuum Welders
490220		Co-extrusion Component and Billet Assembly
490222		Extrusion Presses, Containers, Dies, and Tools
490224		Other, Including Triple Dip, Hot Press, Heat Treatment, Hydraulic Press, Hevi-Duty Resistance Furnaces
4903		Fuel Element Production-Testing and Inspection
490302		Component Mechanical Inspection-Pickle Inspection, Statistical Sampling, Recovered Core Inspection, Gages
490304		Component Electronic or Ultrasonic Testing-Transformation Test, Sort Tester, etc
490306		Fuel Element Inspection-Radiography Inspection, Final Inspection Station, Weld Inspection, Length, Braze and Contour Inspection, Film Developing Equipment
490308		Fuel Element Testing, Bond and Pen Tester, Autoclave Test, Bubble Tester
4904		Fuel Element Production-Component Salvage and Recover: Scrap Recovery
4905		Fuel Element Production-Component Testing (not for new drawings)
4906		Fuel Element Production-Component Supporting Facilities (not for new drawings)
4907		Fuel Element Production-Special Items-Stampers; Tables; Bins; Mechanical Counters
4920		Capsule Storage for Strontium
4921		Capsule, Storage for Cesium
4922		Fuel Driver Assembly
4925		Fuel Closed-Loop In-Reactor Assembly
4928		Fuel Special-Purpose Assembly
4931		Fuel Material Open Test Assembly
4933		Post-Irradiation Open Test Assembly

Appendix B (Cont.)

Index Number	***Tertiary Number Sub-Subject***	***Subject***
4934		Fuel Open Test Assembly
4935		Open Test Assemblies-Tooling
4936		Materials Open Test Assembly
4937		Reflector Assembly
5000		Optical Systems and Devices (including TV devices)
5001		Viewing Windows and Ports
5002		Periscopes
5003		Fuels Development
500301		Machines, Mechanisms, and Dies for Forming, Fabricating, or Assembling
500302		Mechanisms for Testing, Inspection, Calibration, etc
500303		Special Tools, Wrenches, etc
500304		Baskets, Tubes, Containers, and Component Parts
500305		Vacuum Chambers and Component Parts and Equipment
500306		Equipment Support, Storage Racks, Hand Trucks, Tables, etc.
5010		Shipping Containers, Boxes, Pallets Conforming to DOT and RDT Regulations
Instrumentation and Controls		
5900		Instrumentation-General, Index, Notes, Listings
5901		Plans, Section, Elevations and Details (including conduit and tubing)
5902		Panel Schedules, Wire Run Lists
5903		Wiring Diagrams (connections and inter-connections), Elementary
5904		Cable Schedules 5905 Tubing Run List
5906		Equipment Requirements
5907		Equipment Arrangements
5908		Schematic Diagrams
5975		Equipment Outline and Interface Requirement

Appendix B (Cont.)

Index Number	***Tertiary Number Sub-Subject***	***Subject***
	59 Series Sub-Subjects	
	04	Process Radiation Monitor
	05	Personnel Radiation Monitor
	06	Underwater Monitor
	07	Fuel Monitor
	08	Pressure Monitor
	09	Temperature
	10	Process Water Monitor and Sampling
	11	Process Water
	12	Process Gas
	13	Pile Motion
	14	Calculator (Power)
	15	Safety Circuits
	16	Biological and Thermal Shield T/C System
	17	Ventilation Controls
	18	Power Plant Controls
	19	Dissolver Cells
	20	Metal Solution Feed Preparation
	21	Aqueous Make-Up
	22	Solvent Treatment
	23	Waste Treatment
	24	Pre-cycle
	25	Partition
	26	Plutonium Decontamination
	27	Uranium Decontamination
	28	Recovered Acid Storage
	29	UNH Storage
	30	Chemical Storage
	31	Outside Catch Tanks

Appendix B (Cont.)

Index Number	*Tertiary Number Sub-Subject*	*Subject*
	32	Tank Farms
	33	Off-Gas Treatment
	34	Extractors
	35	Stack Sampling
	36	Test Hole Facilities
	37	Seismoscope
	38	Optical
	39	Sodium Systems
	40	Flow and Temperature Monitor Data Logging System
	41	Main Data-Logging System
	42	Rod Control System
	43	Primary and Secondary Loop Instrumentation
	44	Control Room and Miscellaneous Instrumentation
	45	Moisture Detection
	46	Argon Systems
	47	Helium Systems
	48	Products of Combustion Detectors
	49	Instrumentation Service Piping, System SDD No. 23
	50	Instrumentation Radioactive Waste, System SDD No. 24
	51	Instrumentation Heating and Venting, System SDD No. 25
	52	Instrumentation Plant Fire Protection, System SDD No. 26
	53	Instrumentation Reactor Containment System SDD No. 27
	54	Instrumentation Reactor, System SDD No. 31
	55	Instrumentation Heat Transport System, SDD No. 51
	56	Instrumentation Closed Loop, System SDD No. 61
	57	Instrumentation Aux. Liquid Metal System, SDD No. 81
	58	Instrumentation Inert Gas Receiving and Processing, System SDD No. 82
	59	Instrumentation Impurity Monitoring and Analysis, System SDD No. 85
	60	Instrumentation Reactor Plant Control, System SDD No. 90

Appendix B (Cont.)

Index Number	*Tertiary Number Sub-Subject*	*Subject*
	61	Digital Data Handling and Display, System 91
	62	Reactor and Vessel Instrumentation, System 92
	63	Process Monitoring and Control Containment System 93-1
	64	Process Monitoring and Control Heat Transport System 93-2
	65	Process Monitoring and Control Closed Loop System 93-3
	66	Process Monitoring and Control Service Piping, System 93-4
	67	Process Monitoring and Control Radioactive Waste, System 93-5
	68	Process Monitoring and Control Heating and Vent, System 93-6
	69	Process Monitoring and Control Fire Protection System 93-7
	70	Process Monitoring and Control Inert Gas Receiving and Processing, System 93-8
	71	Process Monitoring and Control Aux. Liquid Metal, System 93-10
	72	Process Monitoring and Control Refueling, System 93-11
	73	Process Monitoring and Control Maintenance, System 93-12
	74	Process Monitoring and Control Leak Detection, System 93-13
	75	Process Monitoring and Control Annunciator, System 93-14
	76	Process Monitoring and Control Piping and Equipment Electrical Heating, System 93-15
	77	Fuel Failure Monitoring, System 94
	78	Flux Monitor, System 95
	79	Radiation Monitoring, System 96
	80	Plant Protection, System 99
6000		Instruments-General
6001		Temperature
6002		Flow
6003		Level
6004		Pressure
6005		Density
6006		Humidity
6007		Moisture
6008		Conductivity

Appendix B (Cont.)

Index Number	***Tertiary Number Sub-Subject***	***Subject***
6009		Speed
6010		Viscosity
6011		Weight
6012		Specific Gravity
6013		Weight Factor
6014		Radiation
6015		Differential Pressure
6016		Acidity
6017		Interface
6018		Vibration
6019		Sound
6020		Component of a Mixture
	60 Series Sub-Subjects	
	39	General
	40	Recorder
	41	Controller
	42	Indicator
	43	Alarm
	44	Recorder Controller Alarm
	45	Indicator Controller Alarm
	46	Integrator
	47	Self-Actuated Regulating Valve
	48	Transmitters
	49	Primary Elements
	50	Accelerator
	51	Alpha
	52	Amplifier
	53	Analyzer
	54	Calculator

Appendix B (Cont.)

Index Number	***Tertiary Number Sub-Subject***	***Subject***
	55	Calibrator
	56	Camera
	57	Chambers
	58	Checkers
	59	Counters
	60	Probes
Electronics		
6500		Electronics-General (wave type-includes radio, TV, microwave and laser)
6501		Electronics-Plans, Elevations, Sections, and Details
6502		Electronics-Wiring Diagrams (elementary, connection, and inter-connections)
6503		Electronics-Transmitters Amplifiers, Receivers, and Control Consoles
6504		Electronic-Wave Guides and Antennas
6505		Electronic-Drill and Trim
Flow Diagrams		
7000		Process Flow Diagrams
7001		Engineering Diagrams
7002		Instrument Engineering Diagrams
7003		Logic Diagrams
7004		Piping and Instrument Diagram
7005		Piping and Instrument Diagram CLS
Electrical **NOTE:** *Primary Subjects 73, 74, 75, 76, and 77 cover Inside Building – Electrical. Primary Subjects 78 and 80 cover Outside Building – Electrical*		
7100		Electrical-General, Wiring Requirements (This series includes drawings of a composite nature. A drawing which shows a complete installation for a facility.)
7101		Block Outs, Sleeves, Plans, and Details
7107		Studies-General
7108		Material Lists-General

Appendix B (Cont.)

Index Number	*Tertiary Number Sub-Subject*	*Subject*
7109		Indices
7201		One-Line Diagrams
7301		Power-Plans, Elevations, Sections, and Details (including grounding, block diagrams, and engineering diagrams)
7302		Power-Wiring Diagrams (elementary, connection, and inter-connection)
7303		Power-Motor Control Centers, Switchgear, Transformers, and Control Panels
7304		Power-Panel Schedules
7305		Power-Wire Run Lists, Conduit, Cable, Wire Schedules, and Tray Schedules
7306		Power-Grounding Junction, Pull Boxes, Ducts, Raceways
7307		Power-Motor and Control Station Schedules
7308		Power-Electrical Equipment (motors, heaters, etc.)
7309		Power-Lighting Protection
7401		Lighting-Plans, Elevations, Sections, and Details
7402		Lighting-Wiring Diagrams (elementary, connections, and inter-connections)
7404		Lighting-Panel, Schedules
7405		Lighting-Wire Run Lists, Conduit, Cable and Wire Schedules
7406		Lighting-Junction Pull Boxes, Ducts
7501		Electrical Control-Control Panel Arrangements, Signal Plans, Elevations, Sections, and Details
7502		Electrical Control-Wiring Diagrams (elementary, connection, and inter-connection) Block Diagrams
7503		Electrical Control-Timing Charts
7504		Electrical Control-Panel Schedules
7505		Electrical Control-Wire Run Lists, Conduit, Cable and Wire Schedules
7506		Electrical Control-Junction Pull Boxes, Ducts (This series includes remote signaling door bells, buzzers, annunciators.)
7507		Electrical Control-Relay and Switch Schedules
7508		Electrical Control-Control Equipment and Devices

Appendix B (Cont.)

Index Number	*Tertiary Number Sub-Subject*	*Subject*
7575		Equipment Outline and Interface Requirement
7601		Communications-Plans, Elevations, Sections, and Details
7602		Communications-Wiring Diagrams (elementary, connections, and inter-connection) Block Diagrams
7604		Communications-Panel Schedules, Equipment, and Devices
7605		Communications-Wire Run Lists, Conduit, Wire Schedules, Cables
7606		Communication-Junction Pull Boxes, Ducts (This series includes sound-powered telephone and central station system telephones.)
7607		Communications-Station Schedules
7701		Fire Alarm-Plans, Elevations, Sections and Details
7702		Fire Alarm-Wiring Diagrams (elementary, connection, and inter-connection) Block Diagrams
7704		Fire Alarm-Panel Schedules
7705		Fire Alarm-Wire Run Lists, Conduit, Cable and Wire Schedules
7706		Fire Alarm-Junction Pull Boxes, Ducts
7801		Cathodic Protection-Plans, Elevations, Sections and Details
7802		Cathodic Protection-Wiring Diagrams (elementary, connection, and inter-connection) Block Diagrams
7806		Cathodic Protection-Junction Pull Boxes, Ducts
7810		Lighting Protection-Plans, Elevations, Sections and Details
7900		Criticality Monitoring Systems
7901		Plans, Elevations, Sections, and Details
7902		Wiring Diagrams (elementary, connection, and inter-connection) Block Diagrams
7904		Panel Schedules
7905		Wire Run Lists, Conduit, Cable and Wire Schedules
7906		Junction Pull Boxes, Ducts
8000		Electrical Utilities Transmission and Distribution Operating Drawings (including switching diagrams and distribution maps)
8001		Electrical-Maps, Plot Plans, Plans and Profiles, Plans, Elevations, Sections, and Details (includes substation structures)
8002		Electrical Only-Wiring Diagrams (elementary, connection, and inter-connection) Area One-Line Diagram

Appendix B (Cont.)

Index Number	*Tertiary Number Sub-Subject*	*Subject*
8003		Electrical Only-Pole Line Details, Sag Curves
8004		Electrical Only-Pole Schedules
8005		Electrical Only-Cable Schedules
8009		Electrical Only-Transformer Schedules (This series includes all electrical maps other than the "Civil" map series.)
Insulation and Heat Tracing		
8200		Insulation and Heat-Tracing Reference Designs
8201		Insulation and Heater Arrangements
8202		Insulation Arrangements
8203		Heater Applications-Piping
8204		Heater Applications-Equipment
8205		Heater Schedules
8206		Insulation Schedules
Piping		
8400		Piping-Process Water
8401		Piping-Process Water-Front or Rear Face
8402		Piping-Process Water-Foundation Cooling, Shielding, Horizontal Rods, Risers, and Cross headers
8403		Piping-Process Water-Valve Pits or Tunnels
8404		Piping-Cell Arrangements (includes diversion boxes and trenches)
8405		Piping-Jumpers
8406		Piping-Process-Operating or Sample Galleries
8407		Piping-Process-All other to include: Buried or Exposed Inside Piping, Wash Down, Fog Spray, Solvent Blend, Slug Storage, Hot Shop, Utility Outlets Relative to Process Piping: Also Jets, Valves, Miscellaneous Process Piping
8408		Piping-Water Drain and Waste (non-contaminated)
8409		Piping-Radioactive Liquid Waste (water)
8500		Piping-Water-Other than Process
8501		Piping-Steam Radiators, Coils, and Condensate
8502		Piping-Steam-All Others
8503		Piping-Acids and Chemicals

Appendix B (Cont.)

Index Number	*Tertiary Number Sub-Subject*	*Subject*
8504		Piping-Gas Decay and Disposal
8505		Piping-Compressed Air
8506		Piping-Vacuum
8507		Piping-Refrigeration, Argon
8508		Piping-Sprinkler Systems
8509		Piping-Drains and Waste Inside-Other than Process
8510		Piping-Service (includes grouped services, viz., water, air, steam, drains, etc.; show on the same drawing)
8511		Piping-Hangers, Support, Anchors, Guards
8512		Piping-Hydraulic
8513		Piping-Demineralized and Distilled Water
8514		Piping-Fuel Oil
8515		Piping-Fire Extinguishing Gas, Vapor, Chemical, or Powder
8516		Piping-Heating and Cooling Water
8517		Piping-Heating and Cooling NA and NAK, Insulating Requirements
8518		Piping-Heating and Cooling Gas
8519		Piping-Cover Gas, Argon
8520		Piping-Propane
8548		Piping-Isometric
8550		Piping-NA Reactor Primary
8551		Piping-NAK Reactor Secondary
8552		Piping-NA Receiving and Processing
8553		Piping-NA Closed Loop
855301		Piping and Mechanical Sections A1, 2, 3
855302		Piping and Mechanical Sections B1, 2, 3, 4
855303		Piping and Mechanical Sections C1, 2, 3, 4, 5, 6, 7, 8, 9
855304		Piping and Mechanical Sections D1, 2, 3, 4, 5, 6
855305		Piping and Mechanical Sections E1, 2
855306		Piping and Mechanical Sections F1, 2
855307		Piping and Mechanical Sections G1, 2, 3

Appendix B (Cont.)

Index Number	*Tertiary Number Sub-Subject*	*Subject*
855308		Piping and Mechanical Sections H1, 2, 3, 4, 5, 6, 7
855309		Piping and Mechanical Sections J1, 2
855310		Piping and Mechanical Sections K1, 2, 3, 4, 5, 6, 7
855311		Piping and Mechanical Sections L1, 2, 3
8554		Piping-NA all Other
8555		Piping-Special Loop
8556		Piping-NA Piping Components, Traps, Cold, Freeze, and Vapor
8557		Piping-Equipment Outline and Interface Requirements
8576		Piping-Reference Drawings
8601		Essential Drawings - Water
8602		Essential Drawings - Fire Protection
8603		Essential Drawings - Safety Showers/Eye washes
8604		Essential Drawings - Gas
8605		Essential Drawings - Steam
8606		Essential Drawings - Air
8607		Essential Drawings - Vacuum
8608		Essential Drawings - Waste
Heating, Ventilating, and Exhaust		
8900		Ventilation Exhaust and Heating System-Plans, Section Details
8901		Heating and Ventilating Equipment Location
8902		Heating and Ventilating Schedules, Notes
Air Conditioning Systems		
9000		Air Conditioning Systems-Plans, Sections, Details
Miscellaneous Equipment not Identifiable or Related to Assembled Equipment		
9900		Miscellaneous Equipment Pieces or Parts-Not Identifiable as Electrical, Instrument or Mechanical Category; Unrelated to the Assembled Equipment
9901		Mechanical
9902		Electrical
9903		Instrument

Appendix B (Cont.)

Index Number	***Tertiary Number Sub-Subject***	***Subject***
	99 Series Sub-Subjects	
	01	Scope
	02	Vendor Information
	03	Special Tools

Appendix C - Parts/Material Lists

C1.0 Contents

The Parts/Material List contains all material and separable components on the drawing. The individual pieces of weldments or other inseparable assemblies are not normally numbered separately.

Items that do not need pictorial description for detail are completely described, including dimensions, in the Parts/Materials List.

C2.0 Arrangement and Size

The minimum width of the Parts/Material List block having one quantity column is 239 mm(9.5"). Quantity columns may be added as necessary. To describe the part adequately, the Parts/Materials List vertical spacing may vary as needed. Minimum spacing should not be less than 10 mm (.38"). Refer to Figure 19 for dimensions.

Figure 18 – Parts/Material List

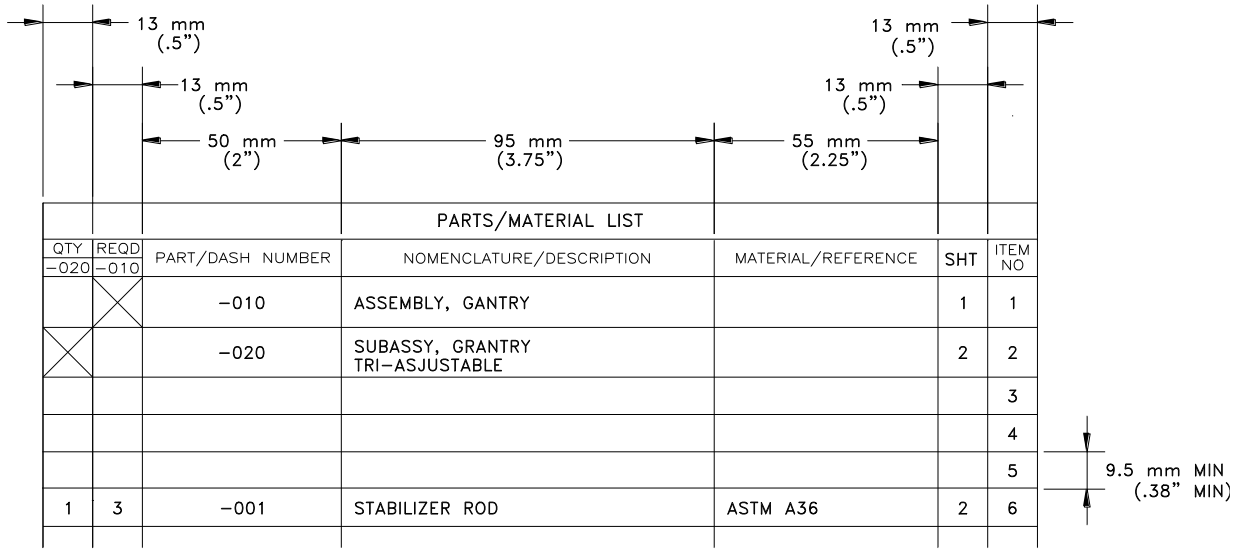

Figure 20 shows a Standard Parts/Materials List and Figure 21 shows a Parts/Materials List with the optional Reference Designation column added.

Appendix C (Cont.)

Figure 19 – Standard Parts/Material List

PARTS/MATERIAL LIST						
QTY −020	REQD −010	PART/DASH NUMBER	NOMENCLATURE/DESCRIPTION	MATERIAL/REFERENCE	SHT	ITEM NO
	X	−010	ASSEMBLY, GANTRY		1	1
X		−020	SUBASSY, GRANTRY TRI−ASJUSTABLE		2	2
						3
						4
						5
1	3	−001	STABILIZER ROD	ASTM A36	2	6
	8	−002	HOLD DOWN CLAMP	ASTM A36	2	7
	1	−003	INSTRUMENT RACK	ASTM A36	2	8
	6	−004	MOUNTING BRACKET	ASTM A36	3	9
						10
						11
						12
	3	H−1−48149−020	SCAFFOLD ASSEMBLY			13
						14
						15
						16
	1	FR211−73	DUPLEX PUMP	MILTON ROY CO		17
	2	(SSS60TF8)	VALVE, BALL, 12 mm FNPT, CL 150	ASTM A275 (WHITNEY)		18
						19
						20
						21
						22
	4		SCREW, SCHD CAP, HEX M6X1−4g6gX50 mm L	ASTM A574M		23
AR	AR		TUBING, TS, 101.6 mm X 101.6 mm X 6.35 mm (4”X4”X.25”)	ASTM A500, GR B		24
AR	AR		PLATE, 6.35 mm (.25”) THK	ASTM A36		25
2	1		CONTINUOUS HINGE, BLANK, W/PIN 1.52 mm (.060”) THK X 38.1 mm (1.50”) WIDE X 1828.8 mm (72”) LONG	TP 304 SST		26

Appendix C (Cont.)

Figure 20 – Parts/Material List with Reference Designation Column

PARTS/MATERIAL LIST

QTY -020	REQD -010	REF DES	PART/DASH NUMBER	NOMENCLATURE/DESCRIPTION	MATERIAL/REFERENCE	SHT	ITEM NO
	X			INSTALLATION			1
							2
	1	SW-EV-CS-2	10250T1371	SWITCH, OPR, 3 POSN, SPR RTN FR RIGHT	CUTLER HAMMER		3
	3	SW-P-X37 SW-P-X36-1 SW-P-X36-3	10250T20KB	SWITCH, SELECTOR, 2 POSN MAINTAINED, 1 NO-1 NC CONTACT OIL TIGHT	CUTLER HAMMER		4
	7	DS-11,13,16,18, 19,20,21	10250T37R	INDICATING LIGHT, 120 VAC, XFMR TYPE WITH 6V LAMP & RED LENS, OIL TIGHT, PRESS TO TEST	CUTLER HAMMER		5
	2	DS-12,14	10250T37G	INDICATING LIGHT, 120 VAC XFMR TYPE WITH 6V LAMP & GREEN LENS, OIL TIGHT, PRESS TO TEST	CUTLER HAMMER		6
	1	BQ-C5	G0-405	TOTALIZER, DIGITAL, 110 VAC WITH EXTERNAL RECTIFIER	MOORE INDUSTRIES		7
	1	PS2	111-24-125	POWER SUPPLY, 115 VAC/24 VDC, 125 WATT	RONAN		8
	1	LELL-X37	4130-0X-601	PROBE, LEVEL ASSY WITH CABLE PROBE, WITH ENCLOSURE LENGTH: 145.5"	ENDRESS HAUSER		9

← AR →

The Parts/Material List is located, or starts, in the upper right-hand corner on the first sheet of the drawing as shown in Figure 2 of this standard.

C3.0 Part Arrangement/Order

The Parts/Materials List should be arranged according to the following category hierarchy:

- Arrangement/installation or assembly
- Subassemblies
- Detailed items
- Designed items
- Commercial/catalog items
- Hardware, e.g., bolts and nuts.
- Material items

Appendix C (Cont.)

Three spaces should be provided between each category for future entries. The sequence of items in the Parts/Materials List may be broken when items are later added by drawing development, progress, or revisions and all reserved spaces have been used. It is unnecessary to rearrange the parts/material list merely to add an entry later.

C4.0 QTY – REQD (Quantity - Quantity Required) Column

The quantities (number of items required) are for one arrangement, one installation, or one assembly only.

C4.1 Counted Quantities

Counted quantities are to be accurate and described in customary trade units.

C4.2 As Required (AR)

Use AR (As Required) only when the exact quantity is not known or cannot be easily predetermined (e.g., piping, structural steel shapes, tubing, shims, gasket material).

C4.3 Identifying Assemblies

For ease in identifying assemblies, place an "X" in the Quantity (QTY) column where the assembly is placed. The "X" can be used to quickly identify the items needed for the assembly and to indicate all the quantities in that column are for that assembly.

C5.0 REF DES (Reference Designation) Column

Used for electrical, electronic, and instrumentation applications only. This column is used when unique identifiers are needed for electrical, electronic, or instrumentation items. The Reference Designator corresponds with the designator used in the field of the drawing. The width of the column is determined by the information needed in the column. See Figure 21.

C6.0 PART/DASH NUMBER Column

Unique part numbers are assigned where control of a design configuration (i.e., assembly, subassembly and detail) is controlled on an H-Series drawing. A part number is used to uniquely identify a specific item. Non-interchangeable items are identified with separate and unique part numbers.

The official part number is the drawing number and the assigned dash number. When a part number is referenced, both the drawing number and the dash number are needed as shown.

Complete Part Number	***Drawing Number***	***Dash Number***
H-3-60670-010	H-3-60670	-010

Appendix C (Cont.)

C6.1 Parts and Assembly Numbers

Each assembly, subassembly, and detailed part is assigned a separate and unique part (dash) number. The primary assembly is assigned the -010 dash number. Additional assemblies and subassemblies are assigned every tenth number consecutively, for example, -020, -030, and 040. The first detailed part is assigned the -001 dash number. Additional detailed parts are assigned -002, -003, -004, etc., with every tenth digit reserved for assemblies.

C6.2 Interchangeable Parts

Interchangeable parts are equivalent in performance and durability. They are capable of being exchanged one for the other without alteration of the item or of adjoining items, except for nominal adjustment. They are also interchangeable in terms of fit and performance. Interchangeability is also explained in the General Notes with a statement in the parts/material list to see the applicable General Note.

C6.3 Part Number Revisions

The Parts/Materials List periodically needs to be revised and/or material deletions due to fabrication changes or modifications to the original design. Either of the following is accepted methods for changing the Parts/Material List, when authorized by a DCN or FMP:

- Remove a part or material item by placing a line through the part or material item. This applies to either CAD or manual drawings.
- Remove a part or material item and add the word "Deleted," in place of the part or material item (e.g., CAD revision).

C6.4 New Part Number

New part numbers, including applicable altered item part numbers, are assigned when the design of a part, fabricated assembly, or procured item is changed. The following conditions determine if a new part number is needed:

- Performance or durability is affected to the extent superseded items have to be discarded for reasons of safety, failure, or malfunction.
- Parts, assemblies, or subassemblies are changed so the new designs are not directly and completely interchangeable with respect to installation and/or specified performance.
- When replaced/redesigned parts are limited to use in specific applications and the newly designed items are not so limited.
- When an existing Hanford item, or vendors' purchased item, needs alteration.
- When existing items cannot be reworked to be directly and completely interchangeable with the new design.

New parts and materials are added at the end of the Parts/Materials List using sequential part numbers. Part numbers are not to be reused for new or different parts/material. New part numbers are assigned.

Appendix C (Cont.)

C6.5 Purchased (Vendor) Items

Purchased items are identified in the parts/materials list with the manufacturer's part number or Vendor Information (VI) number as applicable. These items are normally controlled by the vendor, by industrial or government codes, standards, or file number. The manufacturer's part number is to be used for commercial items. When only a distributor/vendor (e.g., McMaster Carr, Hanford Stores) is known as the source, catalog numbers are noted as reference (in parentheses) in the Nomenclature/Description or Material/Reference Column.

C7.0 NOMENCLATURE/DESCRIPTION Column

The description is to be generic, except where a specific item is needed and the design depends on or is tailored to the specific item. The name of the item is listed first with supplemental descriptive words following. The description of an item is to be complete and provide specifications sufficient to procure the item.

Standard industry language is used to define the item. If the item can be completely described in the Parts/Materials List, it is not delineated on the drawing. If the description/specification is lengthy, it should be placed in the General Notes or in a separate specification. If placed in the General Notes or separate specification, reference the General Note or specification in the Nomenclature/Description column.

Entries in the Nomenclature/Description column should begin with a basic name (a noun name). The noun name is a noun or noun phrase which best describes the basic concept of the item. It describes what the item is and what it is used for, not the material or method of fabrication. A compound noun or noun phrase is used only when a single noun is inadequate. Use modifiers only when there is more than one type of the basic item used in the assembly (e.g., where two brackets in an assembly are identified separately as Bracket, Mounting, and Bracket, Support).

Basic Name	***Type***	***Modifier***	***Complete Name***
Bracket	(noun)	Mounting	Bracket, Mounting
Bracket	(noun)	Support	Bracket, Support
Piston	(noun)	-	Piston
Gear Box	(noun phrase)	-	Gear Box
Terminal Board	(noun phrase)	-	Terminal Board

C7.1 Vendor (Supplier) Items

Specify Vendor supplied parts to obtain the most cost-effective item. Where possible, use generic descriptions rather than brand names. The description should specify characteristics that are sufficient for the intended use but broad enough to permit open purchasing.

C7.2 Hardware and Material Items

List the basic names with modifiers for fasteners and materials (e.g., SCH CAP SCR, 1/4-20-UNC-2A, etc.). Identify materials by form and size (e.g., TUBE STEEL, 4 X 4 X 1/4; PLATE, 1/2 THK).

Appendix C (Cont.)

C8.0 MATERIAL/REFERENCE Column

List the controlling specification for the material (e.g., ASTM, ACI) followed by the kind of material (e.g., SST, 6061-T6A, CS). Never use the word "COMMERCIAL" to indicate any acceptable grade. The words "ANY GRADE" may be used where the grade of material is not a design factor. Always identify the specific material grade when welding.

List the name of the supplier for commercial item and other separate documents controlling material, General Notes, etc.

C9.0 SHT (Sheet) Column

For improved readability, always use this column to note where assemblies, arrangements, or detailed items are depicted on a multi-sheet drawing.

C10.0 ITEM NO (Item Number) Column

Enter consecutive numbers starting with the numeral 1. An item number should always be used for each vertical space, including spaces left blank for future use.

Appendix D - Glossary

Term	*Definition*
Altered-Item Drawing	An engineering drawing used to control and detail alterations to a commercially purchased item. An altered-item drawing reflects only the change and is not intended to show complete fabrication details. Altered-Item Drawings are typically created from vendor drawings included in Vendor Information files and become official Hanford drawings.
Applied Material	Material that is not normally shown on the graphic presentation of a drawing (e.g., glues, adhesive, paint, cleaner). It may or may not have a manufacturer's identification number. Applied material normally is identified in the General Notes and its application explained as needed. Weld rod is excluded from this definition.
Archive	Off line storage of previous document revisions.
Arrangement/Installation Drawing	The top level drawing where multiple related details, assemblies, subassemblies, and certain connecting parts and/or instructions are shown depicting the final arrangement.
As Required (AR)	A notation used when an exact quantity is not known or cannot be easily predetermined. The notation is placed in the "Quantity Required" column of a parts list.
Assembly	A term used to describe parts and/or subassemblies joined to complete a designed relationship. **NOTE:** In view of the difficulty, in some cases, in establishing a clear distinction between the terms "assemblies" and "subassemblies," these two terms may be considered to have the same meaning and may be used interchangeably
Brand Name	For the purpose of this standard, brand name implies the manufacturer, model, catalog name/number, trademark, or identifying name other than generic.
Check In	Copy a new unreleased/unapproved version of the document to the system and change of status so that others may check out and modify the document.
Check Out	Copy the document to an individual’s work space and the change of status that locks the file so others may not modify it.

Appendix D (Cont.)

Term	*Definition*
Component Number	A component number consists of letters and/or numbers that initially serve to uniquely identify a type of equipment/instrument. The component number identifies the relative location of the component on a schematic, flow diagram, one-line, or similar type of engineering drawing. After completion of fabrication/construction and installation, the component number serves as a key in various maintenance and operational activities.
Computer-Aided Design (CAD) Data File	The CAD data file is the computer data file used to produce a hard copy engineering drawing.
Dash Number	A dash number is a unique numerical identification assigned to an item whose design is controlled by the drawing. When suffixed to the drawing number, the dash number provides a unique part number (see Part Number definition) for that item. A dash number is assigned where two or more items or an assembly are depicted on a drawing. The dash number consists of three digits and is assigned as follows: • Assemblies: Every tenth number is reserved for assemblies (e.g., -010, -020, -030, -040). • Parts: -001 for the first part and consecutively for all others, reserving every tenth number for assemblies (e.g., -001 through 009; -011 through -019; etc.)
Design Authority	The engineer that has the authority to authorize changes to a design documents (see CPCC-RD-EN-1819).
Detailed (Piece Parts) Item	An individual item or units of material needing a specific part (dash) number identification because of traceability and accountability needs for that item.
Document Control	Refers to the Records Information Management contractor that maintains data and record copies of released engineering documents. Data for released Engineering documentation is maintained in the Document Management and Control System (DMCS).
Engineering Document	Approved and released engineering documentation (e.g., drawing, specification, functional criteria, etc.) that is maintained as a record. The record copy can be either the original hardcopy or electronic version of the engineering document.
Engineering Drawing	Engineering design output documentation that depicts, by graphical means, the design requirements of an SSC. Engineering drawings are created either as hardcopy manual drawings or CAD drawings.

Appendix D (Cont.)

Term	*Definition*
Fifth-Generation Copy Test	For the purposes of this standard, a Fifth-Generation Copy Test consists of making a full size copy (first-generation copy) from the original document, using a high quality copier. Then making a copy of the copy (second-generation); then a copy of that copy (third-generation copy), etc., until the fifth-generation copy is achieved. The graphics and text of the fifth-generation copy have to be clearly legible without magnification, special lenses, or editing.
Final Plot	The plotted version of an engineering drawing that is the original document used for approval, release, and record creation.
Hanford Title Block Insertion Program (HANTIP)	HANTIP is a LMSI created program that inserts the custom Hanford standard Title Block into a CAD drawing. See Hanford User Help (HUH) for more information.
Hard Copy Drawing	The plotted/printed copy of an engineering drawing.
Hard Metric Conversion	The process of changing measurement language to nonequivalent metric units, usually necessitating changes in the actual physical size and configuration of the part, product, or process that exceed those permitted by established measurement tolerance. Also see definitions for soft metric conversion, inch/pound measurement, and International System of Units (SI).
Hardware Item	Fasteners that may or may not need material identification (e.g., ASTM, and SAE).
HTP	See Hanford Title Block Insertion Program (HANTIP).
Inch/Pound Measurement	Inch/pound measurements are units of the English measurement system (e.g., inches, pounds, degrees Fahrenheit, gallons). The formally recognized inch/pound units are the foot and the pound as defined by the National Institute of Standards and Technology (NIST).
Inseparable Assembly	Parts/material joined in such a manner that they are incapable of being disassembled without destroying the intended function of the item (e.g., weldments, bonded assembly).
International System of Units (SI)	SI is the name of the modern metric measurement system approved by the 11th General Conference on Weights and Measures (CGPM) in 1960. It is adopted by worldwide standard setting organizations such as ISO, ANSI, German Institute of Standards (DIN), Japan Instrument Society (JIS), and Center for Studies of Nuclear Energy (CEN).

Appendix D (Cont.)

Term	*Definition*
Item Number	A number assigned to every line entry of a Parts/Materials Lists to tabulate items in the list. It is also used to locate an item in the field of the drawing and is not used for unique identification purposes.
Material Item	Material used in an inseparable assembly whose final configuration is contained within the configuration of that assembly (e.g., a weldment). Also, see Inseparable Assembly definition.
Master File	The last formally released CAD data file containing the electronic drawing used to plot/print the hard copy drawing that is approved and released. This file needs special handling to ensure that it is available for subsequent revision of the engineering drawing.
Metadata	Data embedded in a document that provides information about the data file (data about data). Examples include Drawing Number, Sheet Number, and revision number.
Microfilm	A photographic copy of a document that is stored on 35 mm film. There are two types of microfilm, silver halide and diazo. The silver halide negative is used as the record file copy and the diazo is called the working copy that is normally placed in microfilm files and used to produce half size blow back copies of the photographed original approved drawing.
Part Number	A part number consists of letters, numbers, or combinations of letters and numbers that may or may not be separated by dashes and are assigned to uniquely identify a specific item. Part Numbers assigned to Hanford "H" series drawings consist of the drawing number plus a dash number. Part Number: H-3-60670-010 Drawing Number: H-3-60670 Dash Number: -010
Parts/Materials List	A tabulation of parts and/or material needed for constructing, fabricating, or procuring the items depicted on a drawing.
Release	The formal process of making an engineering drawing the current controlled revision and placing the original approved hard copy in formal drawing storage and retention of the associated CAD data file in the DMCS.

Appendix D (Cont.)

Term	*Definition*
Revision	The formal act of changing an engineering drawing. Revisions are formally approved and released into the Hanford drawing system to complete the action. The revised drawing replaces the previously approved and released drawing, which is placed into archive. Revisions are represented by a whole number, such as revision 3, 4, 5, etc.
Scan	The creation of a raster image of a document that is stored in an electronic data file.
Soft Metric Conversion	The process of changing measurement language from inch/pound measurement units to equivalent metric units within acceptable measurement tolerances without changing the actual physical size of the configuration of the part, product, of process. Also, see Hard Metric Conversion and Inch/Pound Measurement definitions.
Subassembly	An assembled unit designed to be incorporated with other units. See definition of Assembly.
Thumbnail	A very small raster image of an electronic file that is used for recognition purposes and used to locate electronic files of sheets of electronic files.
Two-Way Traceability	Two-way traceability is cross-referencing existing engineering drawings affected by a new design or modification and vice versa.
Vendor Drawing	A drawing prepared by a vendor according to the vendors drawing requirements. Vendor drawings provide information on configuration, installation, maintenance, and/or operation of SSCs.
Vendor (Supplier) Item	An item procured from an off-site manufacturer that has specific functional and physical features needed to obtain the end-product and has a specific part number identification assigned by the manufacturer.
Versions	An in process control mechanism used to control versions of documents before the current revision is formally approved and released. The electronic files of a document are called versions and are maintained in the Engineering Document Management System (see Work in Process).
Work In Process	The process of saving and restoring working versions of an electronic document before its final approval and release into the Hanford document system.

Appendix D (Cont.)

Term	*Definition*
Workflow	The electronic movement of a document through a defined process to assure that specified actions are completed before advancing the electronic file on to the next reviewer or to the originator.
X-Reference	This is an AutoCAD program feature that allows drawing data to be shared between data files. The shared data is not permanently part of the drawing until the X-Reference data is bound into the master (main) data file.