A/E/C CAD Standard and A/E/C Graphics Standard Frequently Asked Questions (FAQ) updated 8/24/2022

1. Question: Why do I need a CAD Standard?

Answer: The National CAD Standard (NCS) provides the following response to this question:

"For anyone faced with organizing (or simply understanding the organization of) electronic building design data for CAD produced in a multitude of formats, the value of organizing the data in a consistent format is immediately apparent. In the absence of a single national CAD standard, many companies and organizations have developed internal "office standards" as a way of consistently organizing their own electronic CAD data. The value of such office standards is limited to their realm of influence. For design firms, that realm may not extend beyond the firm itself, except in cases where design sub-consultants can be compelled to adopt it. Large building and property owners may require adoption of a "company standard" as a condition for providing design services to them, and thus influence a realm well beyond their immediate organizations. However, the effort required to develop office standards is a now an unnecessary cost of doing business, and the duplication of effort required to develop multiple office standards is a gross and blatant inefficiency."

Prior to the release of the A/E/C CAD Standard or National CAD Standard, each DoD agency maintained their own CAD standard. Oftentimes, each District/Office within each agency had individual internal standards. It was also possible that each Branch within each District/Office developed their own standard! This resulted in a nightmare when exchanging files between branches/Districts/agencies. Standards cut down the confusion over where items should go in a CAD files and what those items should look like. Only within the past year, the CAD/BIM Technology Center received complaints for A-Es performing work for USACE over the number of border sheets they had to maintain. Once A-E provided examples of 9 different border sheets they had to keep up with from 9 different Districts. Why? Same thing with text heights. One District required the A-E to develop drawings using 3/32" high text, while another District required 1/8" high text. Why?

Standards are not just an option for agencies as large as USACE, NAVFAC, Army, Air Force, NASA, or GSA, they are a necessity. Following a standard has been proven to save not only time in the development of CAD drawings, but also money. Developing standards for CAD also allows tools to be developed to further assist in the implementation of standards. The release of tools within the A/E/C Work Structure

takes all of the guesswork out of the Standard (as well as reducing the time in looking up in the Standard how things should look).

2. Question: Is Back-Referencing within the Drawing Area Title for details/sections/elevations allowed?

Answer: The practice of Back-Referencing is not explicitly allowed or disallowed in the NCS. The NCS defines the Drawing Area Title symbol, for the detail ID, as a circle with 1/4" text height (*however, see Question #3 below*). The fact that the NCS does not include Back-Referencing as an option, or provide any mention of Back-Referencing, implies that Back-Referencing is not allowed (however, it is never explicitly stated).

The Work Structure committee (WSC) working with the CAD/BIM Center, has developed a method of adding Back-Referencing to the Drawing Area Title tool, that is not in conflict with the NCS convention. This method of adding text that identifies what sheet and where, in the border sheet grid, the detail/section/elevation callout is located will be included in the next release of the A/E/C Graphics Standard. See the A/E/C Work Structure User's guide for details on the Drawing Area Title tool. **(Supplement to the A/E/C Graphics Standard)**

3. Question: The NCS Drawing Area Title (DAT) symbol requirements do not work with sheet sizes above a D-size sheet because of additional grid modules being available. Are adjustments to the DAT allowed to accommodate larger size sheets?

Answer: The NCS requires that the DAT be sized to the following specifications

The problem that was discovered after the A/E/C CAD Standard R6.0 was published was that for E-size sheets and above, the 1/4" text height requirement within the "bubble" is too large. When placing a detail/section/elevation in grid column 10 or higher, the text spills over the bubble (see figure below).

(D10) (E10) (F10) (G10)

(D11) (E11) (F11) (G11)

(D12) (E12) (F12) (G12)
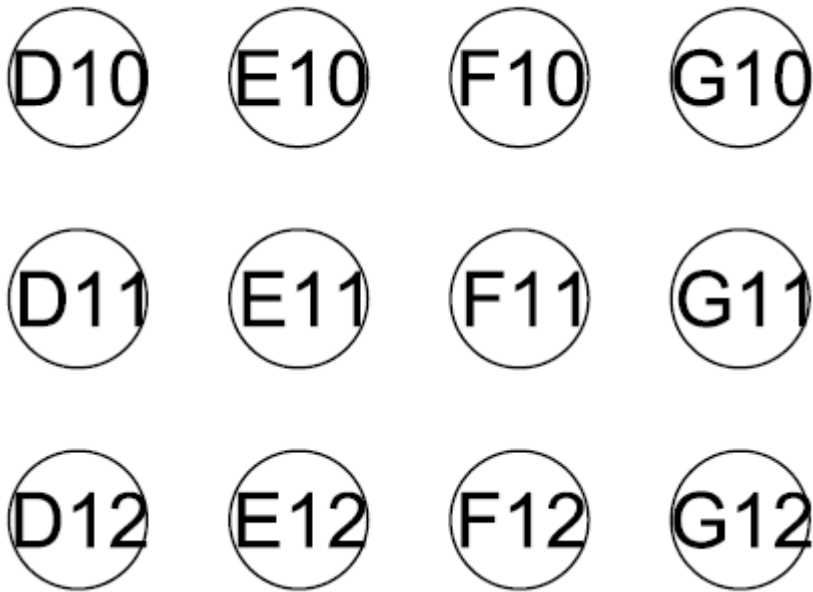
Also, it has been commented that with the majority of the rest of the drawing text set to 3/32", 1/4" text within the DAT looks disproportional to the rest of the drawing. To fix this problem, the text within the DAT bubble and the DAT title text will be reduced from 1/4" to 3/16". All other settings specified by the NCS for the DAT will still be in effect. ***This fix will be made to the A/E/C Work Structure and is an <u>official</u> allowed deviation from A/E/C CAD Standard R6.0. Furthermore, this fix will be submitted as a ballot item for NCS V7 when ballot items are requested. (Revision to the DAT tool in the A/E/C Work Structure and section 4.2.3.2 in the A/E/C Graphics Standard)***

4. Question: Our District has a reviewer that wants to enforce all aspects of the Graphic Standard to the letter. I really do not want to override associative dimensioning to address this issue (i.e., manually editing metric dimension text from 45000 to 45 000).

Answer: This metric dimension requirement cannot be achieved through a dimension style setting in AutoCAD. The only way to do it is by manually editing the dimension (which does override the associativity of the dimension). For R3.0 of the Graphic Standard, this Note will be changed to:

Note: The automatic dimensioning features of AutoCAD do not allow users to replace commas with spaces in dimension text, otherwise the associative properties of the dimension to the object being dimensioned would have to be overridden. Until AutoCAD includes a dimension setting to allow this, AutoCAD users are not mandated to follow this requirement. ***(Revision to the A/E/C Graphics Standard)***

5. Question: In Table 2-3 of the A/E/C CAD Standard (Sheet File Discipline Designators), for all the disciplines with an "S" Level 2 Designator denoting "Site", this typically follows the *D "Demolition" and *- "All or any portion of subjects in the following Discipline Designators" in sequence. However, in the Mechanical part of the table, "Site" is more than halfway through the sequence. Is this correct?

Answer: Mechanical Site "MS" should immediately follow "MD" and "M-" in the sequence in Table 2-3. This will be fixed in R7.0 of the A/E/C CAD Standard ***This fix will be made to the A/E/C Work Structure and is an <u>official</u> allowed deviation from A/E/C CAD Standard R6.0. (Revision to the A/E/C CAD Standard)***

6. Question: All section, elevation, and detail indicators in the A/E/C Standard and Work Structure are 5/8" diameter. The National CAD Standard V6 does not give a diameter size for the detail indicator, 1/2" diameter for an exterior elevation indicator, 3/8" diameter for an interior elevation indicator, and 1/2" diameter for a section indicator. Why the deviation in the Standard and all the variations in the NCS?

Answer: The NCS made the change to the interior elevation indicator for V6 because they felt a 5/8" diameter circle was too large. However, 3/8" is now too small for some potential sheet numbers (see figure below). Even 7/16" diameter is potentially too small. A 1/2" bubble seems to be the best case to fit all text that could be used. So, for all section, elevation (interior and exterior), and detail indicators in the A/E/C Standard and Work Structure, the bubble will be changed to 1/2" diameter. This will bring the Standard and Work Structure in conformance with NCS section and exterior elevation indicators, but will conflict with NCS interior elevation indicators (and unknown for NCS detail indicators, since no size is provided). (**Note:** upon looking at the symbols provided by the NCS, the interior elevation symbols are set to 5/8" diameter, so NCS does not follow what is in the documentation.)
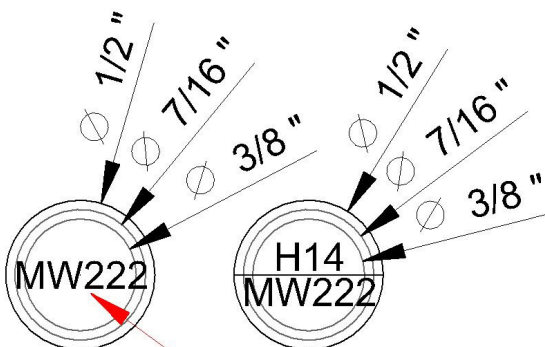
MECHANICAL DISTRIBUTED
ENERGY ELEVATION SHEET

This fix will be made to the A/E/C Work Structure (to be released in September 2016) and will be an <u>official</u> allowed deviation from A/E/C CAD Standard R6.0. Through the end of FY16, the 5/8" diameter bubble is allowed. Furthermore, this fix will be submitted as a ballot item for NCS V7 when ballot items are requested. (Revision to the A/E/C CAD Standard)

7. Question: A lot of the text and drawing items in the A/E/C CAD Standard Level/Layer Assignment Tables are yellow (RGB 255, 255, 0). I realize this choice was made to make these items stick out on a color monitor. However, this is a real problem when you make a color print of your drawing. The yellow is too bright when printed on a white paper background. Could this color be toned down so it becomes more visible?

Answer: With more and more agencies moving to color plots vs black & white, this is a problem. To solve this problem, all yellow (255, 255, 0) items have been changed to more of a "dirty yellow" (255, 200, 0), in order to make them more visible on a color plot. *This fix has been made to the A/E/C Work Structure and is an <u>official</u> allowed deviation from A/E/C CAD Standard R6.0. (Revision to the A/E/C CAD Standard)*

8. Question: In the A/E/C CAD Standard, there is a section about how an "A" or a "B" can be appended to the end of a file name, in order to insert the new file into a pre-existing set. This is allowed to help reduce the work load for a large number of sheets, and having to rename and reorganize a set of plans.

What about the opposite situation? During a review, things change and sheets are needed to be removed from the contract set. Is it true that once an ID is created for a given sheet then that ID should stay with that sheet regardless if it is no longer in the contract? Also, should a history of the sheet being created or deleted from the contract be retained in an Excel file?

Answer: The key question is: when is the addition or the removal of the sheet occurring?

Schedule permitting, if a sheet is being added or removed **before** advertisement, then sheets should be renumbered in sequence. Otherwise, questions will pop up as to "where is the sheet X-XXX?" If the schedule doesn't permit, the sequence numbers can be left as they are.

If a sheet is being removed **after** advertisement, then removal of the sheet should be documented in the index with an amendment or a mod symbol.

If you do need to reuse the sheet ID, then this needs to be noted on the sheet with a revision triangle <u>and</u> a Description in the Revision (Issue) Block to the effect of "Reissued by Amendment (or Modification) XXXXX".

For how the history is retained, this is up to the site. However the Index Sheet is the primary document holder of the sheet IDs and the sequence. *(Supplement to the A/E/C CAD Standard)*

9. Question: The A/E/C Graphics Standards says in the SHEET IDENTIFICATION BLOCK section on page 11 that: "The height of the sheet identifier shall be 1/4" high". If so, why does the delivered Sheet ID cell/block have this height set to 9/32"?

Answer: The text height of the sheet identifier was increased to differentiate this information in the Sheet Identification Block when the Building ID option was added. The text in the Graphics Standard was copied from an older release and failed to get updated. The text should read:

SHEET IDENTIFICATION BLOCK: The Sheet Identification Block (Figure 2-9) contains, at a minimum, the sheet identifier and the "SHEET ID" title. The sheet identifier is composed of the discipline designator, the sheet type designator, and the sheet sequence number (e.g., A-101). The height of the sheet identifier shall be 9/32" high. The "SHEET ID" title shall be 1/8" high. *(Revision to the A/E/C Graphics Standard)*

10. Question: The wording of the General Notes section of the A/E/C Graphics Standards (p. 41) is confusing and conflicts with the National CAD Standard with regard to sheet-specific notes.

Answer: There is a conflict currently in the sentence below, which leads to confusion:

"General notes applicable to specific sheets shall be worded GENERAL NOTES: THIS SHEET ONLY or GENERAL NOTES: SHEETS _____ THRU _____."

To conform to the NCS, the sentence will be revised to state:

"General notes applicable to a range of sheets shall be worded GENERAL NOTES: SHEETS _____ THRU _____.   Sheet-specific notes shall be located on the applicable sheet and titled "GENERAL SHEET NOTES". The following figures will also be added for clarification:

GENERAL NOTES

1. THESE ARE GENERAL NOTES.
2. THEY ARE LOCATED NEAR THE BEGINNING OF A SET OF DRAWINGS ON A G-00# SHEET
3. GENERAL NOTES START IN THE UPPER LEFT CORNER AND CONTINUE DOWN AND TO THE RIGHT AS NEEDED
4. GENERAL NOTES APPLY TO ALL SHEETS IN THE SET

GENERAL (DISCIPLINE) NOTES

1. THESE ARE GENERAL (DISCIPLINE) NOTES.
2. THEY ARE LOCATED AT THE BEGINNING OF THE (DISCIPLINE) DRAWINGS ON A X-00# SHEET
3. GENERAL (DISCIPLINE) NOTES APPLY TO ALL (DISCIPLINE) SHEETS IN THE SET

GENERAL (DISCIPLINE) NOTES: SHEETS X-102 THRU X-109

1. THESE ARE GENERAL (DISCIPLINE) NOTES.
2. THEY ARE LOCATED AT THE BEGINNING OF THE (DISCIPLINE) DRAWINGS
3. THESE GENERAL (DISCIPLINE) NOTES THAT APPLY TO SPECIFIC SHEETS IN THE SET

GENERAL SHEET NOTES

1. THESE ARE GENERAL SHEET NOTES

2. THEY ARE LOCATED IN THE UPPER RIGHT CORNER ON THIS SHEET ONLY

3. GENERAL SHEET NOTES APPLY ONLY TO THE SHEET THEY ARE LOCATED ON

US Army Corps of Engineers®
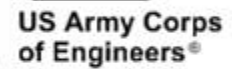
⬡ SHEET KEYNOTES

1. THESE ARE SHEET KEY NOTES

2. THEY ARE LOCATED IN THE UPPER RIGHT CORNER BELOW GENERAL SHEET NOTES IF APPLICABLE

3. SHEET KEYNOTES APPLY TO THE KEYED VALUES IN THE DRAWING ON THIS SHEET ONLY

LEGEND

1. THIS IS A SHEET LEGEND

2. IT IS LOCATED ALONG THE RIGHT SIDE BELOW KEY NOTES AND/OR GENERAL SHEET NOTES IF APPLICABLE

DATE

DESCRIPTION

MARK

SSUE DATE:

OLICITATION NO.:

ONTRACT NO.:

(Revision to the A/E/C Graphics Standard) Note: While this answer solves the NCS compliancy question, comment has been made on the use of "GENERAL SHEET NOTES" for titling sheet-specific text. Specifically, if the notes are

specific, why is the word "GENERAL" included in the title? For the next version of the NCS, it will be recommended in a voting ballot that this wording be revised.

11. Question: Section 5.3 Downloadable Resources under the A/E/C CAD Standard: Release 6.0 refers to a link to download the entire symbology library (https://cadbim.usace.army.mil/aeccadstandard). This link appears to be broken, is there another way to access these files?

Answer: The CAD/BIM Technology Center's website was revised after publication of both Standards documents. The revised link is https://cadbimcenter.erdc.dren.mil/aeccadstandard *(Revision to the A/E/C CAD Standard)*

12. Question: How should match lines be created so they are compliant with the Standard?

Answer: According to the NCS, match lines shall use an "extra wide (i.e., 0.70 mm) center line, 1/8" text, medium line, typical" (see NCS figure below).


For the A/E/C Standards, all match lines shall go on layer G-ANNO-MATC. Per the NCS, the line width shall be 0.70 mm and use line style 014200-914 Center Line. Since it is apparent from the text "MATCH LINE" that the reviewer will be required to go to another sheet to see the continuation, the word "SEE" is redundant and not required. At a minimum, use "XX/X-XXX" only (see figure below for info on these fields) when there are multiple drawing views on the referenced sheet and "X-XXX" when there is only one.

(Revision to the A/E/C Graphics Standard)

13. Question: How should conduits that handle multiple types of cable systems be handled?

Answer: Currently, power/grounding/communication lines are all on separate linestyles. Also, each type of system is on individual layers (e.g., E-COMM-CIRC, E-GRND-CIRC, etc.). When you have multiple circuits passing through the same conduit, the drawing becomes extremely cluttered, because you have linestyles on top of one another. To fix this problem, additional linestyles will be added to the library, showing a single linestyle that represents multiple circuits passing through a single conduit (see image below):
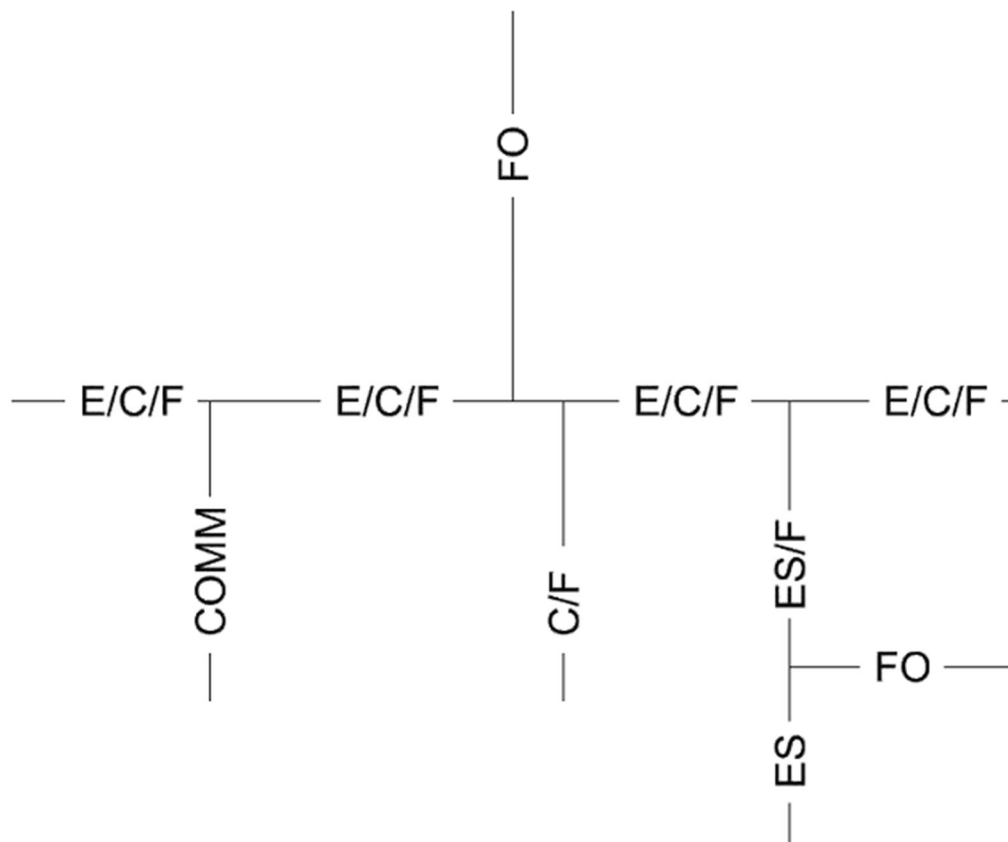
To solve the problem where you must decide which layer a linestyle representing multiple circuits should go on, it will be up to agencies to possibly create additional layers available to the Electrical Discipline. These could potentially be layers like E-DISC-CMB1, E-DISC-CMB2, and E-DISC-CMB3 with the descriptions "Combined utility information – Group 1", "Combined utility information – Group 2", and "Combined utility information – Group 3". Should additional layers be required that covered additional combined utilities, then the user can create CMB4, CMB5, etc. layers. *(Revision to the A/E/C CAD Standard)*

14. Question: Section 5.2.7.3 "Large units of measure" in the A/E/C Graphics Standard requires manual editing of AutoCAD files where metric dimensions are 4 or

more digits to the left of the decimal point. Since AutoCAD does not have a way of achieving this setting, manual editing is tedious. Also, the ASTM standard this section is based on has been withdrawn and never replaced. Manually editing automatic dimensions in essence requires replacement of dimensions with text.

Answer: Since the ASTM standard has never been updated or replaced and since this dimension setting cannot be easily created in AutoCAD (unlike MicroStation), section 5.2.7.3 will be removed with a note stating "Section rescinded". ***(Revision to the A/E/C Graphics Standard)***

15. Question: Table 3-3 in the A/E/C CAD Standard is causing confusion.

Answer: A note will be added below Table 3-3 stating: "Note: When plotting in Black and White, all RGB color values plot as Black and screening is performed by using one or more of the following: indexed colors 250-254, display styles, setting the layer plot style to Screened_60(-20)%, and/or a screening parameters (such as setting logical names of reference files to "SCRN60(-20)"). See AutoCAD and MicroStation help documentation for more information on how to perform screening." ***(Revision to the A/E/C CAD Standard)***

16. Question: Section 2.4.4 in the A/E/C CAD Standard has an error.

"For example, if two sheets need to be added between sheets

ERDC8000A-104 and ERDC8000A-105, then the sheet file names for the

inserted sheets would be ERDC8000A104A and ERDC8000A104B."

This should read:

"For example, if two sheets need to be added between sheets

ERDC8000A-104 and ERDC8000A-105, then the sheet file names for the

inserted sheets would be ERDC8000A-104A and ERDC8000A-104B."

Answer: The current text goes against what is presented in Figure 2-4. This will be revised in Release 6.2 ***(Revision to the A/E/C CAD Standard)***

16. Question: At the request of the Civil CoP, the minimum text height established in the A/E/C Graphics Standard (Table 5.2) is still too small for reviewing drawing sets (currently shows 0.1"). Needs to be at least 1/8".

Answer: Districts were polled to determine if the minimum text height for Civil disciplines needed to be increased from 0.1" to 1/8". The majority of Districts were in

favor of this change. The Executive Committee was briefed on this change on 4/27/20 and they approved this change at the same meeting. If a District still wishes to use 0.1" (or even the very minimum 3/32") for text heights, that is still allowable according to the Standard, however all workspaces and templates will be developed around the revised 1/8" text height. Section 5.1.6 will be revised to the following:

"5.1.6 Text height
The minimum text height for dimensions, notes, callouts, table/schedule text, and general text in plotted files is 3/32 in. (2.4 mm). Title and subtitles shall be plotted equivalent to 3/16 in. (5 mm) and 1/8 in. (3 mm) lettering size, respectively. The text height and text width shall be assigned equal number values. Line spacing shall be equal to one-half of the text height.

To avoid confusion of the word "minimum", Table 5-2a shows the allowable text height variations from paragraph above for all architectural or vertical disciplines (Hazardous Materials, Structural, Architectural, Interiors, Fire Protection, Plumbing, Mechanical, Electrical, Telecommunications, Resource, Other Disciplines, and Operations). Table 5-2b shows the allowable text height variations for civil or horizontal disciplines (General, Survey/Mapping, Civil, Geotechnical, and Landscape). Text heights for symbols, line styles, and text within the border shall follow the heights listed in Table 5-2a, regardless of the discipline.

Table 5-2a. Vertical Discipline
Final Allowable Text Heights.

| Units | Actual | International Feet | Survey Feet | Metric | |
		Architectural	Architectural	Actual	Architectural
Normal Text Height	0.09375"	3/32"	N/A	2.38125mm	2.4mm
Sub-Title Height	0.125"	1/8"	N/A	3.175mm	3mm
Title Text Height	0.1875"	3/16"	N/A	4.7625mm	5mm

Table 5-2b. Horizontal Discipline
Final Allowable Text Heights.

| Units | Actual | International Feet | Survey Feet | Metric | |
		Civil	Civil	Actual	Civil
Normal Text Height	0.125"	0.125"	0.125si	3.175mm	3mm
Sub-Title Height	0.125"	0.125"	0.125si	3.175mm	3mm
Title Text Height	0.1875"	0.1875"	0.1875si	4.7625mm	5mm

Table 5-3 lists recommended text heights for common inch-pound scales, as well as line type scale factors for those scales. Table 5-4 lists recommended text heights for common metric scales."

Note: *The scales shown are not all inclusive. Scales used shall be limited to those commonly found on hand-held architectural, mechanical, and engineering scales. Common scale factors are provided in the A/E/C Workspace through annotation scale. Tables 5-3 and 5-4 are provided as*
a reference for AutoCAD and legacy drawings.

This will be revised in Release 2.2 **(Revision to the A/E/C Graphics Standard)**