

**SECTION 01725**

**AS-BUILT DOCUMENTS**

**PART 1 GENERAL**

**1.01 INTRODUCTION**

- A. As-Built drawings are prepared to show changes made to the project during construction, and are the official records of the project at the time of construction completion. All additions, deletions and other changes made during construction are indicated by modifying the original contract drawings. Accurate as-built drawings are very important for operation and maintenance, and when modifications to a facility are made in the future, particularly for plumbing and electrical systems, which are hidden from view.
- B. Instructions for preparing high-quality As-Built drawings are contained in the following paragraphs.
- C. ***Prior to each request for partial escrow release, Engineer will review the working as-built drawings with the Contractor. Progress payments may be reduced by, as much as 15 percent if working as-builts drawings are not current.***

**1.02 MARKED-UP PRINTS: (Working As-Builts)**

- A. Whenever changes, additions or deletions from the original design are made during construction, they will immediately be noted on each of the as-built print set, as appropriate. No other marks, doodles, notes, or annotations shall be put on these sets of as-built prints. All changes from the contract plans, which are made in the work, or additional information which might be uncovered in the course of construction will be accurately and neatly recorded as they occur by means of details and notes. All changes and/or required additions to the paper prints will be clearly identified in color contrasting to blue or black, preferably red. The as-built print sets will be annotated in as much detail as necessary to clarify exactly what construction changes were performed.
- B. Areas of Concern: The following are some of the general items that need some special checking to ensure that the marked-up prints are complete and accurate:
  - 1. Location, size and type 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.
  - 2. Layout and schematic drawings of electrical circuits and piping.

3. Correct dimensions and details transferred from shop drawings.
4. Verification of alignment, cross-section, and layout of the earthwork.
5. Actual location of anchors, construction and control joints, etc., in concrete.
6. Changes in location of equipment and architectural features.
7. Cross out such words and phrases as “or equal, and list specifically the items of material provided.
8. Unusual or uncharted obstructions that are encountered in the contract work area during construction.
9. Location, extent, thickness, and size of stone protection particularly where it will be normally submerged by water.

C. Minimum Required Data

1. Water Distribution Systems
  - a. At least 2 ties to all valves, service lines, fittings and fire hydrants from permanent points (manholes, property lines, property corners, curbs or pavement). An acceptable station and offset system may be used.
  - b. Location of mains from property or easement lines and alignment distance from centerline of road at 300+/-ft. intervals.
  - c. Separation between force mains and water mains if they exist within 10 feet of water mains.
  - d. Water main material, lengths, and distance of mains from building or structures within 20 feet of the water main.
  - e. Distance from hydrant to hydrant valve.
  - f. Pertinent easement information, including width of easement, legal description, show Official Record Book and page number, and distance from water main to sides of easement.
2. Sewage Collection Systems
  - a. Manholes are to be designated by stationing from a known, and easily located, starting point. Provide sewer line lengths, materials, and slopes between manholes.
  - b. Manhole tops and flow lines are to be designated to the nearest 0.01 feet and referenced to a known bench mark.

- c. Location of force mains and gravity mains from property or easement lines and alignment distance from centerline of road at 300+/-ft. intervals.
  - d. Separation between reuse or force mains and water mains if they exist within 10 feet of water mains.
  - e. Type of sewer main material and distance of mains from buildings or structures within 20 feet of the sewer main.
  - f. Distance from manhole to manhole and distance from downstream manhole to each sewer lateral/main wye. Finished invert and manhole rim elevations in addition to sewer lateral terminating end elevations.
  - g. Sewer laterals are to be located with respect to lot corners.
  - h. Pertinent easement information, showing Official Record Book and page number.
  - i. A certification by the surveyor/engineer accepting responsibility for accuracy of information supplied on the as-built drawings and a statement that all mains are within easements and/or public right-of-ways.
- D. Mark-up Guidelines: The following information is provided to the Contractor as suggestion to improve the quality of the marked-up prints and thereby facilitate preparation of as-built drawings after construction. The most important guideline is that the marked-up changes on the prints shall be complete and understandable. The draftsperson that later will make the corrections on the original tracings likely will not have worked on the original design and probably will not have been on-site during the construction of the project. Visits to the site by the draftsperson, or visits to the draftsperson by the construction superintendent, can be minimized by providing complete and understandable marked-up prints.
- 1. Use written explanations on As-Built drawings more frequently to describe changes - do not rely totally on graphic means to convey the revision.
  - 2. 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.
  - 3. 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.
  - 4. When changes are made, cross out all features, data and captions that relate to that revision.

5. 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.
6. Be sure descriptive markings in red conform to legend symbols shown, or provide a legend if other colors are used.
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's.
10. Annotating the drawing, "Per Change Order #2," means nothing when the actual change order states, "added an additional 12 duplex" outlets or similar statements. The Operator 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.
11. The markups shall be accomplished on blue or black line copies of the most current originals. Frequently the packages received consist of blue or black lines, which do not include one or more revisions made on the originals through the amendment process prior to contract award. This raises the question, which drawing was used for construction? This is especially true if major revision to the facility have been made on the originals.
12. Shop drawings are to be incorporated into the As-Built drawings. They will be provided in electronic CAD file format (or 3 mil double matte polyester or photo mylar for non-electronic contracts). Hand drawn or plotted paper shop drawings will not be accepted as submittals.

The quality of shop drawings which normally accompany "As-Built's" packages are not usable as original drawings for several reasons.

- a) The "shop drawings" are not reproducible in blue line form.
- b) The drawings are not of an adequate scale or are drawn to no scale and are not transferable to the Engineers drawings due to lack of information.

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.

1.03 CONTROLS

A. Minimum Horizontal Controls

1. Within easements: Bearing and distance of utility as referenced to property corners. Bearing to be based on plat data when within a platted subdivision.
2. Within road right-of-way: Stationing with offsets right and offsets left. Stationing to begin at a prominent easily described and easily identified point. Stationing to be based on plat data when within a platted subdivision.

B. Vertical Control

1. A bench mark referenced HTWSA datum (State Plane datum of 1929).

1.04 AS-BUILT DRAWINGS: (Final As-Builts)

A. The Contractor will transfer the changes from the marked-up prints to the original electronic CAD files (or original mylar drawings).

B. At SUBSTANTIAL COMPLETION the Engineer will provide the Contractor the electronic CADD drawing (or original mylar drawings) for his use in preparing the as-builts. The electronic format will be in AUTOCADD 2000 format.

C. Certification

1. Certification Shall Be Placed On The As-Built Drawing And Shall Include:
  - a. Basis of horizontal and vertical control.
  - b. Statement that drawings were checked in the field and are a true representation of improvements.

1.05 DRAFTING STANDARDS:

A. The Owner requires that standard professional engineering drafting practices be utilized in correcting the original contract mylar or electronic CAD drawings to show as-built conditions. In general, the letter styles, line thickness, and scale will be the same as the original drawings. Corrections will be made in black ink, unless the originals are prepared in pencil, in which case the corrections also will be in pencil. When shop drawings or other sheets are added, they will be drawn

in electronic CAD or on 3 mil double matte mylar or reproduced on photo mylar and will be the same size and layout as the original drawings. The following specific requirements apply to the preparation of as-built drawings:

- B. Revisions Block entries: 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 original drawings (or CAD files) will be reviewed for accuracy and initialed by the Contractor.
- C. Marking Revisions: All changes will be indicated by placing an equilateral triangle near the area revised. Where several items in a table or detail are changed (or completely redrawn), one triangle may be placed near the table or detail title. 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, and section or plans title. When only a few items are revised, added or deleted a triangle will be placed near each item. The triangles will contain the same number as the As-Built revision on that sheet.
- D. Revision Procedure:
  - 1. Deletion - when the marked-up print indicates an item was not installed, the item will be crossed out on the drawing along with any associated devices, connecting lines, ducts, pipes etc., including notes and dimensions. When a detail is indicated as not being used, the detail may be boxed and NOT USED lettered across the detail. A box will be drawn on the (reverse side for manual drawings) sheet with an X. The words NOT USED will be in heavy block lettering. A triangle and revision number will be placed inside the box where notes are indicated as not being used.
  - 2. Notes - a line may be drawn thru the note or line item in a table in lieu of erasing the line item or note. The line will be drawn on the reverse side for manual drawings. A triangle and number will be placed near the deleted item.
  - 3. Additions - When the marked-up print indicates items have been added, the new or additional item or items will be drawn on the original 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.
  - 4. Relocations: When the marked-up print indicates an item has been moved and the new location is shown or indicated, the item will be drawn in the new location and erased 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. 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."

6. Shop drawings: When shop drawings are added to the original contract drawing set they need to be appropriately labeled with the HTWSA 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 is smaller than the standard sheet size (i.e. 8.5"x11" or 11"x17" etc.) the sheets will be cut into a standard sheet size border sheet and appropriately labeled.
7. CAD Standards: All as-built "triangled" changes (refer to MARKED REVISIONS paragraph above) shall be on a separate single layer named ASBUILT, using a single color with an associated medium pen width.

1.06                      TRANSMITTAL PROCEDURE

- A. Unless otherwise specified, the as-builts shall be transmitted in accordance with Section 01300.

**PART 2                      PRODUCTS**

Not used

**PART 3                      EXECUTION**

Not used

**END OF SECTION**