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3D Standards; a Continuous Journey of Best Practices
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Learning Objectives
- Gain understanding of why standards in the modeling environment are important to establish and grow
- Grasp the magnitude of 3D tools needed to produce work effectively, no matter who is completing the work
- Understand how design styles and templates can escalate the creation of models, assemblies, and drawings
- Learn how to maintain consistency throughout a project’s lifecycle

Description
Standards! You need standards! Every company needs structure. However, what about 3D standards? If you are using Inventor software, AutoCAD Mechanical design software, AutoCAD Electrical software, AutoCAD P&ID software, and/or Vault data management software, standards are necessary. Inventor has the intelligence of 3D modeling, assembling, and drawing creation—come and see what we can standardize and incorporate to make the design modeling and assembly creations consistent. It’s not just about 2D layers and dimension styles with a drawing, it’s about iProperties, intelligence (iLogic), libraries, bills of material (BOM), analytical data, and much more. Inventor 3D design tools are incredible and can be structured so that you are not continually duplicating the same task repeatedly, and so that the information instilled in the design(s) is captured properly. Structure repetitive steps with iLogic, maintain the digital BOM, format the parts list, and systematically build standards in a database library. Understand how to incorporate data management into a project’s workflow. 3D standards will reach not just into the Inventor modeling world, but further into the intelligence that must stream throughout the lifecycle of a project. See how to capture all 3D CAD standards, and be able to consistently sustain them from release to release and from user to user within your company. See examples of people and companies that did not have 3D standards and then built those standards into their design workflows. Standards—2D or 3D—are an ongoing sustaining process that can and will benefit all aspects of the design processes. There are challenges in starting the standards, because everyone wants what they feel is correct; therefore, it is good practice to form a CAD committee. The CAD committee is a structures entity and can agree on the proper pieces of standards to incorporate.
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Introduction

This continuing journey started six (6) years ago here at Autodesk University as “3D Standards; New Thinking” (CM3844 - 2011). My colleague (Allan Chalmers, Lend Lease out of Australia) and I who met 7 years ago found such common ground in our careers along with passion for the work we do with Cad that we wrote the lecture and presented it together. This year I am alone with his assistance from afar as he is unable to travel to speak.

The intent of this conversation is to have you think (continuously) in a manner that brings both freedom to designs and efficiencies to production. Below is a larger paper plot of Allan’s thinking 6 years ago. Today, his thinking is out in the Forge galaxy disrupting technology from that part of the world and making a difference.

We continue the standards journey and to add to traditional standard thinking allowing a wide range of understandings, methods and workflows for the 3D workplace.

Note: The information presented is for all the “Vanilla” Autodesk® products. Autodesk® Inventor®, AutoCAD®, Autodesk® Vault®, as our main focus is manufacturing, particularly related to Project machine design, the examples given will have this focus.
Standards, in general terms...

If you were to look at the dictionary definition for the word standard, you will see that the definition as the norm, or items considered by many as being the way to go about a process.

**CAD standards**

From Wikipedia, the free encyclopedia

“**CAD Standards** are a set of guidelines for the way computer-aided drafting (CAD), or (CADD) computer aided design and drawing, drawings should appear, to improve productivity and interchange of CAD documents between different offices and CAD programs, especially in architecture and engineering.”

In the CAD environment, we understand it to be the way in which we present our work. The projection methods, colors, line types, text styles and materials. How it presents when printed. As we have evolved from the drawing board, we still make particular reference to all these items. The way a drawing is required to look still dictates the way we prepare our CAD work. Generally, the deliverable specified in the contracts we sign with our clients still dictates some of our standards.

Therefore, these standards become more than just a nice to have! They actually dictate to us what we need to do. For the future though, this will not be the case. The drawing will perhaps play a lesser role and the Metadata on the models will take its place.

**Striving for the best**

Build your Cad standards consistent with company standards and procedures. Remember that these are guidelines interjected into your company for all to follow. These guidelines instantly become sustainable and trainable actions.

One of the goals these days is to expand and integrate 3D standards. From sketching to solids or surfaces to assemblies and presentations, there are many areas to be formed in consistent measures and setting up typical actions for efficiencies. There are many reasons that 3D Cad Standards are imperative to a company’s processes and procedures.

A general Cad Committee made up of an odd number (3, 5, 7) I have found to be instrumental in a company working together to agree on standards. The committee can consist of key persons who work day to day with the tools and those who interpret the final deliverable(s).
Benefits

When you leave today, we hope that you will have a better understanding of what 3D standards can provide your users and your company. With this knowledge, you will be able to apply "a New Journey of Thinking" to your organization. This class will be a chance for you to gain new information related to workflows, along with a reiteration of some already familiar concepts.

3D Tools

Let's talk 3D… Autodesk Inventor is a powerful set of tools that begins from basic solids and surfaces to complex mathematical components iterating multiple shapes and sizes.

Part Components

With 3D modeling, let's look at Parts first. A single part is as simple as an unconstrained sketch and extruded into a solid all the way to a fully parametric iLogic drive component with a vast amount of property data. Inventor 3D design tools are incredible and are structured so that you are not continually duplicating the same task repeatedly, and so that the information instilled in the design(s) is captured properly.

If you want to go fast, go alone. If you want to go far, you need a team.

- John Wooden
Standardizing Parts files for efficiency brings in the methodology of DFM (Design for Manufacturing). Common areas to create and set up are...

- **iProperties**
- **iLogic Form**
- **Materials**
- **Colors**
- **Parameters**
- **Work Features**
- **iLogic Rules**
- **iMates**
- **Sheet Metal K Factors**

Remember when your modeling there are no Layers or Colors to worry about. Modeling consists of data configurations, settings and data information.

Base your settings around a certain global standard such as ASME, ISO, DIN, etc.

Set your default units to imperial or metric. The units can switch if needed.

The Bill of Materials tab is an area to structure this specific part.
Parameters: There are many directions to take with iProperties and the power of data information. As basic iProperties are used in Title Boxes, you need to stretch the ideas of property data ranging from your configured BOM’s streaming to custom properties in the drawing being read by tables, etc.

The idea of a standard excel spreadsheet format can be created and linked to the parameters dialog. Good practice is to purge unused data after some editing and re-establishment of the design.

Assembly Component(s)

This environment has many complexities and variations in 3D standards in which your company methodologies play a factor.

So, let us start with the front page of standards for Assemblies, the Application Options… The options to choose here range from performance decisions to visible information to adaptive moves.

At the top, we begin with Defer update option that is all about performance, but the knowledge of the user is very important in using this. A ways down you can enable the next inserted file to come in at the same orientation as the last. Continue down to visible information shown in the browser.
At the bottom is another performance option which entails opening raster or vector information and at what threshold to determine when.

The BOM is probably the most important attribute of the assembly environment.

Structure the properties that your company deems important. The standardization of BOM properties not only effects the drawing and parts list, but also can and will have effects moving the data through the channels to ERP.
3D Assemblies are more than just a bucket; they are a source of distributed information within a design that can be shared in many ways. These buckets can have snapshots of specific configurations that are both typical to standards and/or special to detailed specs. Features that allow for these configurations are Level of Detail (LOD) or View Representations (VR).

Basic standard procedures in the browser for folders can allow for organization that downstream would bring perspective to another designer.

**Pieces of the pie**

Basic 3D modeling is all about parts and assemblies, but what other aspects of design are there to utilize. Well of course, that would depend on the industry that you are in at that time and the types of designs that you are generating. The other areas could include plastics, sheet metal and possibly electromechanical. All of these areas can also find some common ground and be standardized for yourself and/or a department. There is a frame generator with layout tools to generate assemblies from multi body parts, links to Autocad Electrical to pass design information back and forth and even non-native components and the common use of other Cad data types.

A new area to standardize on is Model Based Definition (MBD). Using Inventor, we now have the tools to generate MBD or 3D tolerances focusing on ANSI Y14.41 standards. These tools can be used on parts and assemblies for which detailing can be tedious. This also brings to the table 3D Pdf’s which uses common data information.

Sheet Metal uses common bends, corners, etc. and like other pieces of the pie has common attributes for flattening and 2D deliverables. Standardizing on bend table is an absolute must and can vary from shop to shop.

**3D Methodologies**

There is a method to everything we do, whether it is walking; running or drawing. So what methods and tools would one use? Methods and techniques are not one in the same, but correlate together. In the manufacturing industry, DFM (Design for Manufacturing) and/or DFA are considered the best methodology to have. With DFM/A comes the techniques of utilizing 3D tools and features correctly and efficiently. Setting consistent workflows with 3D tools is part of being standard.
Example: Deriving components
- What Where When Why
- What do I derive
- Where do I derive
- When do I derive
- Why do I derive

**method**

/ˈmeθəd/ (ditto)

noun
plural noun: methods
a particular form of procedure for accomplishing or approaching something, especially a systematic
or established one.
• a method of software maintenance
  synonyms: procedure, technique, system, practice, routine, modus operandi, process; More
  • orderliness of thought or behavior; systematic planning or action.
    • "historical study is the rigorous combination of knowledge and method"
    synonyms: order, orderliness, organization, structure, form, system, logic, planning, design, sense
    • "there's a method to his madness"
    • short for method acting.
    noun: Method

**technique**

/tekˈnēk/ (ditto)

noun
plural noun: techniques
a way of carrying out a particular task, especially the execution or performance of an artistic work or
a scientific procedure.
• skill or ability in a particular field.
  "he has excellent technique"
  synonyms: skill, ability, proficiency, expertise, mastery, talent, genius, artistry, craftsmanship; More
  • a skillful or efficient way of doing or achieving something.
    "tape recording is a good technique for evaluating our own communications"
    synonyms: method, approach, procedure, system, modus operandi, MO, way; More
Understanding the Options, Settings and Templates

This over the years has been the cornerstone of standards based on drawings for 2D flat designs. The deliverables (Paper drawings) today need to be produced quicker than ever before, so we need to look at the tools that are used to produce views, details, sections, etc.

Application Options

With both Autocad and Inventor a first step to consistent standards are the options. 80% of these options can be set across the board and exported/imported at configurations time. The options do not tie into any specific file and contain settings for files.

Settings & Styles

Document settings contain standards for the specific type of file that is being generated. There is some consistencies such as “Active Standard” which determines what global standard (ANSI, ISO, DOM, Etc.) your data is abiding by. Units (Imperial or Metric) and tolerances are set to product models and create deliverables.

Design Data Styles are controlled through the Styles and most of the settings are for drawings. In addition, these companywide settings are contained inside the templates.

Templates

These files are the basis for every model and drawing produced by the users and contains the document settings that we were just discussing. Templates can be created on a minimal level such as one per file type (Part, Assembly, Drawing, Presentation, Sheet Metal, etc.) or multiple templates containing pre-set model and/or drawing information.
Maintaining Consistency

Design projects consist of a lot of information and there are many ways to maintain Cad Data Standards for a department, office(s) and even global facilities. In the beginning, the environment may be wide open, but as a Cad Manager/Administrator, you can look to capture typical everyday processes and funnel them down to a level that can be sustained.

- Learn how to maintain consistency throughout a project’s lifecycle

Strategize Cad Standards

Take Charge! Look at it first as an improvement project, which begins to influence others and eventually becomes change. Strategize the location and distribution of standards from a server level. Work closely with your I.T. staff so that they understand and trust what you are trying to accomplish. When setting paths throughout the document configurations be sure to use the UNC structure (\) and not a drive letter designation such as G:\.

Structure on the server organized folders that anyone could understand 5 years down the road. Some examples are:

```
\server\Cad...  \server\Cad\Admin\Deployments
\server\Cad\Admin...  \server\Cad\Admin\Deployments
\server\Cad\Software\Inventor...  \server\Cad\Software\Autocad...
\server\Cad\Software\Inventor\Design_Data  \server\Cad\Software\Autocad\Plot_Styles
\server\Cad\Software\Inventor\Templates  \server\Cad\Software\Autocad\Templates
\server\Cad\Software\Inventor\Materials
```

Document

Documentation is the front door key for Cad Administration. Be sure that all of your strategies are written and finalized for others to follow. Store the document in a central managed folder typically under your server location. Make sure to document deployment configurations, licensing, processes and workflows. All the standards and configurations that have been created should be documented on an SOP (Standard Operating Procedures) format.
Updating and Distributing

All the software deployments, standards and documents should be sustainable. Centralizing the standards and their SOP’s allows for administration changes on a companywide level. This structure also can be copied to a test server for testing new software and standards adjustments.

Conclusion

Point of View

The intent of this conversation is to have you think (continuously) in a manner that brings both freedom to designs and efficiencies to production. Over the past 29 years methods of administrating strategies and standards has served a number of companies sustaining benefits.

Specific Action

As you leave today, do the following:
- Think of ways to improve the Cad environment
- Remove repetitive steps of modeling be created
- Look at adding intelligence to models and drawings
- Add more data to templates both 3D & 2D

Benefits

Whether you are a current Cad manager, Administrator, designer or individual user; Standards in the 3D realm can assist with both your freedom to not be repetitive and efficient to produce the deliverables. The benefits of standards cascades across the company and out to the customer.
Closing Statement
3D standards is a journey of improvements, changes and efficiencies. Standard processes and feature usage for creating models will allow your thinking and actions to be clearer.

Remember the Learning Objectives
- Gain understanding of why standards in the modeling environment are important to establish and grow
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“Experience with 3D CAD standards is an important when it comes to developing good workflows that are geared towards your company’s deliverables. Product designs help produce new workflows and better ideas to assist in accuracy and speed to market”.

Jason Hunt, Sr. Designer @ FS-Elliott Co., LLC