UT16057

# A Natural Gas Company's Journey from 2D to 3D and Beyond

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## Learning Objectives

- Understand the steps involved in implementing AutoCAD Plant 3D
- Learn how to identify the correct resources to ensure success
- See how a BIM project lifecycle is implemented and utilized in the natural gas industry
- Learn how applications like AutoCAD P&ID, Navisworks, and BIM 360 Glue work

## Description

This presentation will walk you through the journey a natural gas company took implementing AutoCAD Plant 3D plant design software. We will examine the various steps involving your reseller—Autodesk Consultants—along with internal IT resources to better ensure a successful implementation. We will show you a specific pilot project and its journey through a Building Information Modeling (BIM) project life cycle. We will also touch on some additional applications—like AutoCAD P&ID software, Navisworks software, and BIM 360 Glue software—which enhanced our BIM project life cycle. This session features AutoCAD Plant 3D and AutoCAD Plant 3D.

## Your AU Expert(s)

William is the CAD Design Manager for EQT Midstream, a Natural Gas Production and Midstream company located in Pittsburgh, PA. He manages a team of Piping, Mechanical and Electrical designers, along with 3D and Document Control administrators. Provides overall guidance for EQT Midstream' s design engineering software, including AutoCAD Plant 3D, AutoCAD P&ID, Autodesk Navisworks, AutoCAD Civil 3D, and Autodesk Vault. He has 23 years of experience as an Instrumentation and Controls Designers, 2D CAD Systems and Advanced Engineering Tools Leader. William was a member of the Plant Standards Panel during the 2012 Bentley LEARNing Conference. He helped the audience understand how a standard like ISO 15936 is beneficial to standard-based workflows and how DuPont is utilizing these standards. Bentley published 'DuPont Standardizes on Bentley OpenPlant Based on Results of Rigorous Six Sigma Evaluation Process' which William was noted in.

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Carlos is the 3D Administrator for EQT Midstream in Pittsburgh, Pennsylvania. He provides technical support, training, to a staff of over 60 professionals, in Pittsburgh, PA and our other locations in KY, TX, VA and WV. He has been using AutoCAD® for 20 years. Carlos is an Autodesk Inventor certified professional. Other software that he utilizes includes Plant Design Suite and Vault Professional. His experience is widely varied and includes real-world application of Autodesk products in the architecture, engineering and construction (AEC) and manufacturing industries.

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# Implementing AutoCAD Plant 3D – Steps & Resources

## Scope & Timing

## DESCRIPTION

EQT Midstream is looking for a 3D application which will enable but not limit our Design Engineering team to:

- ✓ Transition from 2D to 3D
- ✓ Ease to Learn/Use
- ✓ BOM Capabilities
- ✓ Clash Detection
- ✓ Review Capabilities
- ✓ Work Flow
- ✓ Drive Standardization
- ✓ Drive Efficiency

## TIMING

- Define – 1Q14
- Implementation – 2/3Q14
- Training – 4Q14
- Pilot – 4Q14

## (5) STEP APPROACH

1. Integrated Team
2. Define
3. Implement
4. Training
5. Pilot

## STEP #1 – INTEGRATED TEAM

Our first step in creating an Integrated Team was reaching out to our Reseller Case Technologies Inc. They were able to set up 3D product demonstrations for us to evaluate which best fit our needs. Once we choose Plant 3D we engaged Autodesk to assist us with implementation. We quickly discovered that the missing piece to make this work seamlessly was our IT resource at EQT.

**Case Technologies Inc.**

- ✓ Reseller
- ✓ Autodesk 3D Evaluations
  - Plant 3D
  - Inventor
  - AutoCAD
- ✓ Training Center
- ✓ Software Supplier

**Autodesk Consulting**

- ✓ Solution Implementation
  - Task Orders
- ✓ Custom Development
  - AutoCAD P&ID
  - AutoCAD Plant 3D

**EQT**

- ✓ IT
  - Hardware
  - Software
  - Network Solutions

✓ **COMMUNICATION**
✓ **UPDATE MEETINGS**
✓ **RESOURCES**
✓ **ONE GOAL**

## STEP #2 – TASK ORDER #1 (DEFINE)

Autodesk Consulting defines the project scope, implementation steps, expectations, schedule and pricing in a document referred to as a Task Order. In the Task Order are 'Tasks' to complete the agreed upon scope. This document went through several draft updates to ensure scope, expectations, schedule and pricing meet our business objectives. Once the Task Order was signed and a PO was received by Autodesk the project started.

**Autodesk Consulting Task Order**

**EXECUTIVE SUMMARY**

EQT has requested services to assist in the implementation of the Autodesk Plant Design solution AutoCAD P&ID and AutoCAD Plant 3D components. Emphasis of these services will be on configuring the P&ID and Plant 3D tools to EQT's specific requirements and providing training to EQT Administrators. The following outlines the detailed tasks, deliverables and assumptions that Autodesk will be performing for this project.

**CONTENT**

- **Task 1 – Validate Product Config Requirements**
- **Task 2 – Configure Products**
- **Task 3 – On-site Product Installation**
- **Task 4 – Mentoring**
- **Schedule**

# TASK 1 – VALIDATE PRODUCT CONFIG REQUIREMENTS

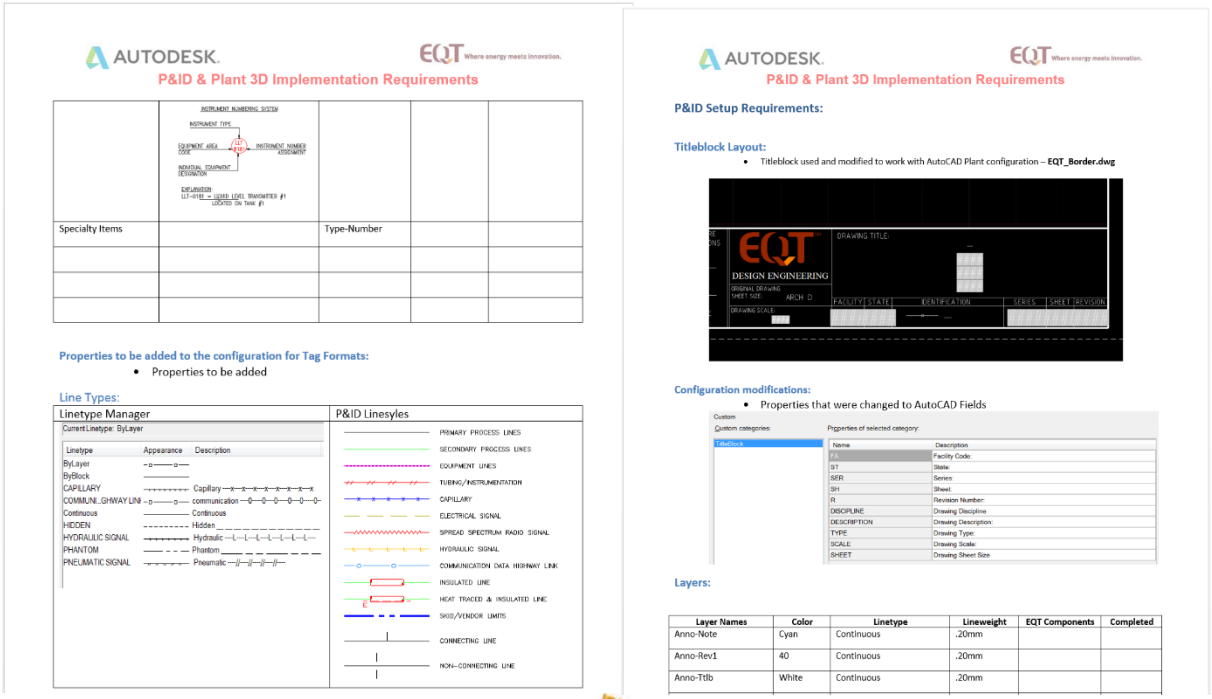
## DESCRIPTION

Autodesk will conduct an on-site workshop to review, refine and validate the specifications and requirements that were provided to Autodesk during the sales process. The purpose of this task is to ensure that the combined Autodesk/EQT team has a thorough and mutual understanding of the specifications and requirements prior to Autodesk configuring the P&ID and Plant 3D products. In addition to the requirements clarification activities, Autodesk and EQT will review Plant Design workflow best practices.

## ASSUMPTIONS

- 75% of EQT's P&ID symbology same as P&ID product out-of-the-box symbology.
- EQT product configuration specifications and requirement
- EQT P&ID standards
- EQT Plant 3D standards

## Example of Autodesk PID & Plant 3D Configuration Requirements document



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P&ID & Plant 3D Implementation Requirements

| | | | | |
|---|---|---|---|---|
| | | | | |
| Specialty Items | | Type-Number | | |
| | | | | |
| | | | | |
| | | | | |

Properties to be added to the configuration for Tag Formats:

- Properties to be added

Line Types:

| Linetype Manager | P&ID Linesyles |
|---|---|
| Current Linetype: ByLayer | PRIMARY PROCESS LINES |
| Linetype / Appearance / Description | SECONDARY PROCESS LINES |
| ByLayer | EQUIPMENT LINES |
| ByBlock | TUBING/INSTRUMENTATION |
| CAPILLARY — Capillary | CAPILLARY |
| COMMUNI..GHWAY LINI — communication | ELECTRICAL SIGNAL |
| Continuous — Continuous | SPREAD SPECTRUM RADIO SIGNAL |
| HIDDEN — Hidden | HYDRAULIC SIGNAL |
| HYDRAULIC SIGNAL — Hydraulic | COMMUNICATION DATA HIGHWAY LINK |
| PHANTOM — Phantom | INSULATED LINE |
| PNEUMATIC SIGNAL — Pneumatic | HEAT TRACED & INSULATED LINE |
| | SKID/VENDOR LIMITS |
| | CONNECTING LINE |
| | NON-CONNECTING LINE |

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P&ID & Plant 3D Implementation Requirements

P&ID Setup Requirements:

Titleblock Layout:

- Titleblock used and modified to work with AutoCAD Plant configuration – **EQT_Border.dwg**

Configuration modifications:

- Properties that were changed to AutoCAD Fields

Layers:

| Layer Names | Color | Linetype | Lineweight | EQT Components | Completed |
|---|---|---|---|---|---|
| Anno-Note | Cyan | Continuous | .20mm | | |
| Anno-Rev1 | 40 | Continuous | .20mm | | |
| Anno-Ttlb | White | Continuous | .20mm | | |

# TASK 2 – CONFIGURE PRODUCTS (P&ID & PLANT 3D)

## DESCRIPTION

Autodesk will configure and test the Autodesk P&ID and Plant 3D products to the agreed upon requirements.

## P&ID CONFIGURATION

Project Requirements

- Project Properties
- Drawing Properties

P&ID Setup

- CAD Standards
- Engineering data
- Title Block creation
- Create P&ID *.dwt

Custom report set-up and creation

Validation setting set-up

✓ P&ID LEADSHEET
✓ CAD STANDARD

## PLANT 3D CONFIGURATION

Plant 3D Setup

- Create Plant 3D *.dwt
- Layers and color settings

Isometric and orthographic templates

- 2 different isometric styles identified by EQT
- Orthographic title block creation
- Orthographic *.dwt

P&ID and Plant 3D data mapping

Custom report set-up and creation

Validation setting set-up

**ASSUMPTIONS** – Piping specifications will be done in a future task order.

## TASK 3 – ON-SITE PRODUCT INSTALLATION, DELIVERY AND VALIDATION OF CONFIGURED PRODUCTS

### DESCRIPTION

After Autodesk has configured the P&ID and Plant 3D products at the Autodesk offices, Autodesk will deliver the configured to EQT for validation / testing.

### DELIVERABLES

- P&ID and Plant 3D products configured per the requirements defined in Task 1
- Documentation for SQL Autodesk database recovery procedure
- Documentation for SQL Server installation

### ASSUMPTIONS

- Use Microsoft Active Directory authentication
- Use AD Groups
- Use preconfigured locations for SQL databases and logs
- Not use the SQL SA account
- Install and setup hardware and software including Microsoft 2008 r2 SQL Server

✓ **DEDICATED RESOURCES**
✓ **ACCESS**
✓ **ACTION ITEMS LIST**

## TASK 4 – MENTORING

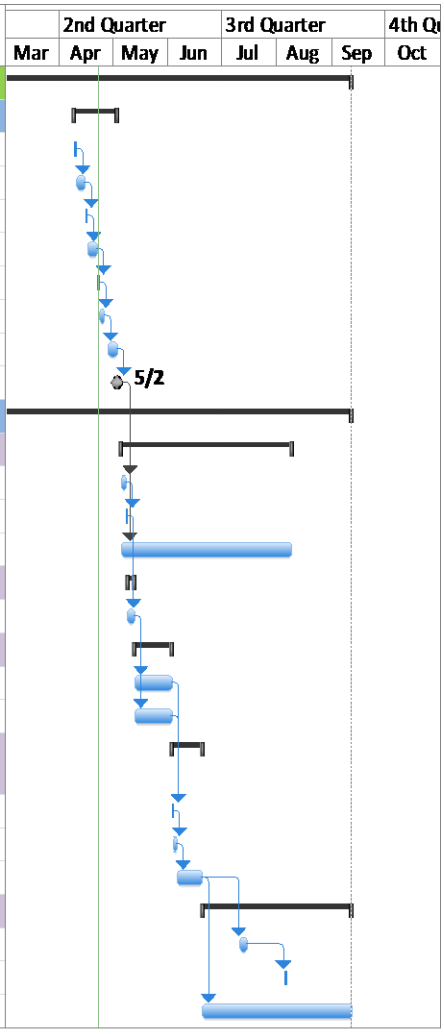
**Technical Consultant** (who completed the configuration)

- On-site mentoring – (4) days
- Remote Support – (16) hours

✓ **PROJECT CONSULTANT**
✓ **ACTION ITEMS LIST**

## TASK 5 – SCHEDULE

| ID | WBS | Task # | Task Name |
|---|---|---|---|
| 1 | 1 | | EQT Plant Solution Implementation |
| 2 | 1.1 | | Phase 0: Contracting |
| 3 | 1.1.1 | | Receive materails from EQT for review |
| 4 | 1.1.2 | | Assess materials and develop ballpark estimate |
| 5 | 1.1.3 | | Discuss with EQT |
| 6 | 1.1.4 | | Develop draft task order |
| 7 | 1.1.5 | | EQT reviews |
| 8 | 1.1.6 | | Finalize task order |
| 9 | 1.1.7 | | EQT contracting / procurement processes |
| 10 | 1.1.8 | | All contractual docs complete |
| 11 | 1.2 | | Task Order 1 |
| 12 | 1.2.1 | 1 | Project Organization and Kickoff |
| 13 | 1.2.1.1 | 1 | Project preparation & resource scheduling |
| 14 | 1.2.1.2 | 1 | Conduct kickoff meeting |
| 15 | 1.2.1.3 | 1 | Ongoing PM |
| 16 | 1.2.2 | 1 | Validate Product Configuration Requirements |
| 17 | 1.2.2.1 | 1 | Conduct on-site requirements validation workshop |
| 18 | 1.2.3 | 2 | Configure Plant Products |
| 19 | 1.2.3.1 | 2 | Configure P&ID |
| 20 | 1.2.3.2 | 2 | Configure Plant 3D - Spec creation |
| 21 | 1.2.4 | 3 | Product Installation and Delivery and Validation of Configured Products |
| 22 | 1.2.4.1 | 3 | Product installation and setup |
| 23 | 1.2.4.2 | 3 | Validate / fix product configuration |
| 24 | 1.2.4.3 | 3 | Provide remote support during EQT's UAT support |
| 25 | 1.2.5 | 4 | Mentoring |
| 26 | 1.2.5.1 | 4 | Mentoring trip #1 |
| 27 | 1.2.5.2 | 4 | Mentoring trip #2 |
| 28 | 1.2.5.3 | 4 | Remote mentoring support |



## STEP #3 – TASK ORDER #2 (IMPLEMENT)

Task Order #2 was created when we discovered that the 'Out of the Box' Catalog's and Specifications would not be sufficient to meet our business objectives. This is a key learning since at the time we had not secured a 3D Administrator to handle this task. Another key learning was finding an outside resource that could complete Catalog's and Specifications with in our project schedule and cost.

**Autodesk Consulting Task Order**

**EXECUTIVE SUMMARY**

The purpose of this project is to add the Plant 3D Catalog and some piping specifications to the Plant 3D configuration. The following outlines the detailed tasks, deliverables and assumptions that Autodesk will be performing for this project.

**CONTENT**

- **Task 1 – Create Plant 3D Catalog**
- **Task 2 – Create Piping Specifications**
- **Task 3 – Delivery and Validation**
- **Task 4 – Specification Creation Training**

✓ **SPECIFIC 3D COMPONENTS**
✓ **SPECIFIC PIPING SPECS**

# TASK 1 – CREATE PLANT 3D CATALOG

## DESCRIPTION

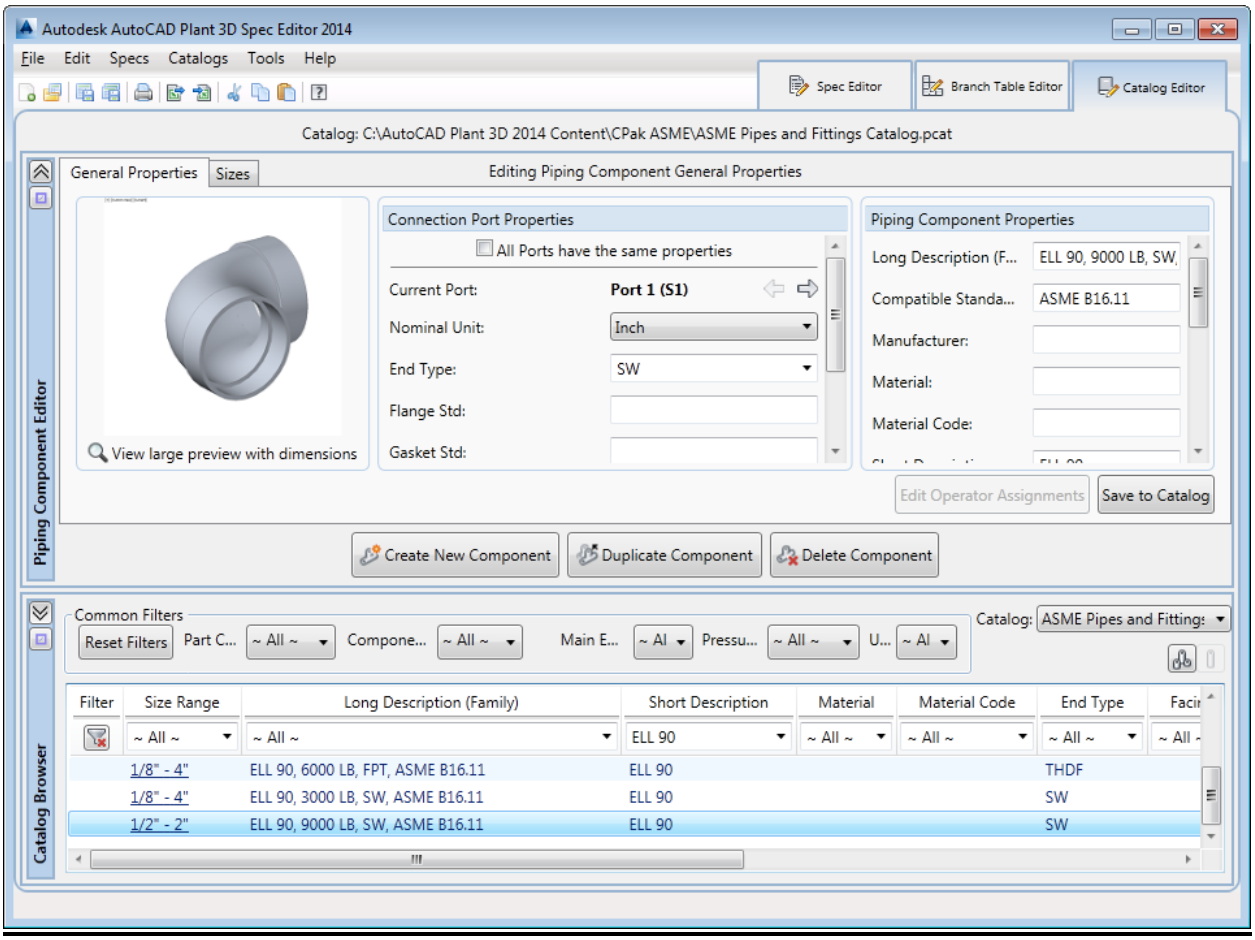
Autodesk will configure the Plant 3D Catalog. Autodesk will perform this configuration based on the requirements documented in the Parts List excel file.

## DELIVERABLES

- Plant 3D Catalog for the Plant 3D 2014 version

## EQT Responsibilities

- Provide all cut sheets






✓ **PARTS LIST**

# TASK 2 – CREATE PIPING SPECIFICATION

## DESCRIPTION

Autodesk will configure Plant 3D piping specifications. Autodesk will perform this configuration based on the requirements documented in the Parts List excel file.

## PIPING SPECIFICATION

- AutoCAD Plant 3D Specifications, (C1, C3, C6, C9)
- Procedure to link piping specifications back to the Catalog in EQT's environment.
- C1, C3, C6, and C9 Excel files with highlighted components that were not created.

| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Minimum S | To | Maximum | Long Description | | | | | | | | | |
| 2 | Spec: C6 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 6 | ---------- BleedRing ---------- | | | | | | | | | | | | |
| 7 | 8" | to | 20" | BLEED RING, 600 LB, RF, FPT | | | | | | | | | |
| 8 | ---------- BlindFlange ---------- | | | | | | | | | | | | |
| 9 | 8" | to | 20" | FLANGE BLIND, 600 LB, RF, ASME B16.5 | | | | | | | | | |
| 10 | ---------- BoltSet ---------- | | | | | | | | | | | | |
| 11 | 1" | to | 20" | STUD BOLT, ANSI 600 RF FLG., STUDS ASTM A193 GR B7 WITH (2) ASTM A194 2H HEAVY HEX NUTS PER STUD | | | | | | | | | |
| 12 | ---------- Cap ---------- | | | | | | | | | | | | |
| 13 | 1" | to | 2" | CAP, ASTM A-234 GRADE WPB, EX. HVY. | | | | | | | | | |
| 14 | 3" | to | 30" | CAP, ASTM A-234 GRADE WPB, STD. | | | | | | | | | |
| 15 | 8" | to | 8" | CAP, MSS-SP 75 GRADE HY42, STD. | | | | | | | | | |
| 16 | 16" | to | 16" | CAP, MSS-SP 75 GRADE HY52, HVY. | | | | | | | | | |
| 17 | 10" | to | 12" | CAP, MSS-SP 75 GRADE HY52, STD. | | | | | | | | | |
| 18 | 20" | to | 20" | CAP., MSS-SP 75 GRADE HY60, HVY. | | | | | | | | | |
| 19 | 1" | to | 2" | SOCKET WELD CAP, ASTM A-234 GRADE WPB, EX. HVY. | | | | | | | | | |
| 20 | ---------- Coupling ---------- | | | | | | | | | | | | |
| 21 | 2" | to | 2" | BUSHING, REDUCING, HEX. HEAD, MPT X FPT, 3000#, ASTM A105 | | | | | | | | | |
| 22 | 1" | to | 4" | COUPLING, MPT, 3000#, ASTM A105 | | | | | | | | | |
| 23 | 1" | to | 2" | SOCKET WELD, COUPLING., ASTM A-234 GRADE WPB, EX. HVY. | | | | | | | | | |
| 24 | 1/2" | to | 1 1/2" | UNION, FPT, 3000#, ASTM A105 | | | | | | | | | |
| 25 | ---------- Elbow ---------- | | | | | | | | | | | | |
| 26 | 1" | to | 2" | SOCKET WELD, S.R. 90 ELL., ASTM A-234 GRADE WPB, EX. HVY. | | | | | | | | | |
| 27 | 1/2" | to | 2" | ELBOW, 45 DEGREE, FPT, 3000#, ASTM A105 | | | | | | | | | |
| 28 | 1/2" | to | 2" | ELBOW, 90 DEGREE, FPT, 3000#, ASTM A105 | | | | | | | | | |
| 29 | 3" | to | 30" | L.R. 45 ELL., ASTM A-234 GRADE WPB, STD. | | | | | | | | | |
| 30 | 3" | to | 30" | L.R. 90 ELL., ASTM A-234 GRADE WPB, STD. | | | | | | | | | |
| 31 | 8" | to | 8" | L.R. 90 ELL., MSS-SP 75 GRADE HY42, STD. | | | | | | | | | |
| 32 | 16" | to | 16" | L.R. 90 ELL., MSS-SP 75 GRADE HY52, HVY. | | | | | | | | | |
| 33 | 10" | to | 12" | L.R. 90 ELL., MSS-SP 75 GRADE HY52, STD. | | | | | | | | | |
| 34 | 20" | to | 20" | L.R. 90 ELL., MSS-SP 75 GRADE HY60, HVY. | | | | | | | | | |
| 35 | 1" | to | 2" | SOCKET WELD, S.R. 45 ELL., ASTM A-234 GRADE WPB, EX. HVY. | | | | | | | | | |



✓ **SPECIFIC SPEC**
✓ **SPECIFIC LONG DESCRIPTION**

## TASK 3 – DELIVERY AND VALIDATION

### DESCRIPTION

Autodesk will deliver the configurations to EQT for validation / testing.

Autodesk will install the configuration on the appropriate EQT environment and ensure that it is ready for testing. Once the configurations are ready for testing, Autodesk will spend two (2) days on-site working with the EQT team to review and test / validate the configuration of these products based on the requirements defined in the Part List Excel file.

### DELIVERABLES

- EQT Plant 3D Catalog configured as defined in Task 1
- EQT Piping Specifications configured as defined in Task 2.
- Document detailing the catalog and piping specification deployment procedure

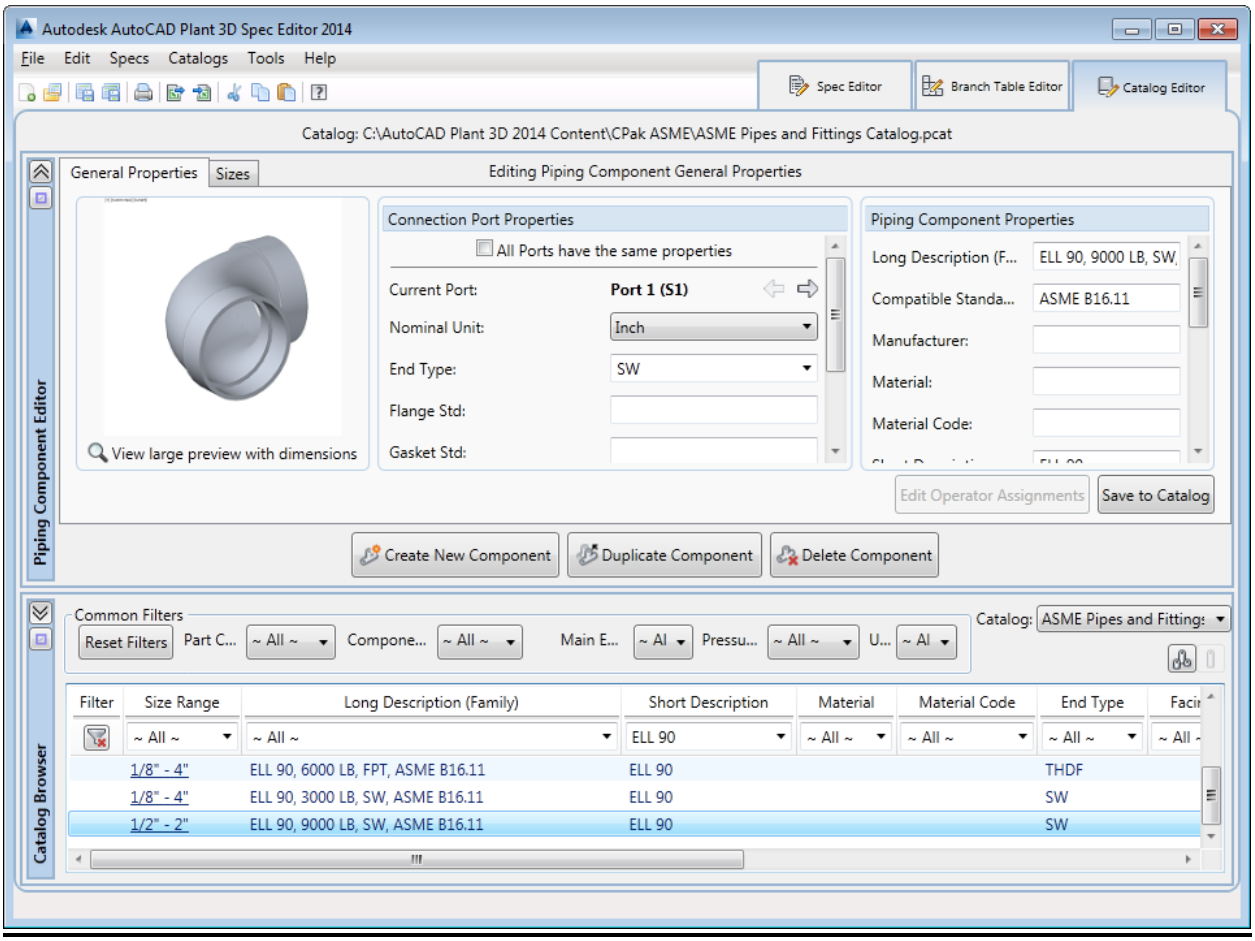
✓ **CATS N SPEC CREATOR**
✓ **ACTION ITEMS LIST**

# TASK 4 – SPECIFICATION CREATION TRAINING

## DESCRIPTION

During the Task 3 delivery trip Autodesk will conduct a one (1) day training session for up to four (4) EQT staff on how to add components to the Catalog and Piping Specifications and how to create new content. During the training, Autodesk will work with EQT to develop a C6x specification as a training exercise. This class will be performed at EQT facilities on the last day of the trip following the test/validation activities.

- On-site Training – (1) day
- Remote Support – (16) hours




✓ 3D ADMINISTRATOR
✓ STANDARDIZATION

## STEP #4 – TRAINING

Training is a critical for the ultimate success of Plant 3D. Ensuring that you secure a Qualified trainer for the appropriate duration and course of study. Next you want to make sure you are training users that plan to utilize the software with a set time period, if not ensure your trainees keep excellent notes in the training manual. If possible, communicate with the trainer in advance to see if they can apply your build or work flows so that training applies to your specific needs.

**Class:** Intro to Plant 3D 2014

**Training Days:** 4 Days

**Location for Training Days:** Case Technologies, Inc Training Lab

**Course:** Hands On - interactive with exercises including:

- Introduction to AutoCAD Plant 3D
- AutoCAD P&ID
- AutoCAD Plant 3D – Imperial
- Autodesk Navisworks
- Setting up and Administering a Plant Project

✓ **TIMING**
✓ **QUALIFIED TRAINER**
✓ **DURATION**
✓ **MANUAL**

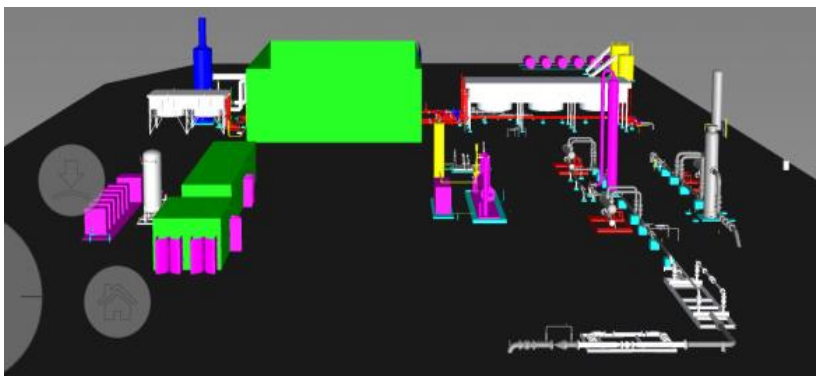
## STEP #5 – PILOT PROJECT

To help prove out the implementation we chose a small Compressor Station with a Dehy as our Pilot Project. As expected we went through learning curves and tweaked several Config files. The Pilot Project meet all of our expectations and was successfully built and operating on time and with in budget.

### NOTABLE UPDATES AND LESSONS LEARNED

- P&ID
  - Certain Instrument Tag's did not display all of their numbers
  - PRV Tag was missing
  - Learning curve on Primary and Secondary Pipelines
- Model
  - Cats n Specs for specific project parts
  - Olet connections kept disconnecting
- ISOS
  - Title Block to show Pipe Line Number
  - ISO Notes
  - How to break Pipe Lines up to fit on ISO
  - BOM to show correctly

**PILOT PROJECT COMPRESSOR STATION WITH DEHY**



# BIM Project Life Cycle – Natural Gas Industry

The US National Building Information Model Standard Project Committee has the following definition:

> *Building Information Modeling (BIM) is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition.*

Traditional building design was largely reliant upon two-dimensional technical drawings (plans, elevations, sections, etc.). Building information modeling extends this beyond 3D, augmenting the three primary spatial dimensions (width, height and depth) with time as the fourth dimension (4D) and cost as the fifth (5D). BIM therefore covers more than just geometry.

Building information models span the whole concept-to-occupation time-span. To ensure efficient management of information processes throughout this span, a BIM manager (also sometimes defined as a virtual design-to-construction, VDC, project manager – VDCPM) might be appointed. The BIM manager is retained by a design build team on the client's behalf from the pre-design phase onwards to develop and to track the object-oriented BIM against predicted and measured performance objectives, supporting multi-disciplinary building information models that drive analysis, schedules, take-off and logistics. Companies are also now considering developing BIMs in various levels of detail, since depending on the application of BIM, more or less detail is needed, and there is varying modeling effort associated with generating building information models at different levels of detail.

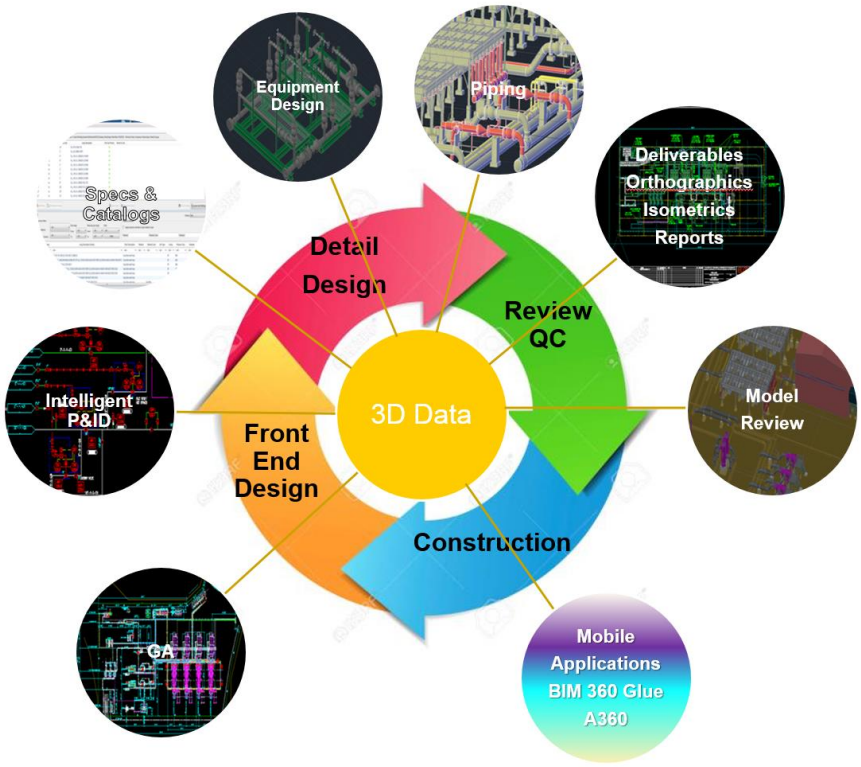
EQT's Integrated working between all disciplines by using a single, shared project model which is held in a common data environment (Vault/ Autodesk Design Suite). All parties can access and modify that same model, removing the final layer of risk for conflicting information.

Benefits of BIM at EQT

- Labor hours
  - Less communication errors
  - Quicker revision process
- Less material loss
- Less rework in Construction Process
- Less errors due to Software interoperability

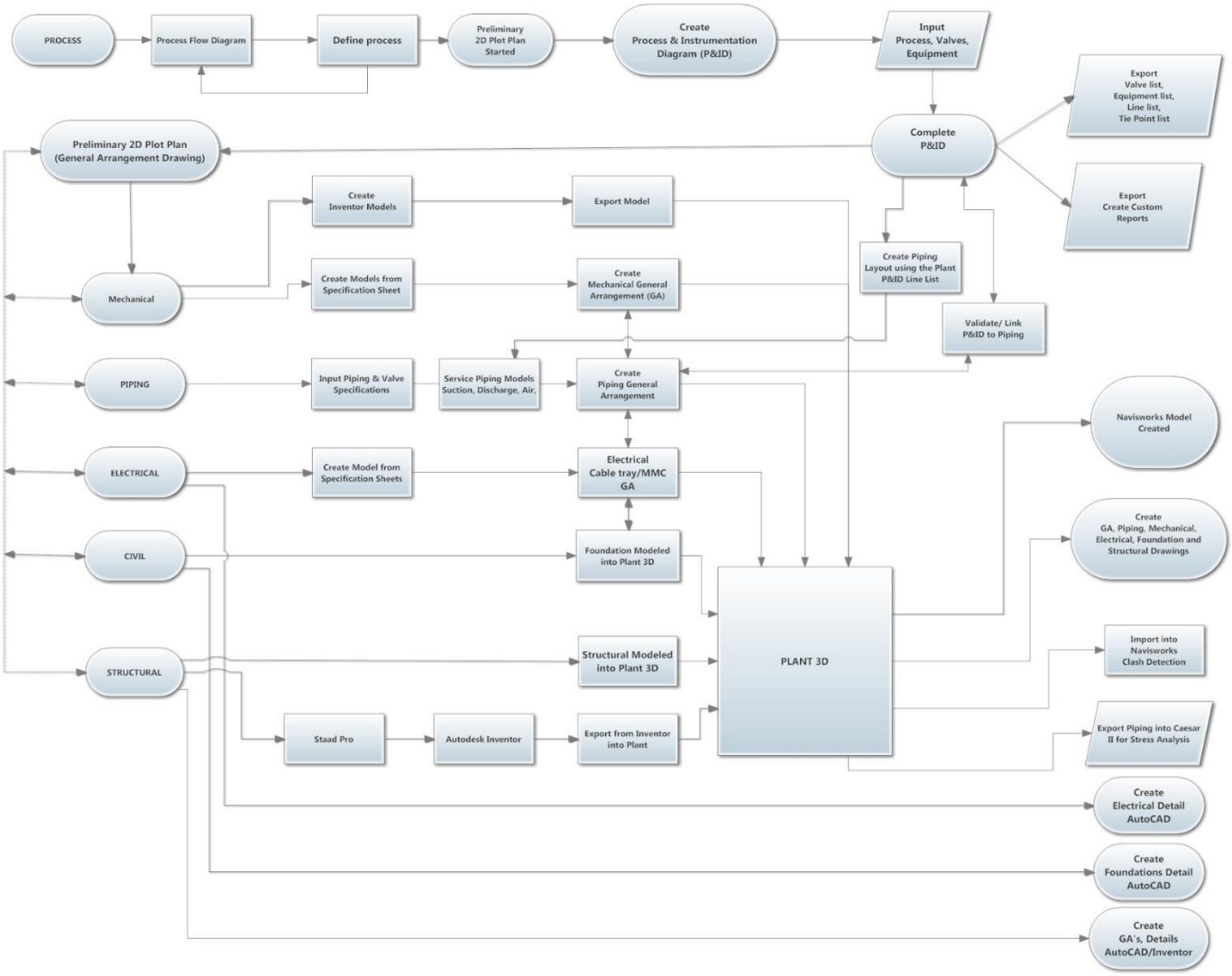
BIM Implementation at EQT has shown to achieve an ROI of min 10%. A Collaborative BIM Model is a truly-interoperable system that offers complete integration and helps project teams tweak and change modules in the models in every stage of a project's work cycle! And interestingly, there is no data loss or conflict in the BIM process.

## LIFECYCLE




- **Front End Design**
  - Preliminary General Arrangement
  - Process Flow Diagram
  - Cut & Fill
- **Detail Design**
  - AutoCAD P&ID
  - Spec & Catalog
  - P3D
- **Review/QC**
  - Deliverables
    - Orthographic drawings
    - Isometrics
    - Reports
      - Line List
      - Tag List
    - Navisworks Model
- **Construction**
  - BIM 360 Glue
  - A360
  - UAV Laser scanning

## Workflow


PROCESS
Process Flow Diagram
Define process
Preliminary 2D Plot Plan Started
Create Process & Instrumentation Diagram (P&ID)
Input Process, Valves, Equipment
Export Valve list, Equipment list, Line list, Tie Point list
Complete P&ID
Export Create Custom Reports
Preliminary 2D Plot Plan (General Arrangement Drawing)
Create Inventor Models
Export Model
Create Piping Layout using the Plant P&ID Line List
Validate/ Link P&ID to Piping
Mechanical
Create Models from Specification Sheet
Create Mechanical General Arrangement (GA)
PIPING
Input Piping & Valve Specifications
Service Piping Models Suction, Discharge, Air,
Create Piping General Arrangement
Navisworks Model Created
ELECTRICAL
Create Model from Specification Sheets
Electrical Cable tray/MMC GA
Create GA, Piping, Mechanical, Electrical, Foundation and Structural Drawings
CIVIL
Foundation Modeled into Plant 3D
PLANT 3D
Import into Navisworks Clash Detection
STRUCTURAL
Structural Modeled into Plant 3D
Staad Pro
Autodesk Inventor
Export from Inventor into Plant
Export Piping into Caesar II for Stress Analysis
Create Electrical Detail AutoCAD
Create Foundations Detail AutoCAD
Create GA's, Details AutoCAD/Inventor

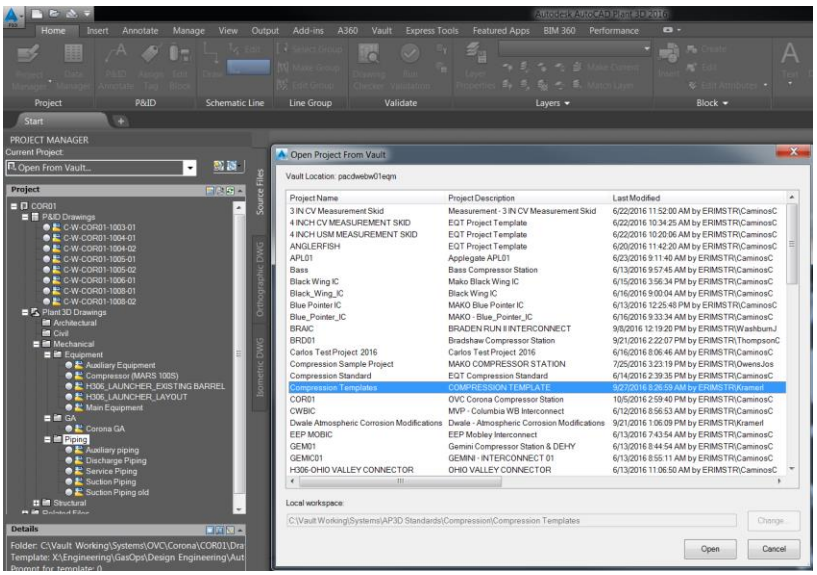
# EQT's Plant 3D Work Flow

## Front End Design

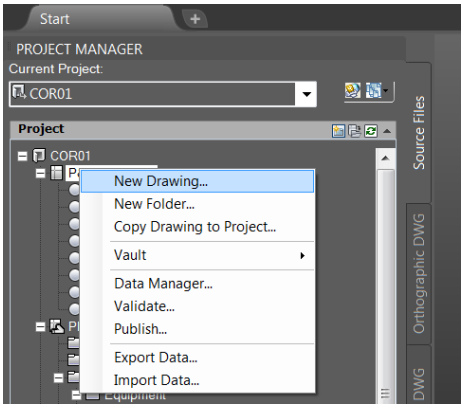
### AutoCAD P&ID

- Project Manager organizes all of your project P&IDs
- P&ID is a simple-to-use drafting tool with built-in intelligence designed to increase P&ID productivity
- P&ID data can be simply managed through Data Manager
- Reports can be created quickly and easily either from inside AutoCAD P&ID or outside the drawing using AutoCAD Plant Report Creator.

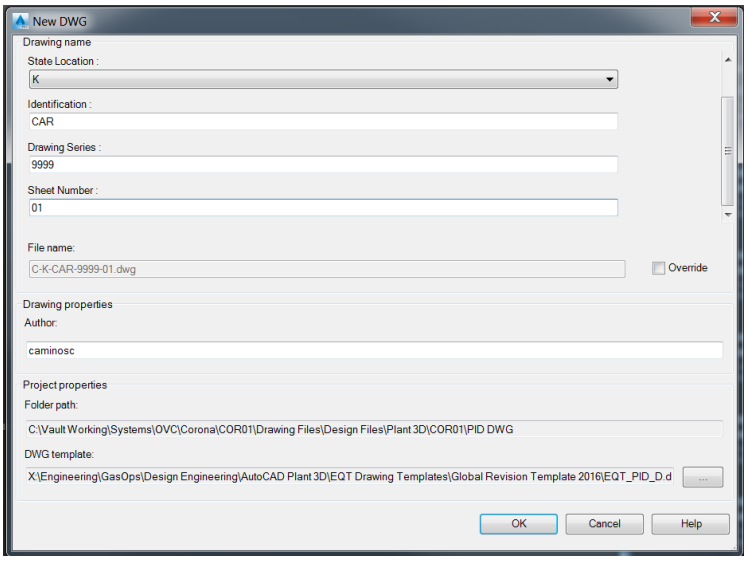
Open the project:




Create new Drawing and assign drawing number.

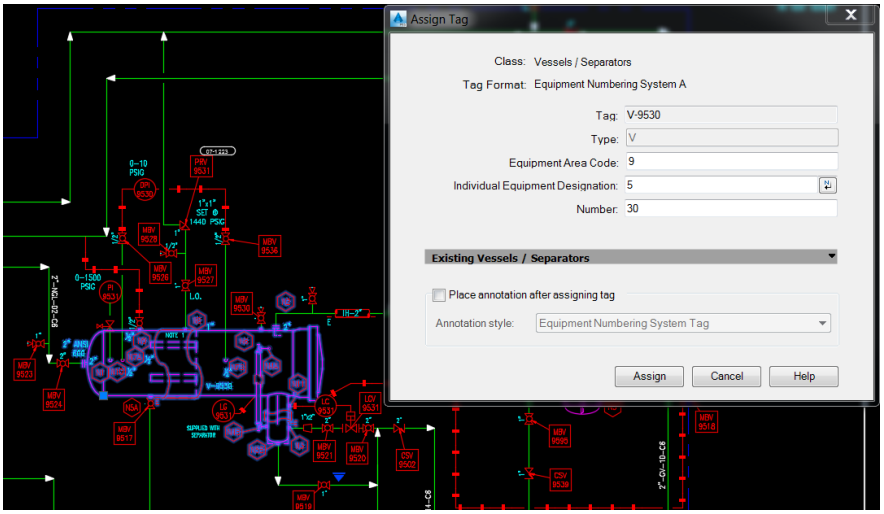


When the drawing opens, make sure you are in the P&ID Workspace. If not, click on the workspace symbol:

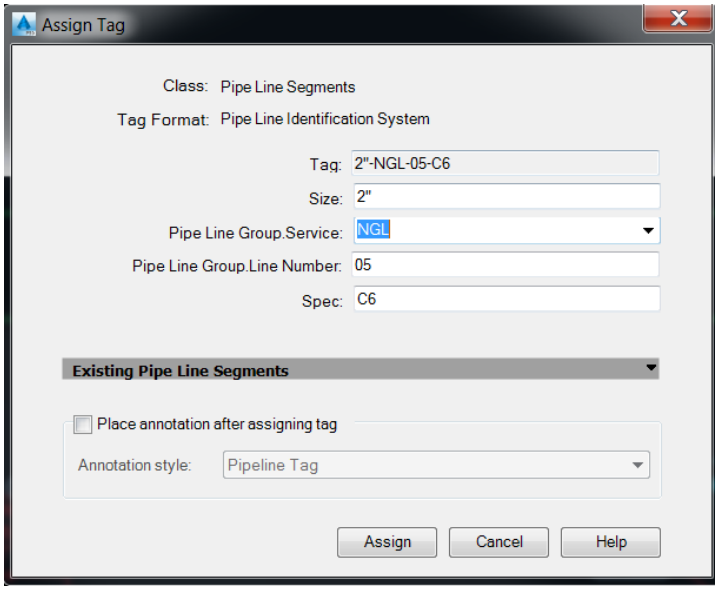


Drop in Equipment first

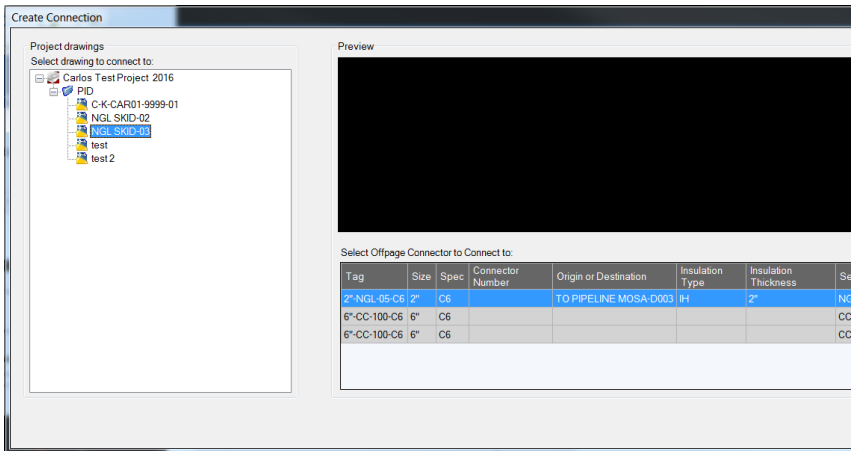
(Compressors, Pumps, and Vessels) and assign tag information:




Run process lines and assign information:

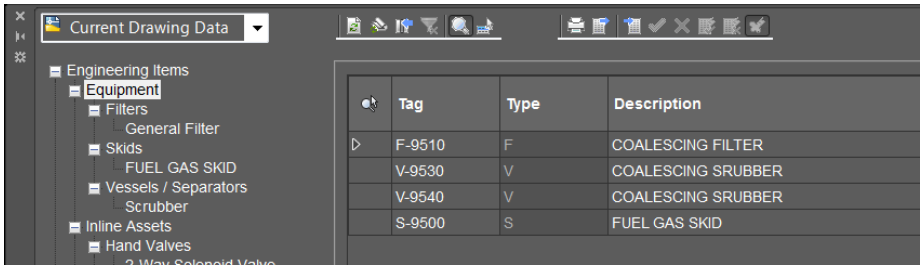



Insert page connectors, right click and connect to page connectors on other drawing:



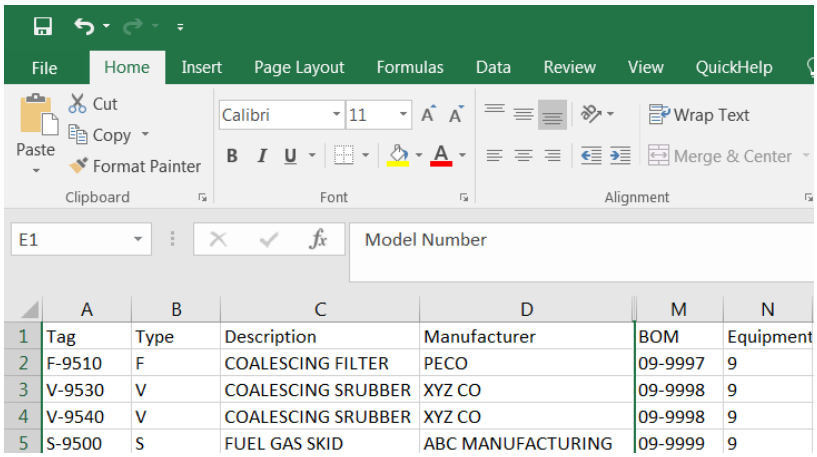
Using Data Manager to update equipment:

- Equipment name
- Tag
- Information

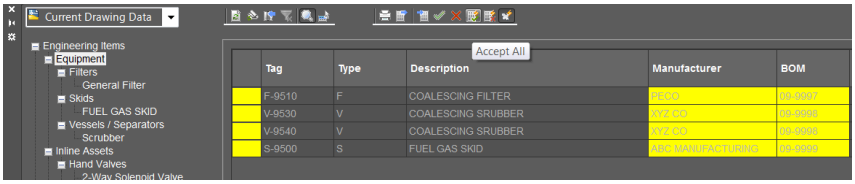



Now use Export / Import to add model number and supplier by an external user through MS Excel. First export the data to Excel:

- You can edit the information and import back into Data Manager

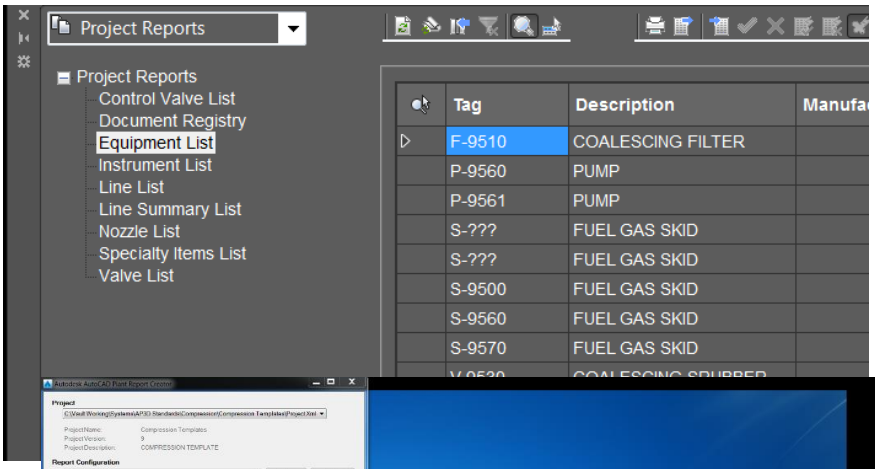



- Import changes back to the project

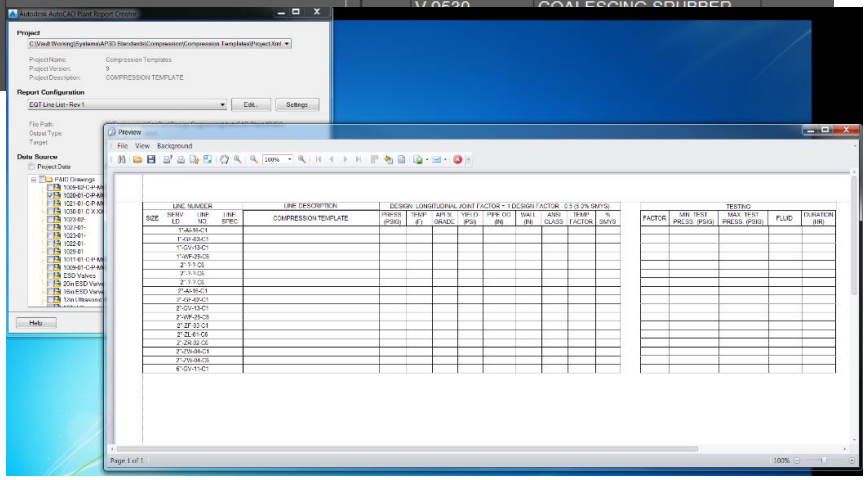


Reporting:

- Using the Data Manager, – select Project Reports in the pull-down:




- Using the Report creator select the project and the type of report to generate:
    - Report creator is used also during the Review process. Ex: BOM Report from Models

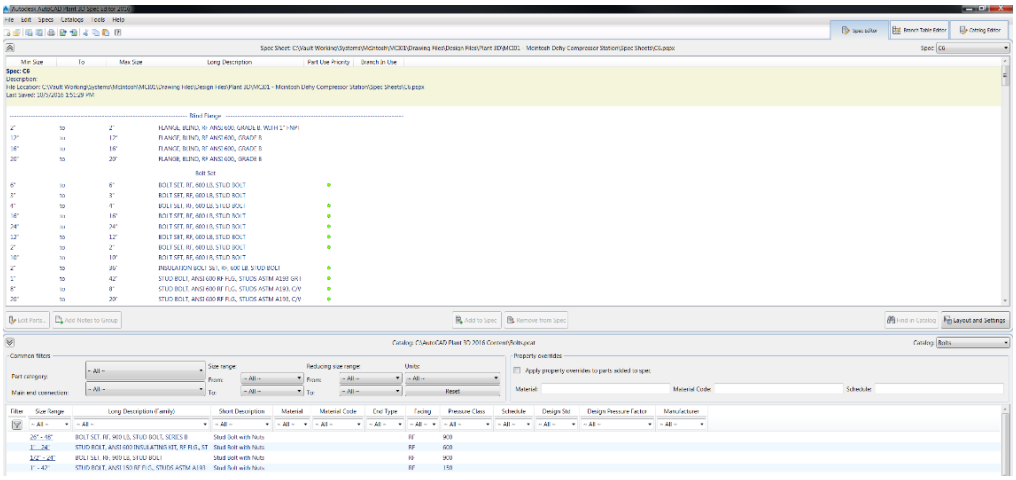


# Detailed Design

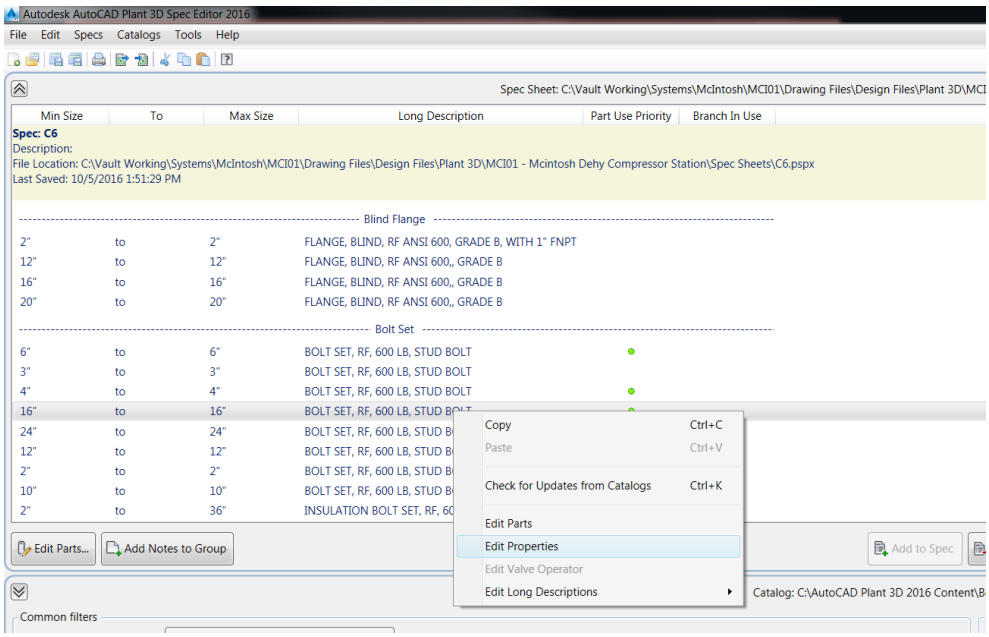
## Autodesk Plant 3D Spec Editor / Catalog Editor

Spec Editor

- Creates and modifies spec sheets.
- Using the Spec editor, you can add parts from a catalog to create a spec sheet. You can then specify which fittings to use when routing for a specific pipe size.



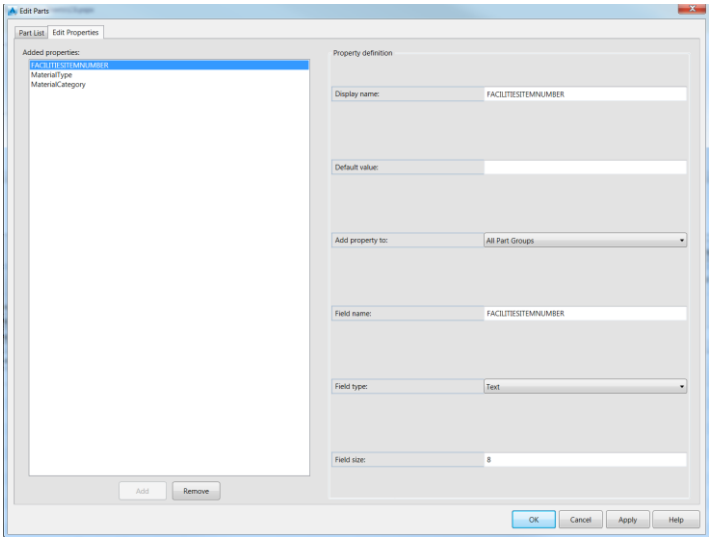
Adding Custom Properties Ex: Part number
Right click on the part



when window appears click on Edit properties
In the edit part window Enter Definition

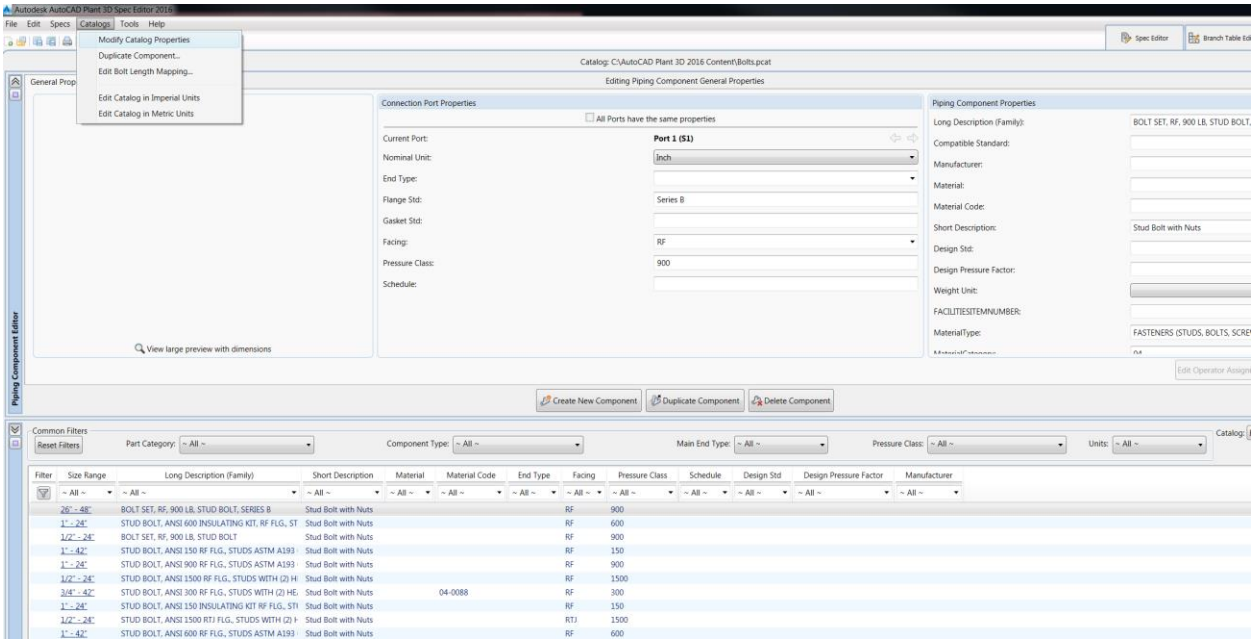
Display name: FACILITIESITEMNUMBER
Default value: (Blank)
Add property to: All Part Groups
Field Name: FACILITIESITEMNUMBER (name of the field that it will pull from the catalog)
Field Type: Text
Field Size: 8 (number of characters)

Click on Add and OK



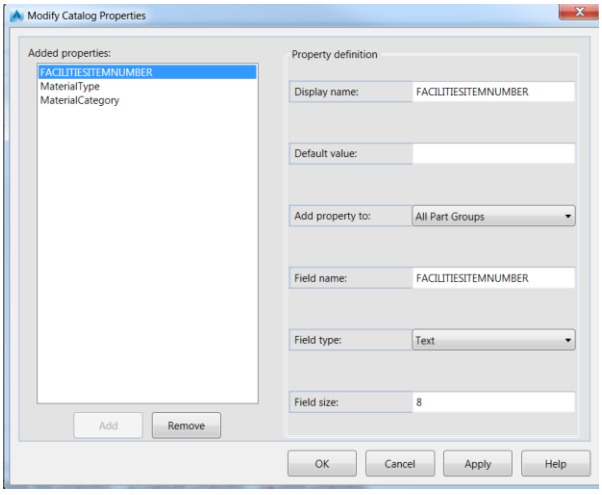
Catalog Editor

- Creates and modifies Catalogs.
- Using the Catalog editor, you can add new parameters to part families. You can then specify which fittings to use when routing for a specific pipe size.

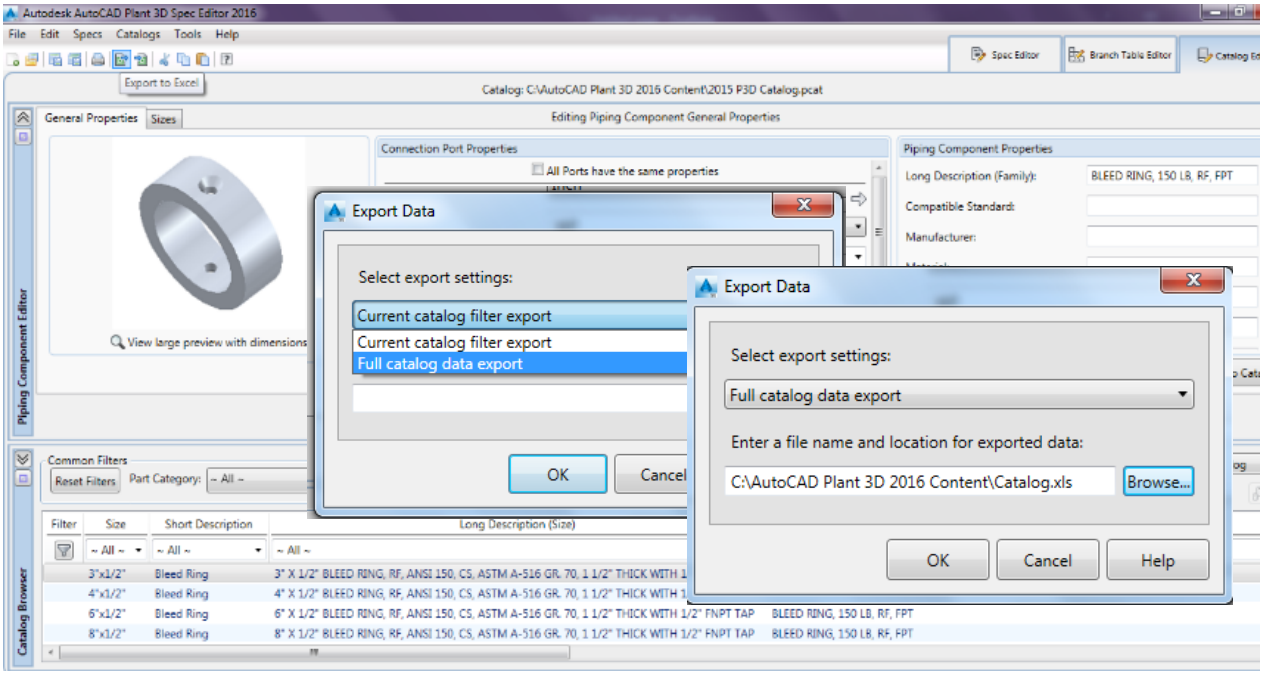



Click on Catalogs
In the pull down click on Modify Catalog Properties
Enter Property Definition

Display name: FACILITIESITEMNUMBER
Default value: (Blank)
Add property to: All Part Groups
Field Name: FACILITIESITEMNUMBER (name of the field in the catalog when you export)
Field Type: Text
Field Size: 8 (number of characters)

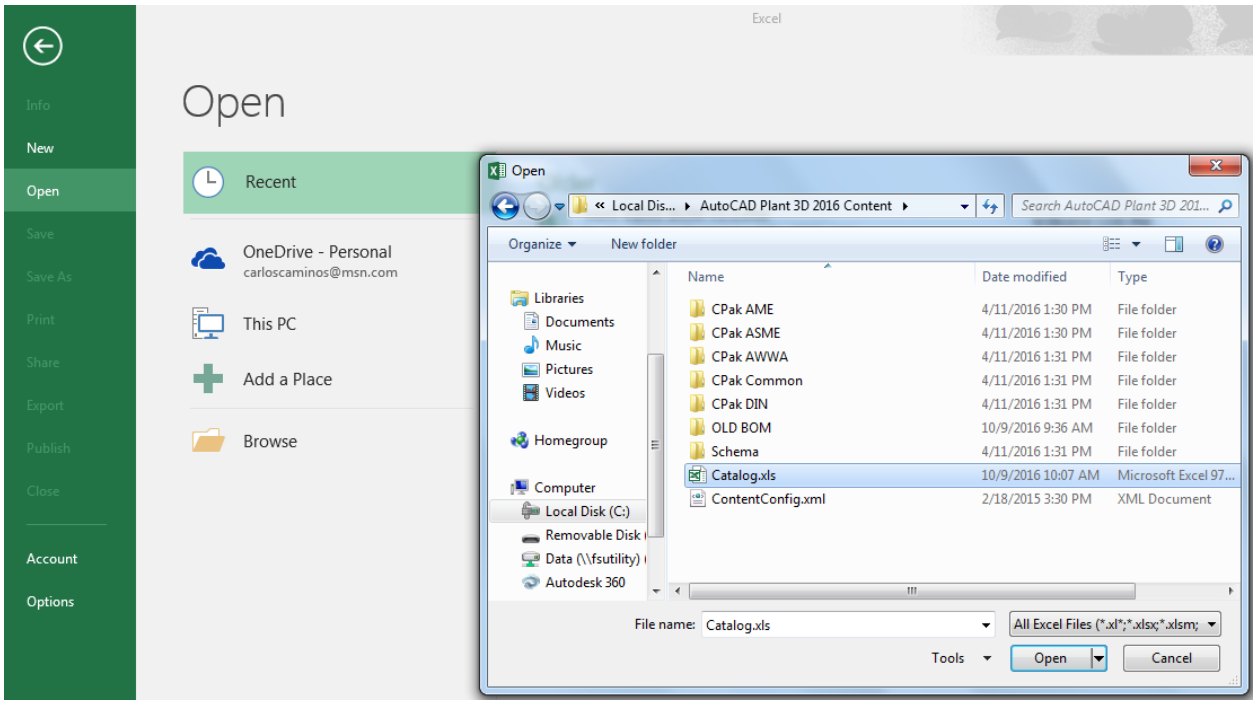


After Creating the Fields in the Catalog, Export it to an excel file to edit.
In the select export settings pull down to Full Catalog Data Export
Choose the location to export the catalog to



Open Excel

Open the Catalog file to edit

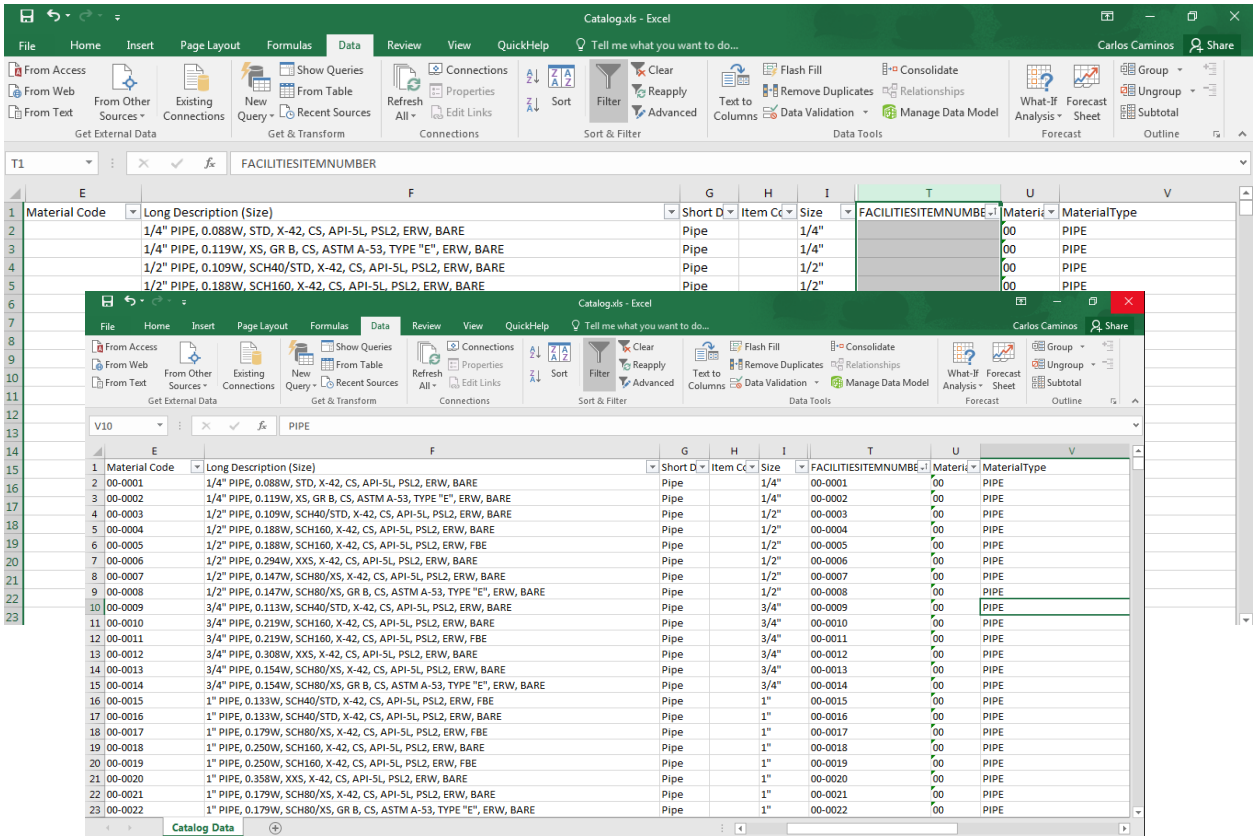


Notice that the Facilities Item Number

You can now edit the new Field

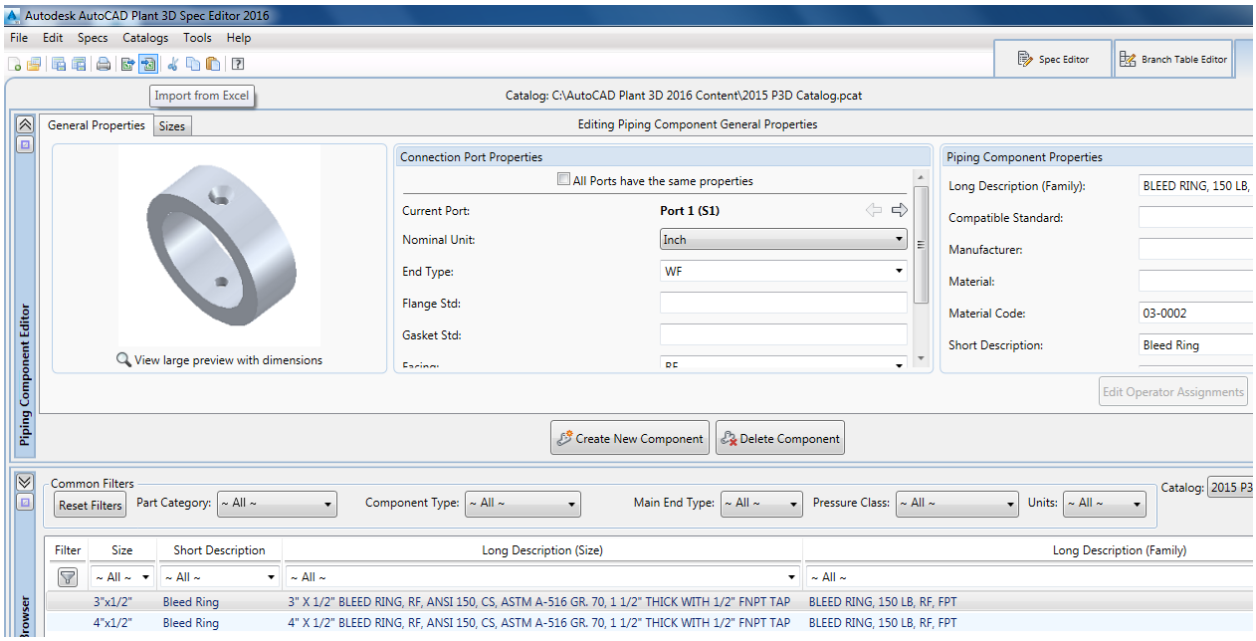
Add Facilities Item Number and same to Material code

Material code can be searched in the Catalog Editor



Return to the Catalog Editor

Click on the Import from Excel Button

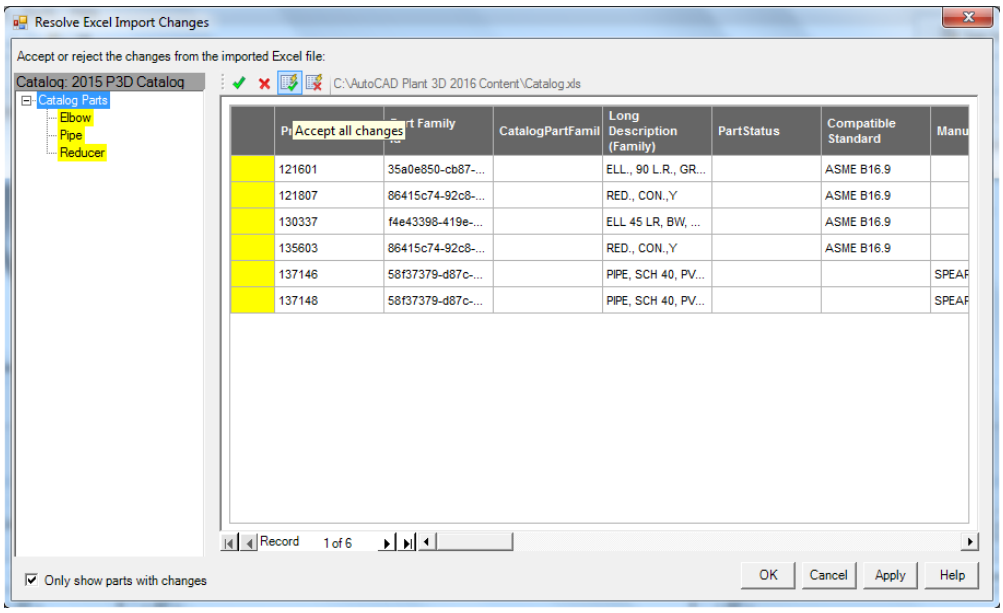



Notice the highlighted areas, these are the areas with new data

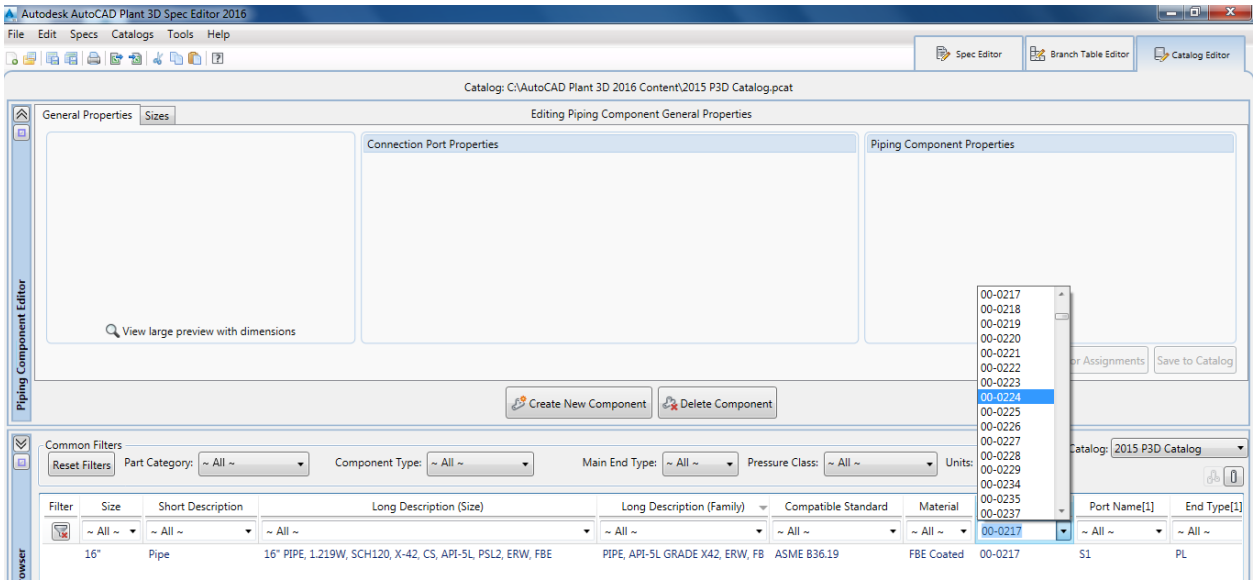
Accept the updates

Click Apply

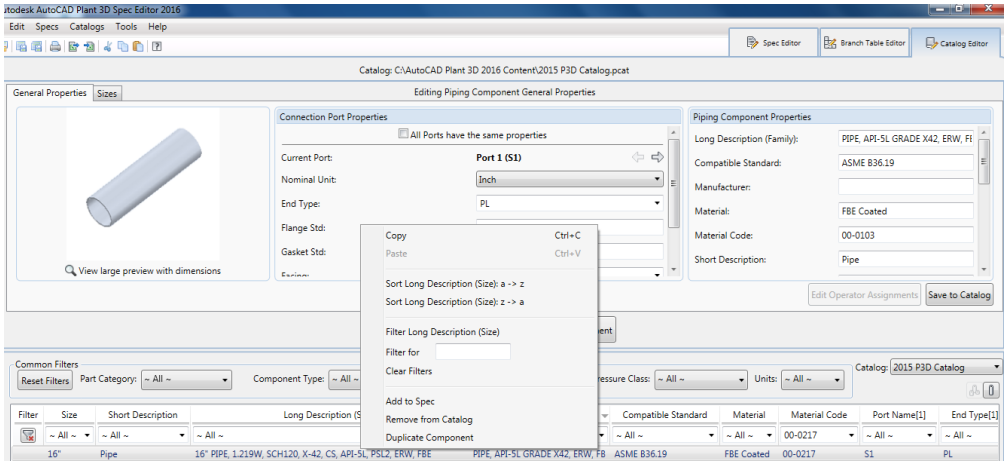
Click OK



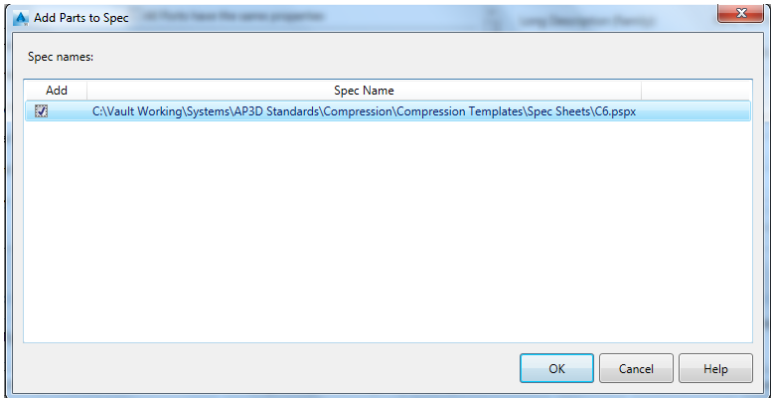
In the Catalog Editor you can now search by number assigned



Right click on part and add to Spec

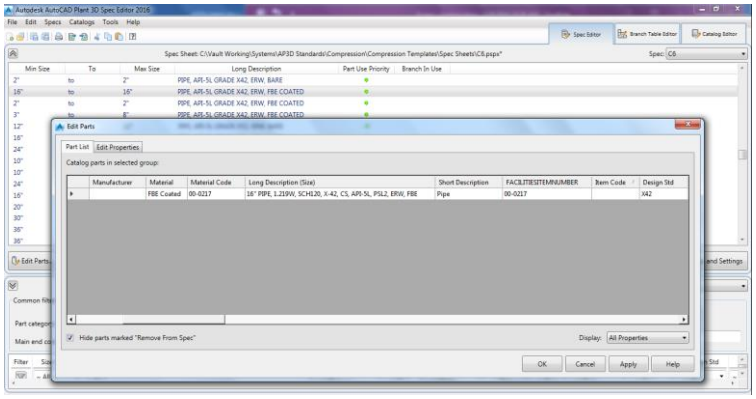



Choose the Spec to add to




You can then see its added to the Spec

Right click and Edit properties



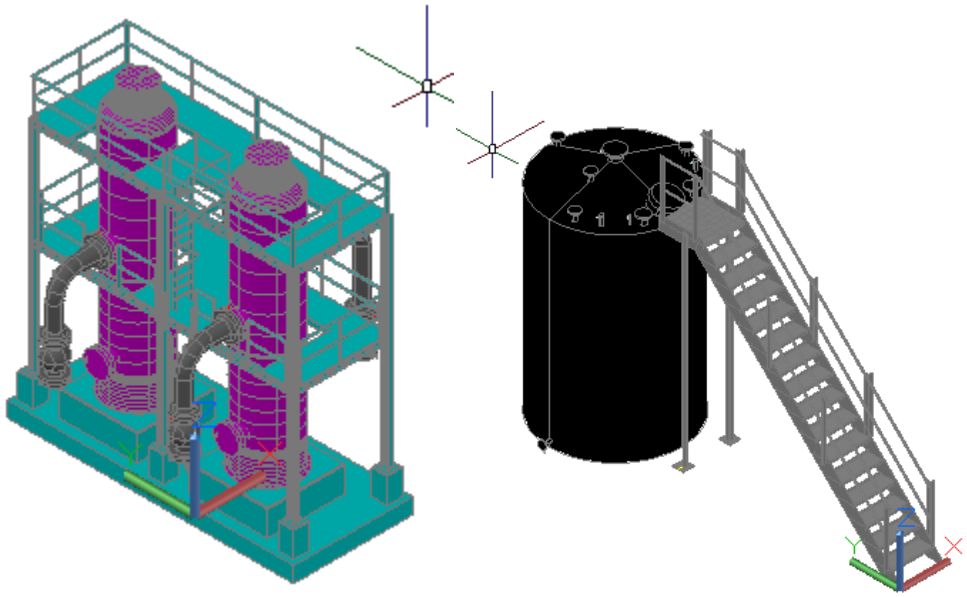
When the Edit parts window pops up, you will now see that the Field data has been transferred from the catalog to the Spec

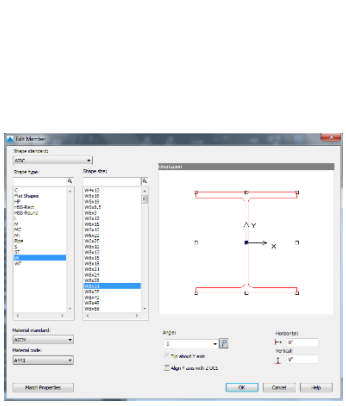
## Equipment Design - AutoCAD Plant 3D

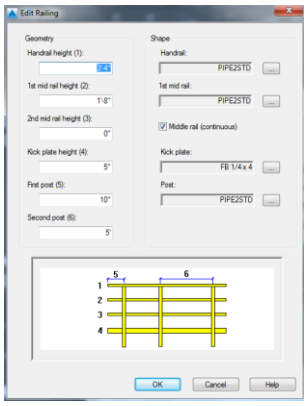
- AutoCAD Plant 3D (P3D) is a simple-to-use comprehensive 3D modeler for performing plant design including; structures, equipment and piping layout to create piping isometrics and orthographic drawings
- Piping isometrics can be easily created using the AutoCAD Isometrics function, which has a graphical user interface for easy customization.
- Inventor models can be imported into the P3D model as equipment and connected intelligently to P3D piping
- Structural models can be imported to P3D from Inventor

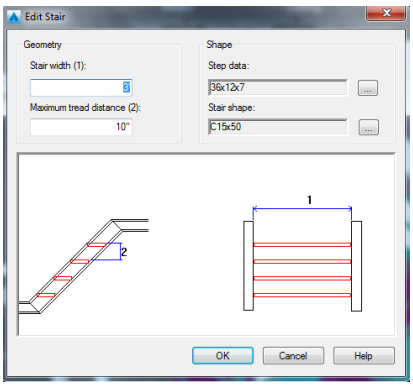
Structural Model:

- Structural model can be created using AutoCAD 3D and X-Referenced in a dwg file from Inventor.
- Using Plant 3D, you also can create the structural shapes. (Structure Tab)



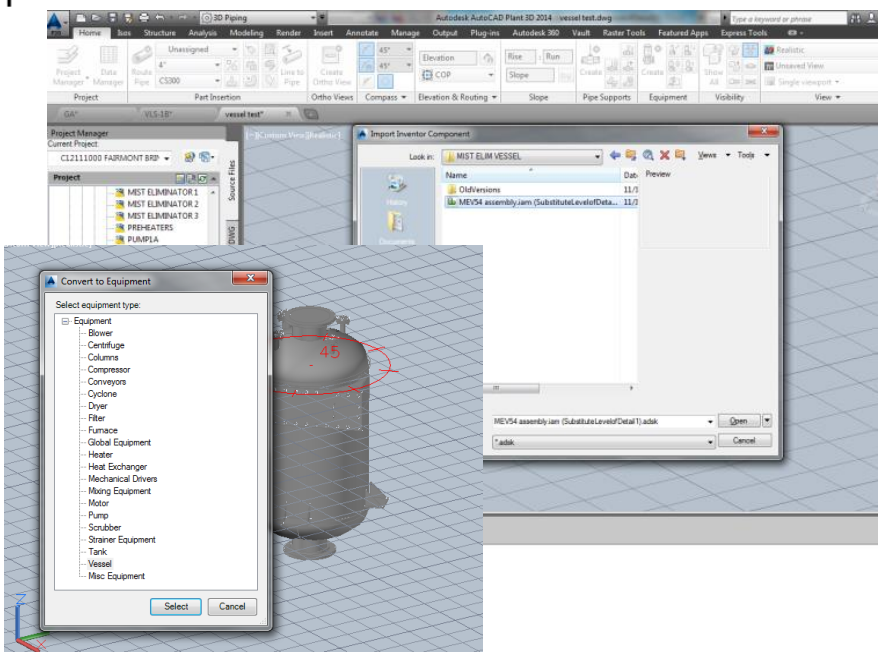




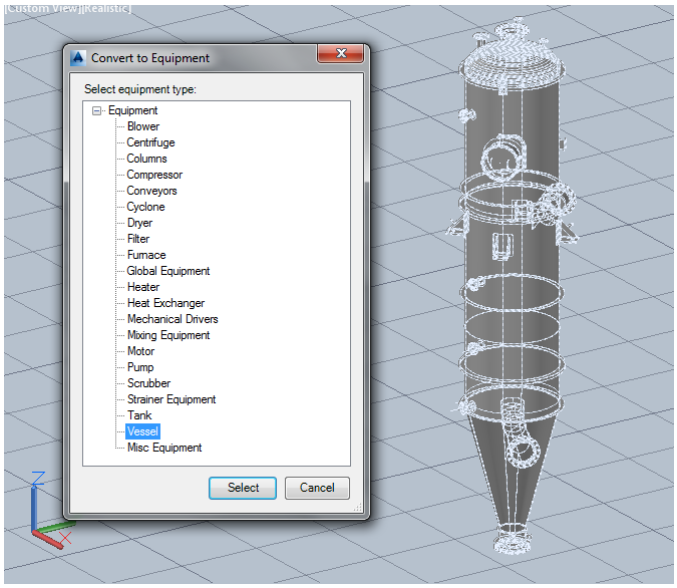



Equipment Layout:

- Models Imported ADSK file:
  - ADSK file are smaller and have less detail

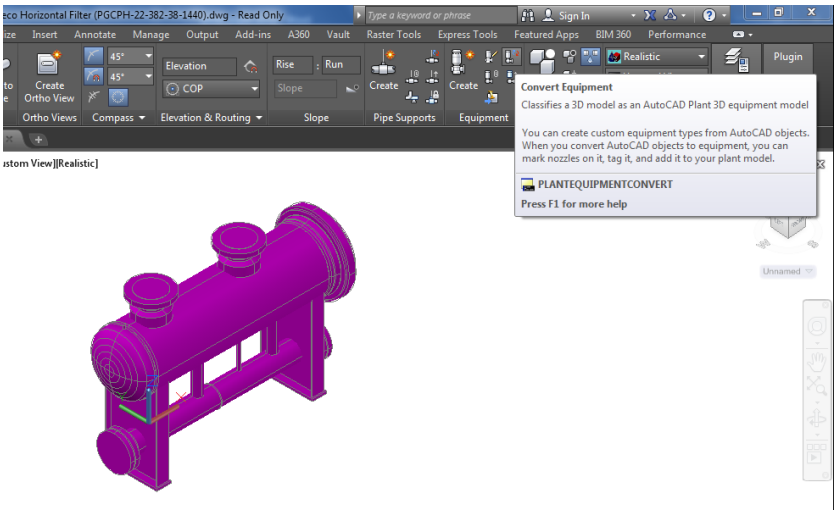



- Create equipment using Inventor models saved as a .dwg file format.
- Use the Plant Equipment Convert function to make this a Plant equipment.
- Assign equipment tag and nozzle locations



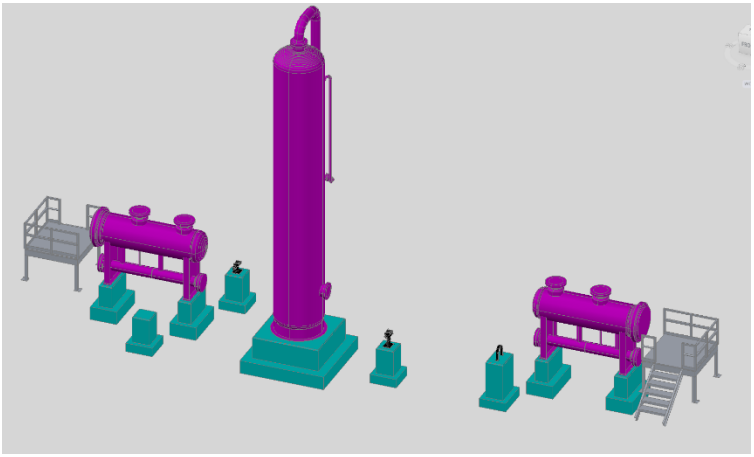
Models can also be created in Plant 3D

- They can be modeled and converted to Intelligent Equipment

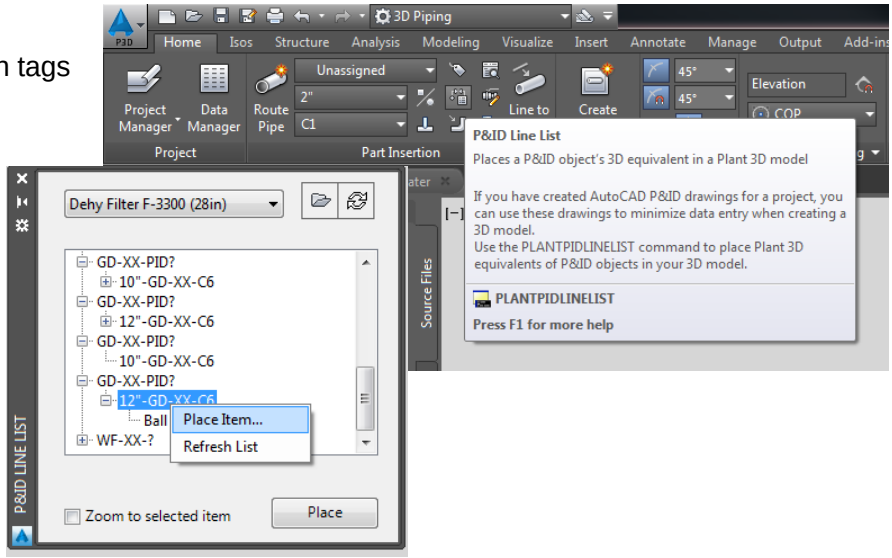



Piping Layout

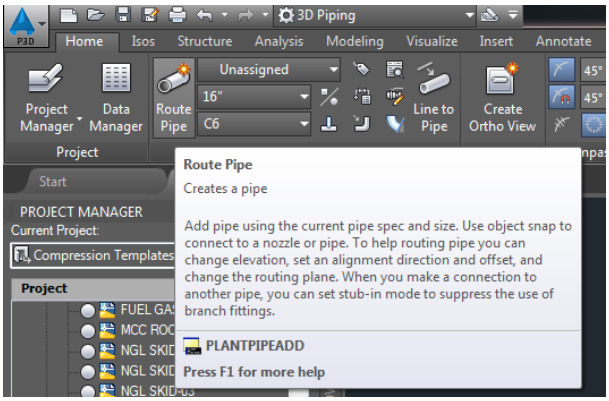
- Unload Structural layout and leave the equipment you are piping “on” from the External References window.



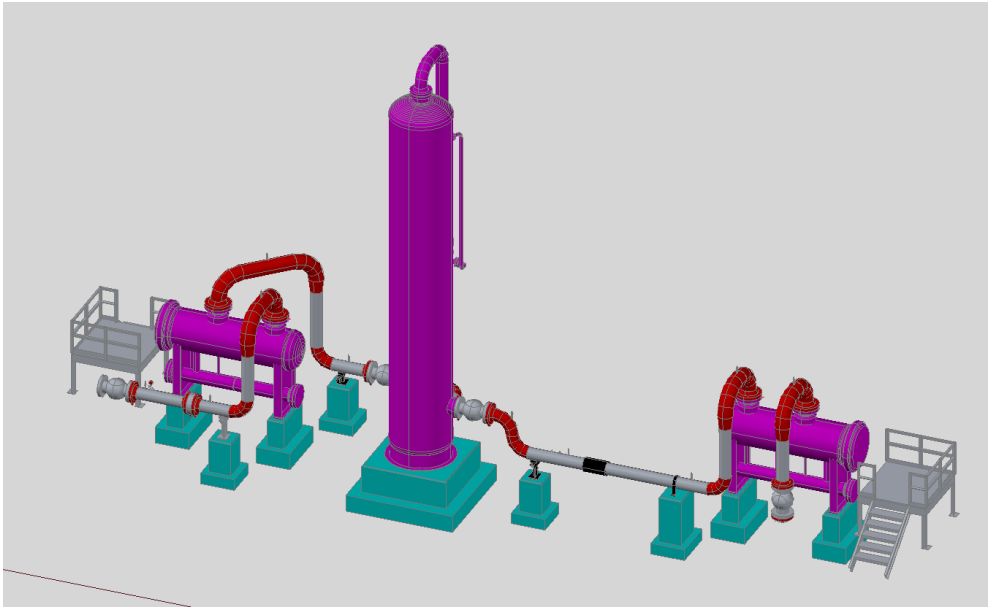
- Use the P&ID Line List to create pipe and valve with tags already assigned



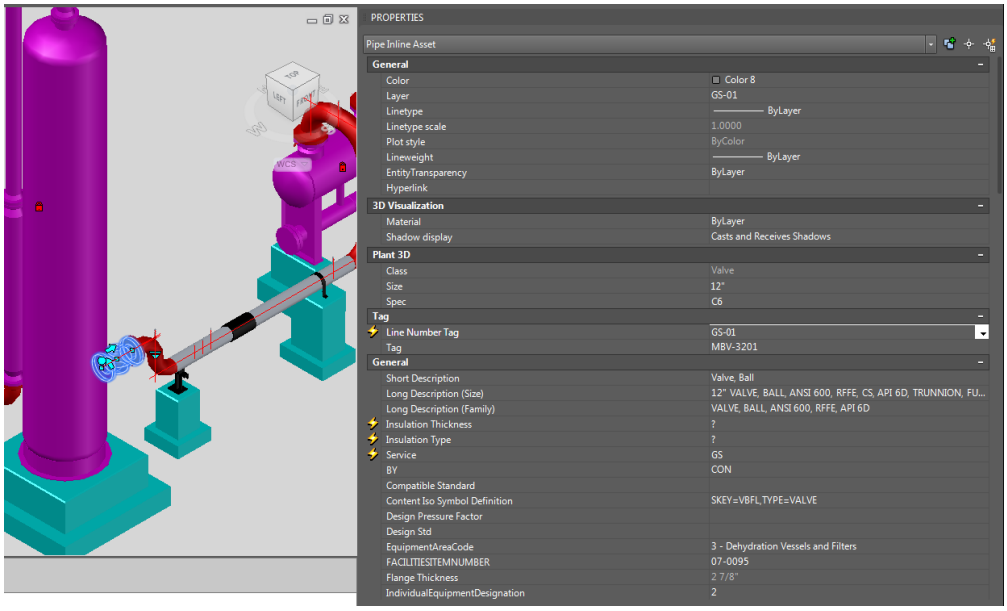
- You can also Choose the pipe size and spec selector from the ribbon.




- Route pipe from nozzle location of one equipment to the other.



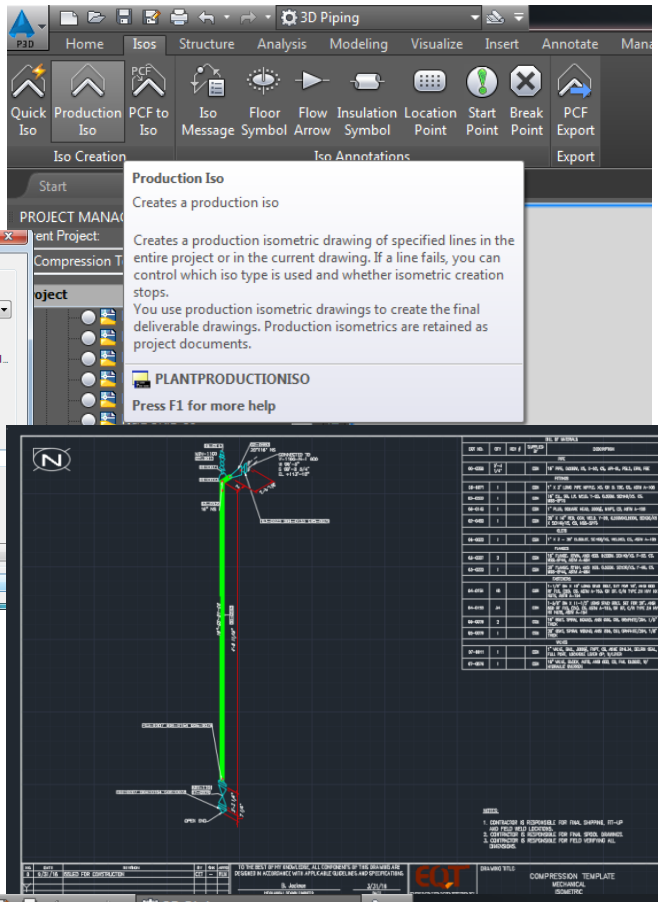
*Notice in the properties of the Valve*
*Line Number Tag and Tag are transferred from the P&ID*
*Description and Facilities Item Number are transferred from the Catalog and Specs*

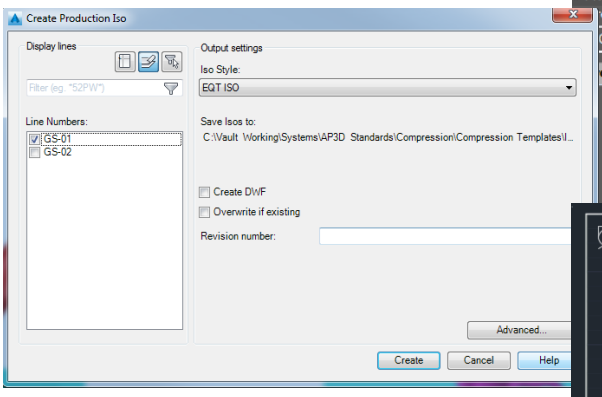

PROPERTIES
Pipe Inline Asset
General
Color
Color 8
Layer
GS-01
Linetype
ByLayer
Linetype scale
1.0000
Plot style
ByColor
Lineweight
ByLayer
EntityTransparency
ByLayer
Hyperlink
3D Visualization
Material
ByLayer
Shadow display
Casts and Receives Shadows
Plant 3D
Class
Valve
Size
12"
Spec
C6
Tag
Line Number Tag
GS-01
Tag
MBV-3201
General
Short Description
Valve, Ball
Long Description (Size)
12" VALVE, BALL, ANSI 600, RFFE, CS, API 6D, TRUNNION, FU...
Long Description (Family)
VALVE, BALL, ANSI 600, RFFE, API 6D
Insulation Thickness
?
Insulation Type
?
Service
GS
BY
CON
Compatible Standard
Content Iso Symbol Definition
SKEY=VBFL,TYPE=VALVE
Design Pressure Factor
Design Std
EquipmentAreaCode
3 - Dehydration Vessels and Filters
FACILITIESITEMNUMBER
07-0095
Flange Thickness
2 7/8"
IndividualEquipmentDesignation
2

## Review/QC

Isometric Creation

- Click on the ISO menu
- Click the type of ISO you would like
- When ISO window comes up choose line number and the ISO style.

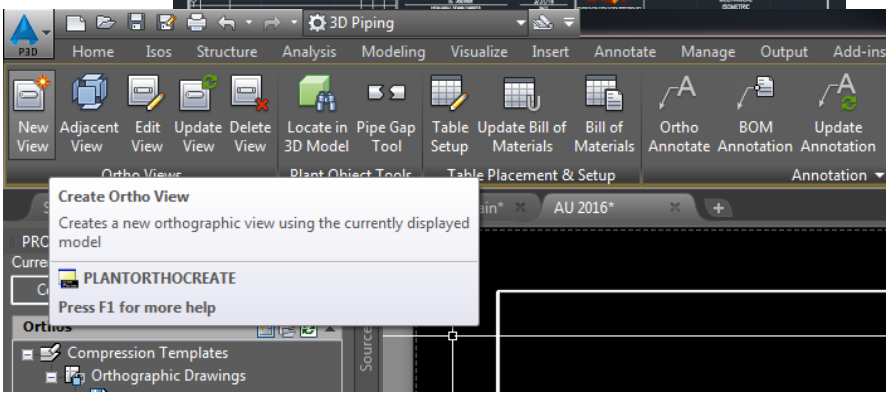


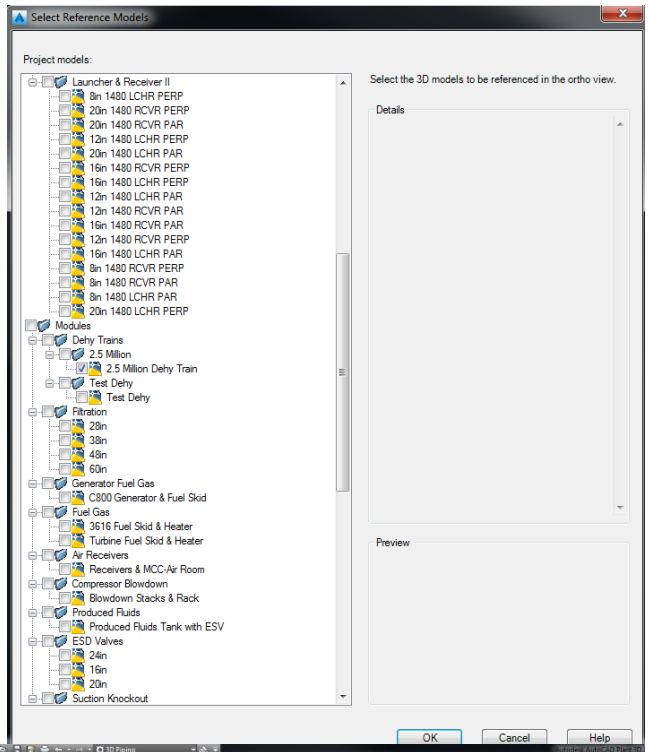



Orthographic Creation

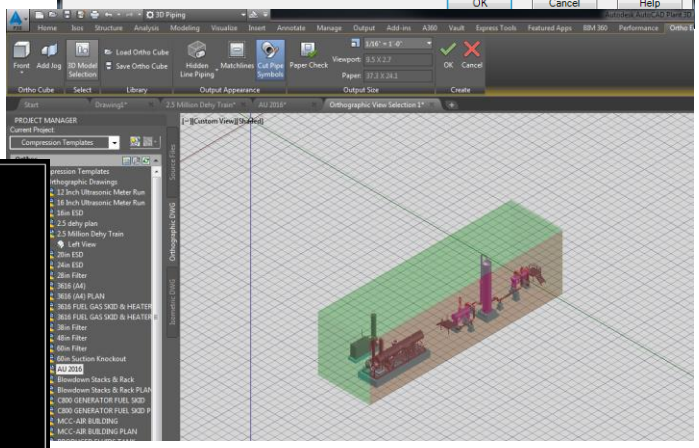
- In the Ortho View Tab
- Using the New View button on the ribbon, this window will appear.

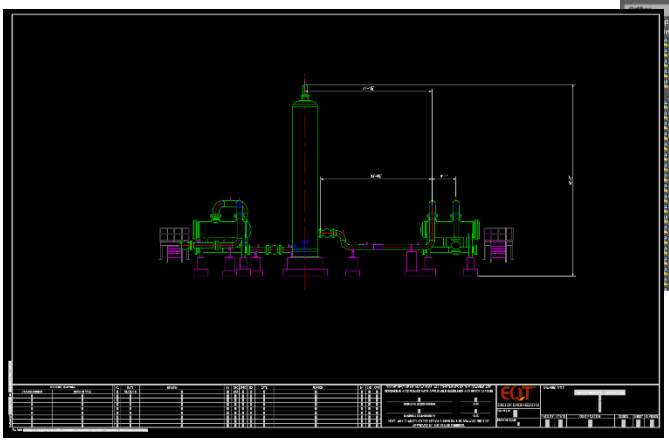


- Choose the equipment, structure and piping. (Models that apply to this Ortho)



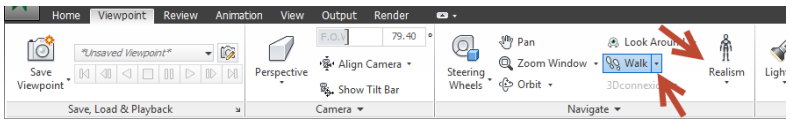

- Choose the orientation for the drawing
- Choose the scale for the view
- Ok to create ORTHO view





## Navisworks

You can use the 'fly' and 'walk' commands to review the project:

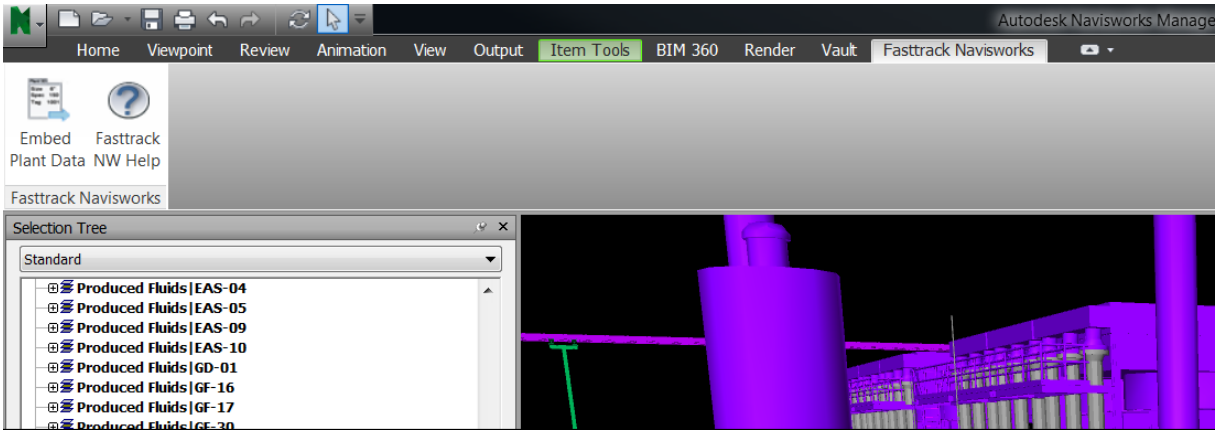



- In 'walk' mode you have various types of realism.
  - 'Collision' - you will not be able to walk through objects
  - 'Gravity' – you can walk through solid objects
  - 'Crouch' – you will attempt to crawl under or jump over objects in your path
  - 'Third Person' – you can look over the shoulder of an avatar

### How to configure Navisworks to show Plant 3D data

### Install 3rd party software

Install Ecad Inc. - Fasttrack
Once the software is installed restart Navisworks
You will now see A Fasttrack Navisworks on your ribbon




### Loading Plant Data

Click on the Embed Plant Data button on the ribbon
Click on the path and add the location of the project.xml to the data you want to use
Click on create Properties to add the data to Navisworks
Click Done

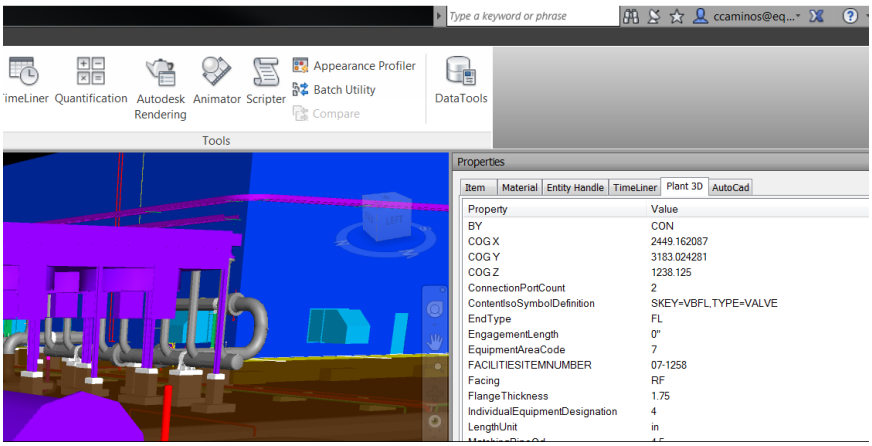
**How to Configure Viewing Settings for Properties Window**

In the Home Ribbon
Click down the Select & Search tab pull down
Selection resolution should be set to Geometry
Note: if you do not set this none of the AutoCAD or Plant 3D data will show in the properties window


Click on the selection tree
Click on the select icon

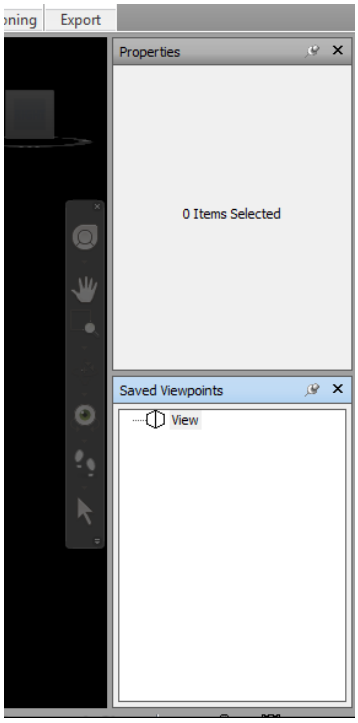
**In the Display Ribbon**

Click on the Quick Properties and the Properties
Then dock the Properties window



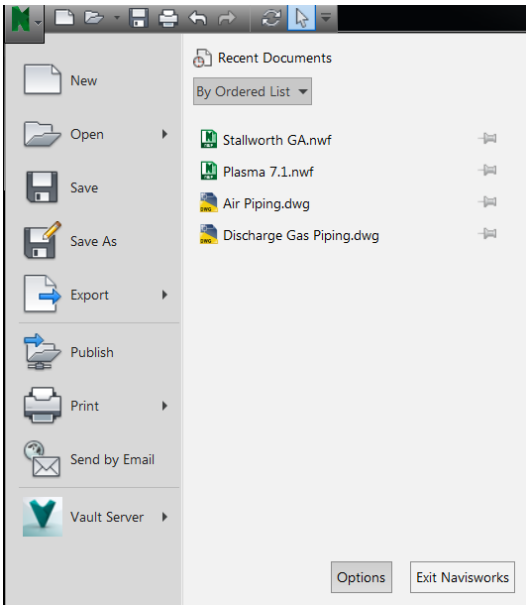
### In the Viewpoint Ribbon

In the Save, Load & Playback Tab
Click on the Save Viewpoint
You will know have two windows on the right side of the screen (Saved Viewpoints and Properties)

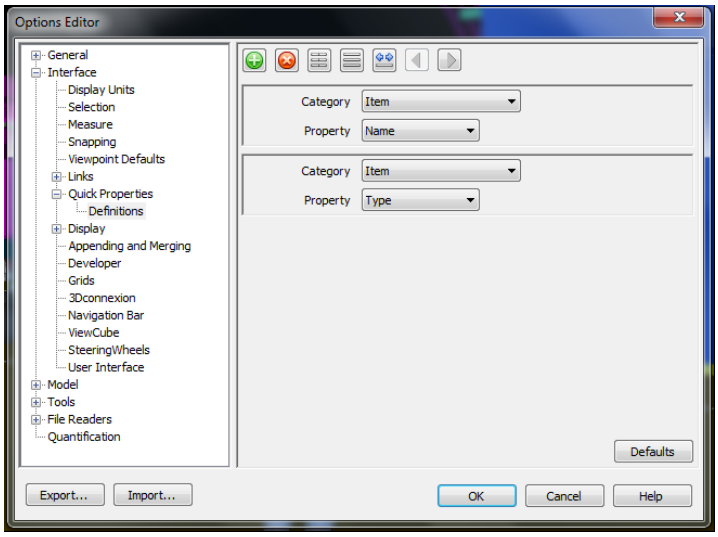


**How to Configure Viewing Settings for Quick Properties**

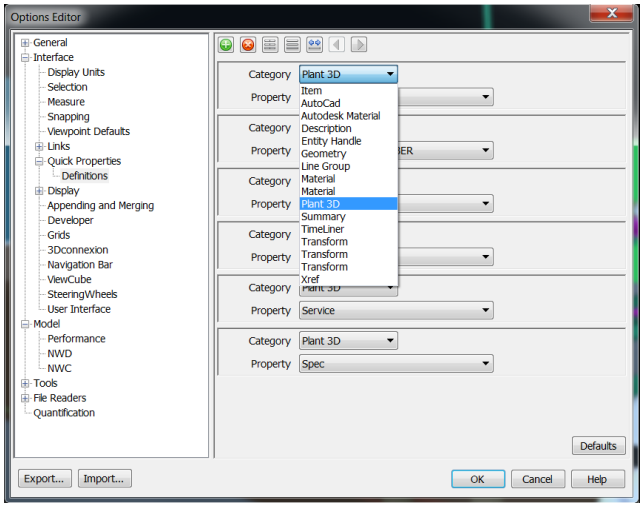
Go to the pull down on the Navisworks Icon
Click on options

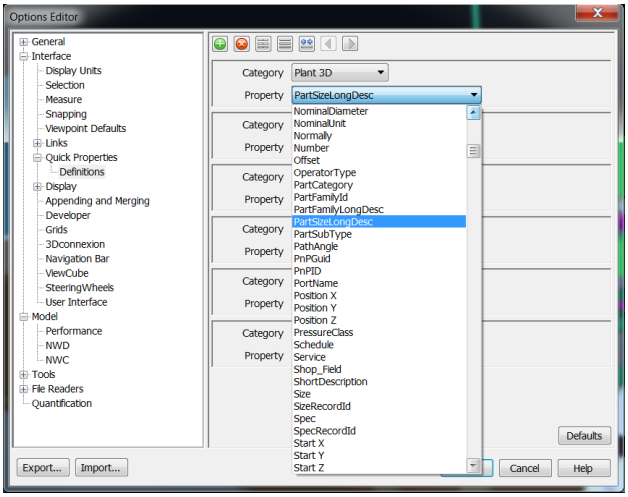



Expand Quick Properties
Click on the green plus sign and add a total of 6 sections

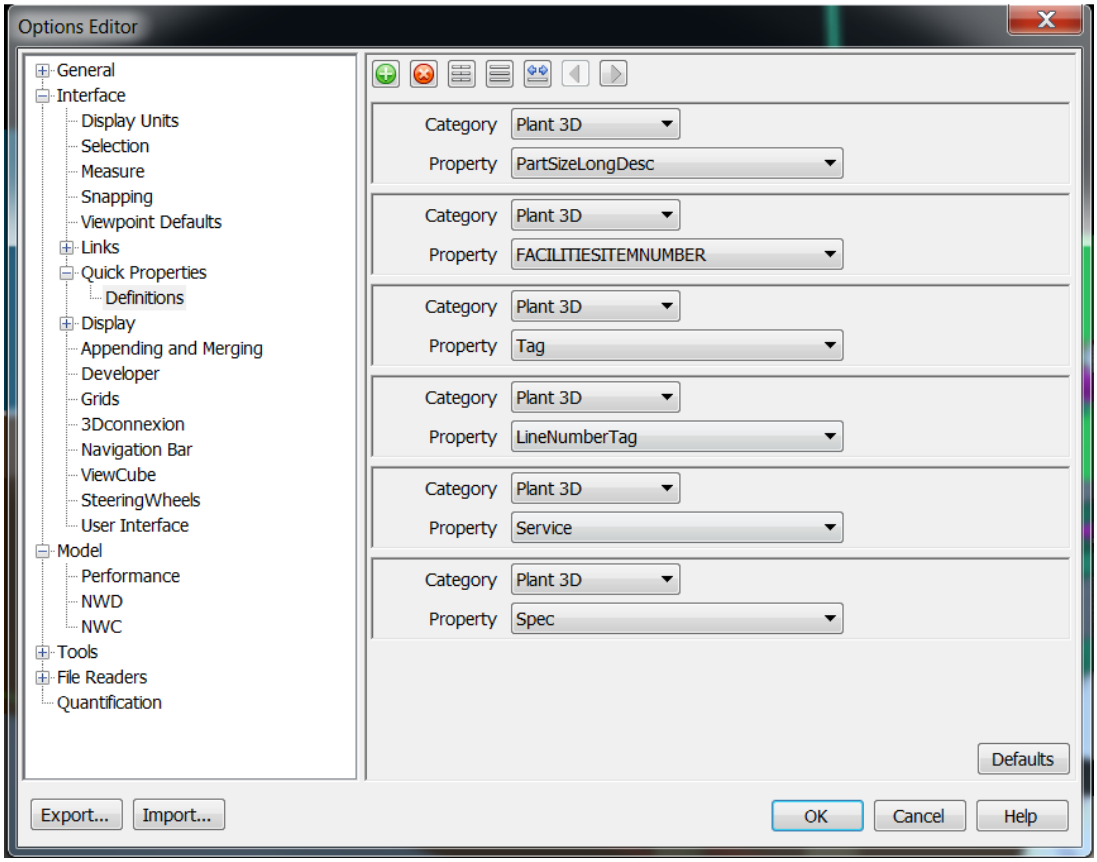


Configure the Category and the Property by using the selections underneath each pull down



Duplicate the configurations below

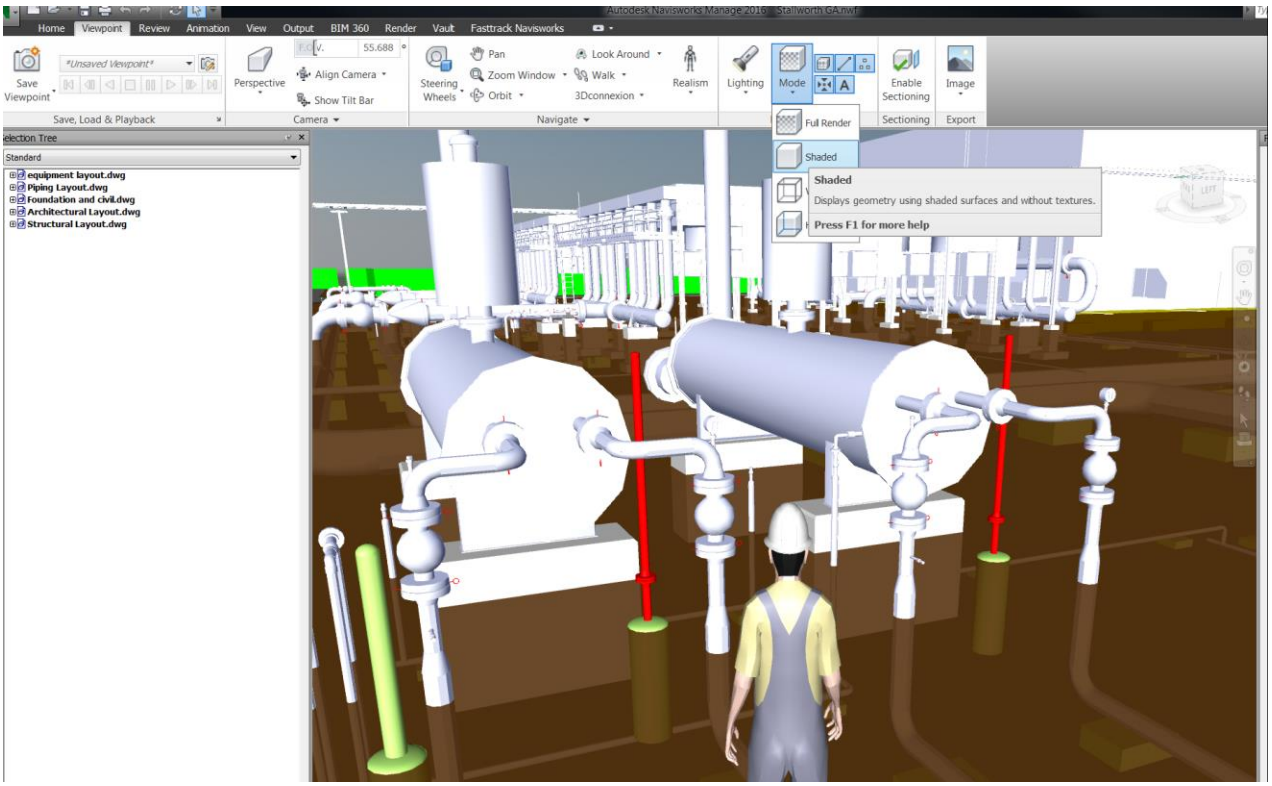



Now you will see the properties when you hover your mouse over a component

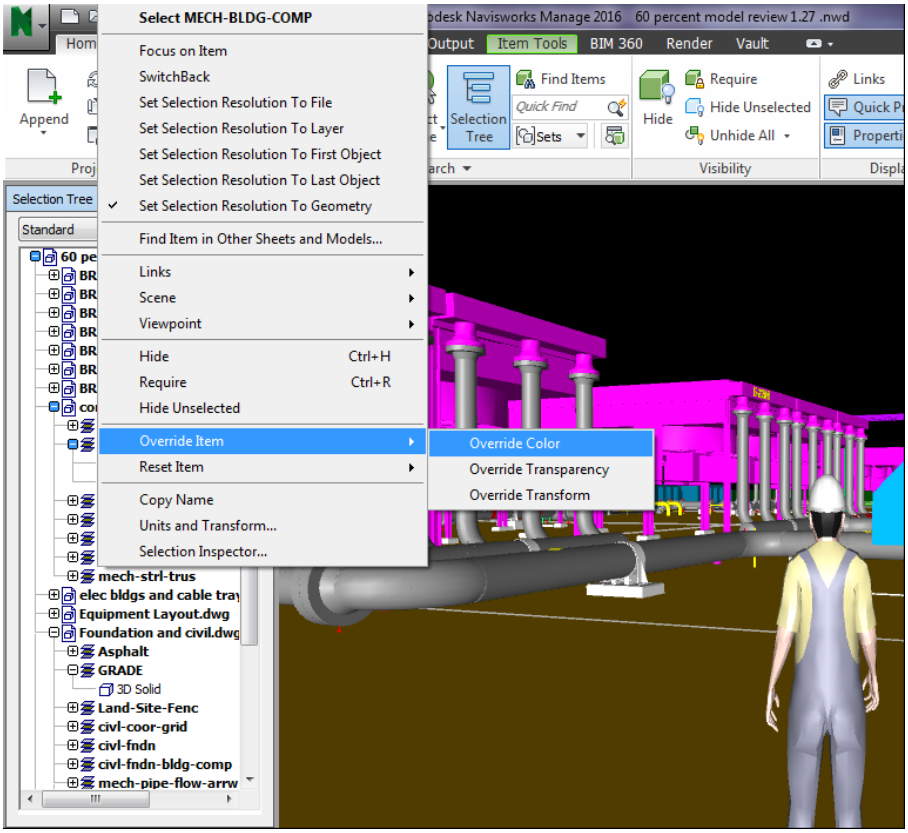
## How to add Custom Colors to Equipment and Pipe

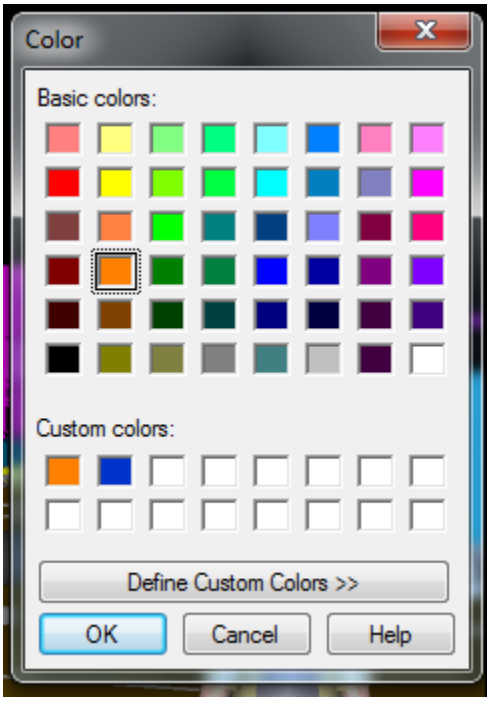
### Customizing colors to Equipment and Pipe

In the view port ribbon
go to the render style tab
Set to shaded



Now you can right click on objects
Click on Override Item> click on override Color
Choose preferred color form color palette

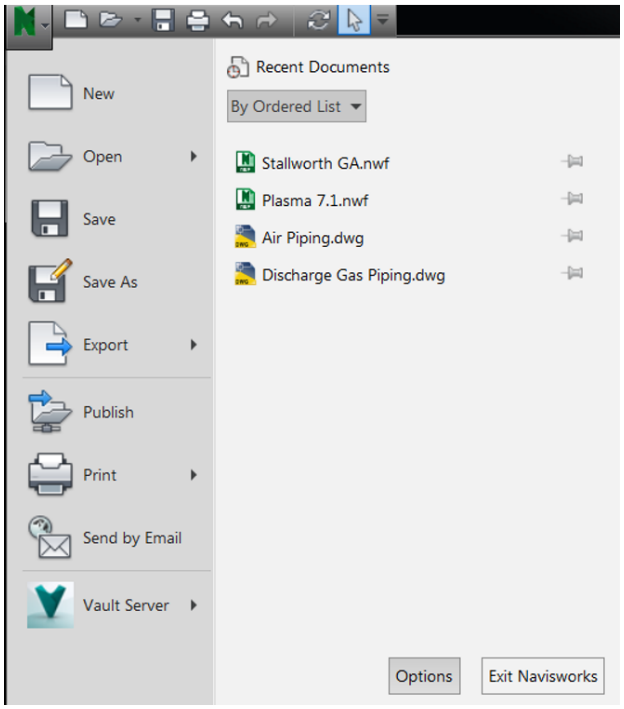


## How to Set the Units

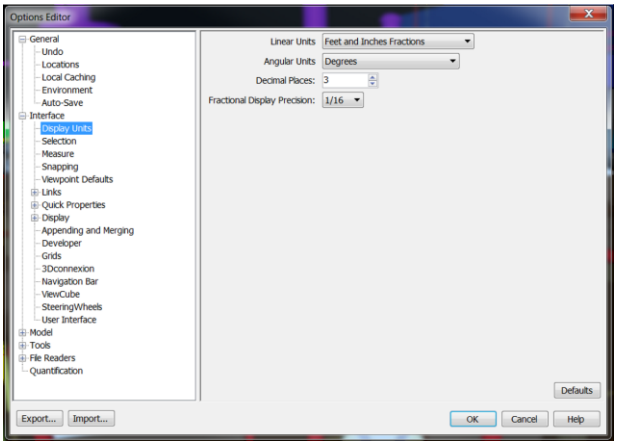
Setting Units

Go to the pull down on the Navisworks Icon
Click on options




Expand Interface

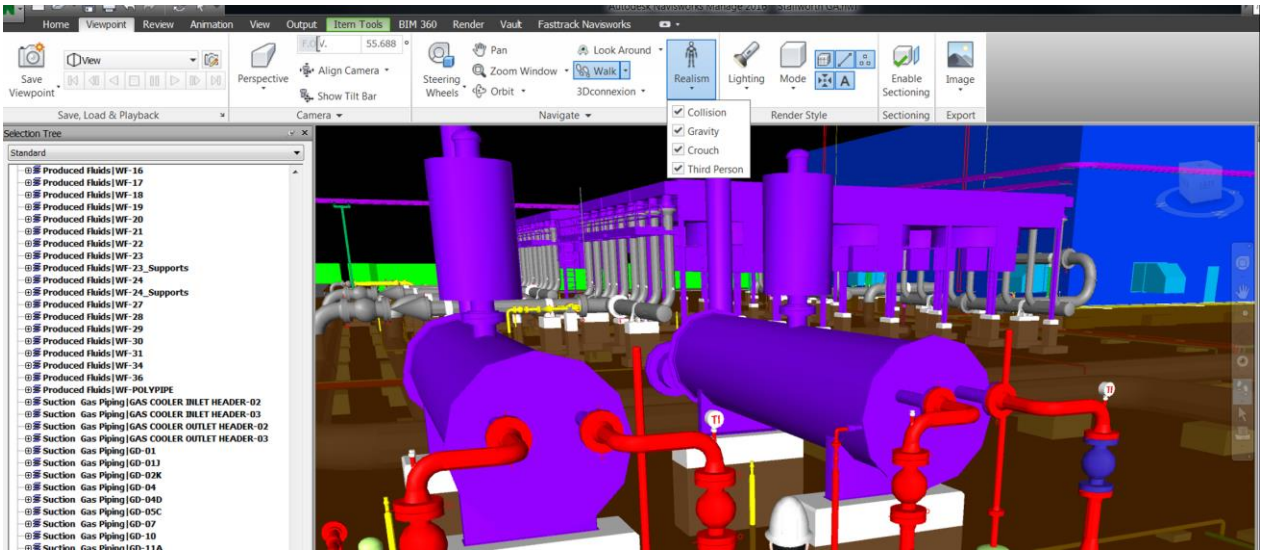
Click on Display Units
Change to Feet and Inches
Set Precision to 1/16
Click OK



How to Set Walking Viewpoint

Walking Viewpoint

Click on Viewpoint on the ribbon
Go to the Navigate Tab and Click on Walk
Next click on Realism, the pull down menu show.
Check the collision, Gravity, Crouch and Third Person
When you get to the desired viewpoint follow instructions from Unit 6



## How to Set Flyby Viewpoint

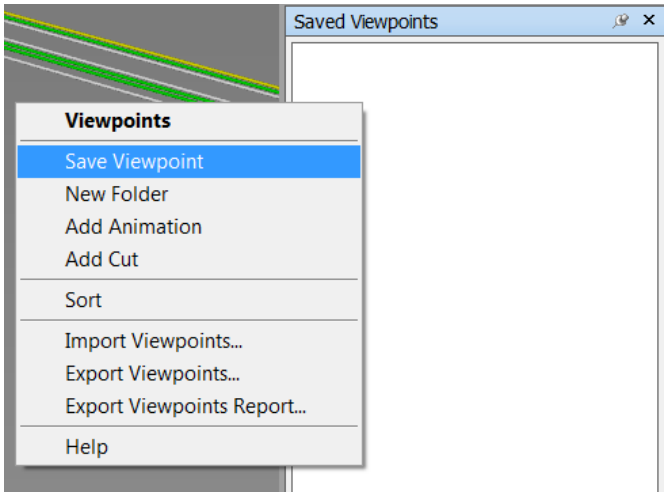
Fly by Viewpoint

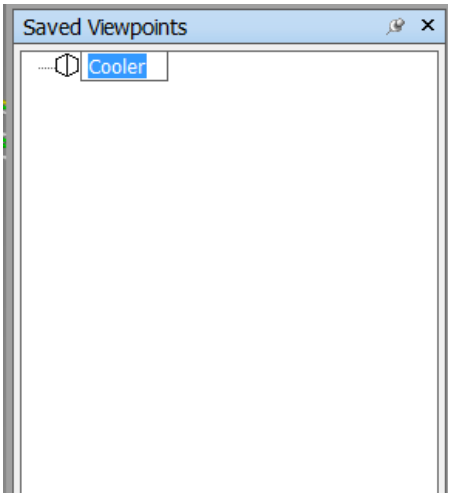
Click on Viewpoint on the ribbon
Go to the Navigate Tab and Click on Fly
Next click on Realism, the pull down menu show
Un-Check the collision, Gravity, Crouch and Third Person
When you get to the desired viewpoint follow instructions from Unit 6

## How to create a saved Viewpoint

Creating a Viewpoint

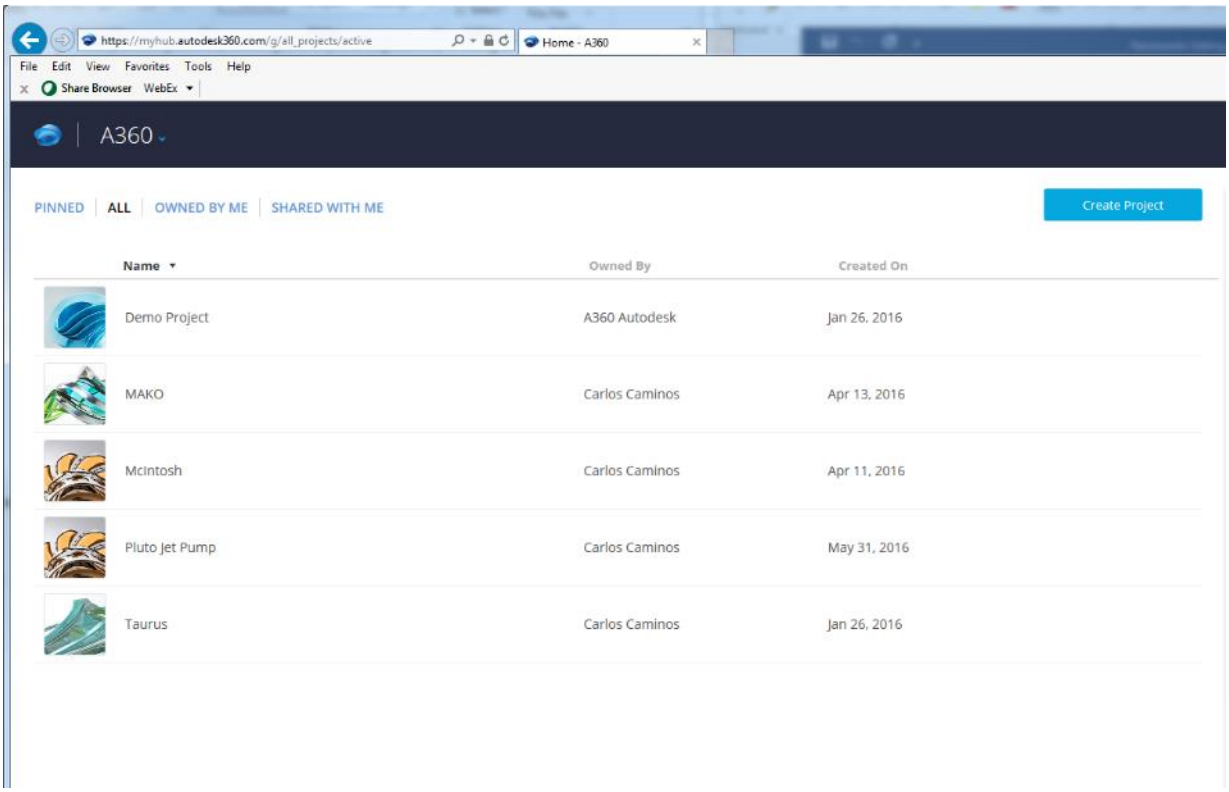
At the desired Viewpoint
Go to the saved Viewpoints window
Right click for Viewpoints window
Then click again in the Save Viewpoint
Give the Viewpoint a name



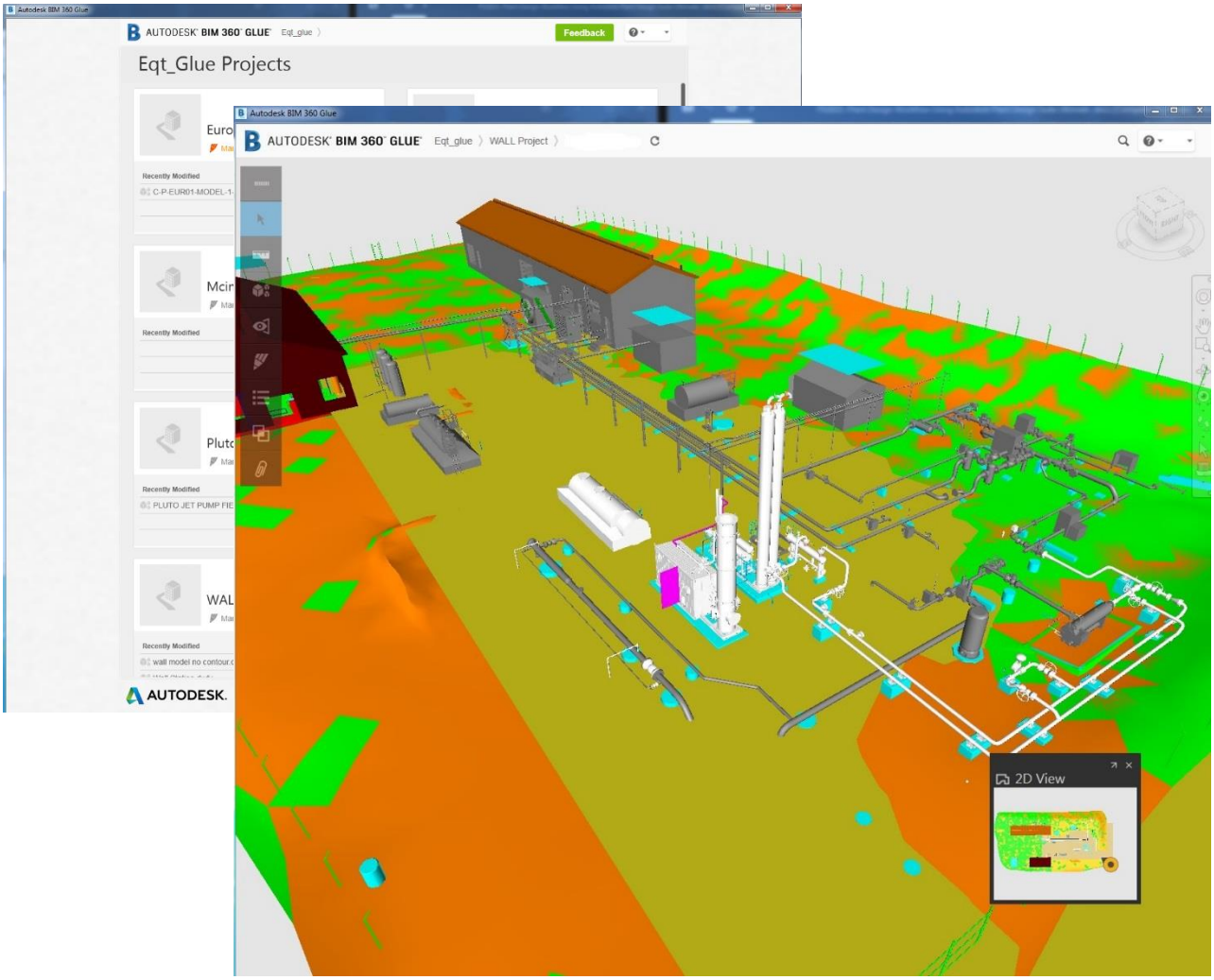



## Construction

- A360
  - Latest issued for construction drawings



- BIM 360 GLUE
  - Latest released General Arrangement model




- Benefits
  - Better team communication
  - Errors caught before construction
  - Clash detection
  - Mark ups for as-built

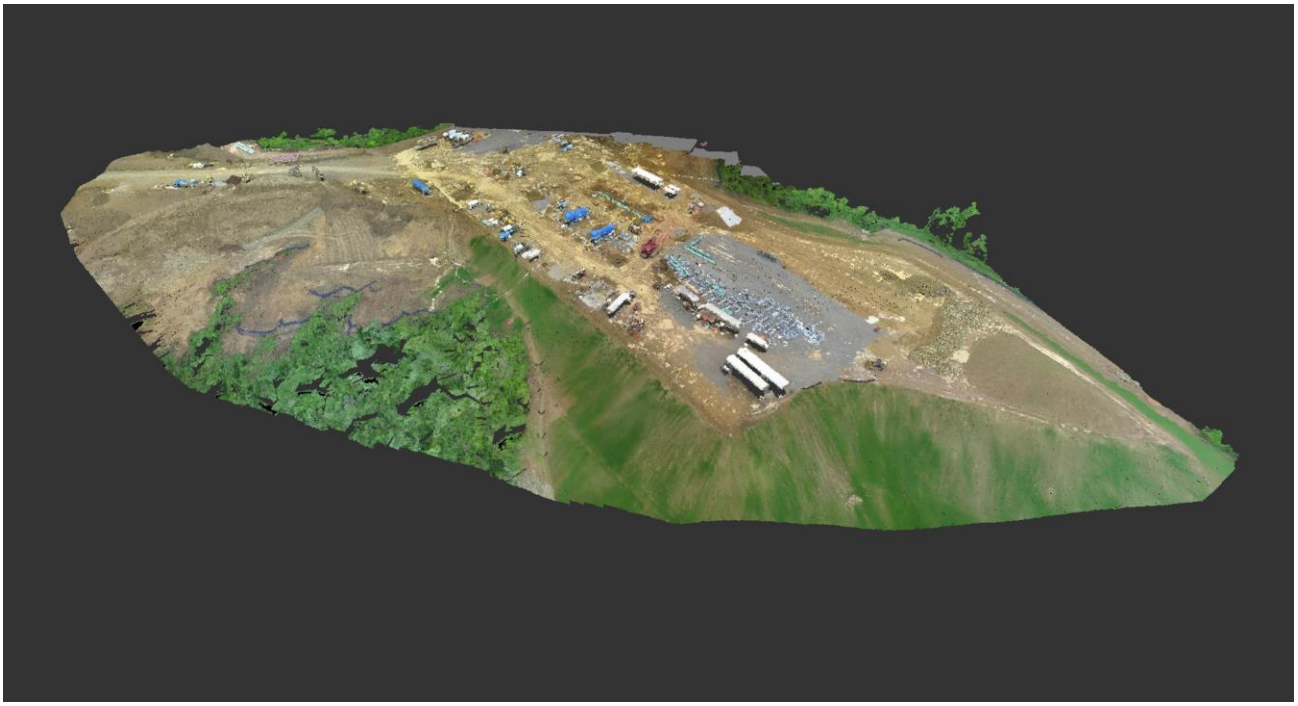
**BEYOND**

UAV Point Cloud Data Technology

Identified TECHNOLOGIES

- Drone Flyby
  - Online access
    - Volumetric data
    - Site access
    - Edit flights
    - Measure
    - Regions of interest
    - Standard mapping formats available

Weekly Construction Meeting using ReCap



Point Cloud Data

- Measure as built vs design Build
- Surface, Contours
- Volumetric Data (Cut/Fill)

Specifications

- Some high level specs on Boomerang UAV:
- Weight: 5 lbs
- Dimensions: 13" x 13" x 9"
- Flight speed: 10-25 mph
- Flight coverage: 100-150 acres per battery
- Battery lifetime: 25-35 mins

Specs on data quality at 400 feet (normal operating altitude):

- Ground Sampling Distance: 2.5 inches
- DSM pointcloud density: 2.5 inches
- Elevation Accuracy: 2-6 inches

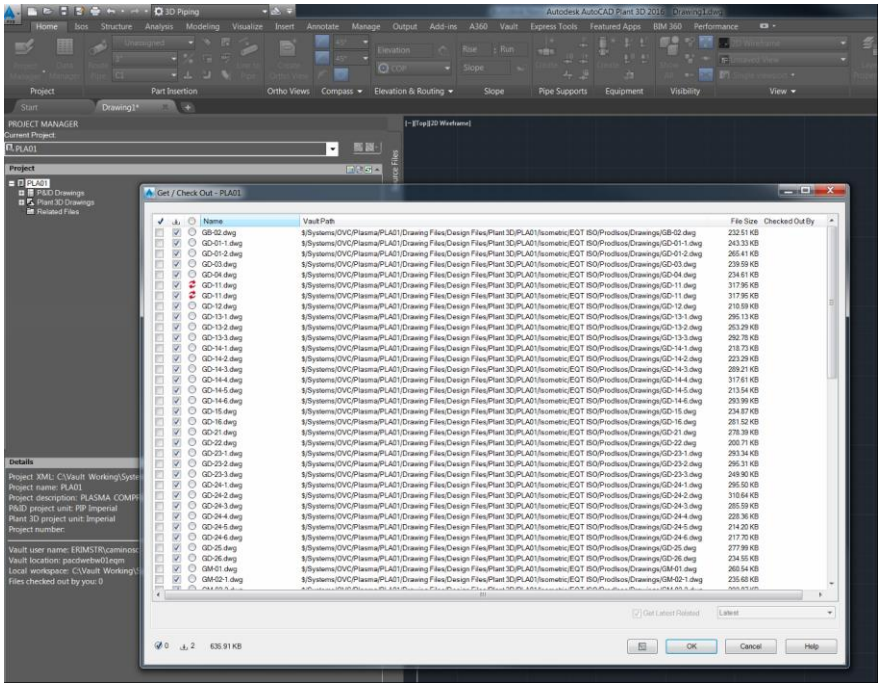
Specs on data quality at 100 feet:

- Ground Sampling Distance: 0.5 inches
- DSM pointcloud density: 0.5 inches
- Elevation Accuracy: 0.5-2 inches

some of the specs are variable because different flight patterns can yield different results

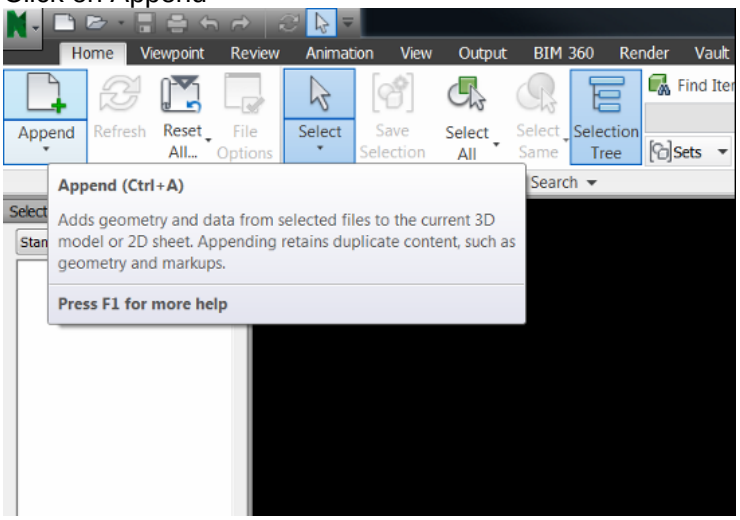
Measure as built vs design Build

Open Plant 3D
Download the project from Vault
Download all 3D models locally
This will allow you to Xref the GA into the Project Site Drawing



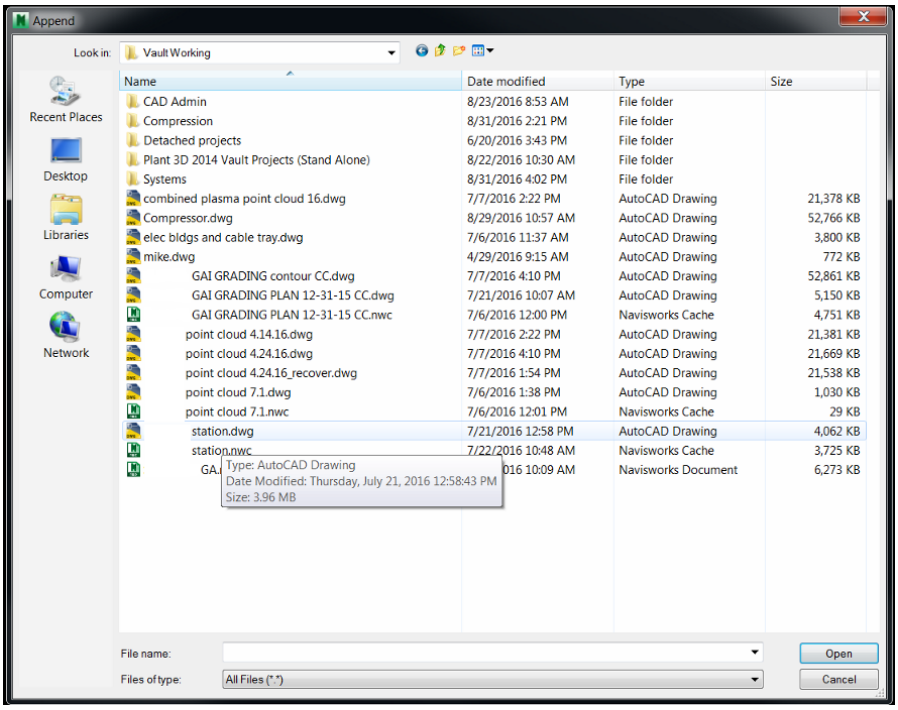
In the Project Site Drawing orient the plant project to the correct location

Open Navisworks
In the Home Ribbon
Click on Append

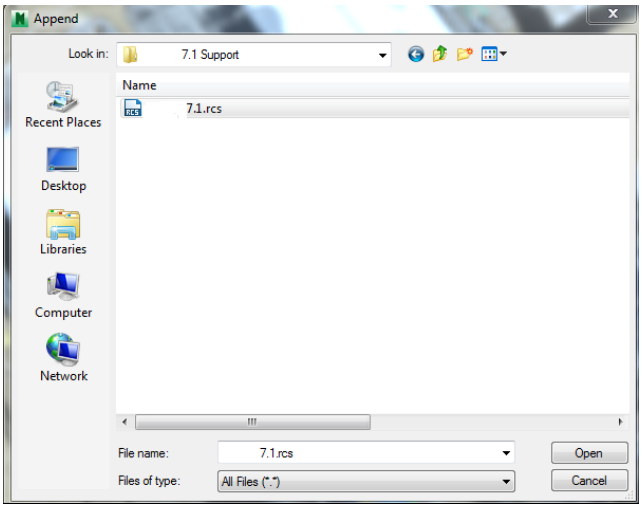


Choose the Project Site File

The Project Site File should have the Plant 3D GA file X-Referenced in to the correct elevation with the correct rotation to match the site Plan Layout

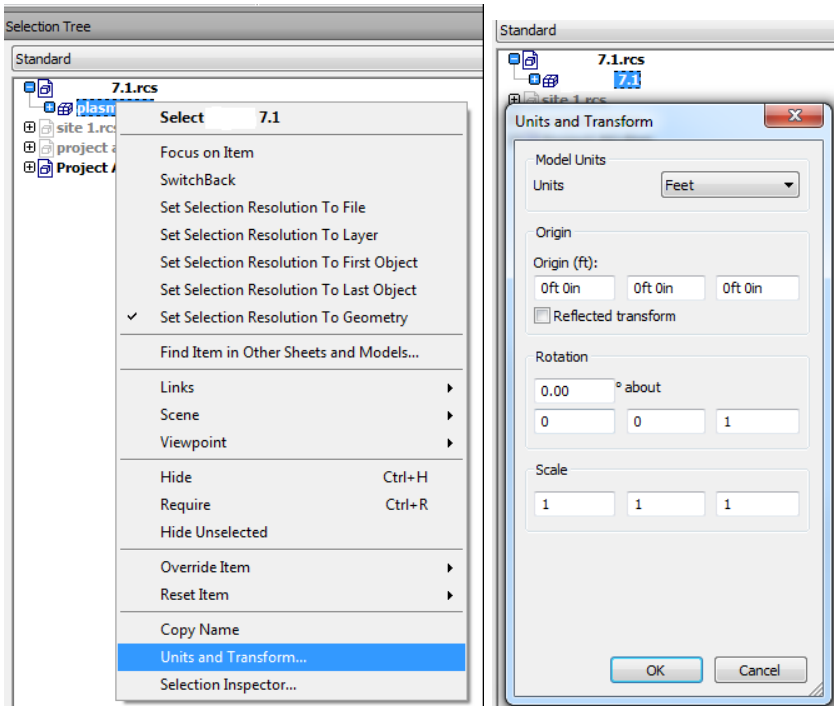



Click on Append and add the RCS file created from ReCap

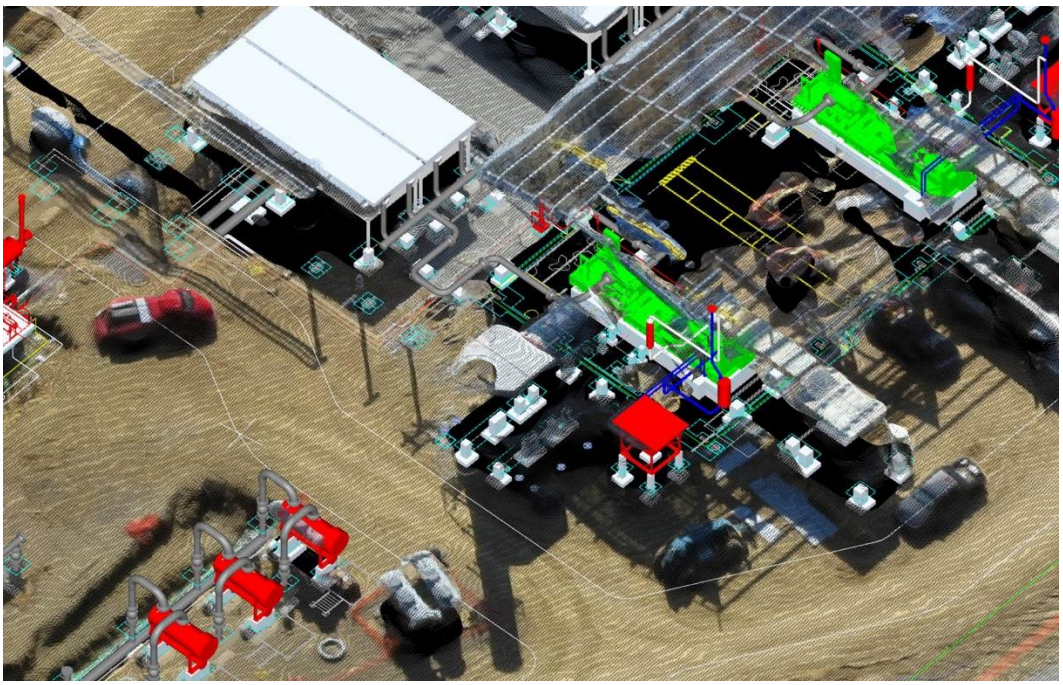


Right click on the RCS file and click on Units and Transform

Adjust the units to Feet



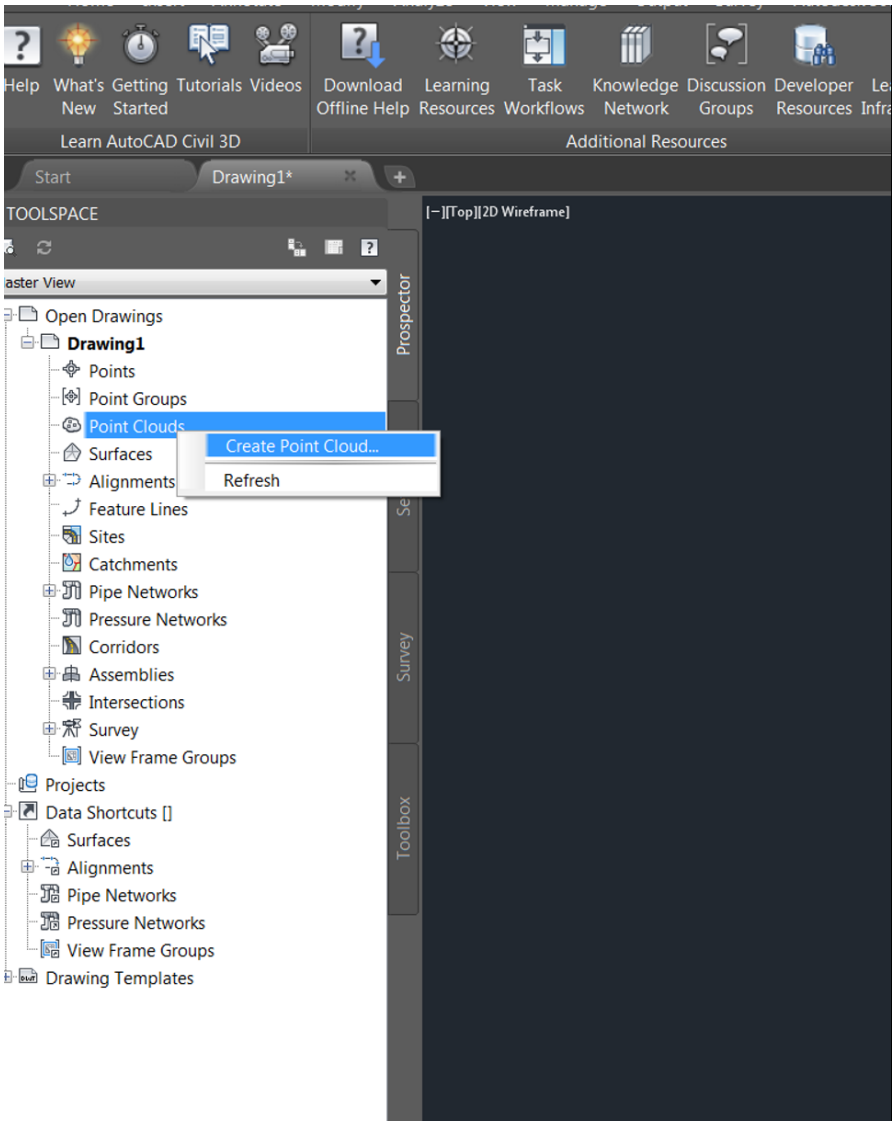

You will now see the point cloud scans and the site drawing with the plant 3D Model



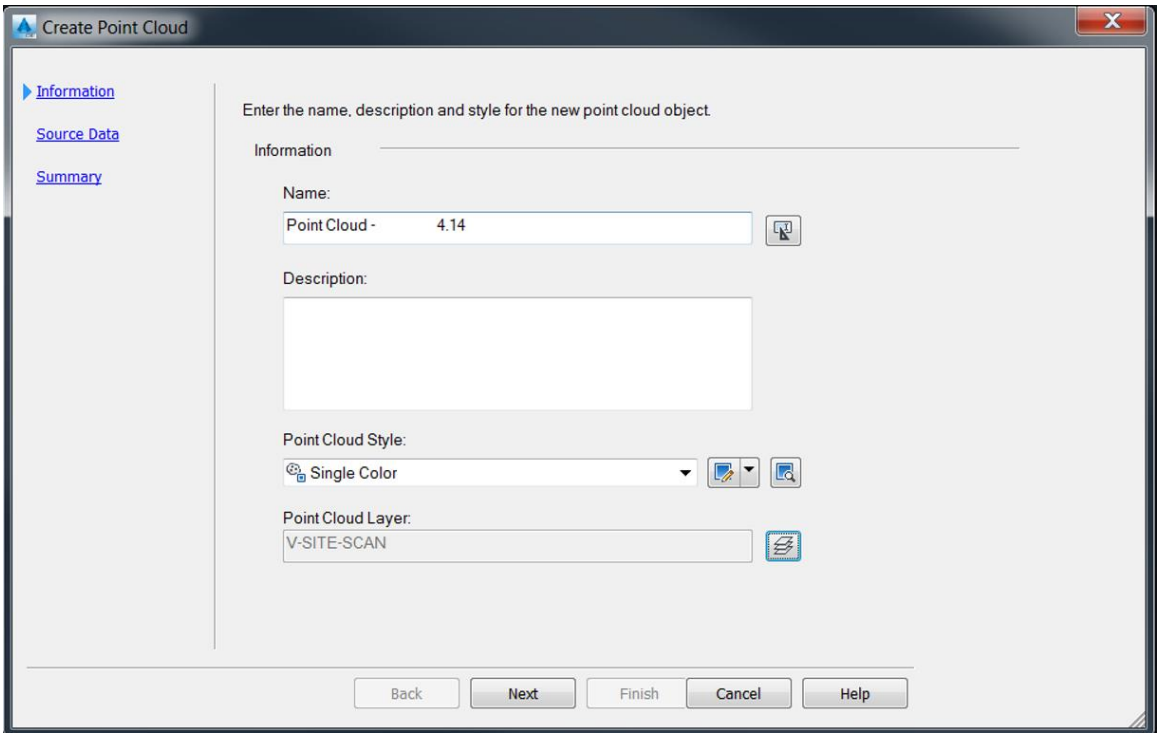
Surface, Contours
Volumetric Data (Cut/Fill)

## Importing point cloud data into Civil 3D

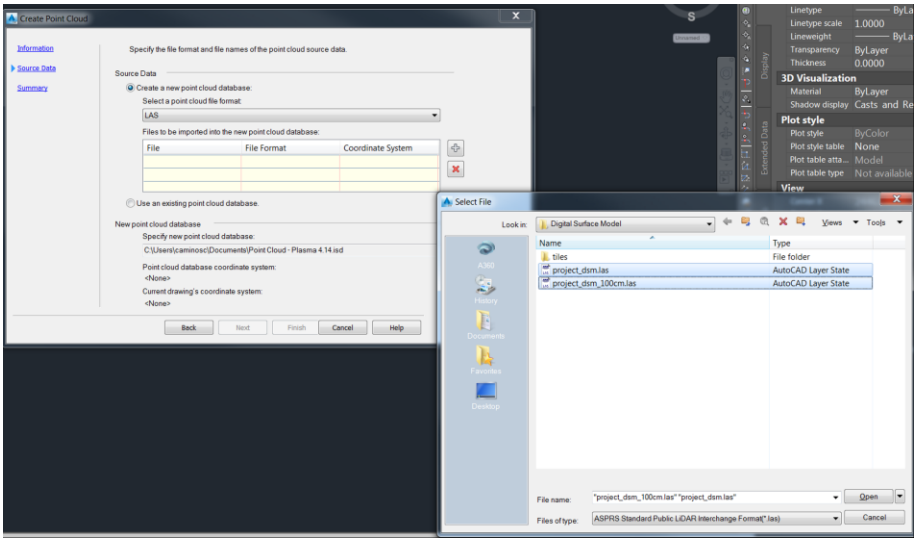
In the Prospector Tab under the current drawing click on Point Clouds
Then right click, click on create point cloud



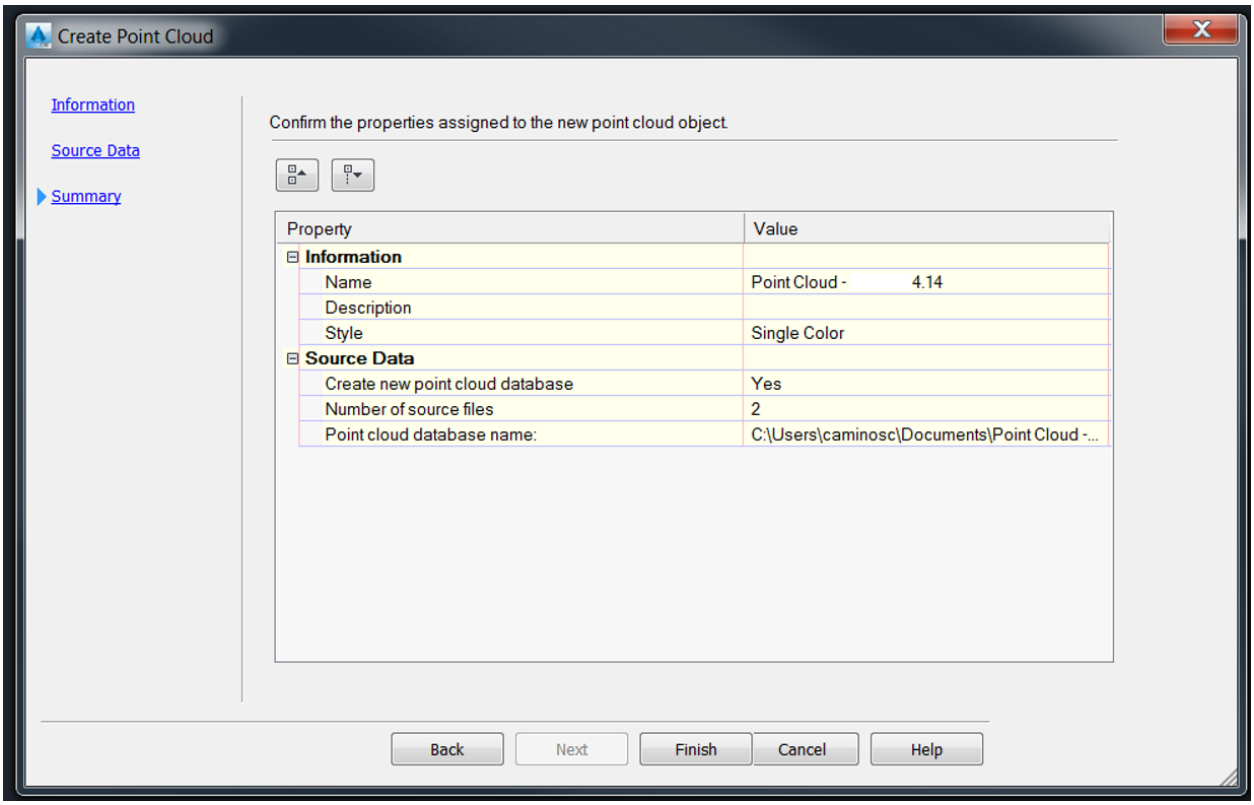
Assign a name to the Point cloud data that you are importing
Click on Next



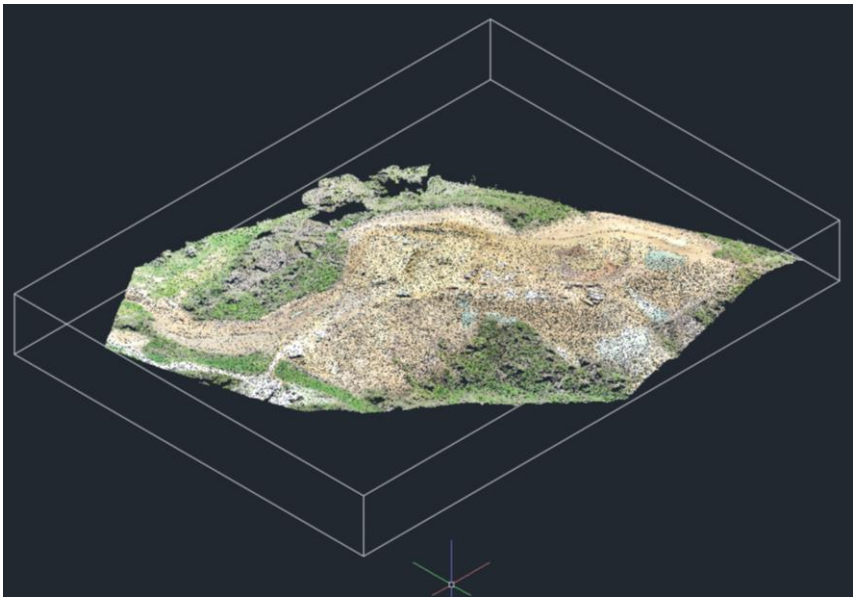

Choose the Point cloud data
Create a new point cloud database
Click on the plus sign
And navigate to the file and open
Then click next



The last window is to confirm the information
Click Finish



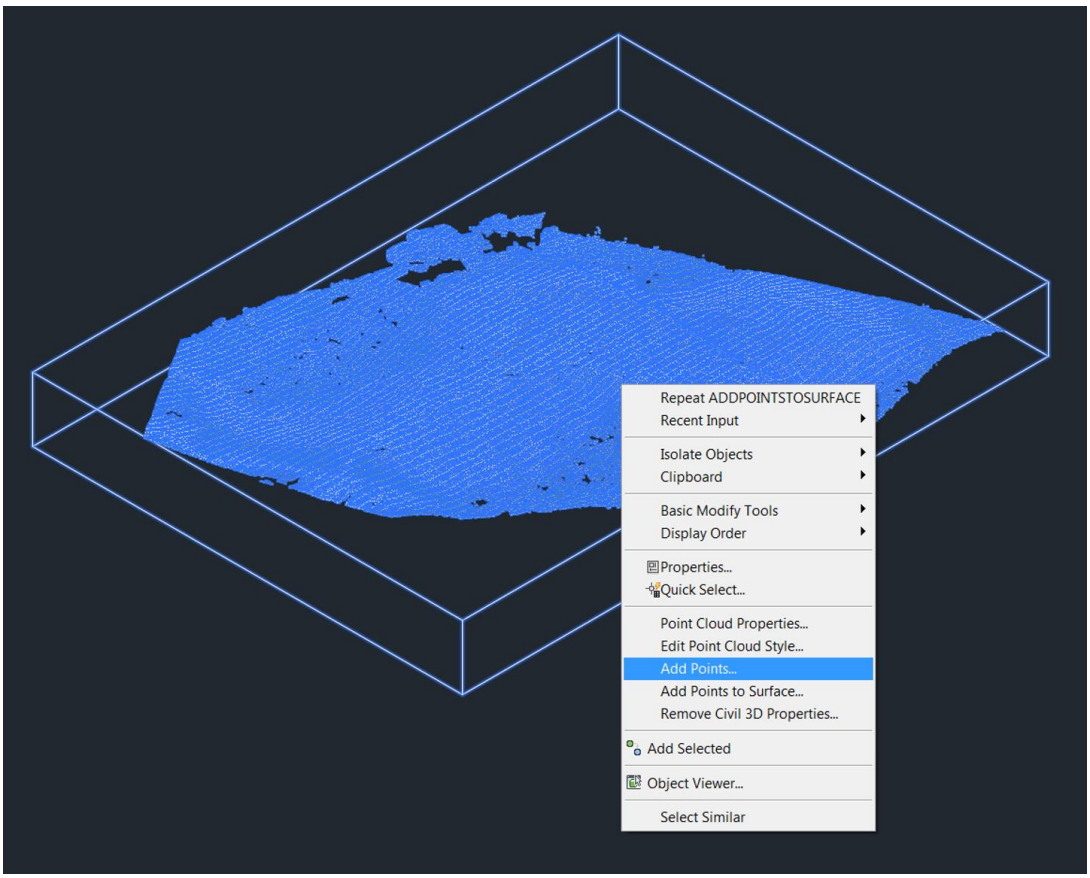

When the its done processing the date the point cloud will appear



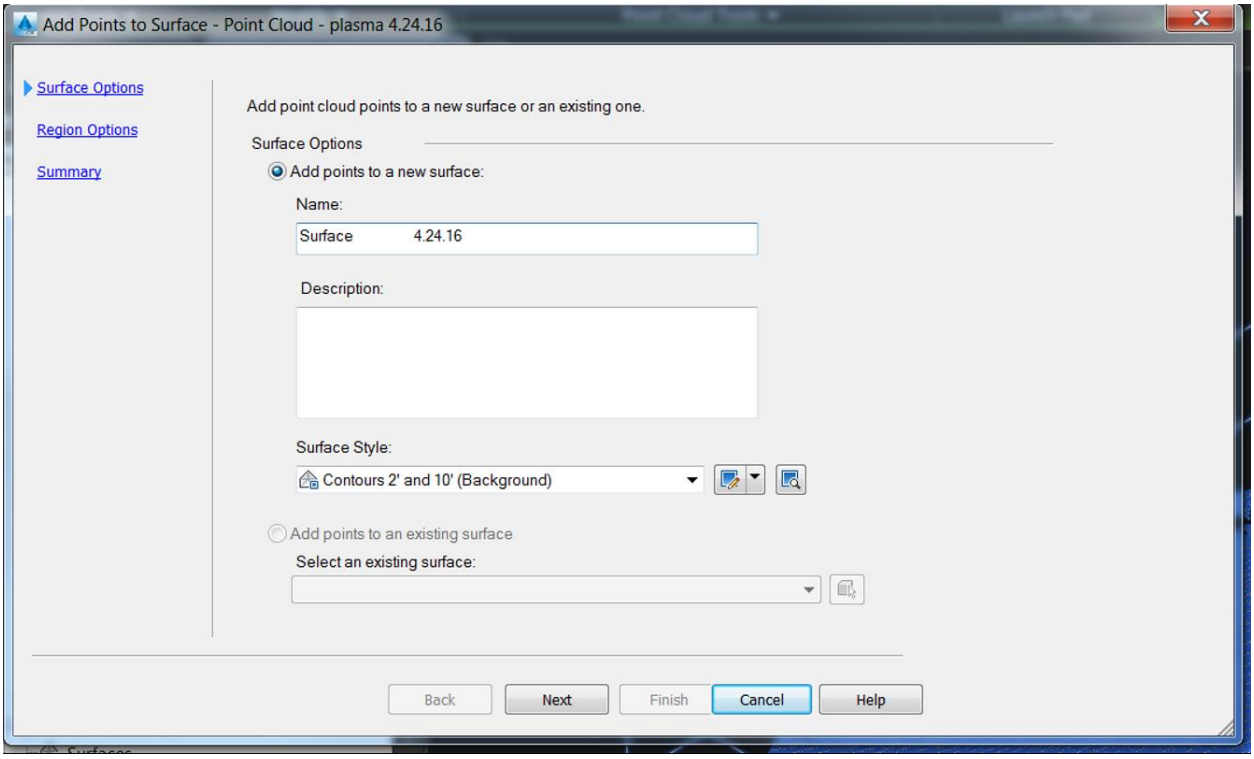
## Creating the surface from the point cloud data

### Instructions to creating a surface from the point cloud data.

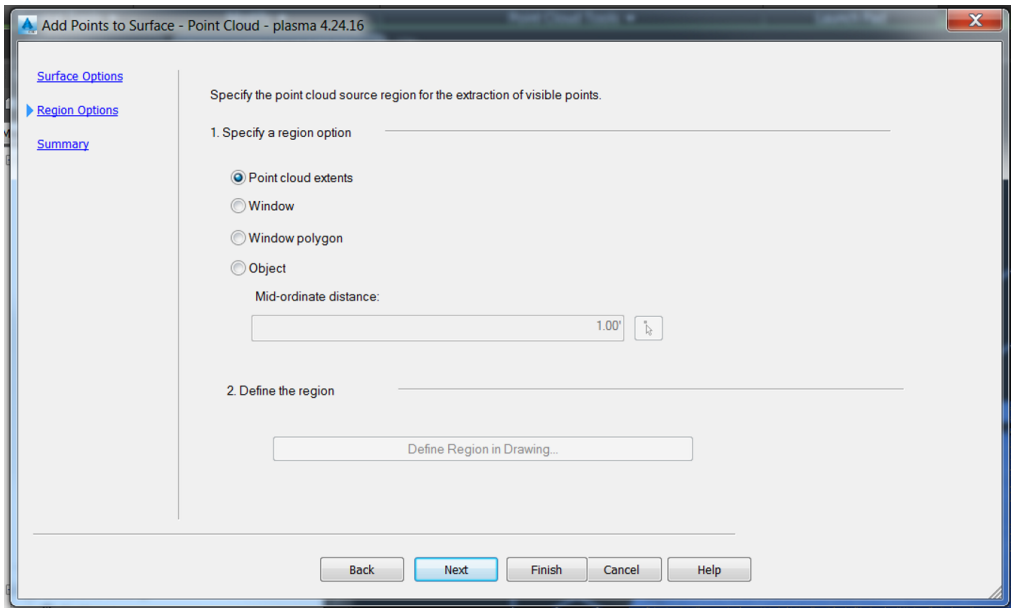
Right click on the imported point cloud data
In the window that pops up click on Add Points



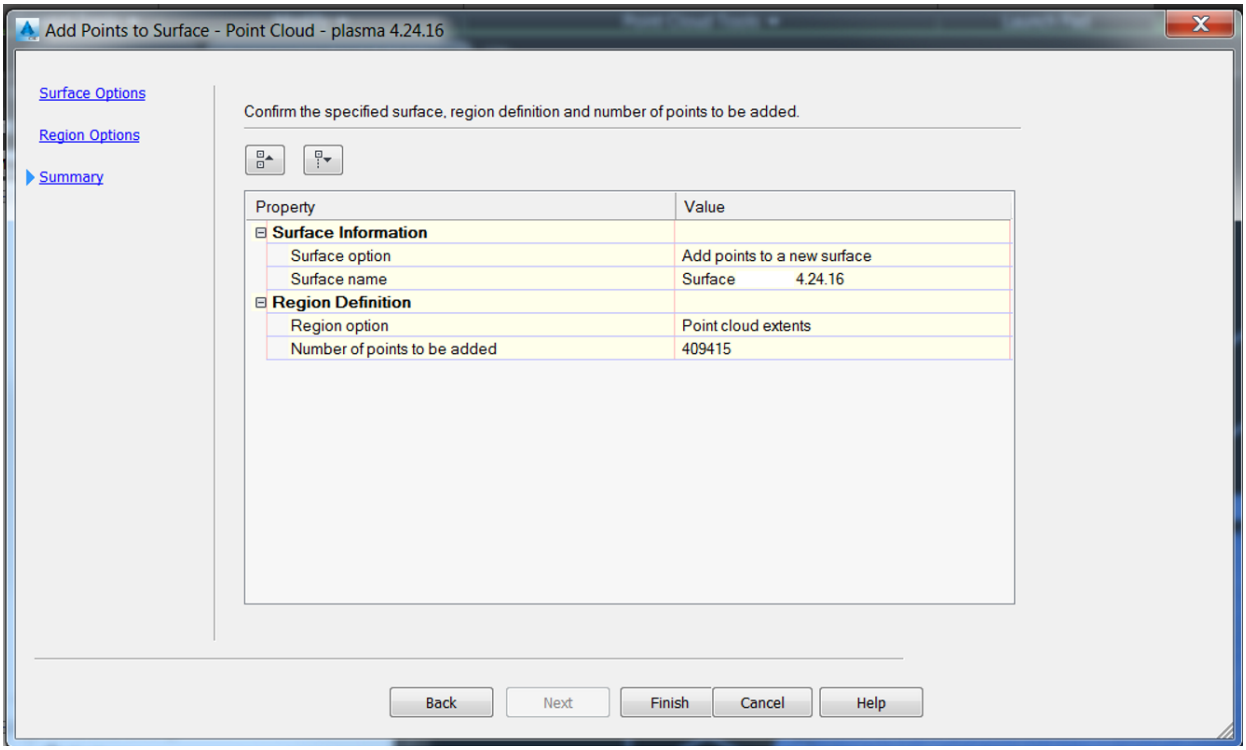
When the add points to surface window pops up
Add a name
Click next



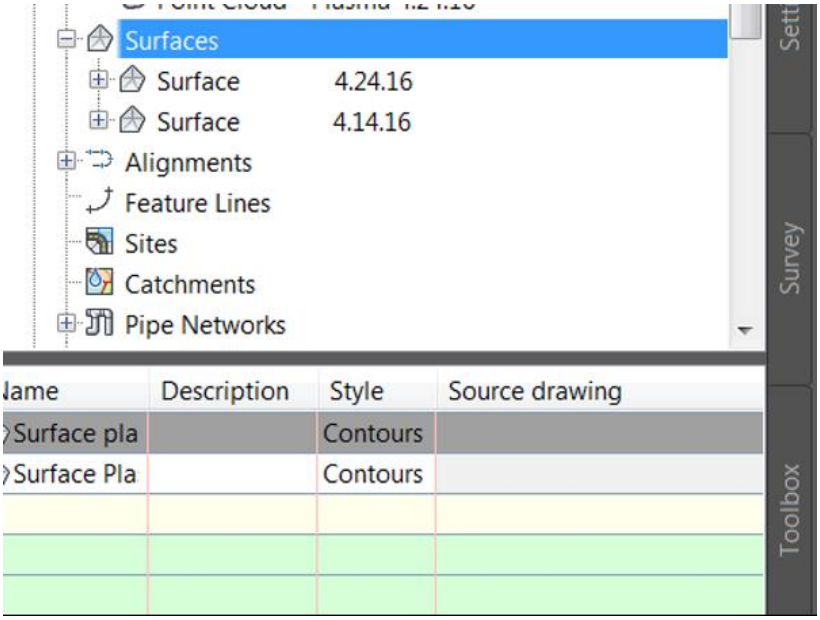
The next window is to define the region in this example we use the point cloud extents
Click on next




Confirm the information
Click finish

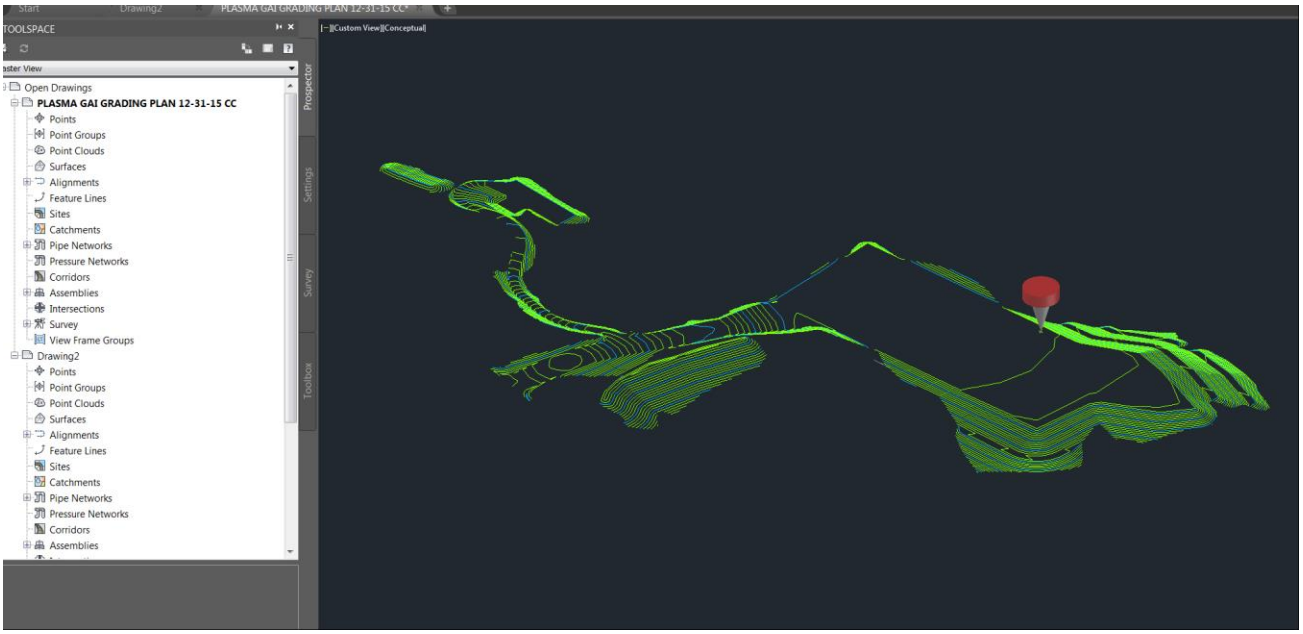


Import the second point cloud date to compare against like above
Create the second surface for the new data
You will see two-point cloud data and 2 surfaces

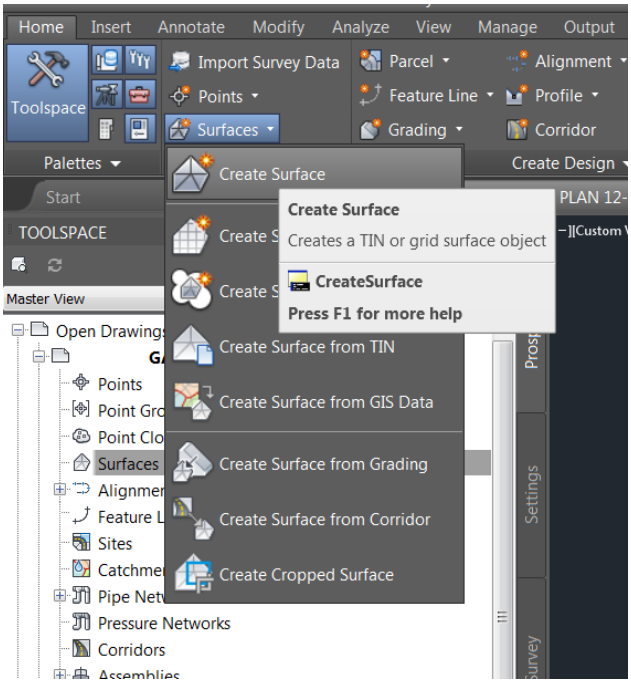


## Creating a surface from a site contour

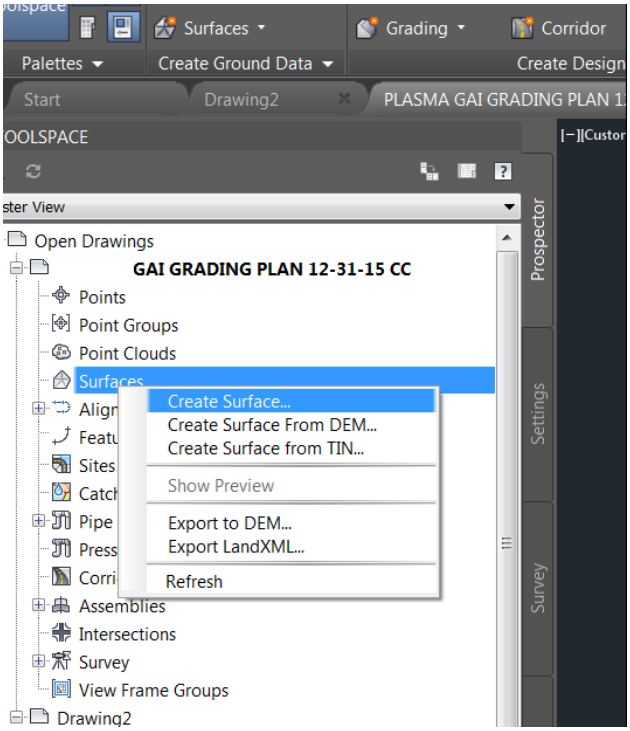
Instructions to create a surface from a site contour



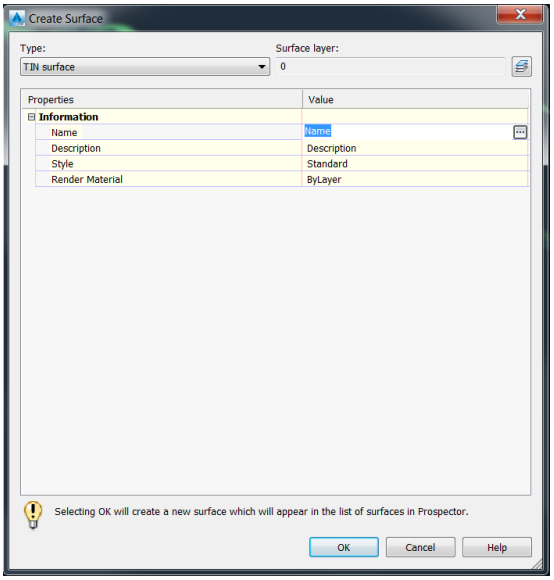

You can either create a surface from the ribbon or in tool space
In the Home Ribbon in the Create Ground Data Tab
Click on Surfaces
Create Surface



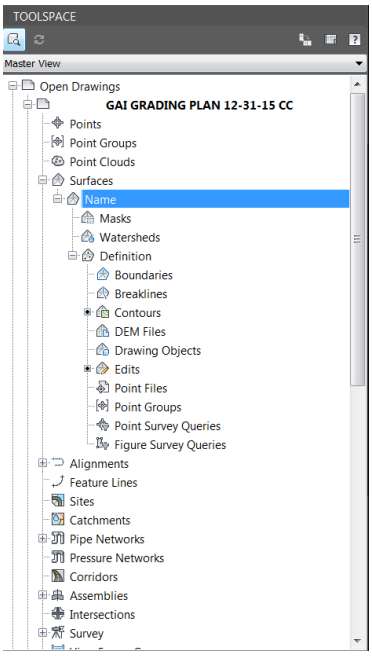
In tool space in the Prospector Tab
Right click on Surface
Create Surface



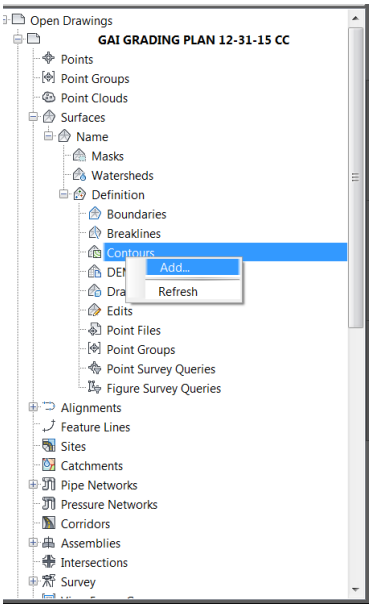

The Create Surface Window will appear
Add a name
Click OK



In Tool space under the prospector tab
Click expand surfaces and you will see" name" underneath it



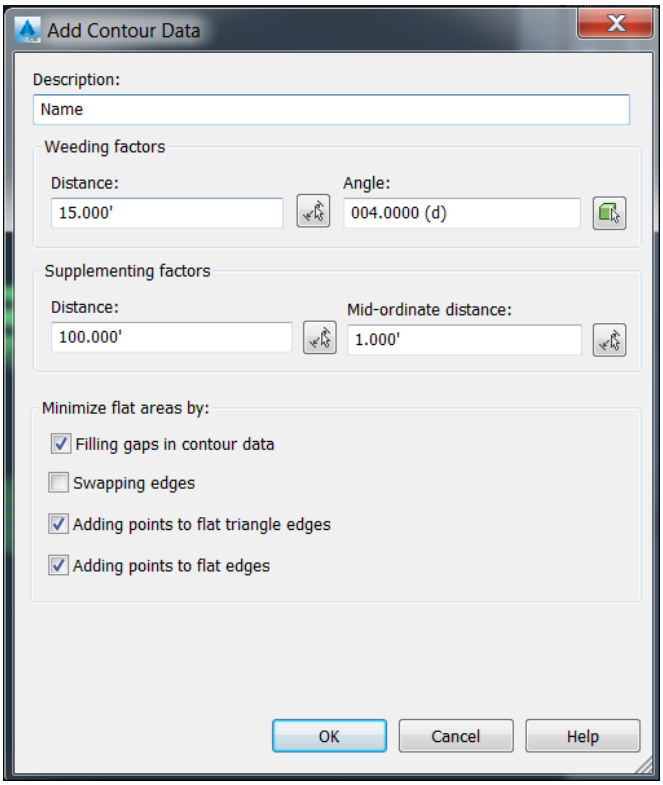

Under the name category, expand it
Expand definitions
Right click on Contours
Click on add




In the Add Contour Data window

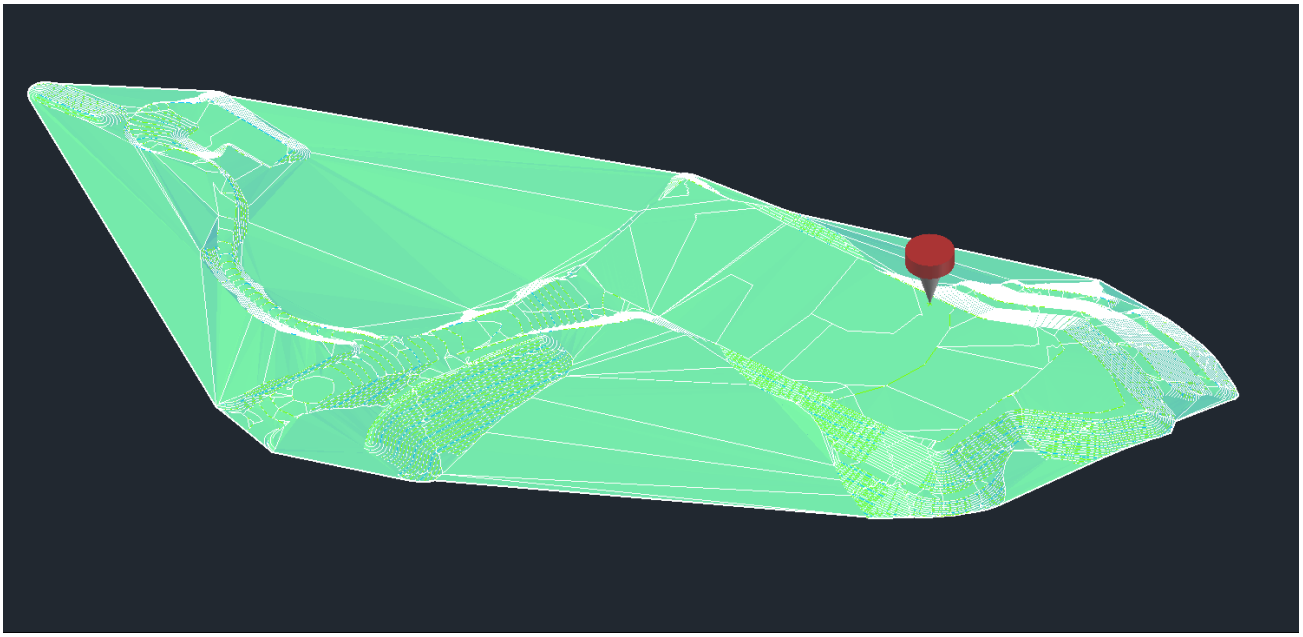
Add the name for the contour “Name”

Click OK



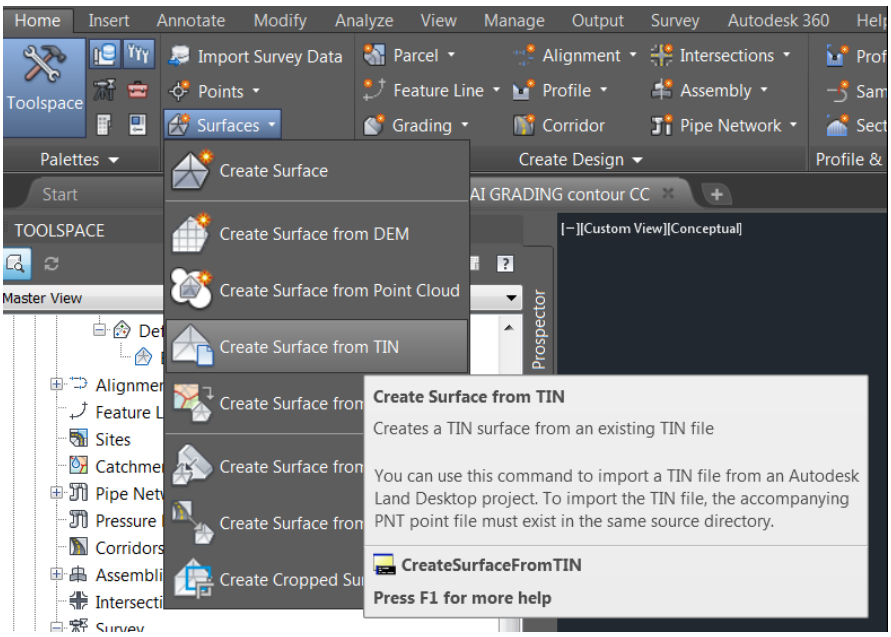

Then you will have the opportunity to choose the contour lines
Select the desired contours to surface
Click enter

You will now see the surface for the Site Contour

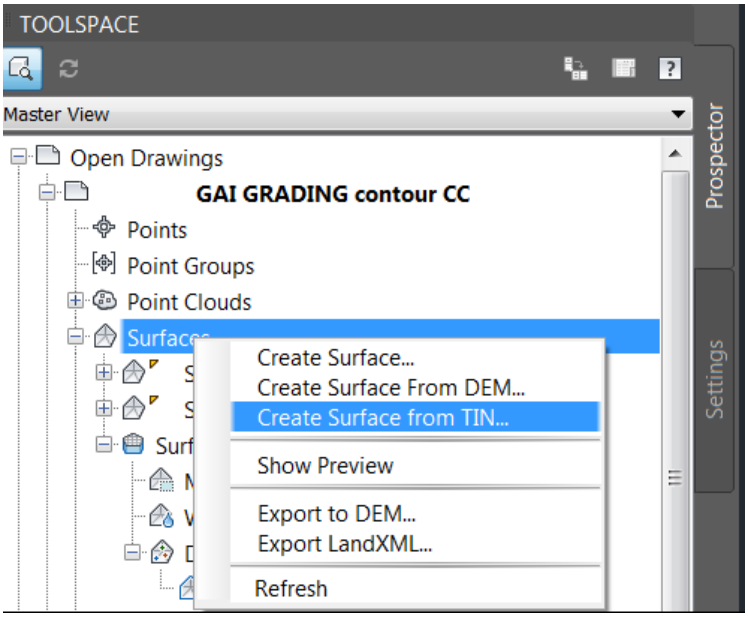


## Creating Surface Volume difference

Instructions to create data for surface volume difference
You can either create a surface difference from the ribbon or in tool space
In the Home Ribbon in the Create Ground Data Tab
Click on Surfaces
Create Surface from Tin

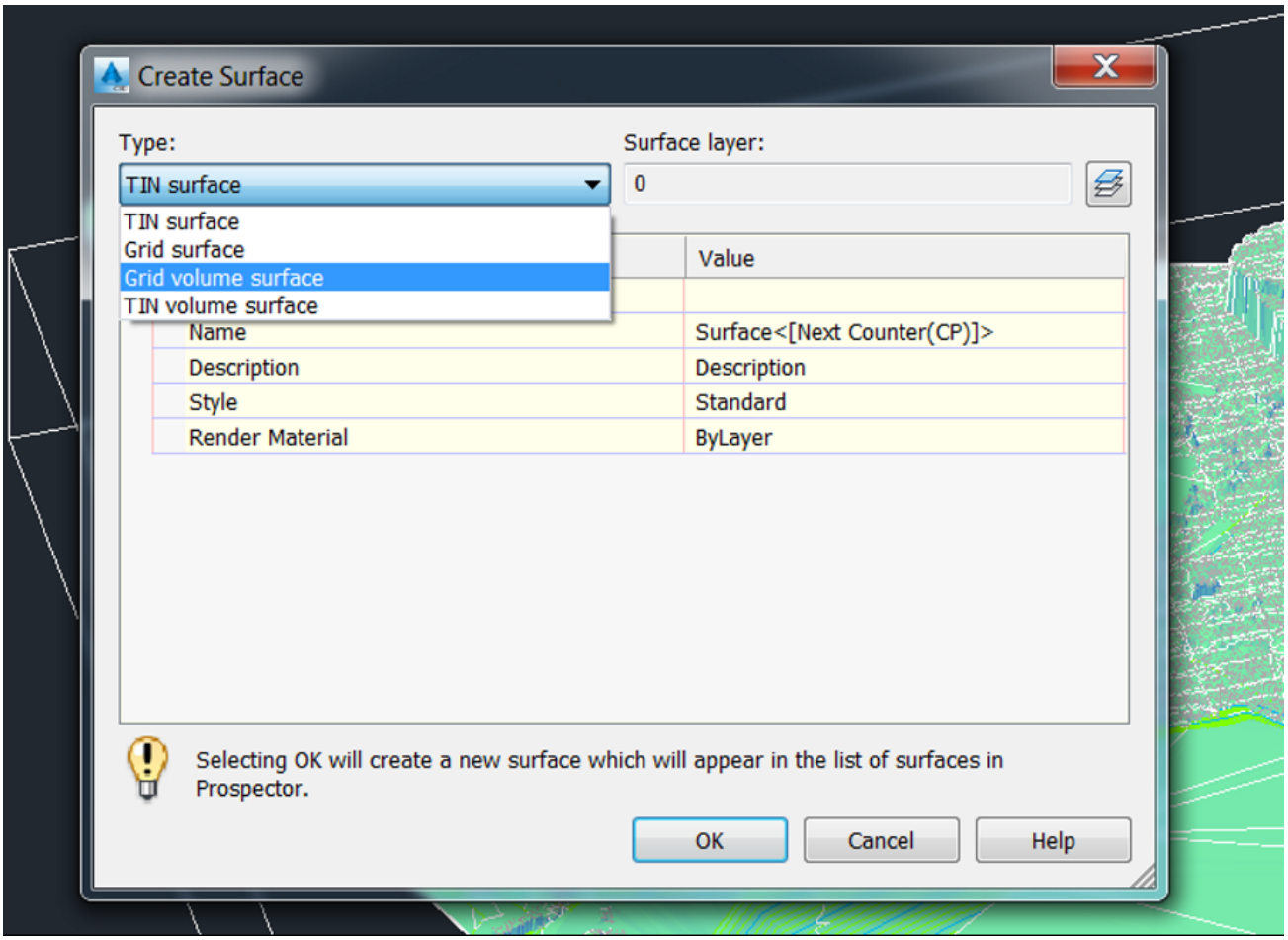



In tool space in the Prospector Tab
Right click on Surface
Create Surface from Tin

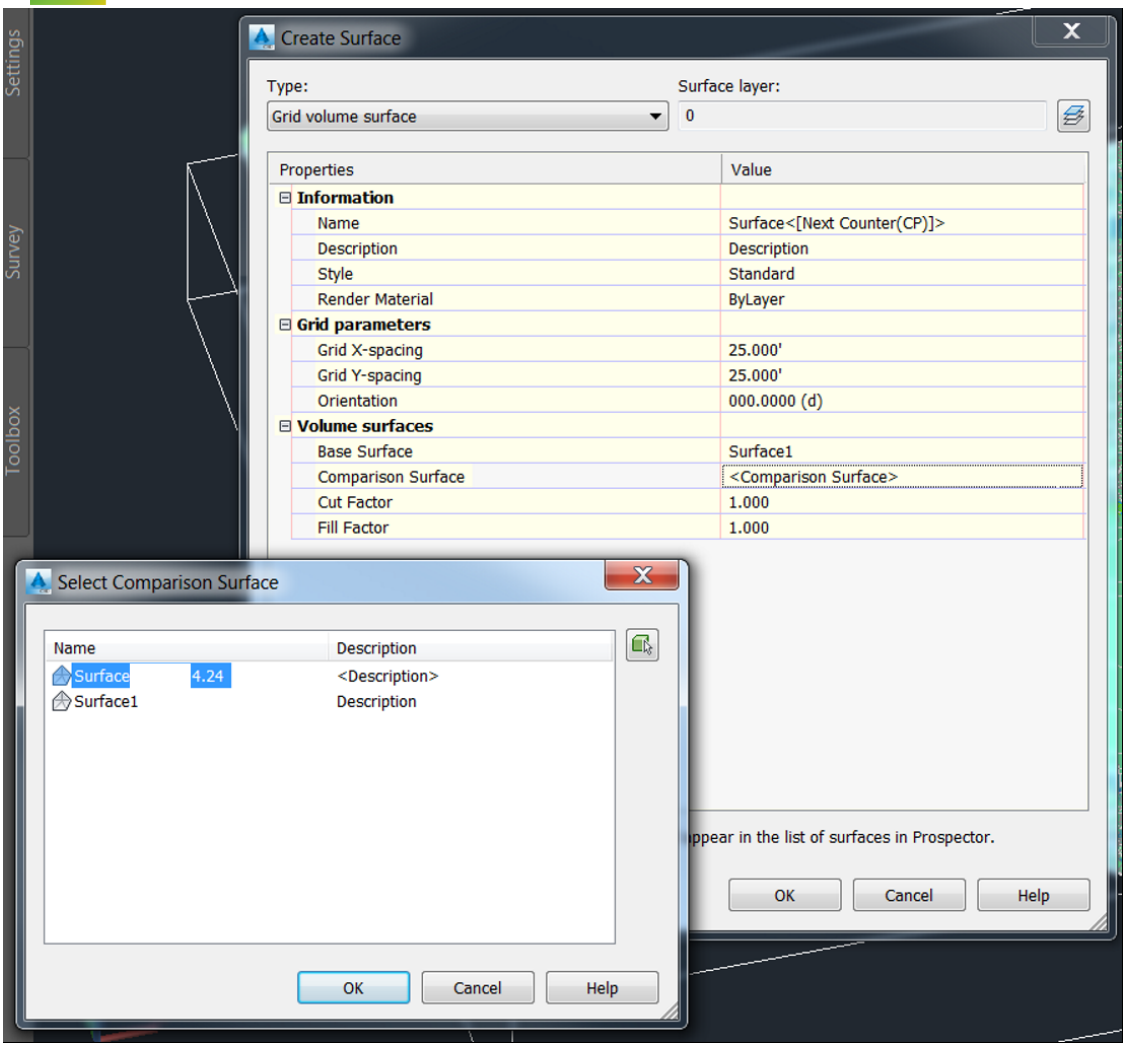


The Create Surface window will pop up

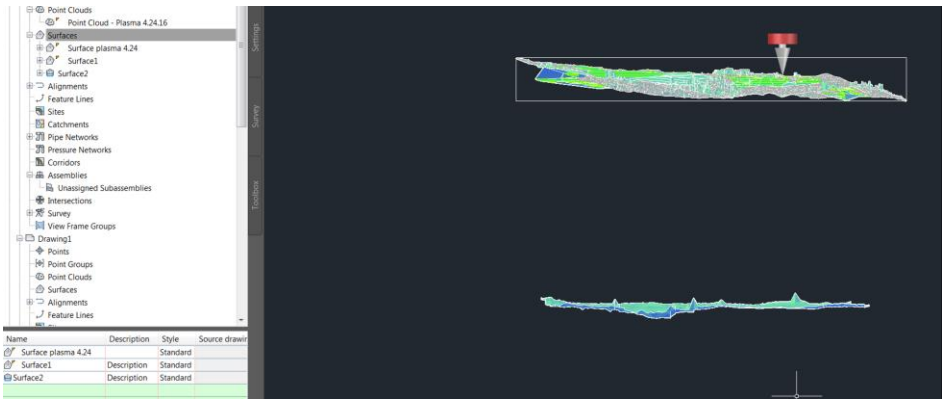
Click in the pull down under Type
Click on Grid Volume Surface



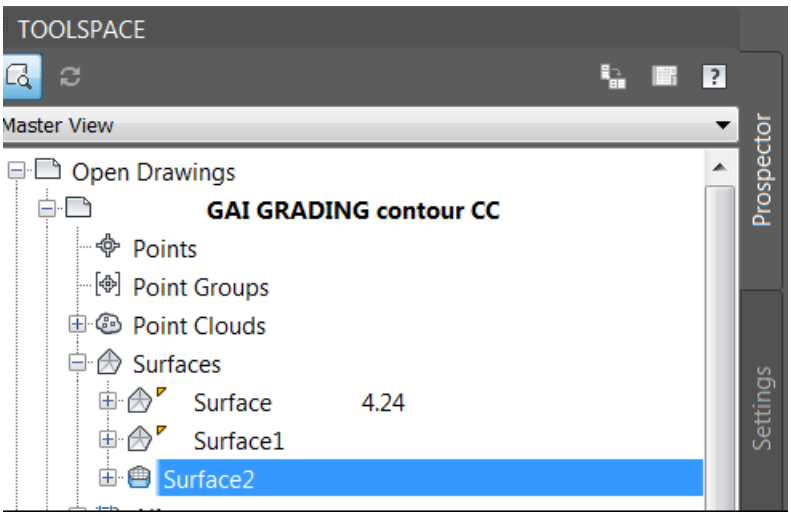

You will then have options to choose both surfaces that you will want to compare
Choose the surface
One will be the Base Surface
The other will be the comparison Surface
Click OK




There will be a Surface created of the difference between the two surfaces
The result is the surface below the original Surfaces



You will now see a third surface created under Surfaces




Right click on the new surface
Click on Surface Properties
The Surface Property window will pop open
Click on the statistic tab
This will give you a mathematical difference between the two surfaces