# Document Control Manual (DCM)

## A1.0 Purpose

The Document Control Manual (DCM) defines the specific steps required to transition engineering design documents from unreleased to released and authorized for use. Additionally, it presents the detailed steps required for Change Control of engineering documents.

## A2.0 Scope

This Manual presents the activities of the Document Control Group (DCG), who has the sole responsibility to control and manage technical design documents.

## A3.0 Definitions

**Approval Signatures -** Approve the contents of an engineering document and grant authorization to commit JLab funds. Digitized signatures appear in the form of a watermark at the bottom right of a released document.

**Engineering Change Order (ECO) -** Form used to initiate the revision process of an existing master drawing. The purpose of this form is to legitimize, record, and manage the flow of changes to a master drawing to ensure the most current documents are archived.

**Foreign Documents -** Documents used by JLab although they originate from a source other than JLab. Upon review and approval, JLab shall take design control and shall be responsible for maintenance and revisions.

**E-Sign -**  Is the electronic signature process used to deliver documents from the author to the approvers and finally to the Document Repository for electronic archiving.

**Incorporated -** Term used when the information from an existing controlled document (Such as an ECO) is included in the revision of new drawing.

**Master** **Document -** The original or latest revision level of a released engineering document.

**Master Storage:**  Location of released engineering documents maintained by the Document Control Group (DCG).

**Media Bond**: Type of paper used to plot preliminary or check design drawings.

**Obsolete** **Drawings -** Drawings which are discontinued. When a drawing is made obsolete, it is marked as “obsolete” with the expiration date.

**OCE -**“Slang” term used (site-wide) to describe the former Electronic Document Archive System. The current electronic engineering document archive is called the Document Repository.

**Preliminary Documents-** Used for review and not signed or approved for construction.

**Revision Level -** The next edition of a Drawing that uses a sequential capital letter, starting with the alphabet "A" which appears in the revision block of a drawing indicating a change to a previously issued drawing. ***Revision letters "I", "O", “Q”, “S”, and “Z” should not be used.*** This is to avoid confusion with the numbers "1", "0", “2”, and “5”. When all single alphabets are exhausted, double letters are used. The revision level is then indicated by **"AA", "AB"**, etc. Should **“AA”** to **“AY”** be exhausted, the next sequence shall be “**BA”, “BB**”, etc. Revision letters shall not exceed two characters (per DOD‑STD-100)

**Superseded Drawings -** Drawings which are incorporated into another drawing or which the identifying title formats (i.e., document number) have been reassigned. When a drawing is superseded, it is marked as “Superseded” with the new document number.

## A4.0 Process Steps

**A4.1 Drawing Format Guidelines**

These guidelines provide formal and standard methodology for generating and processing design drawings. The procedures follow basic guidelines of DOD-STD-100C; Engineering Drawing Practices and industry standard documentation procedures. These procedures are intended to provide the guidelines for the construction and operational phases of the JLab project for the various functional groups.

**A4.2** **Basic Drawing Standards are as follows:**

* All drawing Title blocks should be completed. When no information is applicable, enter a "dash" or "N/A" in the block.
* The “Drawn By” block will be completed by the documents’ creator in block letters.
* The Revision block will show (at least) the initials of the person making changes to the original document. Initials may only be used for revision block area approvals.
* Electronic Drawings (pdf’s) entered into the E-Sign are required to be actual size, (i.e., C Size=17” x 22” pdf, D size = 22” x 34” pdf, etc.)
* Text size can be no smaller than .100 on D/E size drawing to assure legibility when reduced.

The JLab identifier (number) must be unique to the major system or the Engineering Design Group workflow structure. Number Conventions are assigned and managed by the different Engineering Design Groups.

* When entering a drawing into E-sign, the Jlab identifier (number) is entered as the “Document Name”, in addition to the “Document Number” field.
* All drawings shall contain a Title Block w/JLab logo, Description, a JLab unique identifier (drawing number), Tracking/CAD location, Dim/Tol Per ASME Y14.5-1994, Scale and Drawn By Name
* Names of Approvers will appear in the watermark on the bottom right of a “released” document.
* Prior to release, the drawing will have two watermarks. The first will read “DRAFT” in red lettering diagonally across the document and the second will read “Electronic Signature in Progress” along the bottom right of the document.
* Previous revision level signatures and corresponding dates are represented by electronic printed names and dates in both the title block and revision areas.

**A4.3 Multi-Sheet Drawing Standards apply as follows:**

* First sheet has a full title block
* All following sheets have a continuation title block indicating drawing number, rev level, CADD ID, sheet number, and scale
* All sheets will have the same title, size and revision level.
* Electronic multi-sheet drawings (pdfs) may be entered as a single pdf or individually. (Individual sheets require separate E-signs).

**A4.4 Drawing Types are as follows:**

* Artwork
* As Built
* Assembly
* Block Diagram
* Detail
* Drawing List
* Fabrication
* Fabrication & Assembly
* Installation
* Layout
* P&I Diagrams
* Schematic
* Sub-Assembly
* System Diagram
* System Print
* Weldment
* Wire Diagram

**A4.5** **Title Format is as follows**

Title line 1: Major System

Title line 2: Sub System

Title line 3: Component or Part

Title line 4: Type of Drawing

**A4.6** **Title Block Area formatting**

The Title Block is made up of drawing information blocks and located on the bottom, right corner of a drawing. Supplemental blocks can be added to provide additional information as required by Responsible Engineer, Design Authority or Project Managers (PM). For drawings produced after July 1, 2012, the Checker and Approver Blocks are succeeded by a Watermark showing the approval status and names of Approvers. The watermark is located underneath the Title Block.

Signatures (Approver Names) in the Title Block or in the Watermark, indicate who designed/created the drawing, who checked the drawing for technical accuracy (proper drawing techniques, appropriate notes, technical details, etc.), and approval for use. There shall be at least 2 reviewers/signers of a drawing; other than the person who drew it. The checker may also be an approver, so long as they are knowledgeable in the specific application of what is defined by the drawing. Blocks are completed as follows:

**Approver Names**: (1) indicates the Customer requiring the design (Responsible Engineer, PM, etc.) and (2) the person who will be responsible for the commitment of JLab funding to fabricate the depicted parts (Project Engineer, CAM, etc.). These approvers must be included on the initial issue of a new drawing. Additional Approver names may be added as required.

**CADD I.D. No. or Tracking No. Block**: Indicates the complete file path location of the “native file” (CAD file). Blanks, dashes, or N/A are not acceptable in this block.

**Checked By Approver**: Indicates the person who has vigorously reviewed the drawing for its technical content, adherence to JLab document standards, compliance with ASME Y14.5, and good drawing practices. The person signing the “Checked” block shallnot be the same person indicated in the “Drawn” block.

**Date Block:** Indicates the date the approval blocks were signed. All completed Signature Blocks require a date.

**DCG Approver:** Completed by Document Control Group to signify a quality check was performed prior to “release” into the document electronic archive system.

**DIM & TOL Per ASME Y14.5-1994 Block:** Represents the tolerance required to fabricate the parts. When tolerances are not applicable, or if they are indicated within the drawing dimensions, a dash or “N/A” may be entered in this block.

**Drawn Block:** Indicates the designer, detailer, draftsperson, etc. who produced the graphic representation of the parts. This is to be filled in on the CADD system as printed text.

**DWG No. Block:** Indicates the number assigned to a single drawing that is unique to each Major System, Project or Work Breakdown Structure (WBS). Multiple drawing numbers are not acceptable on a single drawing regardless of whether it is single sheet or multiple sheets.

**Finish Block:** Indicates the specific surface finish required for the parts. If the part's finishing requirements are individually indicated on a drawing then a dash or “N/A” shall be entered here.

**Logo Area:** Displays the latest logo of JLab, along with the official name of the facility, (Thomas Jefferson National Accelerator Facility), City, State, and DoE must be present to identify the designing organization.

**Material Block:** Indicates the specific type of material required to fabricate the parts. If a parts list is used on a drawing then a dash or "see parts list" is to be entered. This applies to mechanical drawings only.

**Rev. Block:** Indicates the revision level of the drawing to represent its most current status. A dash should be entered in this block for the initial issue of a new drawing. Subsequent revised issues are indicated as defined in Section A3.0 “Revision Level.”

**Scale Block:**  indicates the scale used to depict the parts shown on the drawing. If scale is not used, the words “DO NOT SCALE DRAWING” or “NONE” shall be applied. A dash is to be entered if the scale is indicated with the parts to be fabricated.

**Sheet of Block:** Indicates the first sheet of one or a multiple drawing set and the total number of sheets in the set. Subsequent sheets indicate the sheet number and the total number in the set. If a drawing has only one sheet, sheet 1 of 1 should be entered. No blanks or dashes are acceptable in this block.

**Size Block:** Indicates the drawing format size. Recommended sizes are A, B, C, D, and E. Drawings larger than these become cumbersome to use. The smallest reasonable size should be used.

**Title Block:** Provides a basic description of the drawing following the format provided in the Title Format section ([Section A4.5](#A4_5TitleFormat)).

**Used on Assy No. Block:** Indicates any associated assembly drawing number which provides information in understanding the depicted parts. If no assembly is applicable, a dash or N/A is to be entered.

**For JLAB Internal Use Only Block (*where applicable)*:** Is a Title Block extension used to identify Weld Classification, Weld Specifications and Weld Analysis (Calculations) documents.

**A4.7 Revision History Area**

This area is made up of drawing change information blocks and is located at the upper right corner of a drawing. Any changes which result in the advancement of the revision level of a drawing are recorded here. Changes requiring an Engineer Change Order (ECO) shall be annotated by the identifying ECO Document number in the Description Block. Blocks are completed as follows:

**Approver Names:** The same authorization level as "Approver Names” in the Title Block. The name or initials of “Drawn By” may also go into this block or be annotated in the “Description” block. Additional Approver Names may be added as required and as designated by the Project Leader. All revision history shall be applied.

**Date Block:** Indicates the date the approved block was signed. All completed Signature Blocks require a date. All revisions that follow require the electronic application of the same date.

**Description Block:** Is the detailed description of the changes that have affected the drawing. The ECO number can be entered here; e.g., ECO 1234. The ECO would then contain all the detailed information required to change the drawing. The specific change to a drawing can be entered here when an ECO is not required,

**Rev. Block:** Indicates the revision level of the drawing after changes have been implemented. This letter should coincide with information indicated on the ECO. This revision level should be reflected in all revision blocks on all sheets of the drawing.

**Zone Block:** Indicates where the changes occur on the drawing.

**A4.8 Engineering Document Format Guidelines**

Forms (Coversheets), for Engineer Specifications, Statements of Work, Procedures, Change Orders, and Calculations can be downloaded from the DCG Website (under “Forms”) or by contacting the DCG office. All “released” documents can be accessed in the Document Repository under “Document Control Group”...

**A4.9 Basic Document Format Standards are as follows:**

* All document blocks should be completed. When no information is applicable, enter a "dash" or "N/A" in the block.
* “Manual” signatures and initials on a document are to be signed using a medium point black ink pen. Initials may only be used for revision block area approvals.
* The JLAB Document Identifier (document number) must be unique to the Major System, Project or Work Breakdown Structure (WBS).
* Number conventions are assigned and managed by each Engineering Design Group.
* Previous revision level signatures and corresponding dates are represented by electronic printed names and dates in both the title block and revision areas.
* Released Documents shall contain the most recent JLAB Logo, Document Description, Page Numbers, Native File tracking information, Activation Date, a JLAB unique identifier (document number), and Originator-Checked-Approved Signatures or Names.
* Subsequent (continuation) pages will repeat document number and revision letter when applicable. Names of Approvers will appear in the watermark on the bottom right of a “released” document.
* Prior to release, the document will have two watermarks. The first will read “DRAFT” in red lettering diagonally across the document and the second will read “Electronic Signature in Progress” along the bottom right of the document.

## A5.0 Drawing Turn-In and Signature Process (E-sign)

Review Process: Prior to releasing a drawing, the designer will ensure the document is compliant by review by the approving designees.

E-Sign Process: Drawing originator initiates an E-sign in the Document Repository by completing required information, uploading the reviewed drawing and assigning approvers. The drawing will appear as a “DRAFT” and a watermark located in the bottom right, will read: “Electronic Signature in progress”. An E-Sign Tutorial is located in the Document Repository on the Document Control Group main page.

Approval Process: E-signs pending approval are automatically sent to each signer (via e-mail), including the Document Control administrators. Approvers will accept or reject -with explanation, and results will automatically return to document originator. When all signatures are applied, the watermark will read: “Document is Approved” followed by the Names of the approvers.

Drawing Status: Once a document is uploaded into the Document Repository, it cannot be removed. The status of a drawing is marked by a Green Checkmark for Approved, a Red “X” for Rejected and a Yellow Caution Triangle for “in process”.

**A5.1 DCG Quality Approval & Drawing Receipt Standards**

* DCG is automatically included in the E-Sign signature process to perform a quality assurance review of all documents uploaded in the Document Repository. \
* DCG will review electronic documents for size requirements, Title block typos and completeness and will communicate any discrepancies to the document originator.
* DCG will review the E-sign attribute and signature information for typos and completeness and communicate any discrepancies to the E-sign originator.
* DCG is the “gatekeeper” for the Electronic Document Repository. Questions and concerns regarding E-sign and the Repository should be made directly to the DCG office.

**A5.2 Foreign Drawing Turn-In & Approval**

* Any “Foreign” drawing that has implied confidential, proprietary or copyright verbiage must be accompanied by a letter from the originating organization, prior to DCG processing.
* The letter is obtained by the owner responsible for the drawing being turned-in.
* The letter approves the drawing's usage at JLab and exempts JLab from any legal or copyright ramifications due to its usage.

Foreign drawings may be electronically All Foreign Drawing Approval documentation with be mainwill be digitized into pdf format and attached as a continuing page to the relative drawing to be maintained in the Document Repository.

* Foreign Drawings that do not contain the copyright verbiage do not require an accompanying letter.

**A5.3** **Engineering Document Turn-In & Approval**

Engineering Documents include Statements of Work, Specifications, Engineering Change Orders, Calculations and Analysis. These documents will be entered into the Document Repository using the E-sign process outlined in the Drawing Turn-in and Approval Process of this appendix (Section A5.0). An E-Sign Tutorial is located in the Document Repository on the Document Control Group main page. Engineering Document Blank Forms and guidelines are available on the DCG Website or by contacting the DCG office.

In addition to the Document Repository, DCG will maintain a master log for all Engineering Documents which have been submitted in the following location: [M:\dcg\DCG\_MasterLogsEngineeringDocument](file:///M:\dcg\DCG_MasterLogsEngineeringDocument)

## A6.0 Change Control

**A6.1 Drawing Revision Process**

Design drawing changes are required to represent the factual, constructed components or assemblies of devices used to build and repair systems used or designed at JLab. When drawings require changes to make cosmetic or basic updates, changes are made directly to the drawing and revision letter is annotated to reflect latest revision level. When changes are made to a configured item, an Engineer Change Order (ECO) is required. The original of all ECOs shall be entered into the Document Repository for record keeping purposes. When it has been determined that a drawing requires changing, refer to the following procedures.

**A6.2 Vendor/Foreign Drawing Changes**

* . The originator must obtain the most current drawing revision level
* Changes to a vendor or a foreign drawing include posting the revision on the JLab title block and revision block.
* Upon revision, customer resubmits the drawing by following the Engineering Document turn-in process ([Section A5.5).](#A5_5_DrawingTurnin)

**A6.3 Preliminary or Non-Issued Changes**

Requires no formal record; however, numeric revisions shall be used for unreleased documents, with an increment in the revision whenever changes are made and the document distributed beyond the responsible designer/engineer.

**A6.4 Initiating an Engineering Change Order (ECO**)

* The ECO is a traceable document that describes in detail the proposed changes to a drawing.
* The purpose of the ECO is to request, document, and approve changes to released documents. Therefore, it is important to be clear and detailed.
* The ECO and attached, supporting documentation (marked up drawings, etc.) shall be able to stand alone (without explanation) for communicating proposed changes.
* There should be "no" accumulation of ECOs.
* The ECO form location and basic document standards are explained in “Engineer Document Format Guidelines ([Section A5.3](#SectionA5_3DocFormat)). Additional instructions specific to Engineer Change Order Standards, Approvals and Turn-in requirements follow.

**A6.5 Engineer Change Order (ECO) Standards**

* It is the responsibility of the originator to obtain the most current drawing revision level to be used as a “mark-up” copy and attached to the ECO form. The originator must obtain the most current drawing revision level to be used as a “mark-up” copy.
* All ECOs should be entered into the Document Repository using the E-sign process outlined in the Drawing Turn-in and Approval Process of this appendix (Section A5.0). The term “Multiple Zones” may be used to describe identical changes in several areas. (e.g., in Zones A5, B7, & C9 change "through hole" FROM 8-32 UNC TO 10-32 UNF).
* “Incorporated” ECOs are approved ECOs in which the changes have been applied to the associated drawing as the next revision.
* It is the responsibility of the originator to ensure affected drawings in the CADD electronic drawing file have been tagged with ECO Identifier in bold letters (e.g., "ECO 00xx Pending.”)
* Revised ECOs should be indicated by capital alphabets starting with A, B, etc., and be sequential. Revision letters "I" and "O" should not be used to avoid confusion with the numbers "1" and "0" (also Q, S, and Z – per DOD-STD-100) when all single alphabets are exhausted, double letters should be used.

**A6.6 ECO Form Formatting & Approvals**

* **Header Blocks** - All Header information shall be completed in accordance with Basic Document Format Standards ([Section A4.2](#A4_2BasicDrawStandards)).
* **Change Affects Blocks** – At least one block shall be checked. For the “*Do Existing Parts Require Rework?*” block, an explanation shall be given in the “*Reason for Change”* section.
* **Reason for Change Section** - Gives an explanation for the change requirements. “*General Revision*” and "*General revision to drawing, extensive changes*" may be used.
* **Action to be Taken Section/ Detail** - describes in detail the changes made to the text (e.g., calculations, materials, dim and tol, etc.). “*See Attached Mark-up*” may be used when details are too extensive.
* **Originator Block** - Indicates the designer, detailer, draftsperson, etc. who completed the ECO form. This name must be typed directly on the document.
* **Reviewed (Checked)By Watermark** - Indicates the name of the person that has vigorously reviewed the document for its technical content and text accuracy and compared it with the marked- up drawing to ensure directives “*shall be able to stand alone (without explanation) for communicating proposed changes*.”
* **Approved By Watermark** - (1) indicates the customer requiring the design change (Responsible Engineer, PM, etc.) and (2) the person who will be responsible for the commitment of JLab funding to fabricate the depicted parts. The Watermark indicates the names of the approvers of on the initial issue of a new drawing. **For changes to Configuration Items**, the author of the ECO shall get approval from the appropriate group which is operating and maintaining the product or system impacted by the change as outlined in [Section A6.0](#A6_0ChangeControl).

**A6.7 ECO Turn-In & DCG Processing**

ECO documents will be entered into the Document Repository using the E-sign process outlined in the Drawing Turn-in and Approval Process of this appendix (Section A5.0). An E-Sign Tutorial is located in the Document Repository on the Document Control Group main page. **A7.0 References**

ASME Y14.5-1994 – Dimensioning & Tolerancing

ASME Y14.100 - 2004 Engineering Drawing Practices

DOD-STD-100 – Engineering Drawing Practices