

**GUIDELINES FOR PREPARING AS-BUILT DRAWINGS
FOR THE US ARMY CORPS OF ENGINEERS - CHICAGO DISTRICT**

SCOPE:

As-built Drawings are the amended "As-designed" drawings revised to show the project as the contractor built and constructed it. The revisions from contractor markups and field inspection notes are transferred to the final as-built set of drawings. The final as-built drawings include modifications during construction, field requested changes, shop drawing modifications, and contractor designs.

This guidance will compliment the as-built subpart contained in [01.10.00.00.03-General Provisions](#). The content contained in the specification for the project is the governing document, in the event there are any discrepancies presented in this web page. The intent is to aid the contractor and resident engineer in the development of high-quality as-built drawings to show changes made to the project during construction. As-built drawings are an official record of the project at the time of construction completion. The original "as-designed" contract drawings and specifications are modified to show all additions, deletions and other changes made during construction. Accurate as-built drawings are very important for project operation and maintenance, and future modifications, particularly for plumbing and electrical systems, which are hidden from view.

WORKING AS-BUILT DRAWINGS:

The Contractor shall maintain two sets of paper drawings and specifications (marked-up prints) to track changes, additions or deletions from the original design during construction. The working as-built marked drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer and Contractor before submission of each monthly pay estimate. Monthly review of the working as-built CADD printouts shall at minimum cover all sheets revised since the previous review. At least one paper set of as-built drawings shall be available on the jobsite at all times.

1. Where contract drawings or specifications present options, only the option selected for construction shall be shown on the final as-built prints. Cross out such words and phrases as "optimal requirement," "or equal," etc., and list specifically the items of material provided.
2. Unusual or uncharted obstructions that are encountered in the contract work area during construction.
3. Location, extent, thickness, and size of stone protection particularly where it will be normally submerged by water.
4. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.
5. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.
6. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, the Contractor shall furnish a contour map of the final borrow pit/spoil area elevations.
7. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems

8. Changes or modifications that result from the final inspection.

MARK-UP GUIDELINES:

The following information is provided to improve the quality of the marked-up prints and thereby facilitate preparation of final as-built drawings. The most important guideline is that the marked-up changes on the prints shall be complete and understandable.

1. Where possible use three base colors in marking up the hard copy of the working as-builts. If the base colors are deviated from, provide a legend indicating any special purpose of the colors used. Traditional base colors:
 - a. Deletions (Red) - Deleted graphic items (lines) shall be colored red with red lettering in notes and leaders.
 - b. Additions (Green) - Added items shall be drawn in green with green lettering in notes and leaders.
 - c. Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes shall be in blue.
2. Frequently use written explanations on as-built drawings to describe changes - do not rely totally on graphic means to convey the revision.
3. Legibility of lettering and digit values shall be precise and clear when marking prints, and clarify ambiguities concerning the nature and application of change involved.
4. Wherever a revision is made, make changes to affect related section views, details, legend, profiles, plans and elevation views, schedules, notes and call-out designations, and mark accordingly to avoid conflicting data on all other sheets.
5. When changes are made, cross out all features, data and captions that relate to that revision.
6. When changes are required on small-scale drawings and in restricted areas, suggest large-scale inserts be drawn or sketched, with leaders to the location where applicable.
7. Be sure to add and denote in legend, any additional equipment or material facilities, service lines, etc., incorporated under as-built Revision if not already shown in legend.
8. When attached prints (or sketches) are provided with marked-up print, indicate whether:
 - a. Entire drawing shall be added to contract drawings or
 - b. Whether the contract drawings shall be changed to agree, or
 - c. For reference only to further details not required for initial design.
9. Make the comments on the drawing complete without reference to letters, memo's, or materials that are not also a part of the as-built. Annotating the drawing, "Per Change Order #42," means nothing when the actual change order states, "added an additional 12 duplex" outlets or similar statements. The same is true when the drawing is marked, "changed per COE instructions." This office and ultimately the using organizations must know what was changed, how it was changed, where the items(s) were relocated to and how the affected connections were altered. Change Orders usually do not provide information as to how the facility was changed, only what was changed.

10. The markups shall be accomplished on black line prints of the most current sheet.
11. Shop drawings are to be incorporated into the as-built drawings. They will be provided in electronic CADD file format and conform to the A/E/C CADD Standards. Hand drawn or plotted paper shop drawings will not be accepted as submittals.

The hand drawn or plotted paper shop drawings are not usable as original drawings for several reasons.

- a. The "shop drawings" are not easily reproducible in a useable format.
- b. The drawings are not of an adequate scale or are drawn to no scale and are not transferable to the CORPS drawings due to lack of information.
- c. The limited numbers of reproducible shop drawings that have been received have not been on the Corps of Engineers standard sheets sizes making it difficult to convert these drawings to standard COE drawings.

Any drawing provided by non-COE sources will be drawn in CADD. Sheets shall be drawn at the same scale as similar drawings in the set (example: Fire alarm systems shall be drawn to the same scale as the plumbing or electrical drawings). The drawing shall meet the same standards required for the rest of the drawings set. Sheet number, detail number, etc shall tie details and sketches to existing drawings.

12. The sheet index shall be updated if any sheets are added or the sheet name has been modified.

EXAMPLE OF MODIFICATIONS:

There are some general items that need special attention to ensure that the marked-up prints are complete and accurate. The working as-built shall show, but shall not be limited to, the following:

1. The actual location, kinds and sizes of all of existing and new utility lines, especially underground lines within the construction area. Measurements will be shown for all change of direction points and all surface or underground components such as valves, manholes, drop inlets, clean outs, meters, etc. The descriptions of exterior utilities shall include the actual quantity, size, and material of the utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Valves, splice boxes and similar appurtenances shall be located by dimensioning along the utility run from a reference point. The average depth below the surface of each run shall also be recorded.
2. The location and dimensions of any changes within the building structure.
3. Layout and schematic drawings of electrical circuits and piping.
4. Correct dimensions and details transferred from shop drawings.
5. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

6. Actual location of anchors, construction and control joints, etc., in concrete.
7. Changes in location of equipment and architectural features.

FINAL AS-BUILT DRAWINGS:

The retainage amount referenced in the specification, shall be withheld until the final as-built submittal has been approved and accepted by the government.

If the working as-builts are properly maintained, when the project has been constructed the final as-built drawings should be near completion.

DRAFTING STANDARDS:

The Corps requires that standard professional engineering drafting practices be utilized in correcting the original electronic CADD drawings to show as-built conditions. In general, the letter styles, line thickness, and scale will be the same as the original drawings. Any additional sheets added, shall conform to AEC CADD Standards.

CADD Standards: File Naming Convention will be maintained on all existing CADD files and followed for any new files added. The Contractor shall revise CADD files as-built drawing layers, to show the as-built conditions during the prosecution of the project. All as-built "triangle" changes shall be on a separate single layer, using a single color, with an associated medium pen width placed

- Level Number: 63
- Level Name: ANNO-REVS
- Level Description: Revisions

The following specific requirements apply to the preparation of as-built drawings:

1. As-Built Stamp: When final revisions have been completed, the cover sheet drawing shall show the wording "RECORD DRAWING AS-BUILT" followed by the name of the Contractor and project completion date in letters at least 3/16 inch high. All other contract drawings shall be marked in the bottom right-hand corner of each drawing either "AS-BUILT" drawing denoting no revisions on the sheet, or "REVISED AS-BUILT" denoting one or more revisions. Original contract drawings shall be dated in the revision block. For an example, see "Sample Drawing Attachment".
2. Revisions Block entries: Those sheets, which have no changes, will only be labeled AS-BUILT as described above. Those sheets which have changes shown on them will have REVISED AS-BUILT entered in the first available space. This will be revision one and a number 1 will be entered in the triangle at the beginning of that line. In the event the sheet has already been revised and a number and revision appear in the revision lines the next sequential number will be used. Normally the first entry is made in the first line. The completed originals CADD file drawings will be reviewed for accuracy and initialed by the Contractor. For an example, see "Sample Drawing Attachment".
3. Marking Revisions: Place an equilateral triangle (3/8" per side) near the area revised for all changes. One triangle may be placed near the table or detail title where several items in a table or detail are

changed or completely redrawn. This same method may be used for general revisions to floor plans and system plans (plumbing, electrical, a/c, heating); when a major portion of the drawing is changed, the triangle may be placed near the diagram, detail, section or plans title. A triangle will be placed near each item when only a few items are revised, added or deleted. The triangles will contain the same number as the as-built revision on that sheet. *Any modification that results in a change order, shall include the contractor's cost to change the working and final as-built drawings to reflect the modification.*

4. Revision Annotations:

- a. Deletion - to show an item was not installed, cross the item out on the drawing along with any associated devices, connecting lines, ducts, pipes etc., including notes and dimensions. To show a detail is not being used, box the detail and letter NOT USED across the detail. A box will be drawn on the sheet with an X as shown in Attachment 5. The words NOT USED will be in heavy block lettering a minimum of 5/8" high. Place a triangle and revision number inside the box where notes are indicated as not being used.
 - i. Notes - draw a line thru the note or line item in a table in lieu of erasing the line item or note. A triangle and number will be placed near the deleted item.
 - b. Additions - show a new or additional item or items and associated connections made if the print indicates such connections. A triangle and number will be placed near the new item. All lettering will conform to the existing lettering on each sheet.
 - c. Relocations - draw the item in the new location and erase it from the old location. All connections will be transferred if applicable, such as wiring, piping, and ducts. Revision triangles with appropriate number will be shown at the new and old location.
5. Sentence Tense: Changes to As-Built drawings shall not include text changes that are tense changes, for example, "EXISTING GROUND LINE" to "ORIGINAL GROUND LINE"; "SHALL BE REMOVED" to "REMOVED."
6. Drawing continuity: The applicable drawings shall be marked-up when a change was made, although this will not always be the case. Final responsibility for drawing continuity is with the person doing the as-built. When one floor plan indicates a wall, room, doors etc., has been changed, the same change shall be made on all other applicable drawings. When the change is applicable to only one discipline such as electrical and does not directly affect other discipline sheets, a note may be added to other discipline sheets such as "See sheet _____ for as-built Conditions."
7. Shop drawings: When shop drawings are added to the original contract drawing set they need to be appropriately labeled with the Chicago District file number, and discipline and sequence sheet number. The Index of Drawings will also need to be revised to show the additional sheet (s) with the appropriate sheet title. In the case where the shop drawing are smaller than the Corps standard sheet size (i.e. 8.5"x11" or 11"x17" etc.) the sheets will be cut into a standard Corps sheet size border sheet and appropriately labeled. (For additional information refer to Mark-up Guidelines, Shop drawings above.)
8. Microstation Resource files unique to Chicago District can be provided upon request.

GENERAL PROCESS:

1. During the preconstruction meeting, USACE will provide the Contractor two hard copies of the drawing and specifications and a CD with the electronic files. The contractor shall use these to make modifications, additions or deletions from the original design during construction.
2. As changes are made to the as-designed drawings, follow "[MARK-UP GUIDELINES](#)" and "[DRAFTING STANDARDS](#)" presented in this publication.
3. Transfer the changes from the working as-built marked prints to the "as-designed" electronic CADD files.
 - a. Final as-built drawings shall be prepared after the completion of each definable feature of work as listed in the Contractor Quality Control Plan (Foundations, Utilities, Structural Steel, etc., as appropriate for the project).
4. The Resident Engineer will conduct monthly meetings held between the Project Office's Staff and Contractor's Staff. The Resident Engineer will denote any deficiencies in the working as-builts. If the deficiencies are not addressed in a reasonable time frame. A portion of the monthly payment maybe retained by the government, to make the corrections. The amount is not to exceed the amount listed in the specification.
5. The contractor shall submit the Final As-built on a new CD and two sets of ANSI D or ANSI F Size plots to the Resident Engineer. The size of the plots is dependent upon what was provided to the Contractor on the Contract Set CD. Use the same sheet size as used in the original drawings.
6. The Resident Engineer shall perform a review and provides comments back to the contractor. The As-builts will then be sent to the District Office for additional review for completeness. Any major oversights will be sent back to the contractor for correction. The contractor will plot a new set of drawings and the burn a CD with the electronic files (CADD and PDF).
7. Upon acceptance by the government, the retained amount for the government's expense to create the as-builts, identified in the specification will be released.

REFERENCES:

The Architectural, Engineering, and Construction (A/E/C) standards may be downloaded from the CADD*BIM Technology Center at the following link:

<https://cadbim.usace.army.mil/CAD>

The U.S National CAD Standard (NCS) presents a comprehensive U.S. CAD Standard for the design, construction and facility management industries. The A/E/C CADD Standard is a DoD implementation of the NCS.

<http://www.nationalcadstandard.org/>

CREDITS:

The original guidance for preparing as-builts was published in 2004, by USACE, Sacramento District. The guidance was modified in 2007 for USACE, Chicago District.