

Importing a DXF Drawing Into SESShield-3D



Revision Record

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IMPORTING DXF DRAWING INTO SESSHIELD-3D

Introduction

The specification of the system data for a lightning protection analysis using SESShield-3D can be a time consuming process. This data is often available in some CAD format – generally convertible to DXF (Drawing Exchange Format) files - but in the present version of SESShield-3D such files cannot be directly imported in the program. This functionality is presently under development. In the meantime, however, you can use SESShield-3D's capability to import MALT files as an indirect way to import CAD files, using SESCAD's features in an intermediate step.

This How To... describes step-by-step two different methods that allow you to create a MALT model from a CAD file using SESCAD and import it into SESShield-3D to create a 3D model for a lightning shielding analysis. The two possible ways are:

- Directly import the DXF drawing into SESCAD, then save it as a MALT file.
- Create a MALT file that identifies the zones that require protection based on a screen shot of the DXF drawing.

This How To... is illustrated on an example based on a realistic substation (Filename: **sampleequipment.dxf**) that must be analyzed in SESShield-3D. This example was built using AutoCAD as Computer-Aided Design (CAD) software, but the procedures would be essentially the same using any CAD tool.

System Requirements

It is recommended that your computer has at least the following configuration to properly run **SESShield-3D**:

- A 2 GHz or better class processor
- A minimum of 1 GB (preferably 3 GB or more) of physical memory
- Operating System: Windows 7, Windows Vista or Windows XP
- Microsoft DirectX

Input and Output Files Used in Tutorial

All input files used in this tutorial are supplied on your DVD. These files are stored during the software installation under *install* \Howto\SESShield-3D\Importing DXF (where *install* is the SES software installation directory, e.g., C:\Users\Public\Documents\SES Software\version and *version* is the version number of your CDEGS Software).

Copying Input Files to Working Directory

For those who prefer to load the input files into the software and simply follow the tutorial, you can copy all of the files from the *install* \Howto\SESShield-3D\Importing DXF directory to your working directory.

After the tutorial has been completed, you may wish to explore the other How To...Engineering Manuals which are available as PDF files on the SES Software DVD in the folder \PDF\Howto.

If the files required for this tutorial are missing or have been modified, you will need to manually copy the originals from the SES Software DVD. Both original input and output files can be found in the following directories on the SES Software DVD:

- Input Files: Examples\Official\HowTo\CDEGS\SESShield-3D\inputs
- Output Files: Examples\Official\HowTo\CDEGS\SESShield-3D\outputs

Note that the files found in both the 'Inputs' and the 'Outputs' directories should be copied directly into the working directory, not into subdirectories of the working directory.

Important Disclaimer Note: Whilst the protective methods implemented by SESShield-3D are based on the recommendations of one or more lightning protection Codes and Standards around the world based on hybrid methods combining analytical and empirical techniques and considerations, the results are estimates only and therefore must not be interpreted as fully scientific or complying fully with any particular national or international Standard. It is the responsibility of the user to determine that the input and computation results are sound..


CREATING A SESSHIELD-3D MODEL FROM DXF FILE

This section describes the creation of the SESShield-3D model from a DXF drawing by first importing it into SESCAD and subsequently exporting it to SESShield-3D.

Preliminary Step – Preparing the DXF File

1. As a first step, the CAD drawing must be exported to the DXF format. At this stage, it can prove useful to simplify the CAD drawing as much as possible before exporting it, keeping only the elements that should be part of the SESShield-3D model. Even though it is possible to perform this operation in SESCAD after importing the DXF file (see the following sections), it can be more efficient to do so in the original CAD package. This is because much of the information that is present in the CAD drawing (and that could be useful to help identify the various parts of the model) is *not* imported by SESCAD.

Importing the DXF File in SESCAD

2. The next step consists in importing the DXF file into SESCAD and manually removing redundant or unimportant information present in the drawing. Proceed as follows:
1. Start **SESCAD** (.
 2. Create a new document (**File | New Document | Blank Document**).
 3. Import the DXF drawing (*sampleequipment.dxf*) into the new document (**File | Import...**). Be sure to selected all the Convert to Conductors options so as to import all the type of lines available in the DXF file as shown Figure 1.
 4. From **Type of Files** dropdown list of the **File Import** screen, select **DXF Files (*.dxf)**.

5. Click **Ok**.

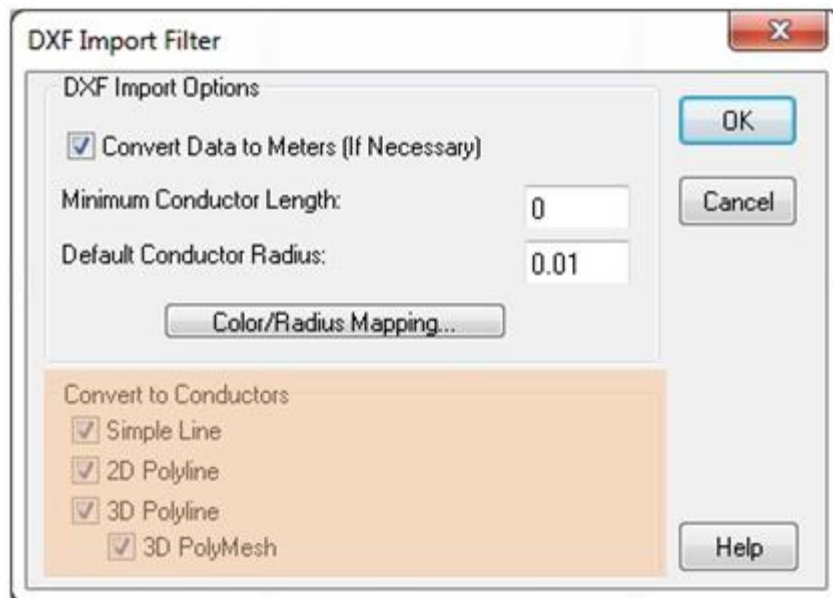


Figure 1: Select the entire Convert to Conductors options to get a maximum of information from the DXF file

Figure 2 shows the result of the importing step of the DXF file into SECAD (Filename: **MT_Substation Imported.f05**).



Figure 2: Objects imported into SECAD after the importing step

Removing Unwanted and Unneeded Information

3. The third step is to “clean” the drawing and keep only the objects that need to be modeled in SESShield-3D. Proceed as follows:

1. Select all the objects just imported into the new document (**Edit | Select All**).
2. Ungroup the objects (**Edit | Ungroup**).
3. Delete the undesired objects (lines, arcs, etc...).

Figure 3 shows (highlighted in red) the objects that must be kept in the SESCAD Model and imported into SESShield-3D. The black lines must be removed (Filename: **MT_Substation Clean.f05**).

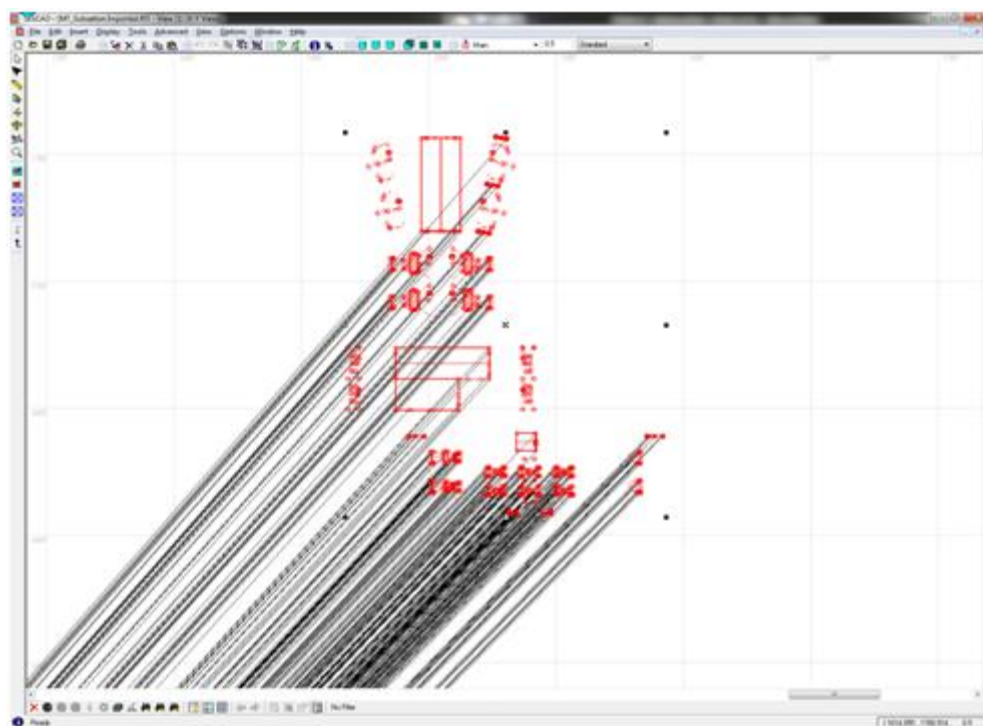


Figure 3: Selecting the objects that must be kept and removing the undesired lines

Shifting and Conductor Size Increase

4. The next step shifts the objects and increases the size of the conductors so that they can be properly displayed in SESShield-3D. Proceed as follows:

1. Select all the objects (**Edit | Select All**).
2. Shift the selected object to the origin (**Tools | Shift...**).
3. In the **Shift** zone of the **Move Object** screen, select **Move To** from the dropdown list. Set X = 0.0 m, Y = 0.0 m. The Z value is calculated from the following relation, for which the Z_{From} and Z_{To} values are obtained from the **Properties** screen (**Display | Properties...**):

$$Z = \frac{Z_{From} - Z_{To}}{2}$$

The reason why the Z value is divided by 2 in this formula is that the reference point for the **Move To** operation is the center of the selected objects, and we want the lowest point of the objects to be at Z = 0. For our case, Z = -10.142 m.

4. Click **Apply**. Figure 4 and Figure 5 illustrate this step.

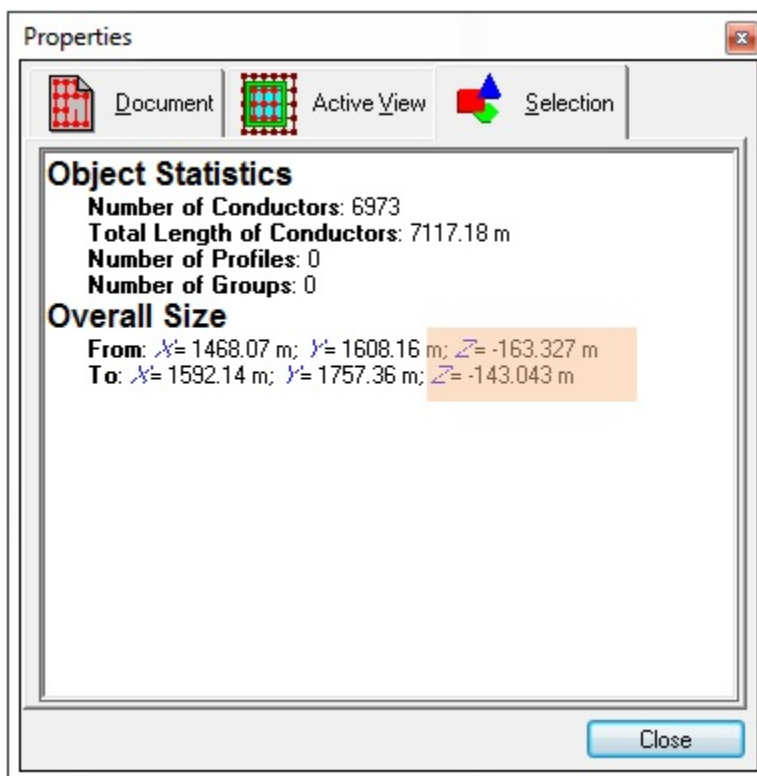


Figure 4: The Z value is calculated from the Z values of the overall size

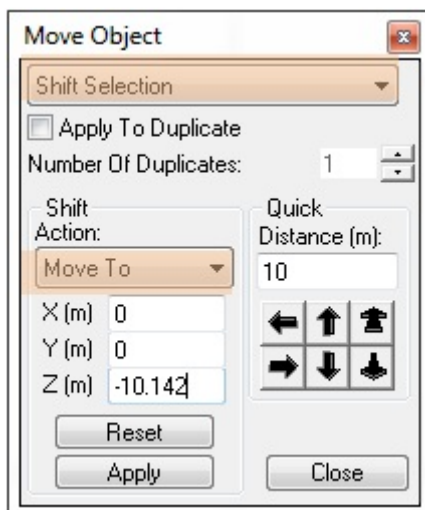


Figure 5: The selected object are moved to the origin using the **Move Object** tool

5. Increase the radius of the conductors so they can be properly displayed in SESShield-3D. Select all the objects (**Edit | Select All**) and edit their characteristics (**Edit | Characteristics**).
6. From the **Characteristics** screen, set the radius of the conductor to be 0.1 m (about 4.0 in). Figure 6 illustrates this.
7. Save the cleaned drawing as a MALT file (**File | Save Document As...**). The filename must be of the form *MT_JobId.F05*).

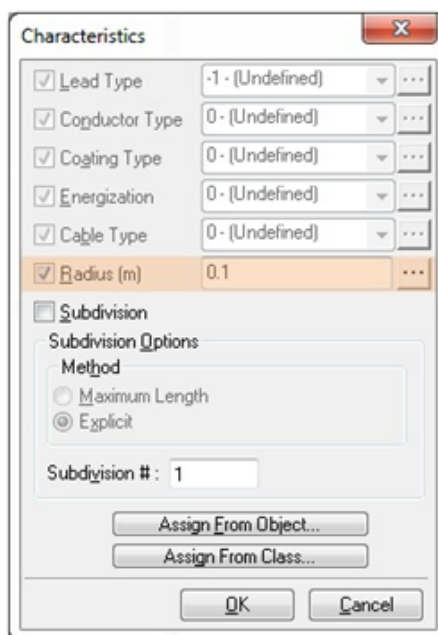


Figure 6: Specify a new radius in the **Characteristics** screen

Figure 7 shows the 3D view of the final SESCAD model after the cleaning step (Filename: **MT_Substation - Shifted.f05**).

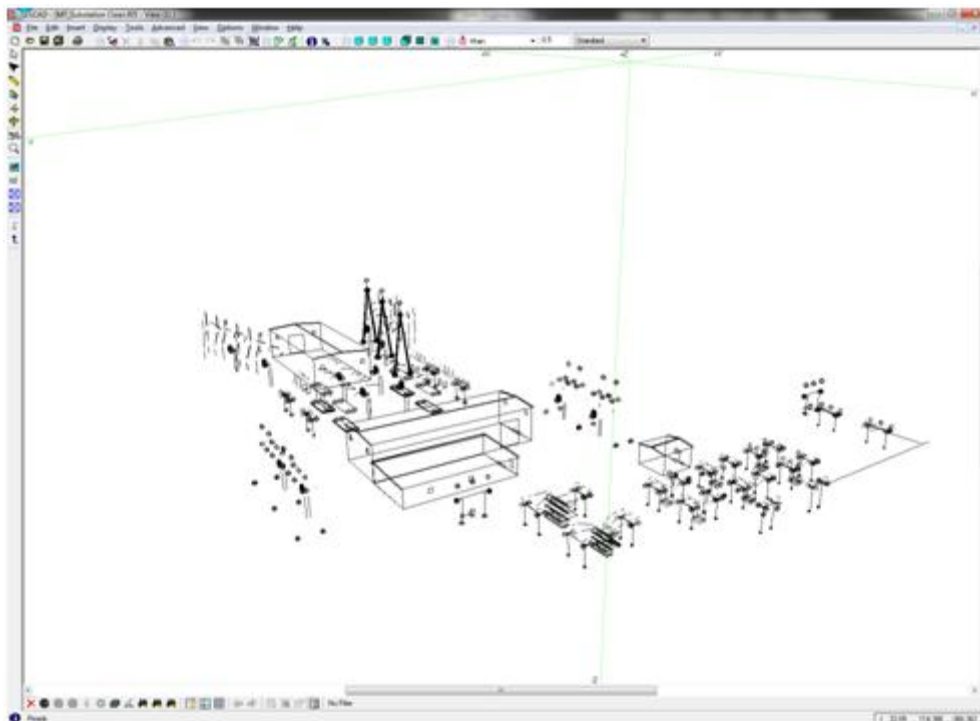



Figure 7: 3D view of the SESCAD model after a cleaned DXF file has been imported

Importing the SECAD Model in SESShield-3D

5. The last step consists in importing the SECAD model in SESShield-3D and creating the volumes that require protection using the objects available in SESShield-3D. Proceed as follow:

1. Start the **SESShield-3D** program ().
2. Import the **SESCAD** model created in the previous step using the **SESShield-3D Import Wizard (File | Import...)**.
3. Based on the objects imported, draw the volumes using the objects available in SESShield-3D.

Once all the 3D objects are created, the construction lines that are not needed for the analysis can be removed.

Importing DXF Drawing Into SESShield-3D

Figure 8 shows the intermediate SESShield-3D model of the substation with only the buildings/shelters/structures represented by the objects available in SESShield-3D (Filename: **SD_Substation - Intermediate Design.f05**).

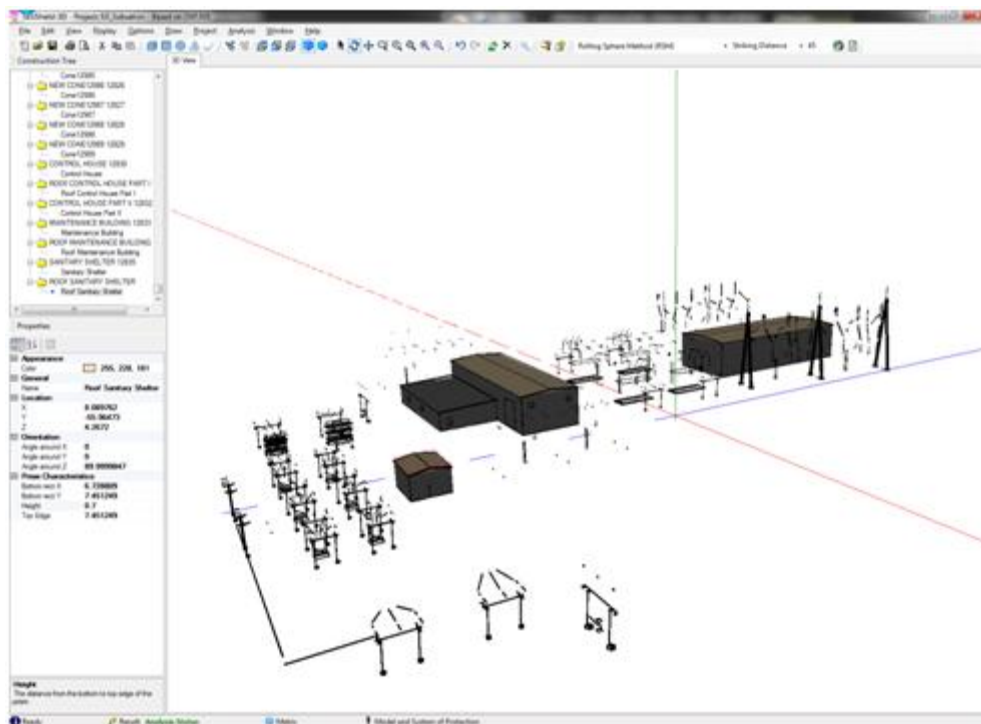


Figure 8: Intermediate SESShield-3D model

CREATE SESSHIELD-3D MODEL FROM PICTURE

This section describes the steps that lead to the creation of a SESShield-3D model based on a picture file inserted in the background in SESCAD. In that case, a top view is normally used in order to identify the zones that require protection.

Exporting the DXF File as a Meta File


1. The first step consists in exporting the DXF file as a Metafile file in order to insert it as a picture in the background of the SESCAD document. Proceed as follow:

1. Start **AutoCAD**.
2. Load the DXF drawing you wish to export as a picture.
3. Export the opened document as a Metafile (**File | Export**).
4. From **File of Types** dropdown list of the **Export Data** screen, select **Metafile (*.wmf)**.
5. Click **Save**.

Note that these steps can be reduced to a screen capture of the drawing and saved in Microsoft Paint or any other picture editing program.

Identifying the Zones that Require Protection

2. The second step identifies the zones that require protection by drawing them directly on the picture inserted in the background of the SESCAD document. Proceed as follows:

1. Start **SESCAD** ()
2. Create a new document (**File | New Document | Blank Document**).
3. Insert the previous WMF file into the new document (**Insert | Picture...**).


4. From the **Files of Type** dropdown list of the **Select Picture to Insert in Document** screen, select Metafile (*.wmf).
5. Click **OK** in order to insert the picture in the background layer of the document. Note that you can switch between the layers using the **Layers** dropdown list.
6. Identify the zones that require protection using the **Conductor** tool () so as to create guide lines that will help you create the model in SESShield-3D.
7. When all the zones are identified and properly defined, the final SESCAD model is obtained by removing the background (**Advanced | Active Layer| Background**).
8. Finally, increase the radius of the conductors so they can be properly displayed in SESShield-3D. To realize that, select all the objects (**Edit | Select All**) and edit their characteristics (**Edit | Characteristics**). From the **Characteristics** screen, set the radius of the conductor to be 0.1 m (about 4.0 in). Figure 6 illustrates this step.
9. Save the cleaned drawing as a MALT file (**File | Save Document As...**). The filename must be of the form MT_*JobId*.F05).

Figure 9 and Figure 10 show the SESCAD models with and without the background, respectively. The model without the background is then imported in SESShield-3D in order to create the volumes (Filename: **MT_Substation Without Background.f05**).

Importing DXF Drawing Into SESCOAD-3D

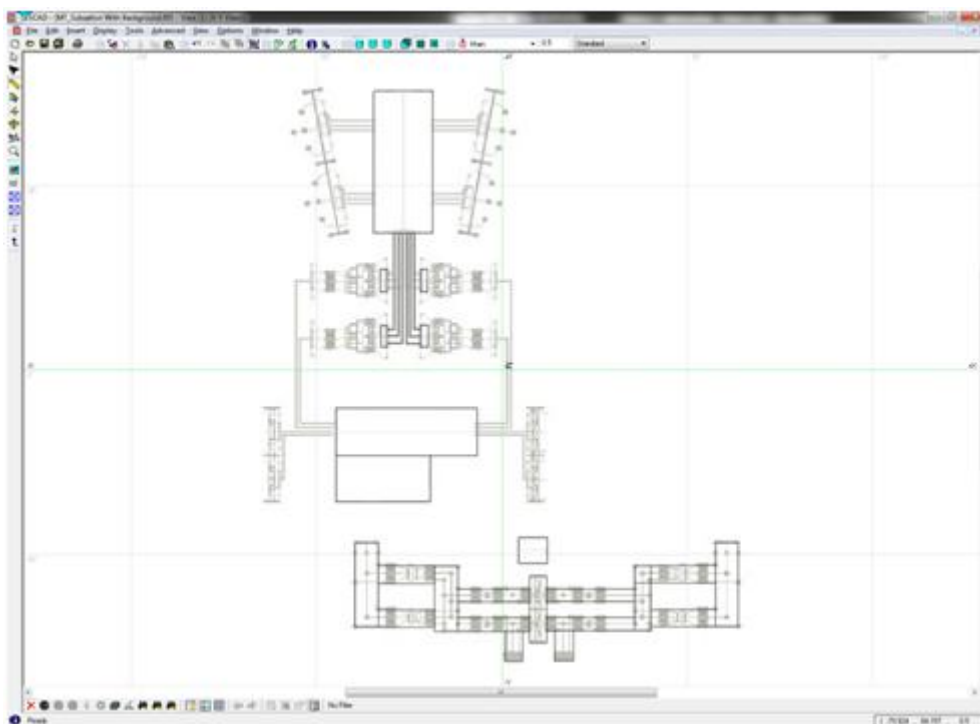


Figure 9: SESCOAD model with the top view of the substation inserted as a picture into the background of the SESCOAD document

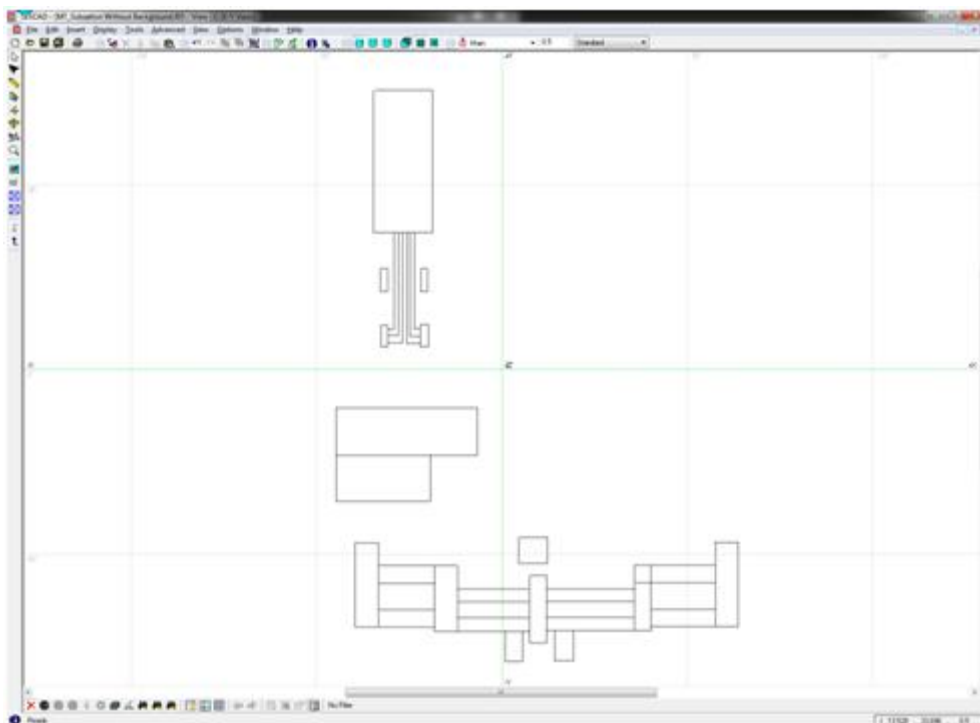


Figure 10: SESCOAD model with the zones that require protection identified as blocks

Importing the SESCAD Model in SESShield-3D

3. The last step consists in importing the SESCAD model and creating the volumes that require protection identified in the previous step using the objects available in SESShield-3D. Proceed as follow:


1. Start the SESShield-3D program().
2. Import the SESCAD model without the background created in the previous section using the **SESShield-3D Import Wizard (File | Import...)**.
3. Based on the imported lines, draw the volumes using the objects available in SESShield-3D (Box, Cone, Prism, etc...).

Figure 11 and Figure 12 show the SESShield-3D models without (**SD_Substation - Based on Picture - Identified Zones.f05**) and with (**SD_Substation - Based on Picture.f05**) some of the volumes that require protection, respectively. Note that only the buildings/shelters/structures are represented.

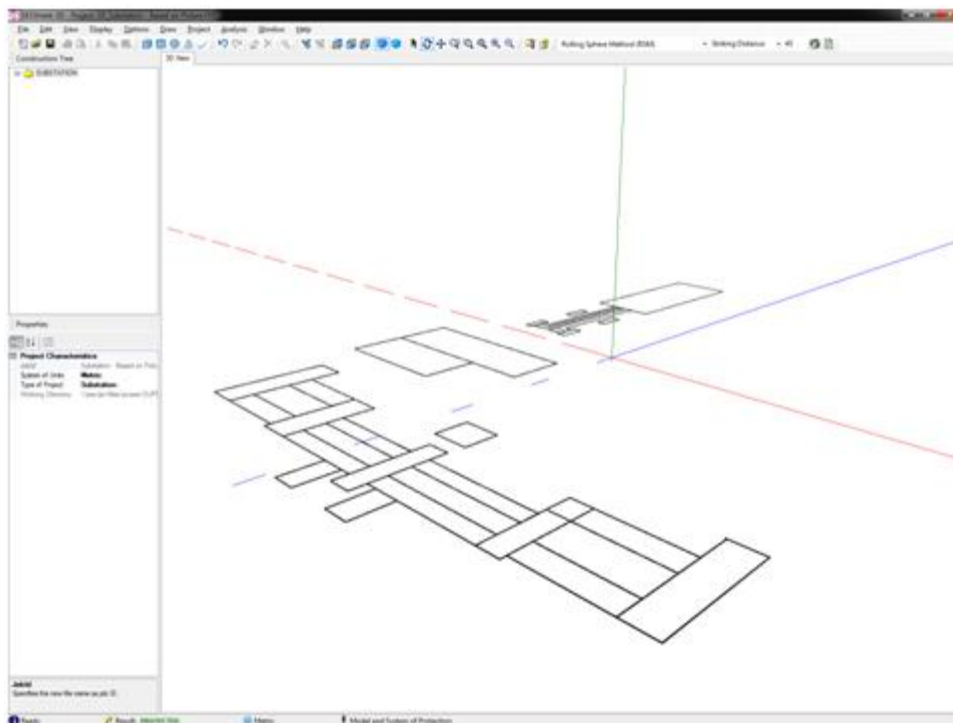


Figure 11: SESCAD model imported into SESShield-3D to create the volumes that require protection against lightning strikes

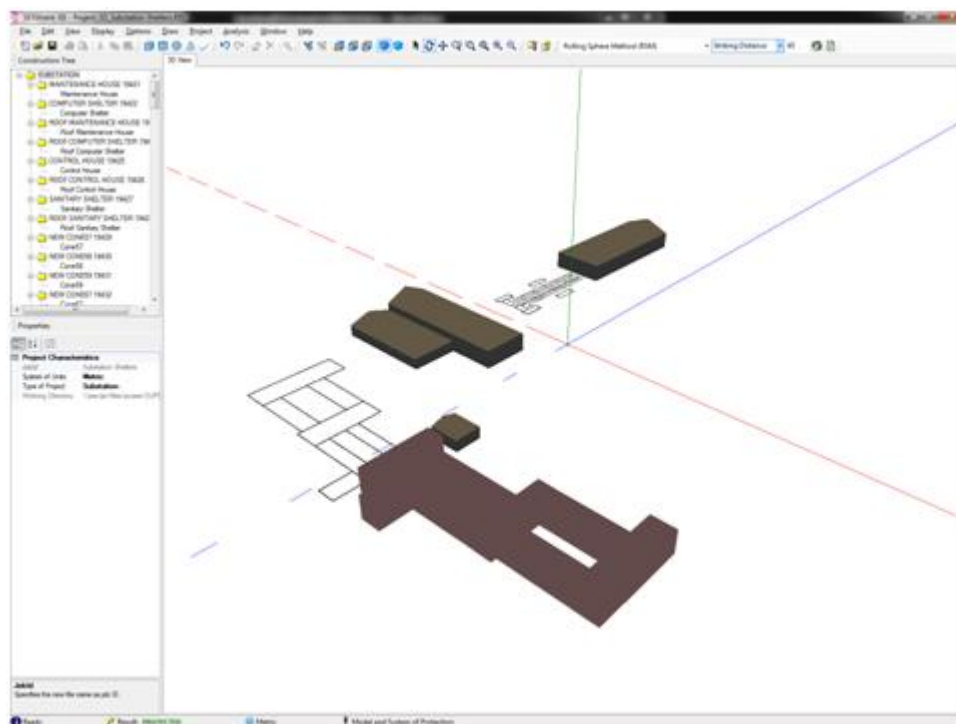


Figure 12: Intermediate SESShield-3D model of the substation.

CONCLUSION

This concludes this How To....Only the two main ways to generate SESShield-3D models from DXF drawing or picture have been introduced. Note that SESShield-3D models can also be created from DWG files. However, an additional step is required and consist in converting the DWG drawing into DXF.

You can also consult the Online Help file for more information about the capabilities of the software. In order to load this document, simply press the **F1** key or select the **Help | Contents** menu item, at any time.

