AUTODESK UNIVERSITY

FAB Parts In Revit: Quickly & Easily Go From Design To Fabrication To ESTmep & Beyond

Josh Asche
Comfort Systems USA

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Learning Objectives

- Reviewing the Design to Fabrication Workflow in Revit to go from Revit Design Project to Fabrication Parts
- Learn how to export out an Autodesk Fabrication file that then can be opened in ESTmep, CADmep or CAMduct
- Learn how to utilize new Estimating Summary features in ESTmep to quickly review project contents and make modifications to Price and or labor on the fly
- Learn how to take the modified file and review it with CADmep; compare it to the original file and prepare ductwork for fabrication with CAMduct

Description

In this class we will explore how to utilize Fabrication Parts in Revit by taking a Revit project and go through the Design to Fabrication workflow. Once this has been reviewed and is complete we will export out an Autodesk Fabrication file from Revit that we will open up in ESTmep. Once inside of ESTmep we will review the contents of the project and make any changes required. Then utilizing the new Estimating Summary options, the Pricing & Labor will be reviewed and make any adjustments necessary. Once this is complete we will review our options for sending the .maj to CAMduct and CADmep.

Josh Asche

Josh is currently working at Comfort Systems USA as a BIM Integration Specialist. Comfort Systems USA has become America's leader in installation and service for building mechanical systems and currently has 36 subsidiary companies with over 96 locations across the United States. CSUSA has a total of 24 companies, 7 sheet metal fabrication shops with 190 users sharing the same Autodesk Fabrication Database. Josh is responsible for implementation, training and advisement on best practices for these companies, developing standards within the organization and continuing to utilize new technology to the fullest extent. Previous to working at CSUSA Josh was a sheet metal worker for 12 years, MAP Software trainer for 3 years and a Regional Sales Manager for Technical Sales International for 2 years. Josh has been working with Autodesk Products for 16 years.

Bryan Miller

Bryan is a Project Designer and BIM Specialist at Environmental Air Systems. EAS is one of the leading mechanical contractors in the Carolinas and been a part of the Comfort Systems USA family for five years. Specializing in Off-Site Construction (OSC), EAS provides fully custom modular penthouses, central energy plants, super skids, electrical skids, and air handling units to clients across the country. EAS off-site construction projects range from $100K to $20M+ in project scope. EAS provides structural, electrical and mechanical engineering services as well full BIM capabilities. EAS has fully implemented REVIT as their primary platform for the entire OSC design work cycle. Bryan has 20+ years training and experience in the Architectural, Structural and MEP fields using AutoCAD and Revit.

Reviewing the Design to Fabrication Workflow in Revit to go from Revit Design Project to Fabrication Parts

The first step in this process is to open up the Revit file containing the mechanical systems you are involved with. Then you will need to identify which Systems you would like to go from Design Parts to Fabrication Parts. Once the Systems have been identified you will need to select them using the best method for your situation. I recommend selecting one System at a time and doing it bite size pieces. See Figure 1 below with Image of Design Ductwork and Piping.

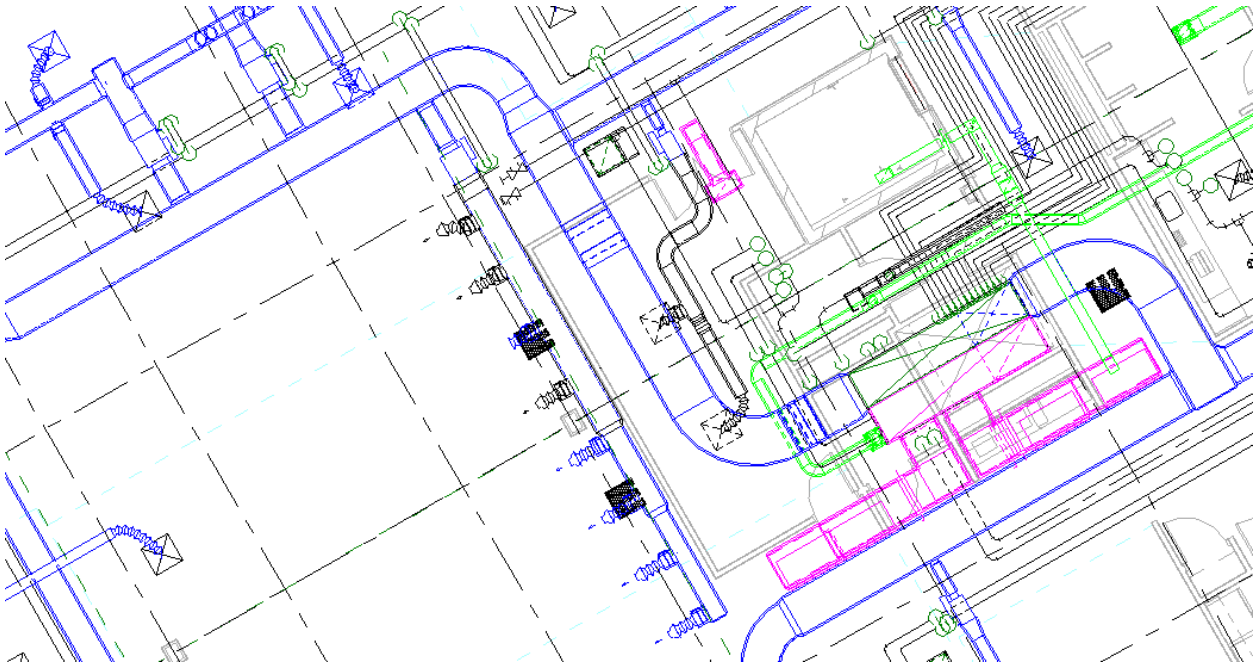

FIGURE 1: IMAGE OF DESIGN DUCTWORK & PIPING

Design to Fabrication

Once the Systems have been identified that you are looking to go from Design to Fabrication, you will need to select them using the most efficient method for your situation. Once the system is selected you will need to choose the Design to Fabrication button on the Ribbon. See Figure 2 below with Image of Design Ductwork selected and Design to Fabrication button on the Ribbon.

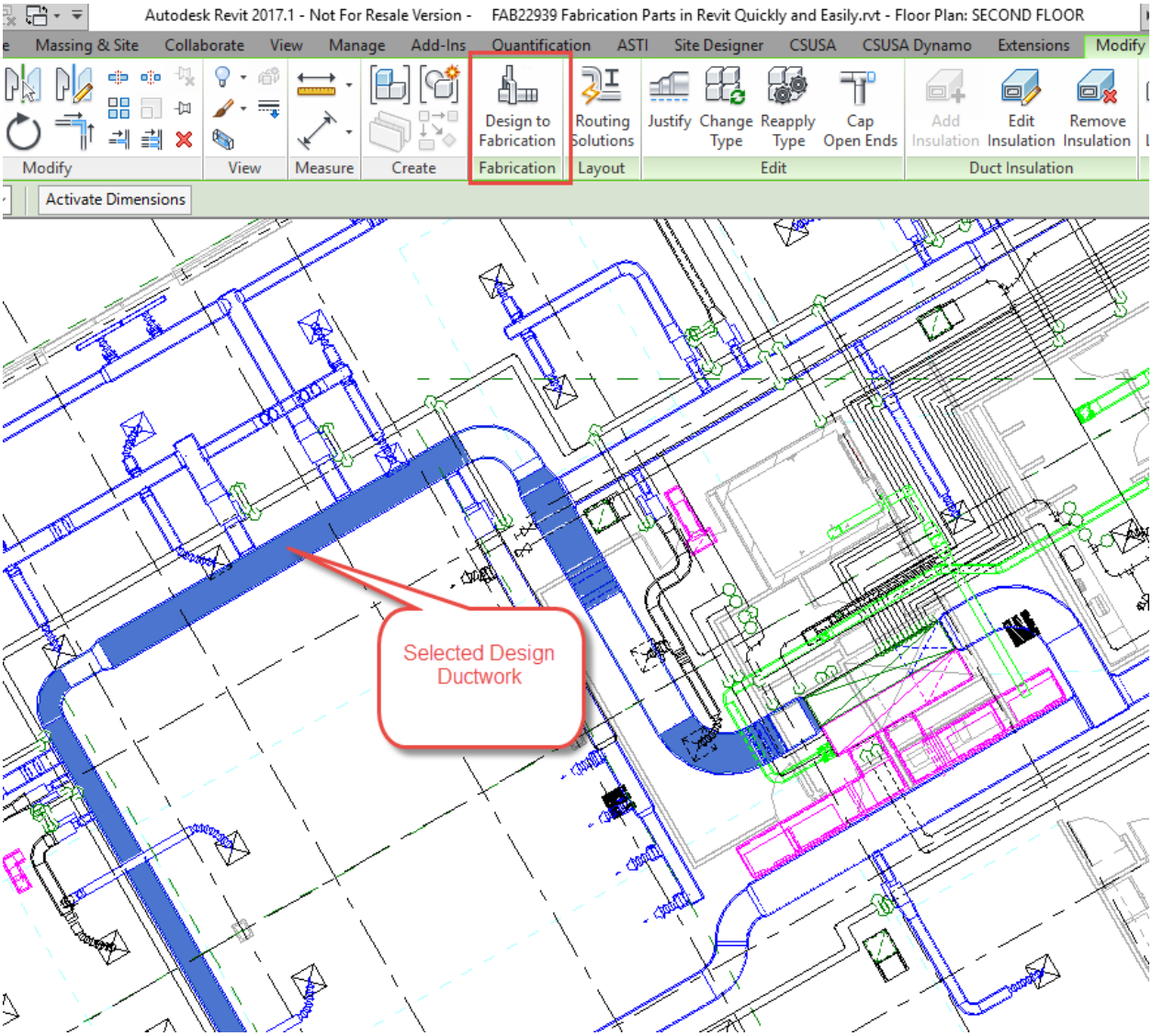

FIGURE 2: IMAGE OF SELECTED DESIGN DUCTWORK & DESIGN TO FABRICATION BUTTON

Design To Fabrication

After selecting the Design to Fabrication button on the Ribbon a dialog box will open up prompting you to select the Fabrication Service you would like to use for Conversion. You will need to select the Fabrication Service you would like to use and then select Ok. See Figure 3 below with image of this process.

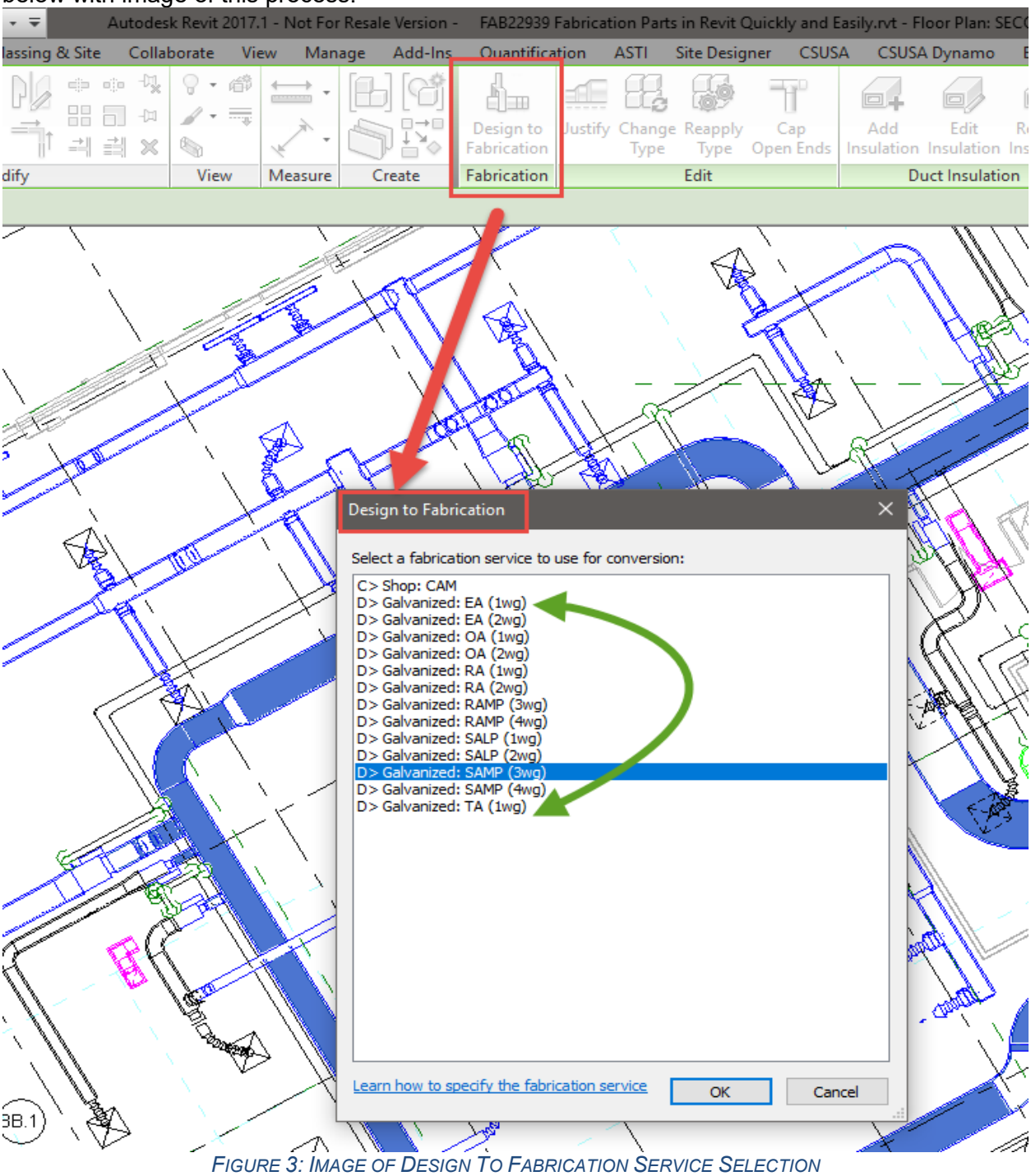

FIGURE 3: IMAGE OF DESIGN TO FABRICATION SERVICE SELECTION

Design To Fabrication

Once selecting Ok you will notice the selected items get converted from Design items to Fabrication items based off of the Service you selected. See Figure 4 below with image of converted items.

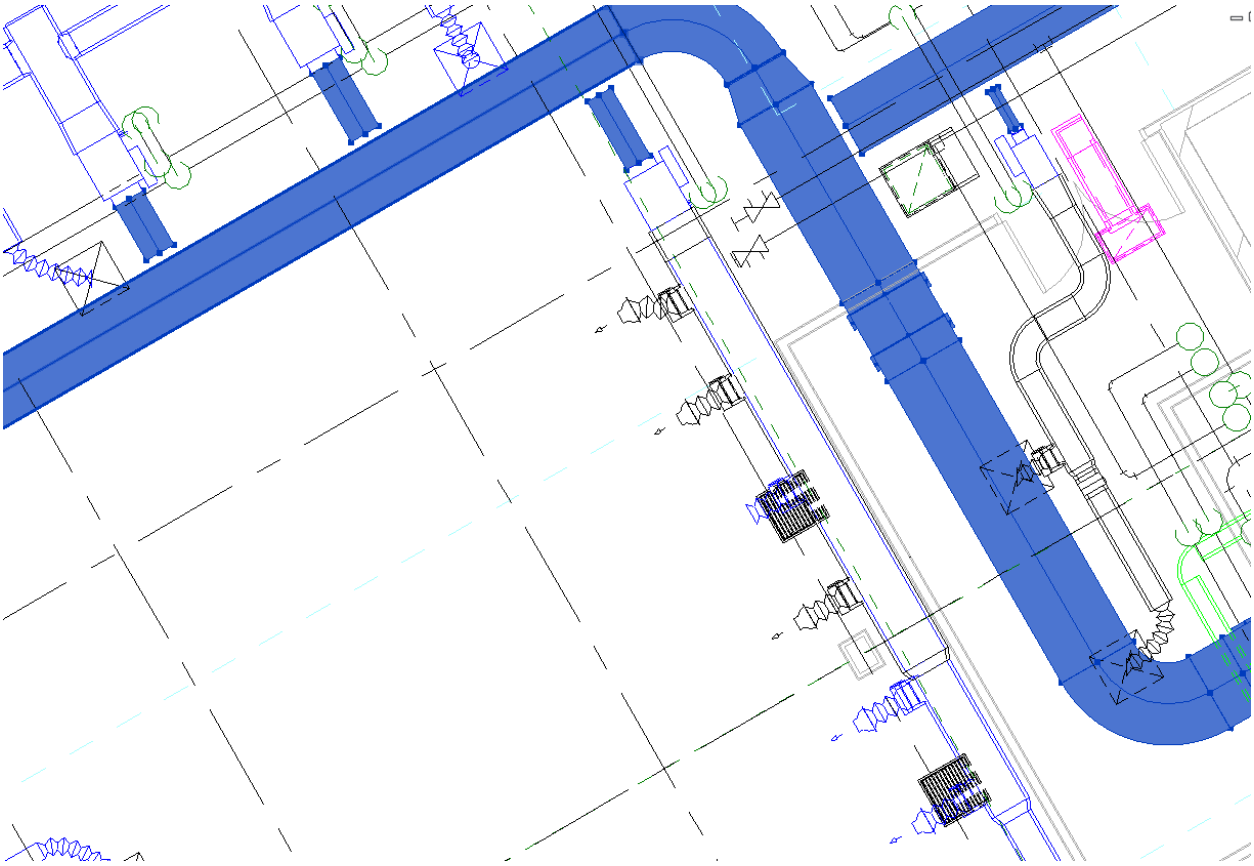

FIGURE 4: IMAGE OF CONVERTED ITEMS

Design To Fabrication

You will notice in the Figure 4 Image the Items were converted and the level of detail is much greater with the ductwork now having the appropriate seams and connectors as an example. However, you will notice the standard length of fittings and straights of ductwork were not optimized per the pressure class or fitting constraints. This is where the Optimize Lengths button comes into action. By selecting the items that were converted to Fabrication Parts the Optimize Lengths can be selected changing the lengths of ductwork to match the pressure class and constraints. See Figure 5 below with image of this process.

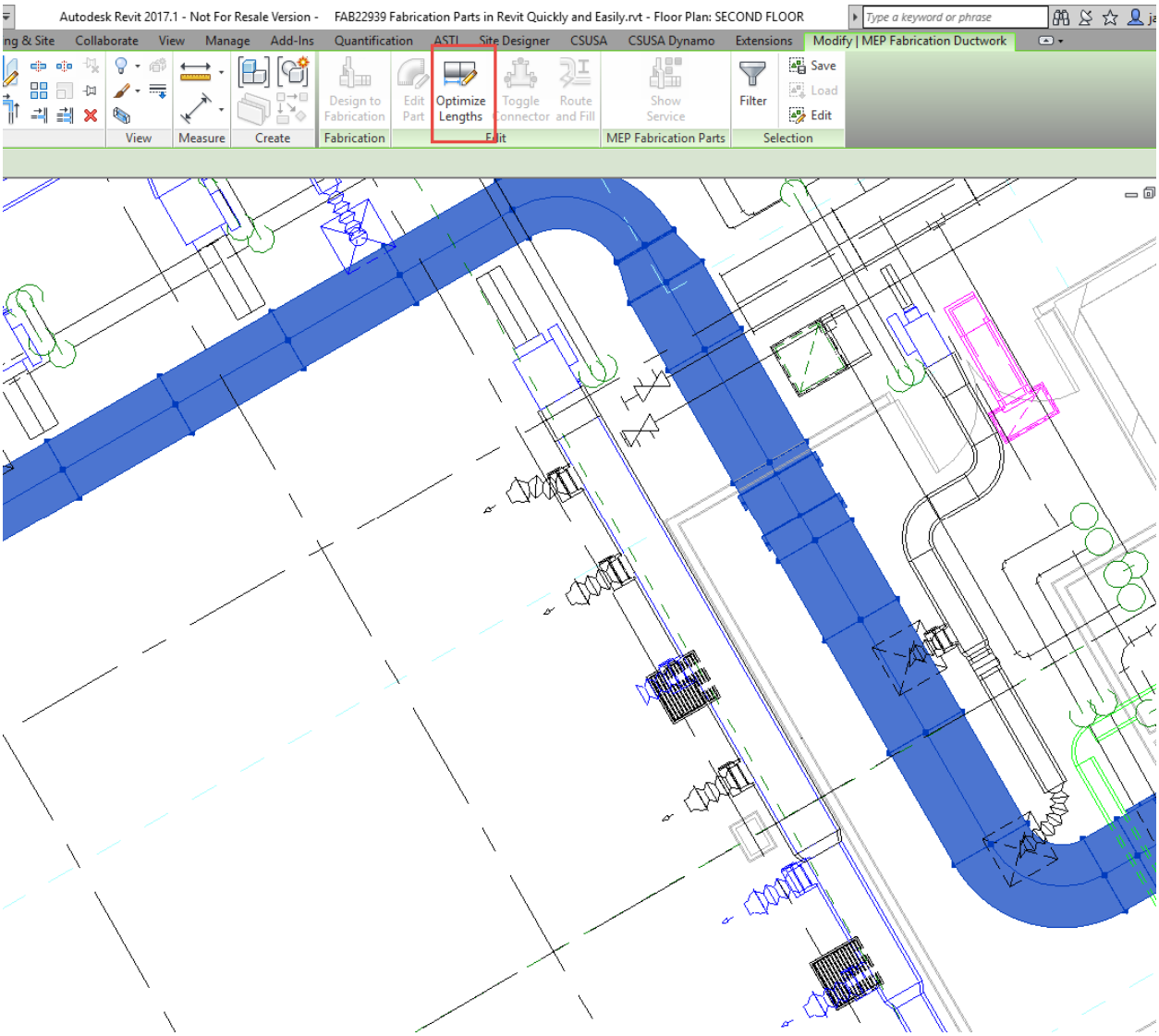

FIGURE 5: IMAGE OF OPTIMIZE LENGTHS EXAMPLE

Design To Fabrication

You will also notice that my elbows defaulted to long radius elbows with any prompts from the Design to Fabrication button. This is being driven by the way your Service is set up. However, you have the option to exclude fittings in your Service before you use the Design to Fabrication option. See Figure 6 image below of this process.

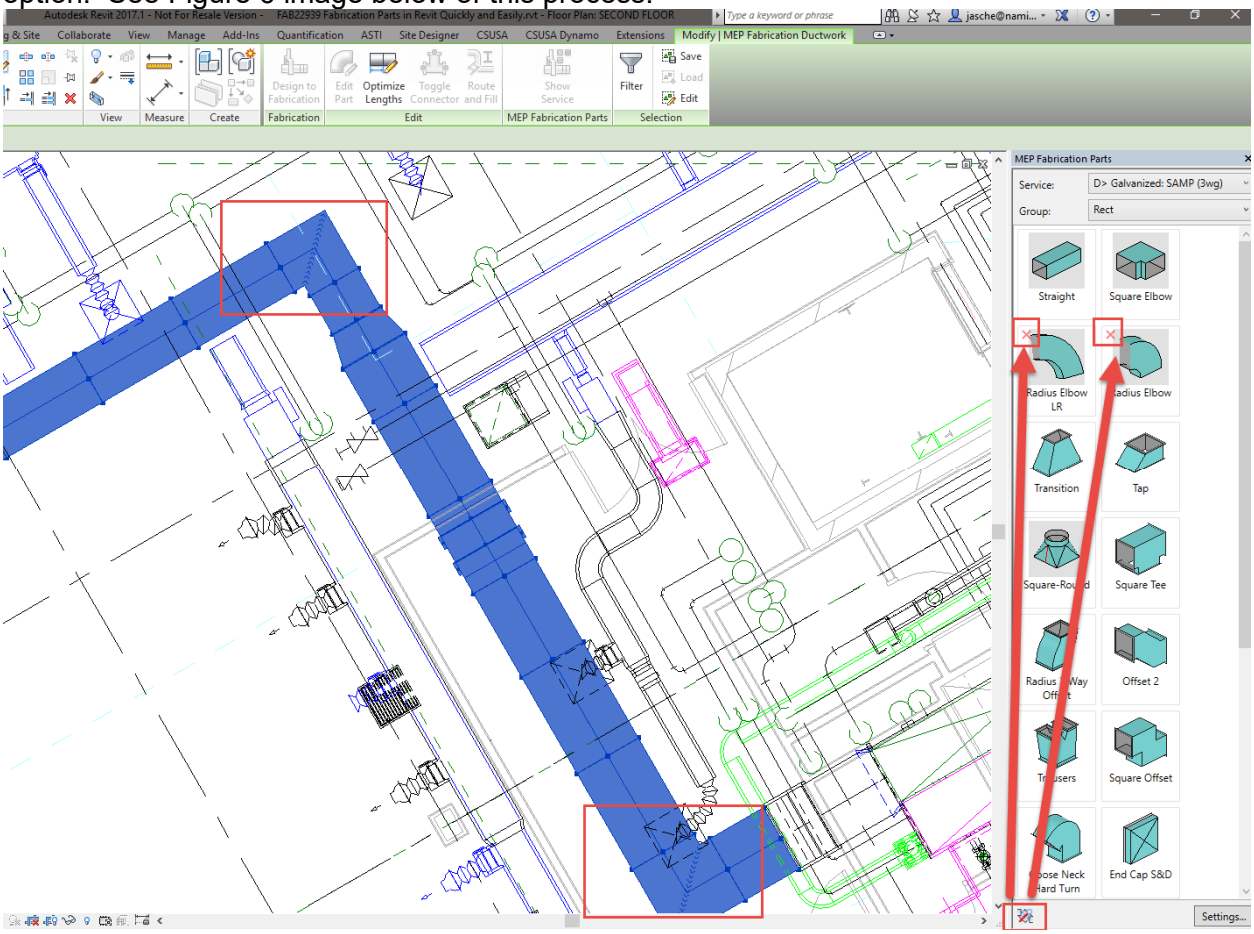

FIGURE 6: IMAGE OF EXCLUSIONS TOOL

Design to Fabrication

When it comes to using Design to Fabrication for converting generic inline accessories you may have experienced these items not being converted. In fact, prior to the 2017.1 release these items would have been deleted when using the Design to Fabrication process. See Figures 6 and 7 below with images of this.

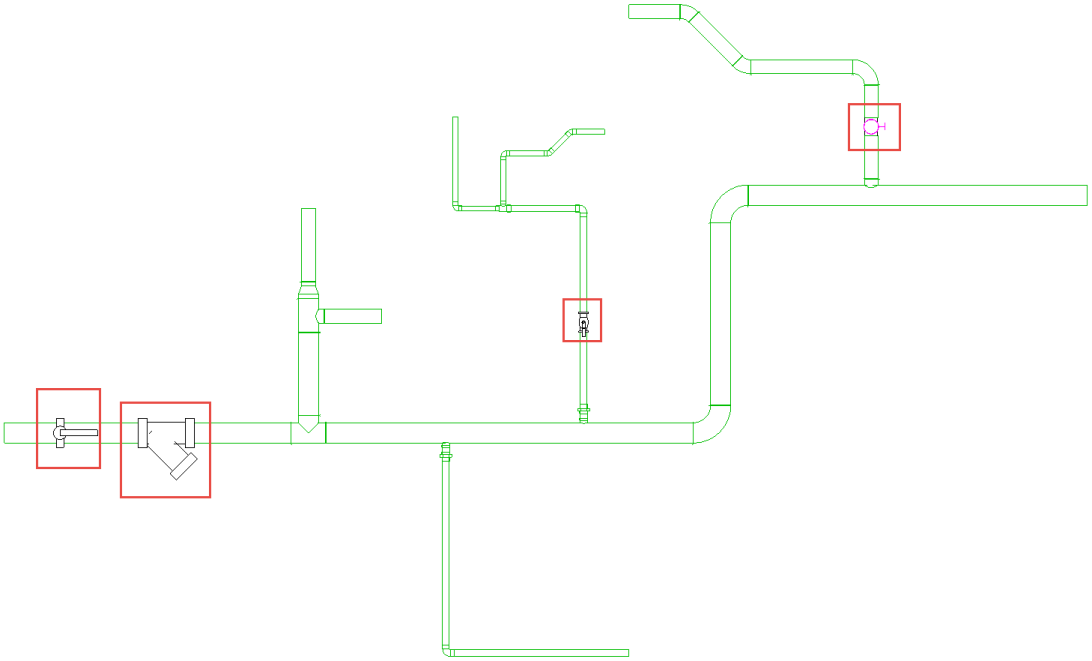

FIGURE 6: IMAGE OF GENERIC INLINE PIPE ACCESSORIES

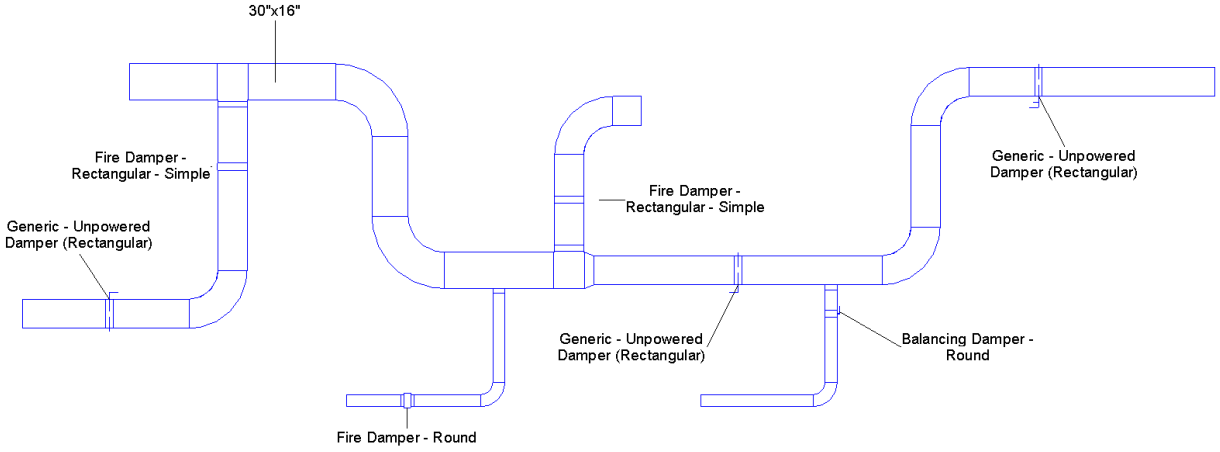

FIGURE 7: IMAGE OF GENERIC INLINE DUCT ACCESSORIES

Design to Fabrication

We can take this a step further and convert these generic inline items to Fabrication Parts. Prior to converting these items, you will need to modify your Button Mappings in Fabrication. See steps listed below and Figure 8 with image of Button Mappings.

1. You will need to generate a schedule for Piping Accessories using one field “Family and Type” and condense this schedule to only show one instance by sorting by “Family and Type” and unchecking “Itemize every Instance” on the Sorting and grouping tab of the schedule properties.
2. Export the schedule out to a text file
3. Edit the text file or import into excel to edit the text. As an example The generic ball vale text will be (Ball Valve - 2-6 Inch: 2") I will need to replace the (“:” and “space”) with an “_” the result being (Ball Valve - 2-6 Inch_2")
4. Edit the service/s in Fabrication to include these button Mappings and assign the button code for the fabrication part that you want to replace it with.

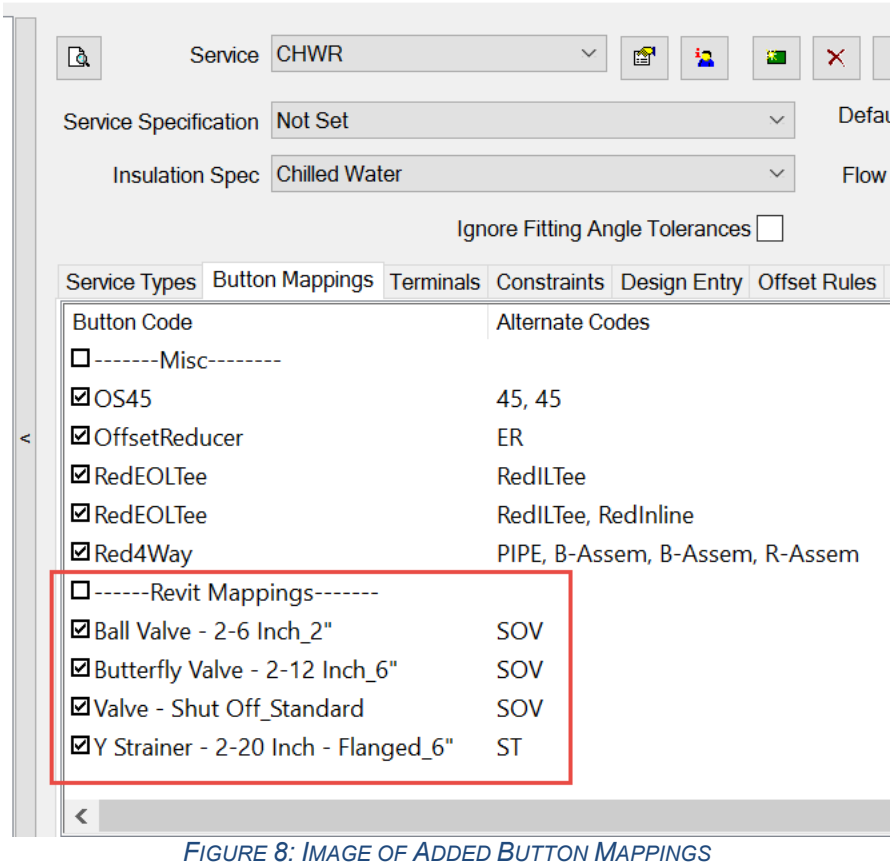

FIGURE 8: IMAGE OF ADDED BUTTON MAPPINGS

Design to Fabrication

For the inline generic duct accessories, the process is exactly the same. The Button Mappings of the appropriate duct Services will need to be modified in Fabrication. See Figure 9 image below with additional Button Mappings.

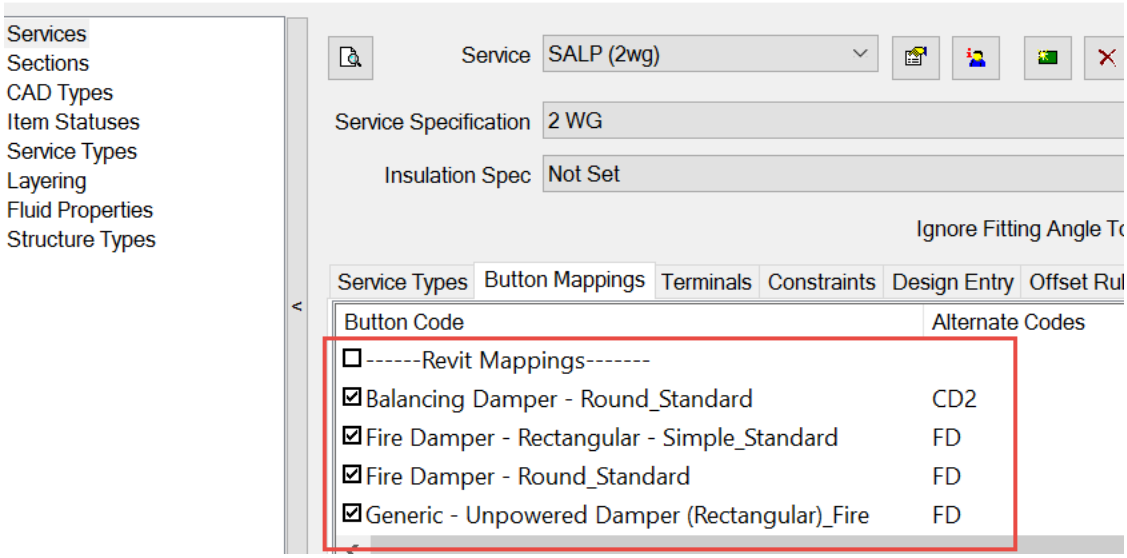

FIGURE 9: IMAGE OF ADDED BUTTON MAPPINGS

Design to Fabrication

You will now see the inline generic pipe and duct accessories are being filled with the corresponding Button Mapped Fabrication items. See Figures 10 and 11 below for images of the results of this.

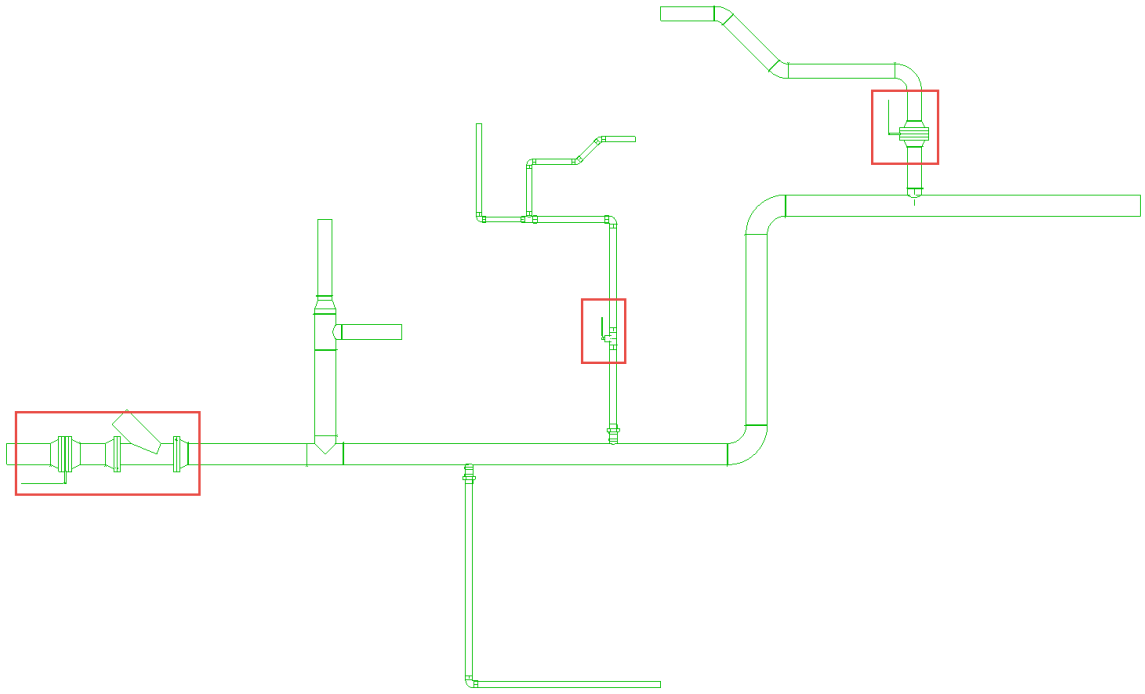

FIGURE 10: IMAGE OF INLINE PIPING CONVERTED TO FABRICATION PARTS

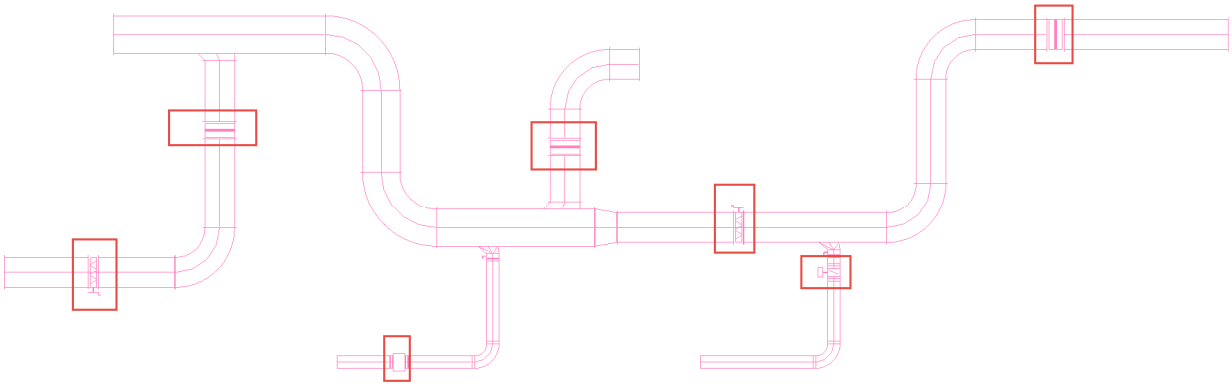

Figure 11: Image of Inline Duct Items Converted to Fabrication Parts

Design to Fabrication

The workflows and processes laid out in this document will give you good idea of how to go about this and how things are working. The examples used are going to work for both piping, plumbing and sheet metal items. For additional information on topics discussed and further information please see Fabrication Detailing in Revit See Figure 12 below for image of Help File.

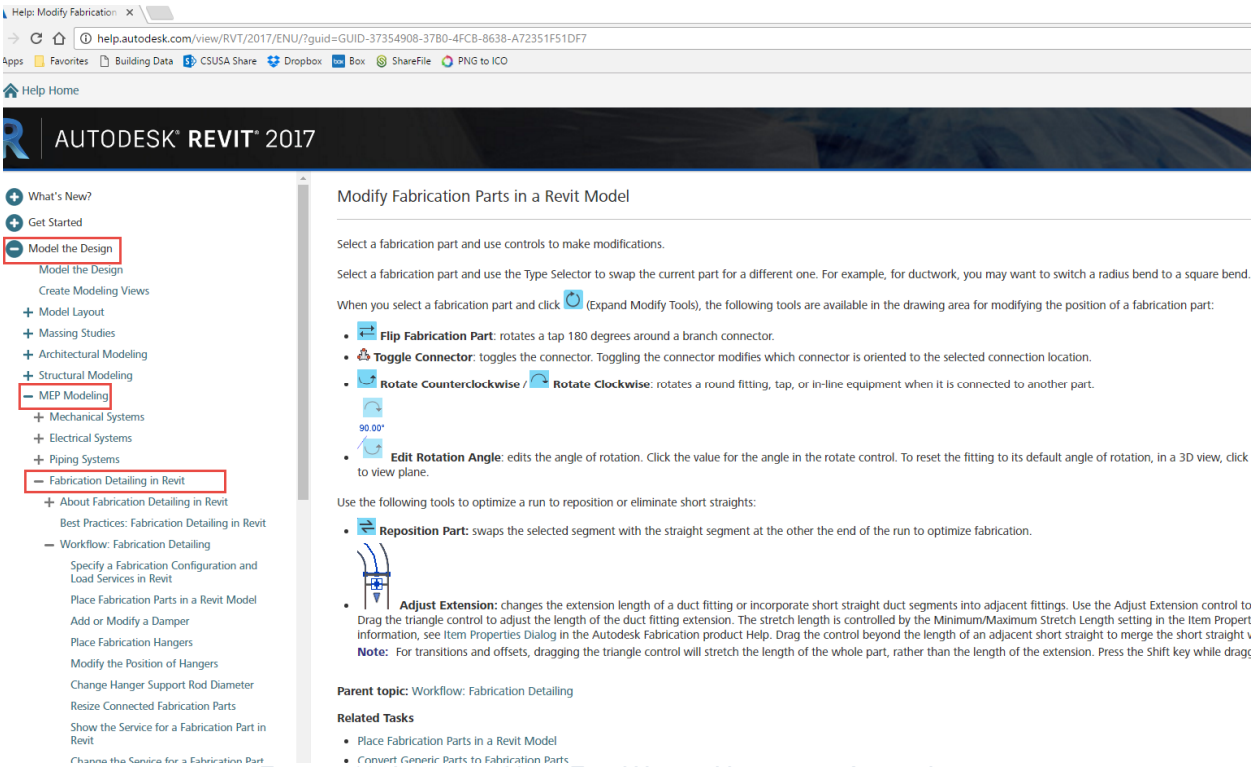

FIGURE 12: IMAGE OF HELP FILE WHERE HYPERLINK ABOVE LEADS

Learn how to export out an Autodesk Fabrication file that then can be opened in ESTmep, CADmep or CAMduct

Exporting .MAJ File Out of Revit

Once you have converted all of the items you are concerned with from Design Parts to Fabrication Parts, you have the ability to export out a. MAJ file out of Revit. In order to do this, you will need to select the items you would like to export out. To create your selection set of items you can select the items however you would like but I find it easiest to use the Filter tool under the Modify section of the Ribbon. See Figure 13 below for image of Filter tool.

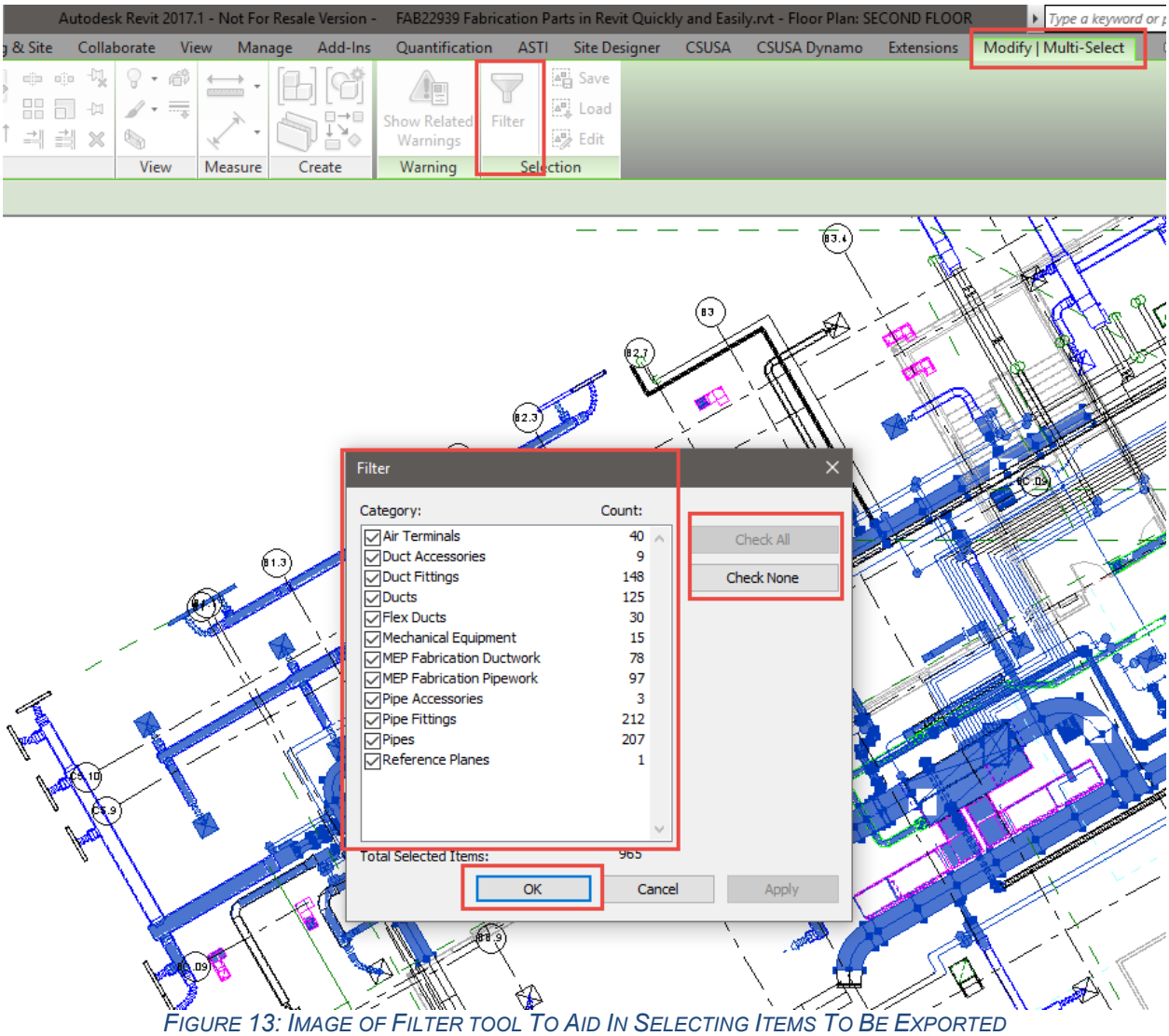

FIGURE 13: IMAGE OF FILTER TOOL TO AID IN SELECTING ITEMS TO BE EXPORTED

Exporting .MAJ File Out of Revit

See Figure 14 below for image of Add-Ins “Revit Extension for Fabrication” and then “Export Autodesk Fabrication Job File”

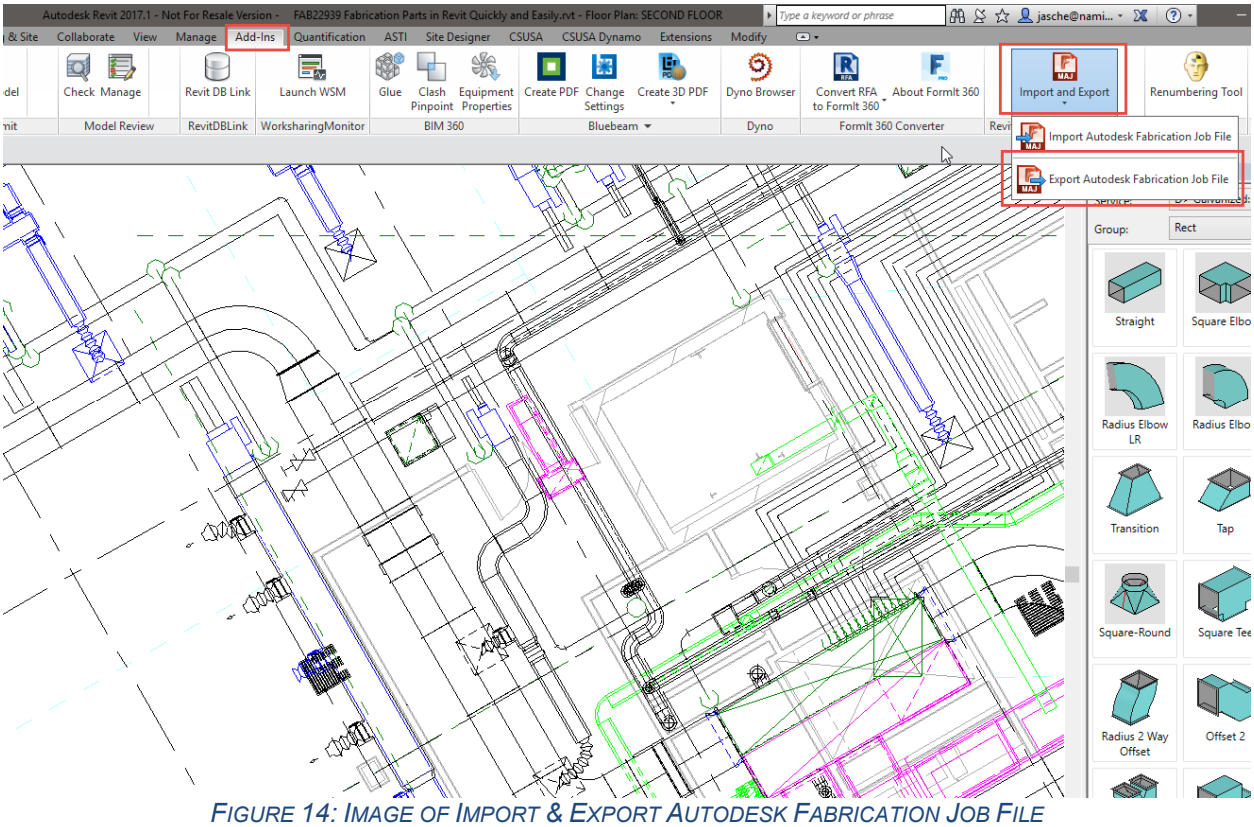

FIGURE 14: IMAGE OF IMPORT & EXPORT AUTODESK FABRICATION JOB FILE

Exporting .MAJ File Out of Revit

Once the “Export Autodesk Fabrication Job File” has been selected you will see a Window open asking you to select a location for the .MAJ file and also to give it a name. See Figure 15 below with image of the dialog box that opens.

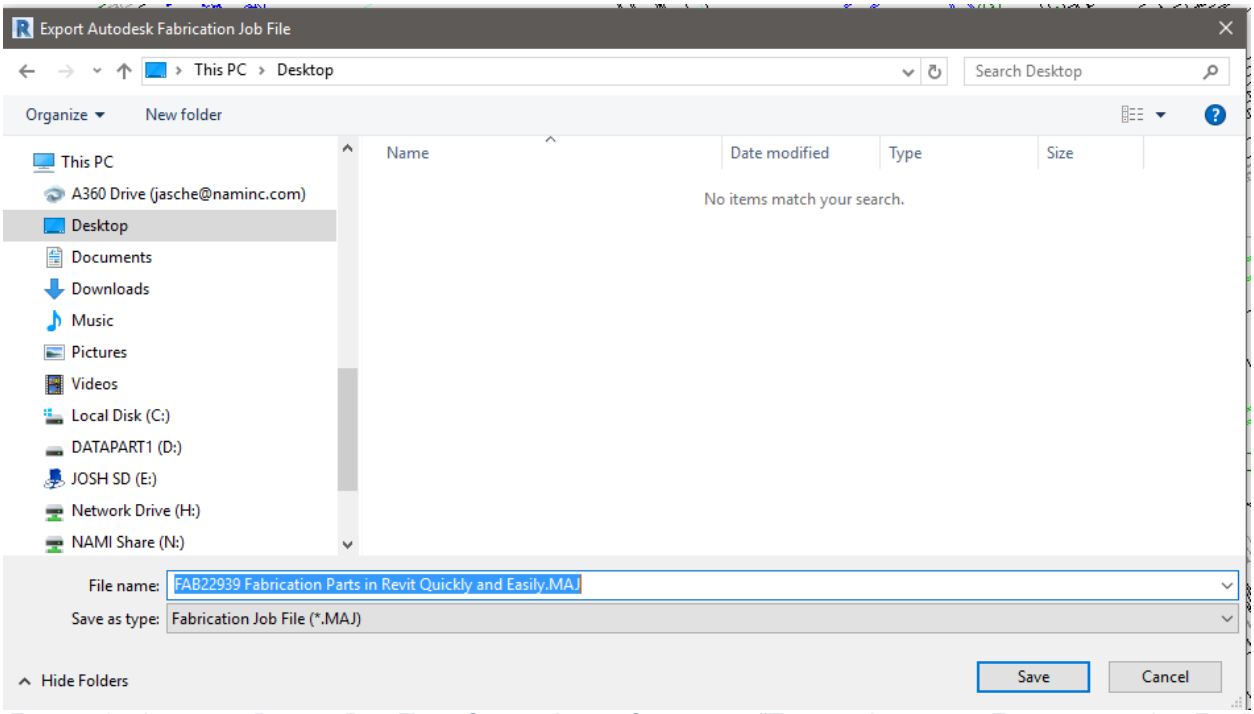

FIGURE 15: IMAGE OF DIALOG BOX THAT OPENS AFTER SELECTING “EXPORT AUTODESK FABRICATION JOB FILE”

Exporting .MAJ File Out of Revit

You can now browse to the location selected in previous image and you will find the .MAJ file that was exported out of Revit. The .MAJ file is now ready to be used with any of the Autodesk Fabrication products such as CADmep, ESTmep, CAMduct, FABviewer etc. See Figure 16 below with image of exported .MAJ file.

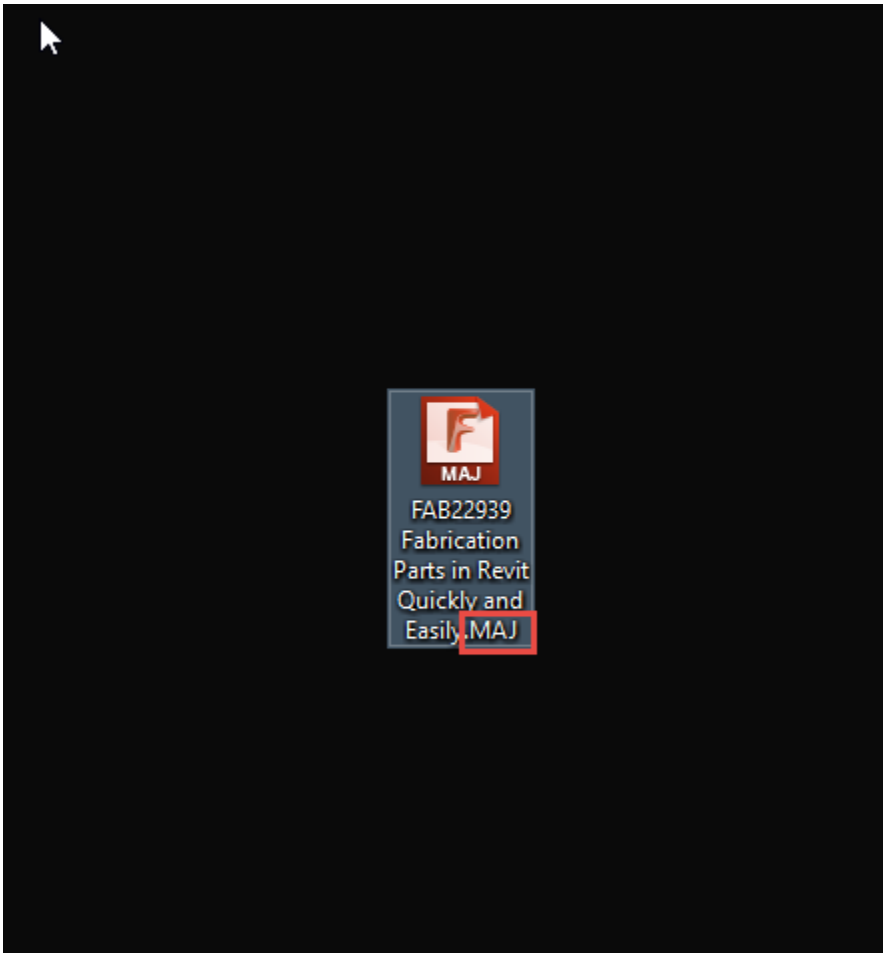

FIGURE 16: IMAGE OF EXPORTED .MAJ FILE

Exporting .MAJ File Out of Revit

One side note I wanted to mention is if you do not select any items from the Revit file and you select the “Export Autodesk Fabrication Job File” button you will get an error message. The message will state the Revit Extension for Fabrication - Export Failed “Select the fabrication parts you want to export. This is simply prompting you to select the items you would like to export out first, before selecting the “Export Autodesk Fabrication Job File” See Figure 17 image below of error message.

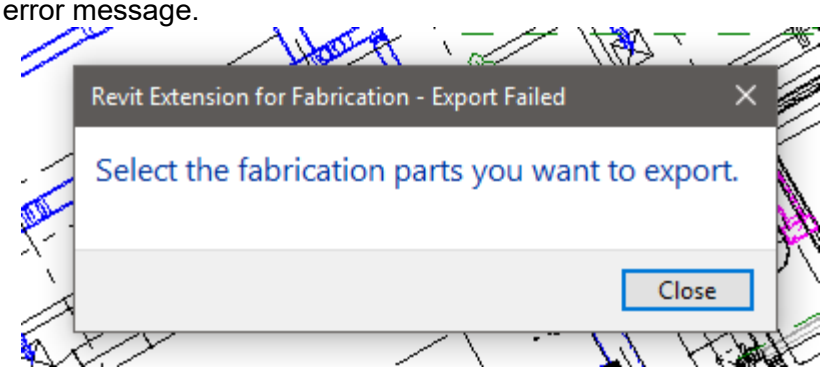

FIGURE 17: IMAGE OF ERROR MESSAGE

Learn how to utilize new Estimating Summary features in ESTmep to quickly review project contents and make modifications to Price and or labor on the fly

Estimating Summary New Features

Once the .MAJ file has been created it can now be opened up with any of the Autodesk Fabrication Products. For this section I am going to focus on ESTmep and specifically on the Estimating Summary.

Estimating Summary New Features

In the 2017 release of ESTmep there were some very useful features added to the Estimating Summary to aid in the process of data validation. There are now 3 new tabs located in the Estimating Summary for validating Pricing, Fabrication Time and Installation Time. On each of these tabs a user can now review the Pricing, Fabrication and Installation times on each item in the open file. Along with reviewing this a user can quickly search for items missing cost, fabrication and installation times along with adding this information on the fly. A user can also adjust the multipliers assigned to these items along with writing this information back to the database to fill in any missing data.

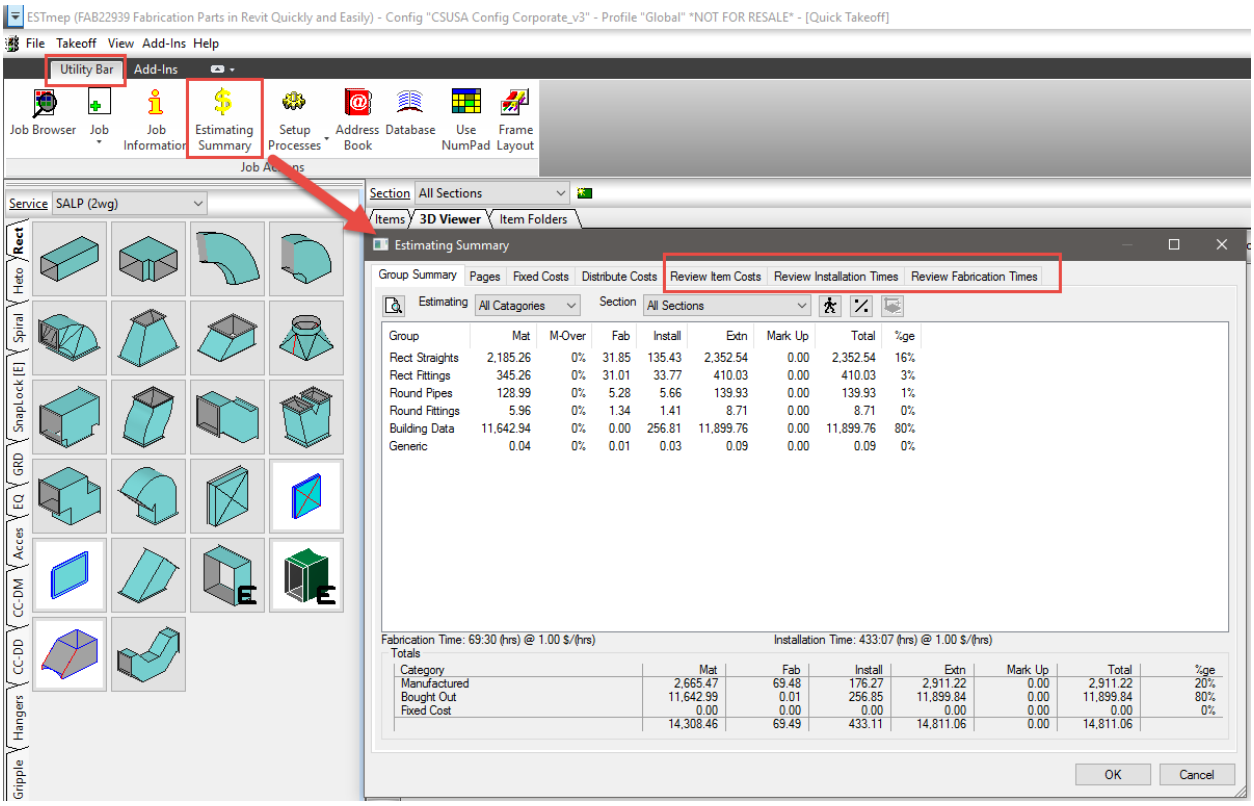

FIGURE 18: IMAGE OF LOCATION OF ESTIMATING SUMMARY & NEW TABS

Estimating Summary New Features

The first new tab is the Review Item Costs tab. This tab by default is set to automatically list any items that do not have any price assigned to them or have list price of 0. Also by default it is setup to Collate Items so like items are grouped together. By unchecking the "Only show items with no Costs" button and the "Collate Items" button a user can show not only all of the items regardless of cost but also each item line by line. To take this a step even further a user can access Filters in these tabs by right clicking on the line entry tabs. See Figures 19 - 21 images below.

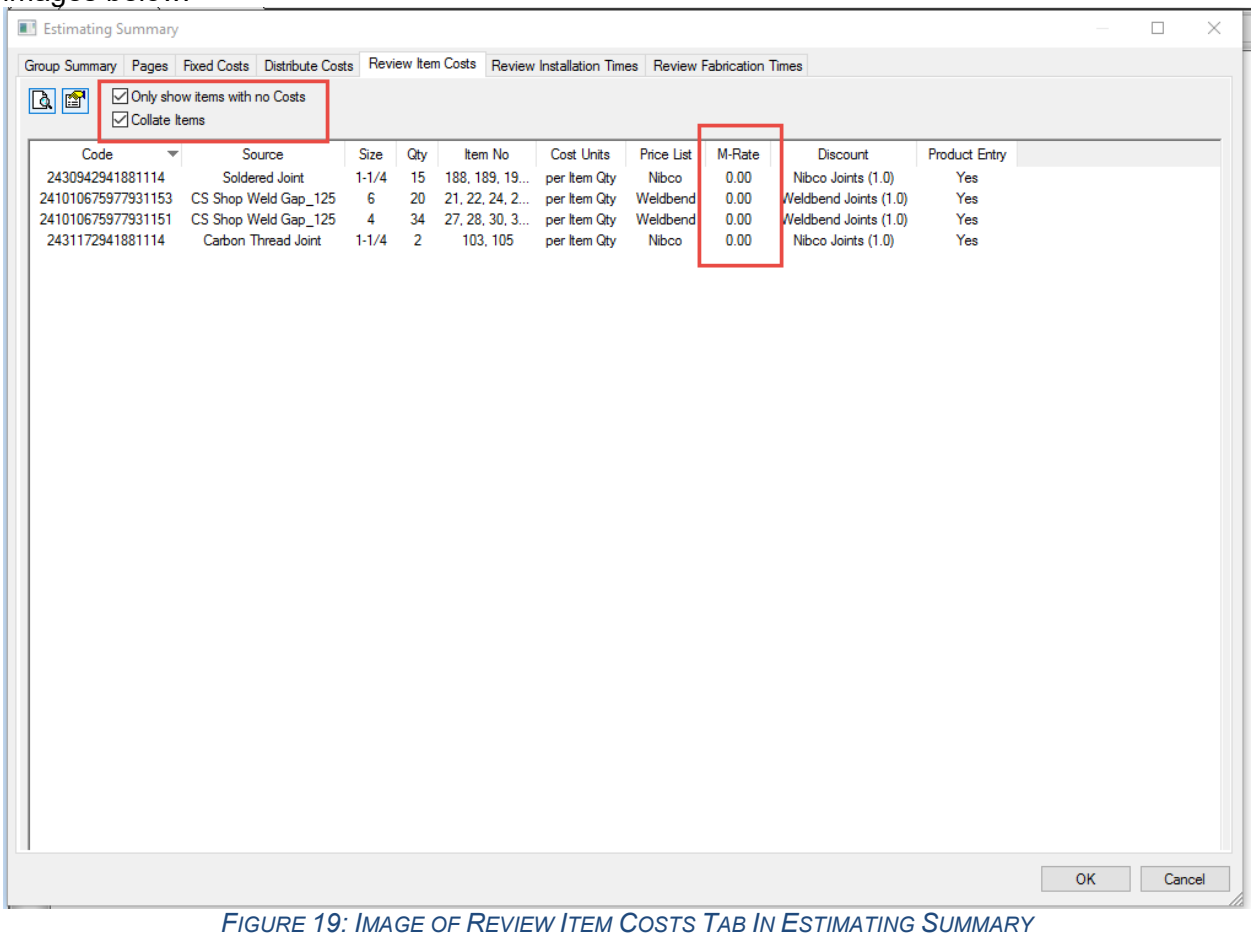

FIGURE 19: IMAGE OF REVIEW ITEM COSTS TAB IN ESTIMATING SUMMARY

Estimating Summary New Features

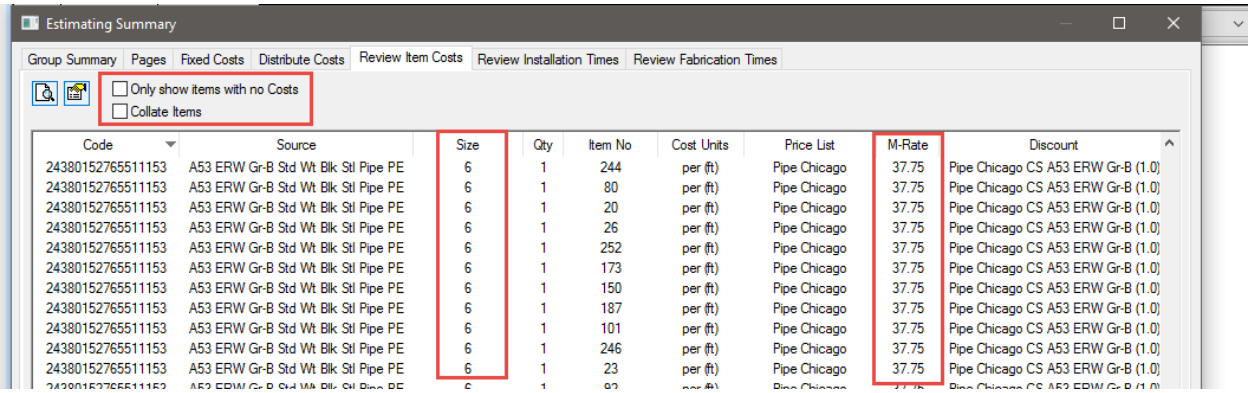

FIGURE 20: IMAGE OF ONLY SHOW ITEMS WITH NO COSTS & COLLATE ITEMS UNCHECKED

Estimating Summary New Features

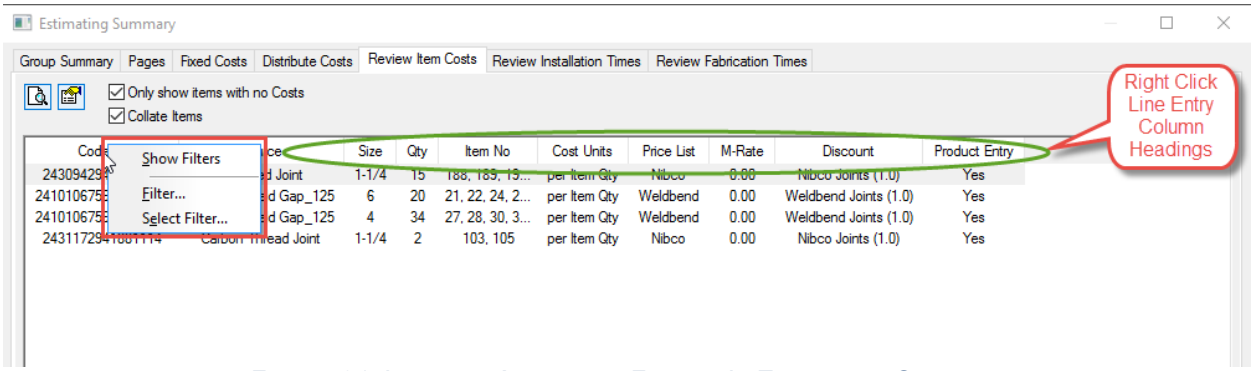

FIGURE 21: IMAGE OF ACCESSING FILTERS IN ESTIMATING SUMMARY

Estimating Summary New Features

In order to modify item(s) a user can either select an entry by left clicking on it and then clicking on the Properties button or by double left clicking on the entry. Both of these options have the same result and open up the "Modify Costs of Item(s)" dialog box. It is here a user can adjust the Price List the item(s) are pointing to and the cost(s) of the item(s). If a user chooses to do so, it is also here a user can write this information into the database with the idea of not having to fill this information again. *Writing information into database is controlled by user permissions/credentials. See Figure 22 and 23 images below.

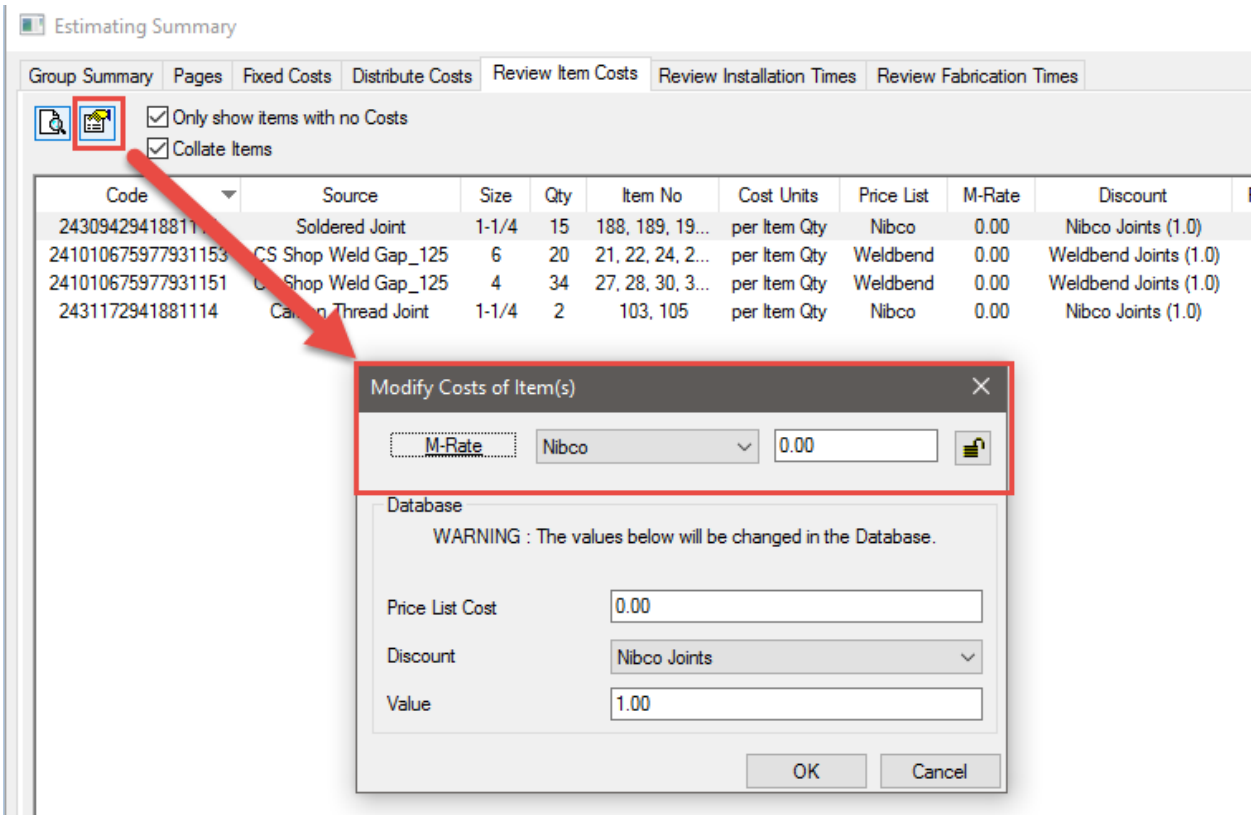

FIGURE 22: IMAGE OF MODIFY COSTS OF ITEM(S) ON JUST THIS INSTANCE

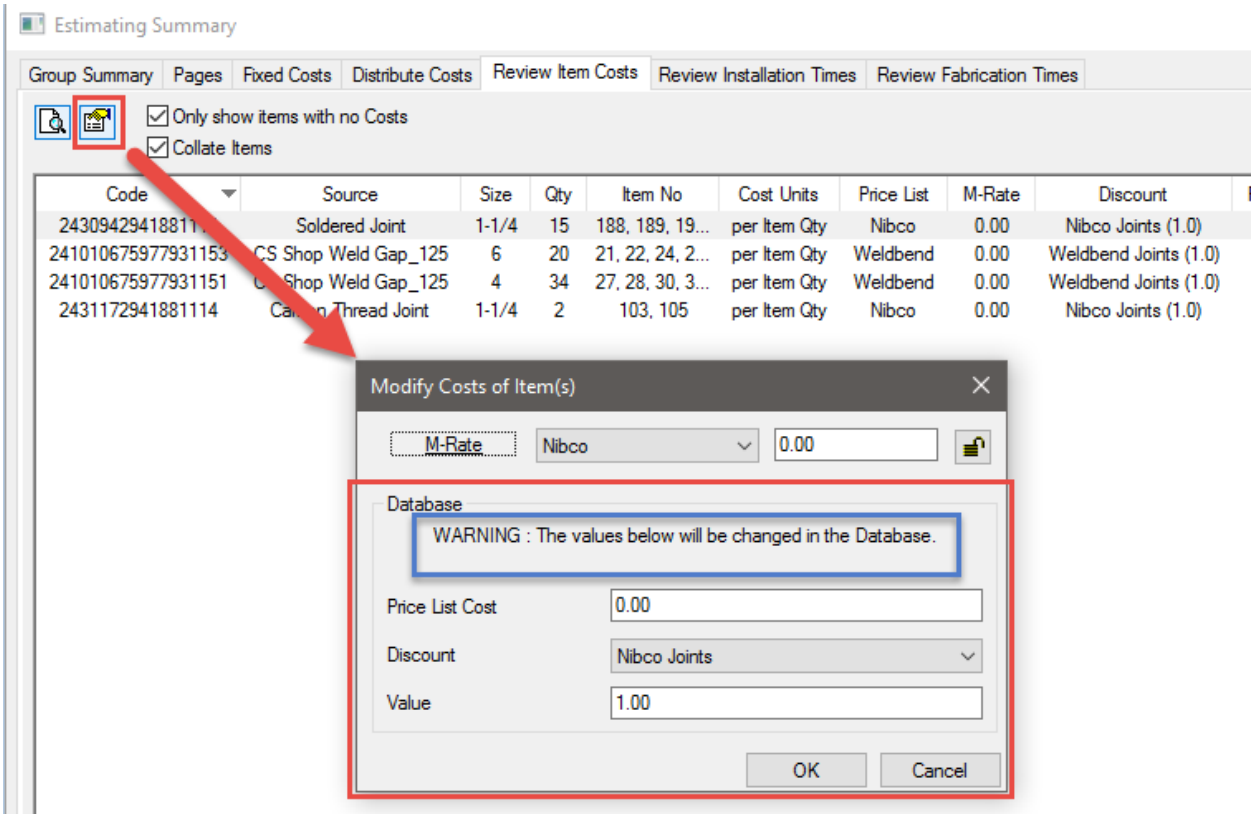

Figure 23: Image of Modify Costs With Writing Information Into Database

Estimating Summary New Features

With the understanding of how the Review Item Costs works from above the Review Installation Times and Review Fabrication Times works exactly same. Only difference is rather than modifying pricing a user would be modifying the fabrication time or installation time of respective items. See Figure 24 and 25 images below. For additional information on this topic you can visit the [Autodesk Fabrication Help File]

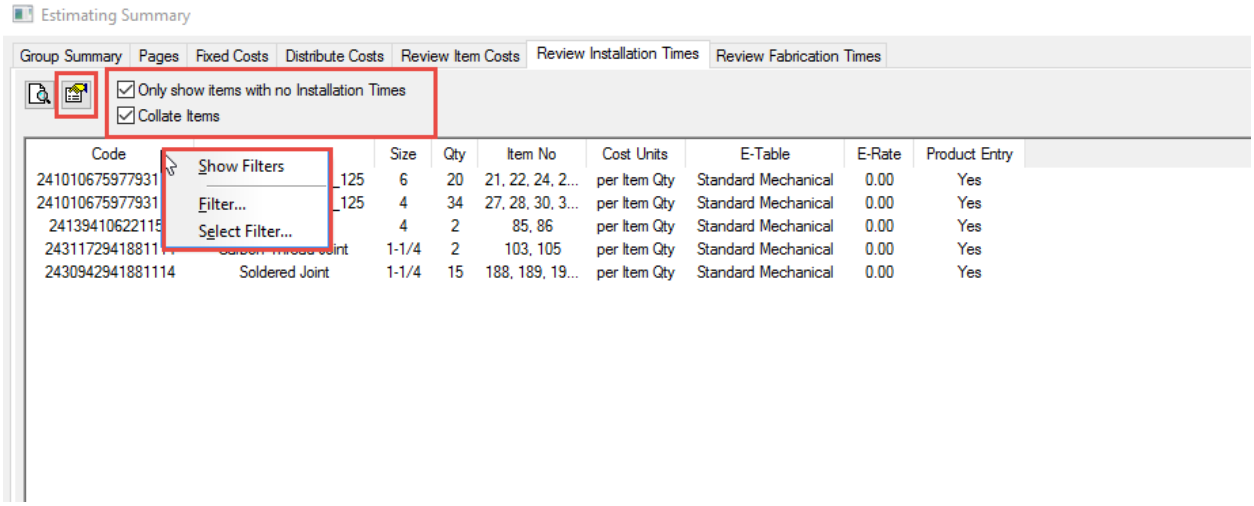

FIGURE 24: IMAGE OF REVIEW INSTALLATION TIMES IN ESTIMATING SUMMARY

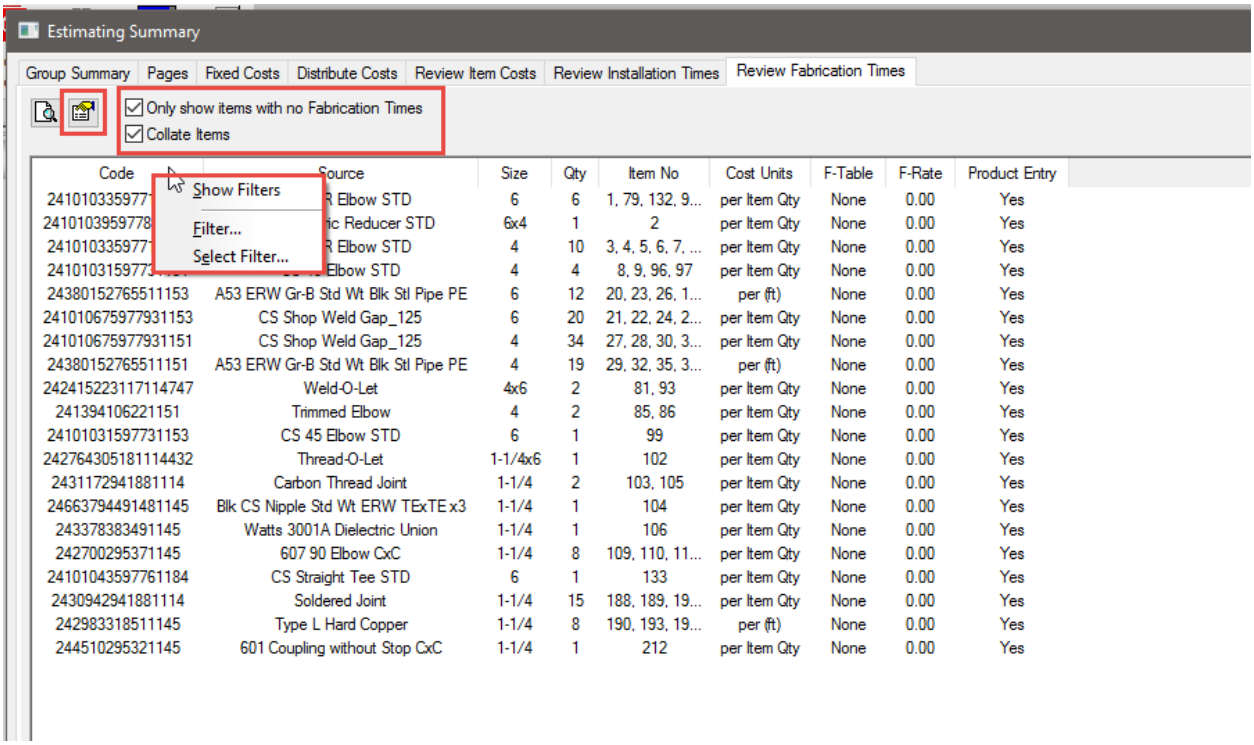

FIGURE 25: IMAGE OF REVIEW INSTALLATION TIMES IN ESTIMATING SUMMARY

Learn how to take the modified file and review it with CADmep; compare to it to the original file and prepare ductwork for fabrication with CAMduct

After the file has been reviewed in ESTmep it can now be opened in CADmep to start the coordination process. We can open the .MAJ file by using the “Openjob” command in CADmep. Then browse to the file location and open it. One thing you may notice is that there is not a Design Line present with the exported file from Revit and ESTmep. If you choose to do so you will need to add the Design Line by using the “Revdesign” command. This command can also be ran in ESTmep if you choose to do so. Before running this command in either software, I would suggest isolating each Service one at a time. See Figure 26 and 27 images below.

Reviewing File in CADmep

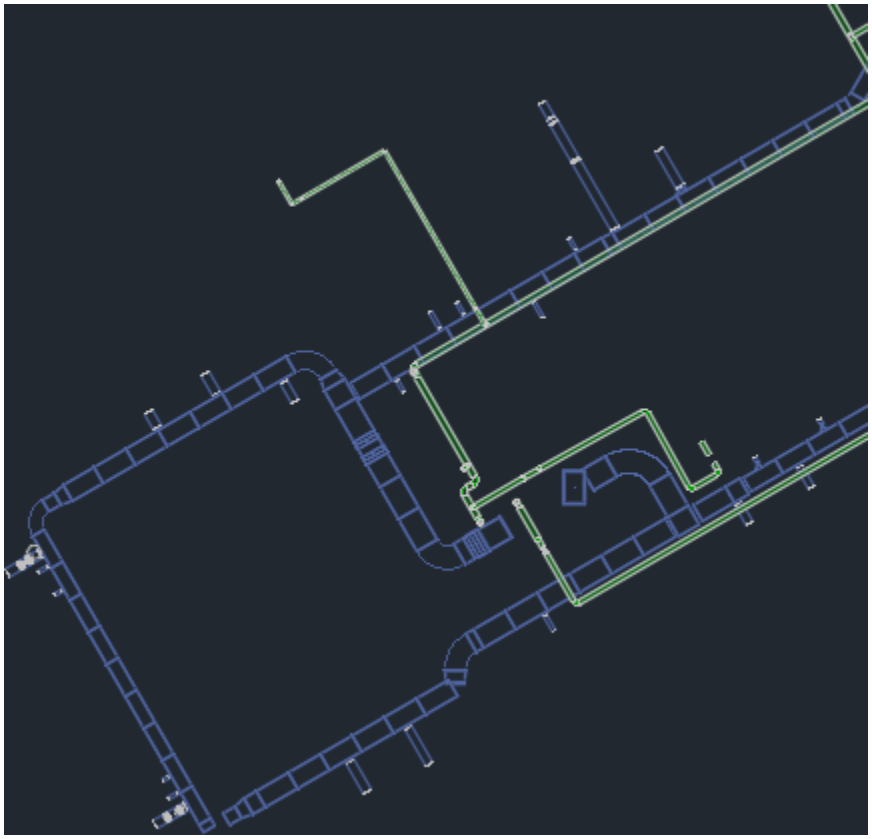

Figure 26: Image Of File Opened In CADmep With Multiple Services & No Design Line

Reviewing File in CADmep

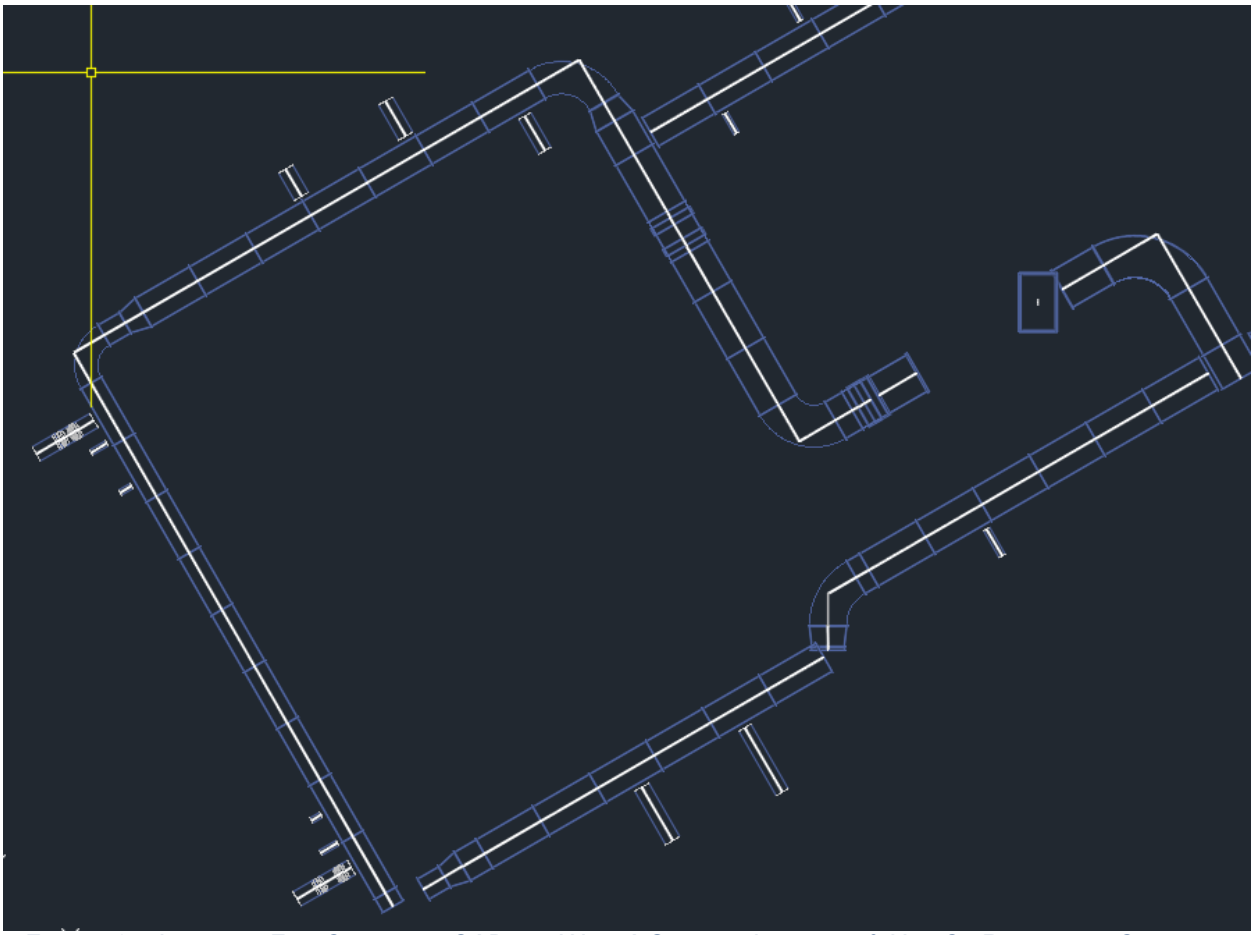

FIGURE 27: IMAGE OF FILE OPENED IN CADMEP WITH A SERVICE ISOLATED & USE OF REVDESIGN COMMAND

Reviewing File in CADmep & Comparing to the Original

At this point the user can continue to run the "Revdesign" command as needed for the project. The user will take the file from here and do what is necessary for the coordination process. Once the coordination process is complete the user can utilize the Item Reports to compare the original file to modified file. See Figure 28 and 29 below for images of reports ran comparing the files.

Project:

COMFORT SYSTEMS USA
Quality People. Building Solutions.

Job #:

Ship To:

Service Type	Cut Type	Qty	Length (ft)	Area (sq ft)	Weight (lb)	Shop Hours	Field Hours	Material Cost
Rectangular Duct	Machine Cut	61	113	1129	1404	42:55	56:38	810.4
Rectangular Duct	Decoiled Straight	76	356	2751	3239	19:56	112:34	1,720.1
Round Duct	Machine Cut	11	2	23	21	1:21	1:26	6
Round Duct	Spiral Straight	37	90	297	269	5:17	5:40	129
		185	562	4199	4933	69:30	176:18	2,665.5

FIGURE 28: IMAGE OF ITEM REPORT SHOWING ORIGINAL FILE TOTALS

Project:

COMFORT SYSTEMS USA
Quality People. Building Solutions.

Job #:

Ship To:

Service Type	Cut Type	Qty	Length (ft)	Area (sq ft)	Weight (lb)	Shop Hours	Field Hours	Material Cost
Rectangular Duct	Machine Cut	87	170	1739	2190	63:24	83:51	1,257.7
Rectangular Duct	Decoiled Straight	111	520	4122	4807	30:13	164:30	2,563.4
Round Duct	Machine Cut	19	3	38	34	2:13	1:58	8.6
Round Duct	Spiral Straight	57	131	423	383	7:39	8:13	184
		274	824	6322	7415	103:29	258:32	4,013.8

FIGURE 29: IMAGE OF ITEM REPORT SHOWING MODIFIED FILE TOTALS

Preparing ductwork in file for CAMduct

After the coordination process has been reviewed and signed off, the ductwork is now ready to be prepared to send to CAMduct. Depending on the job and situation you may also choose to spool the ductwork before sending to CAMduct. For example purposes I am going to skip the spooling process and go directly into sending the ductwork as is.

Renumbering

You once again may choose to Isolate Services before renumbering depending on your situation and requirements. Once this has been determined the user is going to want to use the "Renumber" command to renumber the ductwork. See Figure 30 and 31 images below of this process.

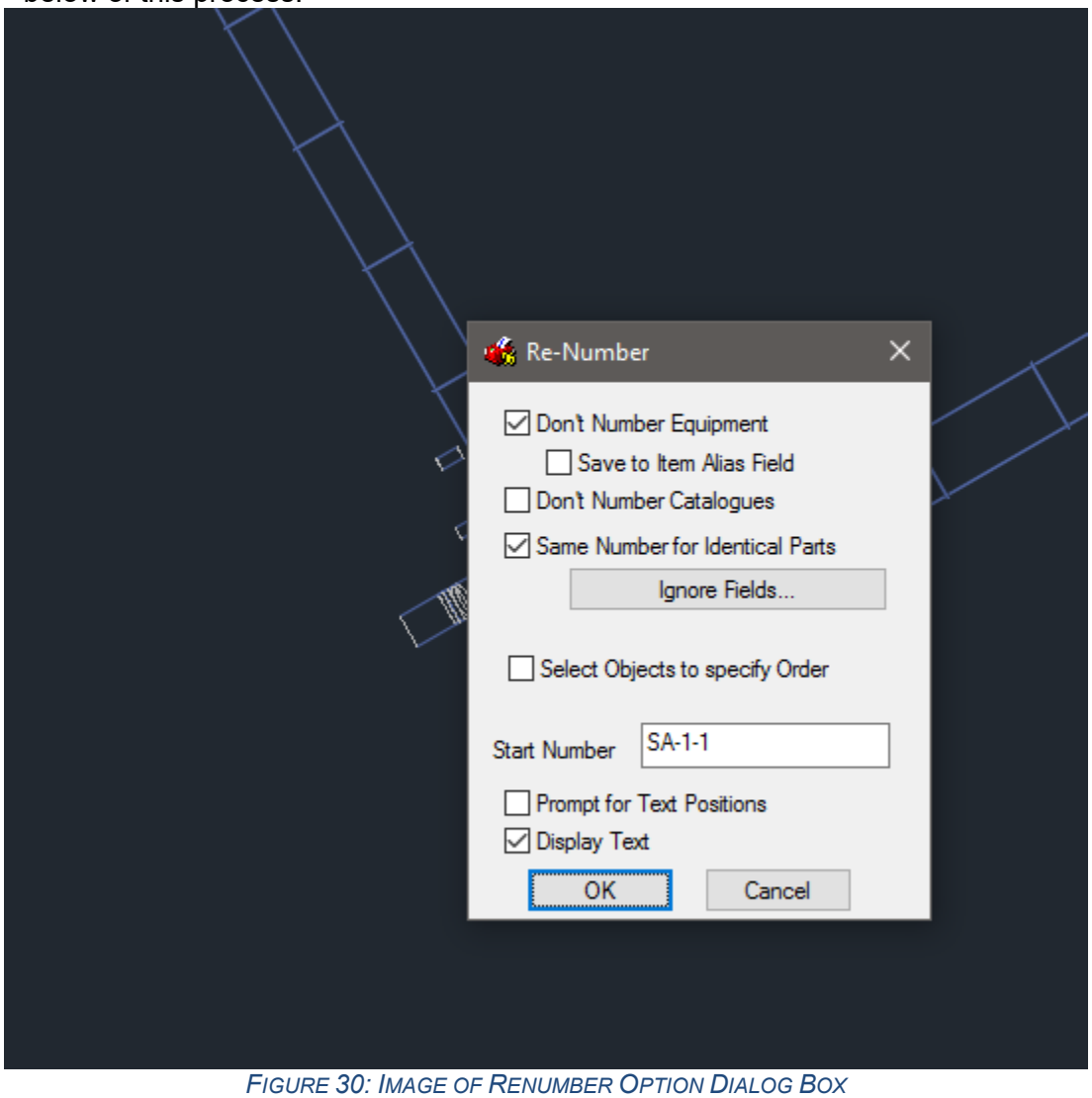

FIGURE 30: IMAGE OF RENUMBER OPTION DIALOG BOX

Renumbering

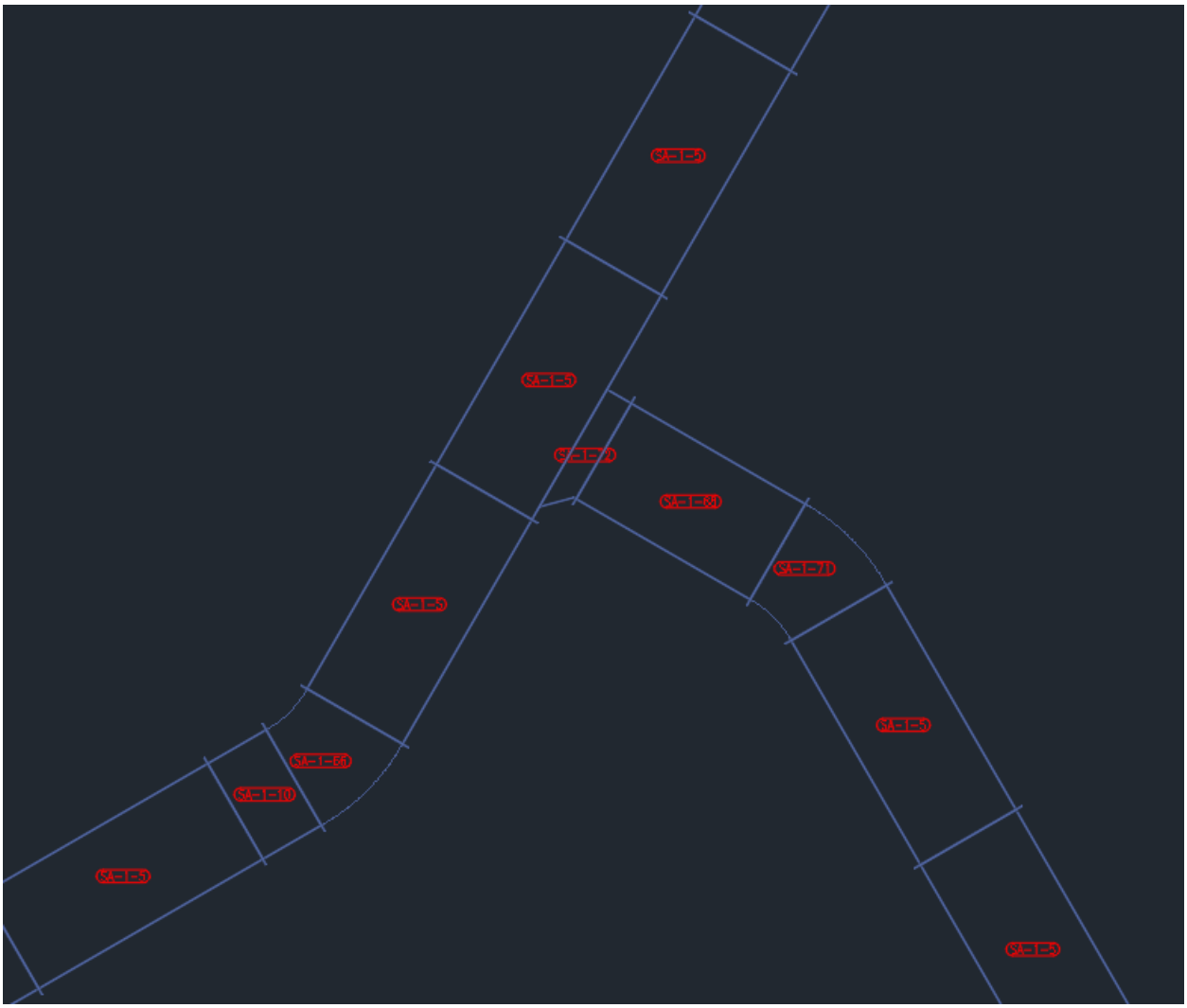

FIGURE 31: IMAGE OF DUCTWORK RENUMBERED

Renumbering

This will be the process for the rest of the ductwork in the file that is being sent to CAMduct. For additional information on renumbering please visit the Autodesk Help File

Sending modified file to CAMduct

Once all of the ductwork has been renumbered it is now time export the file out of CADmep. This can be done by the command “Createcam” and then selecting items in the file you would like to send to CAMduct. Once items have been selected a Window will open asking you to name the file and select a location for it to be saved. See Figure 32 image below of this process.

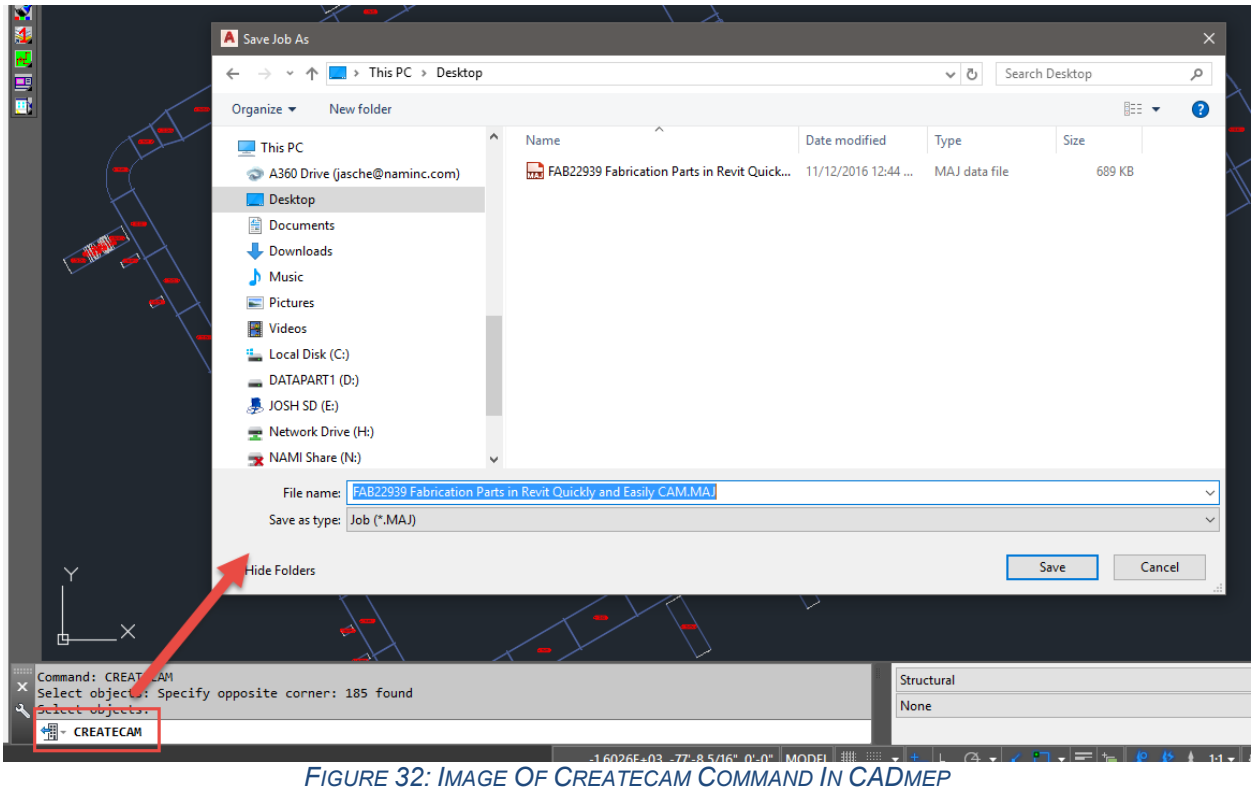

FIGURE 32: IMAGE OF CREATECAM COMMAND IN CADMEP

Opening .MAJ File in CAMduct

The final step in this process is to open the file with CAMduct. Once CAMduct is open you can browse to the location where you saved the file to from CADmep. You can click on the Open Job button select the file and then click Open. In the 3d Viewer you will now see the items you selected from CADmep in CAMduct. The duct is now ready to be sent out to the sheet metal shop to be fabricated. See Figures 33 and 34 images below of this process.

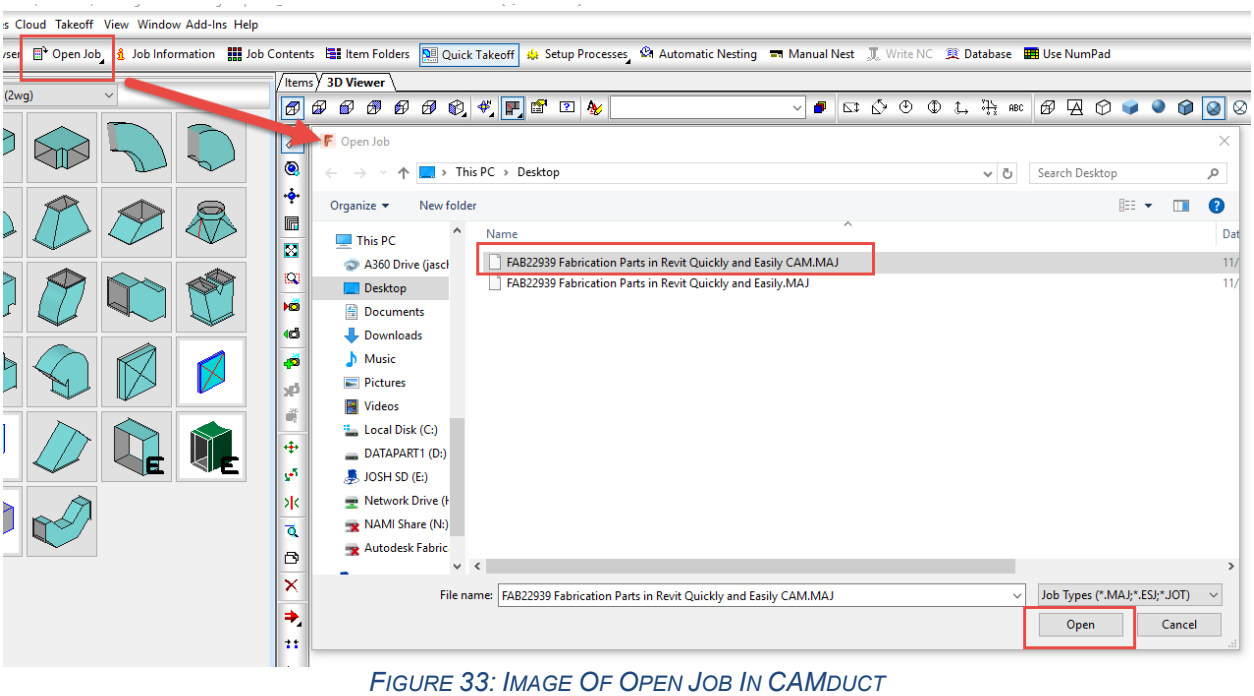

FIGURE 33: IMAGE OF OPEN JOB IN CAMDUCT

Opening File in CAMduct

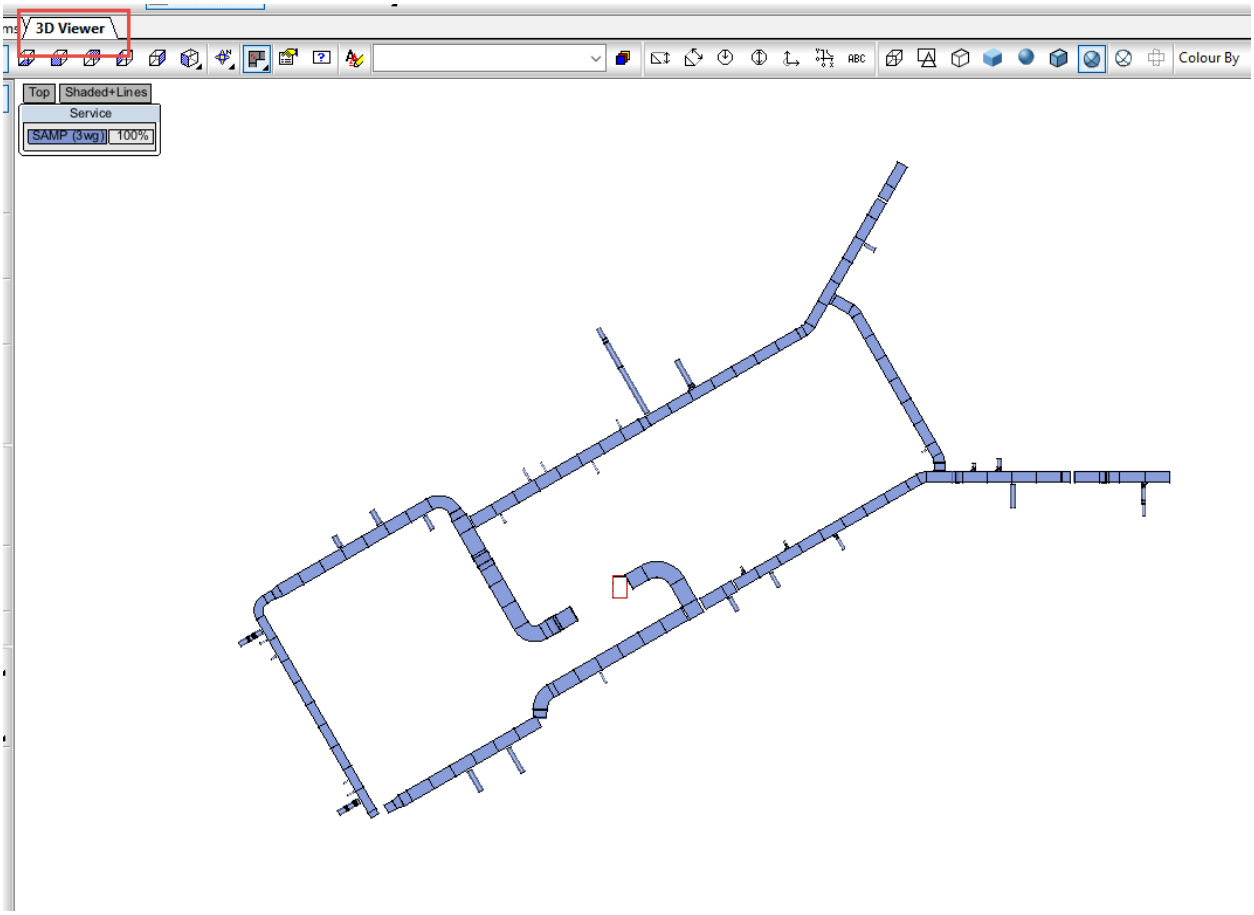

FIGURE 34: IMAGE OF FILE OPENED IN CAMDUCT FROM CADMEP

Final Thoughts

As you can see we started with an out of the box Revit file opened in Revit 2017. Directly inside of Revit 2017 we converted the Revit Design Parts to Fabrication Parts using our Fabrication Services. We then exported a .MAJ file out of Revit 2017. The .MAJ file that was exported out of Revit 2017 was then opened up in ESTmep to review and modify the takeoff including pricing fabrication times and installation times. Then from ESTmep the same .MAJ file was opened up with CADmep to start the coordination process. The same .MAJ file could have also been opened up in Revit for coordination. Once the file was coordinated and ready to go we saved a .MAJ file out of CADmep or exported from Revit to be opened up with CAMduct. This completes a full 360 degree circle with the same .MAJ file from Revit to ESTmep to CADmep to CAMduct or any work flow you would prefer.

As you can see the .MAJ is key to this process utilizing your Fabrication Database!!