# Plant Design-to-STAAD.Pro Translator

## (for CADMATIC)

## 1.0 Introduction

This Translator is used to extract the data from CADMATIC structural model (Beams) to carry out the structural analysis using an external stress analysis package called STAAD.Pro. However it must be stressed here that only geometry, and sectional properties of the structural model are transferred.

The transfer of data takes place in two phases. In the first phase CSL is used to extract the data and to create a neutral file. In the second phase an external program is used to read the neutral file and to create the STAAD.Pro input file.

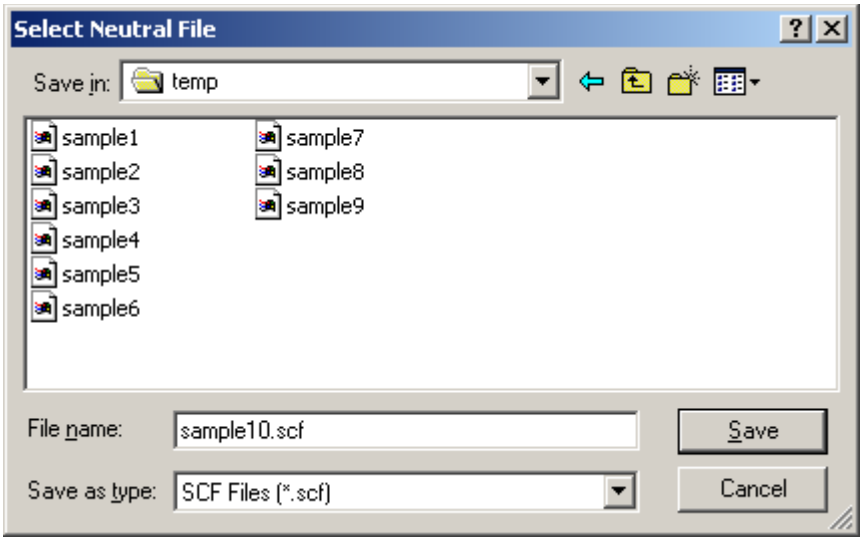
## 2.0 Installing Program

To install PD2STPRO on Windows NT, load the product CD supplied by InfoPlant and execute the followings step:

Browse the CD, and run the program "SETUP.EXE" and follow the instructions as they appear on the screen.

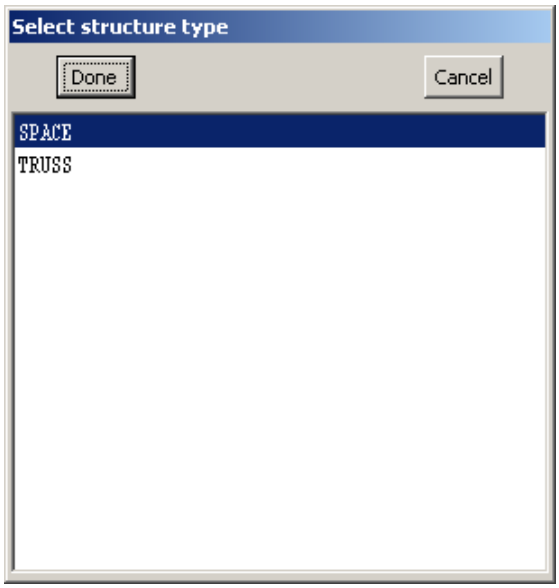
## 3.0 Neutral File Extraction

3.1 To use the Translator, run the program “Setup\CADTOST.mac” present in the directory where the software is installed to invoke the Translator. The following form appears.




Type the name of the neutral file with extension “scf” and press the “Save” button.

**3.2** When the “Save” button is pressed, the following form will appear. This form should be used to select the structure type. Selecting the option “SPACE” shall transfer the structural members as SPACE members which effectively means that the members are assumed to have axial, torsional and bending stiffness. Option “TRUSS” means the members will have only axial stiffness. Press the button “Done” when proper option is selected.




3.3 After pressing the button “Done” a message “Select Beams to be transferred to STAAD.Pro” will appear. Select the “BEAM” objects, which are to be transferred to STAAD.Pro for analysis.

3.4 When all the “BEAM” objects selected are transferred a message "Transferred successfully. Check < Neutral File Name> for neutral file." will appear.

## 4.0 Limitations

1. Only one-dimensional structural members are transferred, not 2-dimensional plate or shells or any other 3-dimensional members.
2. Only straight prismatic sections are transferred and not tapered members.
3. Since CADMATIC does not have any provision to specify the connectivity between members it is not possible to transfer the member connectivity to STAAD.Pro. However, this can be overcome by following the suggestion listed in Appendix A of this document.
4. Material properties are not transferred directly. Only material name is transferred and then material properties are extracted from the material database using the material name.
5. “BEAM” objects, which have shape id equal to zero, are not transferred.

## 5.0 Features of CSL Program

1. Only “BEAM” objects are transferred. Hereafter “BEAM” object will be referred as object.
2. If the object acts as a bracing member or is a truss member then it is advised to select the option “TRUSS” while transferring so that the member will be treated as section having only axial stiffness in STAAD.Pro or else it will be treated as a SPACE member having axial, bending and torsional stiffness.
3. The orientation of the profile member in STAAD.Pro is done by considering the definition of orientation in STAAD.Pro and the local axes directions in CADMATIC.
4. “BEAM” objects with cross section as n-Polygon are not transferred at this time.

5. For “general L” cross section, “tw” shall be assumed a value equal to “th”. In other words, the value of “tw” for “general L” is not transferred to STAAD.Pro at this time.

## 6.0 How the CSL program works ?

1 When the user runs the file “CADTOSTPRO.mac” supplied with the software, it prompts the user to select the “BEAM” objects to be transferred. Press the “Enter” to proceed further.

2 The program then checks the shape code of the selected object. If it is a “BEAM”, then it checks the shape id. Depending on the shapes id, it collects the dimensions associated with the shapes. For example, if the shape code is equal to 6 (BEAM), and the shape id equals to 1 (Equal angle), then the program performs the following.

   a. Collects the first length quantity type from the dimension table and writes the same as “Length” of the leg.

   b. Collects the second length quantity type from the dimension table and writes the same as “Thickness” of the angle.

   The following table gives the shape id and their corresponding shapes considered for interfacing with STAAD.Pro

| Shape ID | Descriptions | Dimensions |
|---|---|---|
| 1 | L with equal sides | l, t |
| 2 | L with unequal sides | h, w, t |
| 3 | General L | h, w, th, tw |
| 4 | U - shape | h, w, th, tw |
| 5 | T - shape | h, w, th, tw |
| 6 | I - shape | h, w, th, tw |
| 7 | Square shape | L |
| 8 | Rectangular section | h, w |

3. The material from the corporate catalogue corresponding to the BEAM object shall be transferred as the material name for that object. This name is then mapped in the material database supplied with the software.

4. The co-ordinate of the origin (1$^{st}$ end point) of the “BEAM” object is transferred as the start node. The co-ordinate of the 2$^{nd}$ end point is transferred as the end node of the “BEAM”s.

5. The co-ordinate of the origin (1$^{st}$ end point) of the “BEAM” object is transferred as the start node. The co-ordinate of the 2$^{nd}$ end point is transferred as the end node of the “BEAM”.

   *Note: In STAAD.Pro the neutral axis will be placed on the line joining both the nodes.*

6. Refer Appendix B for the local co-ordinate system considered in CADMATIC for orientating the members in STAAD.Pro.

# Appendix A

### Member connectivity in CADMATIC

CADMATIC has provision for creating structures, but the present version of CADMATIC does not have the direct provision to store information like support condition, stiffness releases for structures and connectivity of a member. As a result, the present version of the Translator is not able to extract the information such as support condition, stiffness releases and connectivity from the Plant Modeler. Because of these missing informations, the present version of Translator will transfer the “BEAM” objects as independent members in STAAD.Pro without connectivity. To overcome this difficulty and to transfer some vital information to

CADMATIC, user is advised to split all the “BEAM” objects at the joints and to have a common end point for all the “BEAM” objects meeting at that joint. The point is illustrated below.

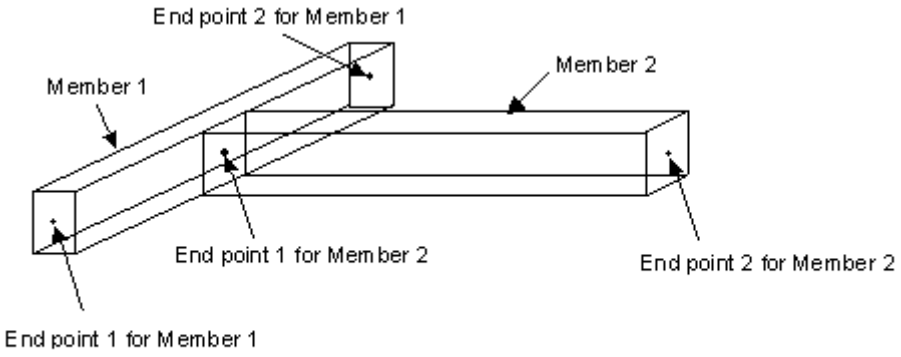



**Figure A.1**

The figure above shows a typical CADMATIC structure consisting of two rectangular sections. When this structure is transferred to STAAD.Pro using the Translator, we get a structure as shown in Figure.A.2 (shown in blue line). One can see that both the members are independent of each other. They are not connected to each other. To avoid this problem and to have a structure where members are connected properly when transferred to STAAD.Pro we can model the structure as shown in Figure A.3. In the model shown in Figure A.3, “Member 1”(in Figure A.1) is split into two members namely “Member 1 “ and “Member 2”. “Member 3”, which was “Member 2” in Figure A.2, has been modeled in such a way that all the members have a common end point at the joint. When this model is transferred we will get a structure, which is connected properly at the joint.

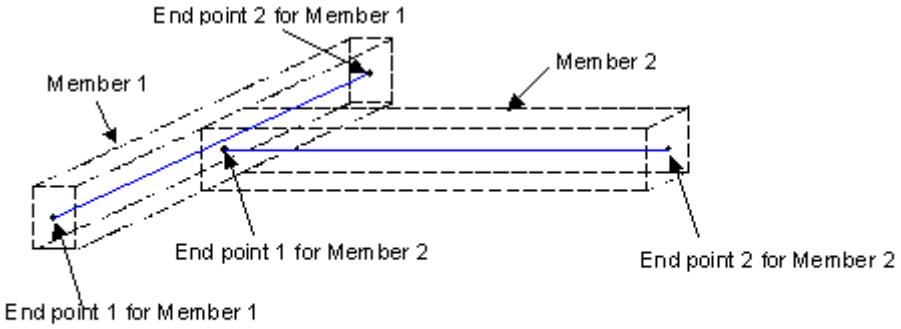



**Figure A.2**

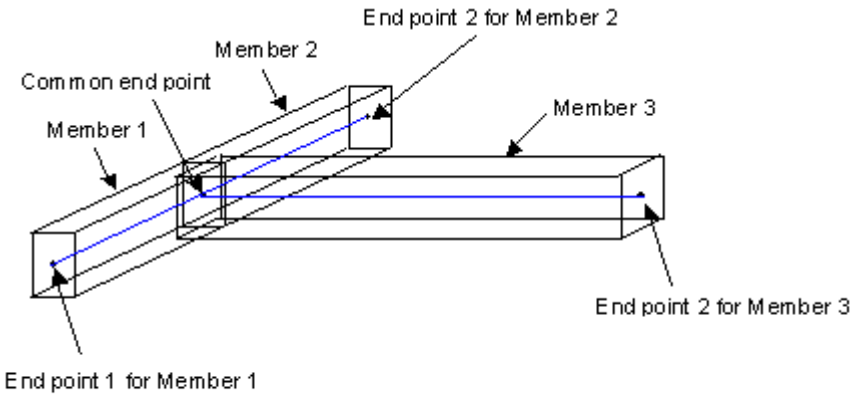



**Figure A.3**

Few examples are given below to illustrate the point discussed above. First the models were modeled in usual way, because of which you may notice from the STAAD.Pro input file that the connectivity between the members were not transferred. The STAAD.Pro input file was then modified to get the desired result. Secondly, the same structures were modeled in CADMATIC as suggested above (connectivity created manually) and transferred to STAAD.Pro. Hence, you may see the connectivity information being transferred to STAAD.Pro input files. The neutral files and STAAD.Pro input files are included in the distribution CD under the folder "CADMATIC_Verication" for reference.

### Example 1

The details of the example are given below. The structure is modeled in CADMATIC without having common end point at the joints. The neutral file was then created using CSL and the name of the neutral file is "cadsample1.scf". Secondly, the STAAD.Pro input file created by the Translator ("cadsample1.std") is modified to have connected members ("cadsample1_mod.std"). The support condition has been added in the STAAD.Pro file after it is transferred. Refer cadsample1_mod.std for more details on modification.

**Section details**

| Member number | Profile Type | Dimension | Material |
|---|---|---|---|
| 1 to 10 | Square | 300mmX300mm | Concrete |
| 11 to 21 | Rectangular | 300mmX400mm | Concrete |

**Node details**

| Node Number | External support |
|---|---|
| 1 to 6 | Fixed |

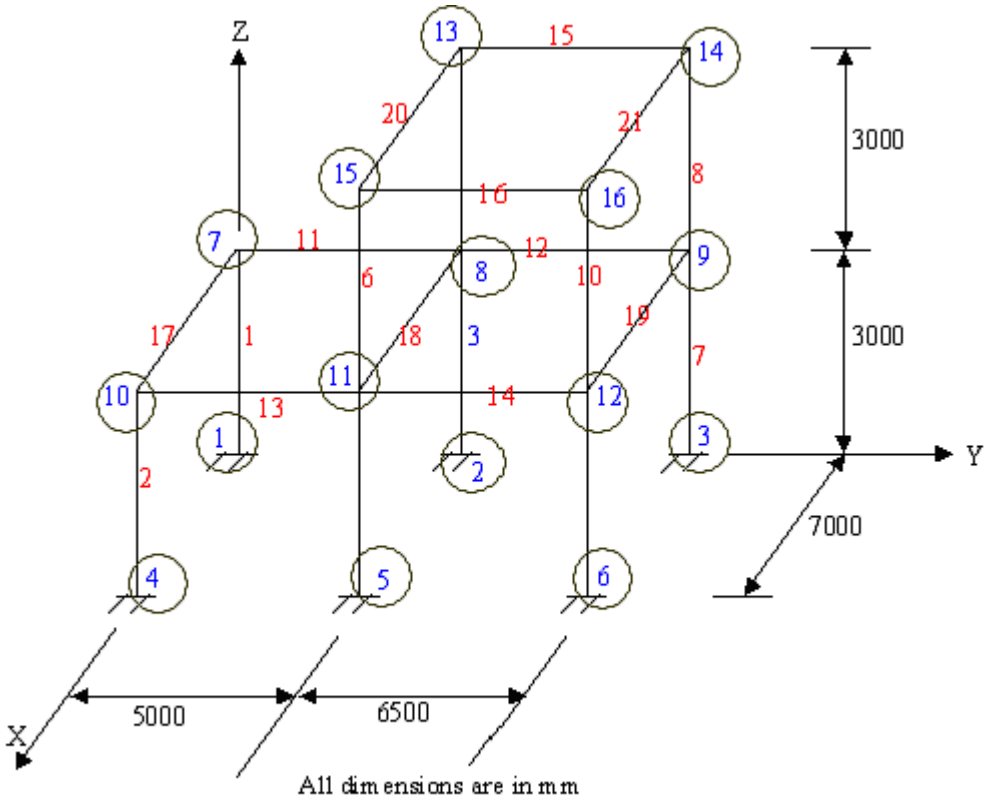



**Figure A.5**

## Example 2

The details of the example are given below. The structure has been modeled in such a way that at all the members meeting at the joint have common end point. The neutral file ("cadsample2.scf") is then transferred to get the STAAD.Pro input file ("cadsample3.std"). The support conditions have been added after the transfer.

**Section details**

| Member number | Profile Type | Dimension | Material |
|---|---|---|---|
| 1 to 10 | Square | 300mmX300mm | Concrete |
| 11 to 21 | Rectangular | 533mmX406mm | Concrete |

**Node details**

| Node Number | External support |
|---|---|
| 1 to 6 | Fixed |

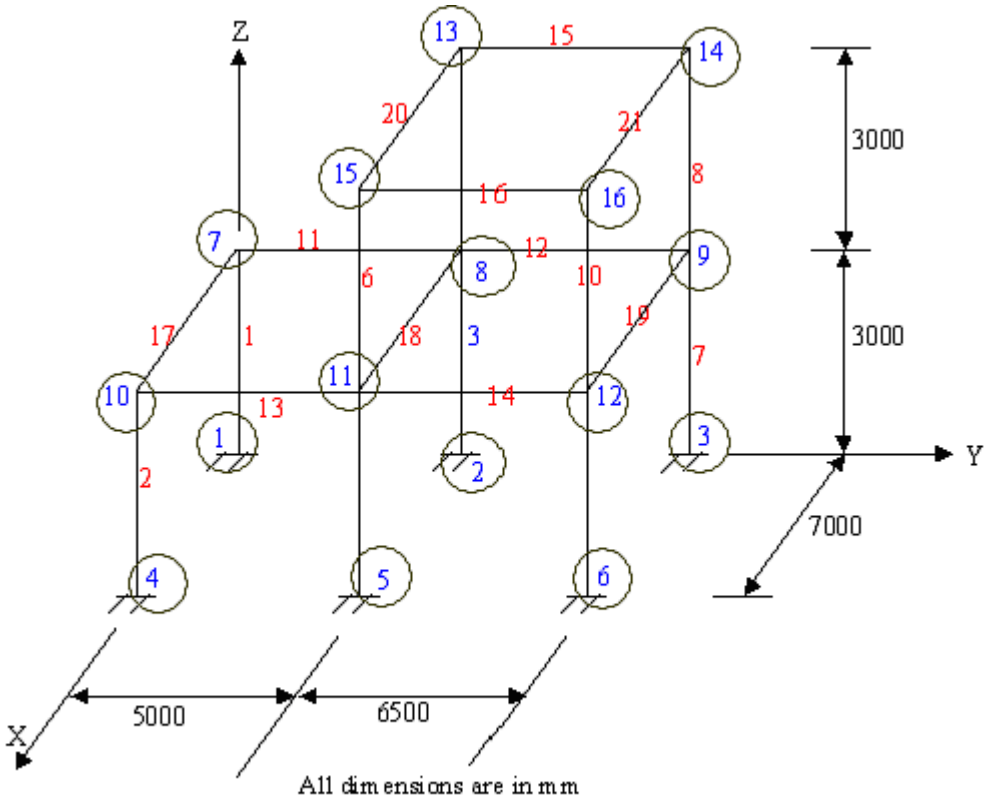



**Figure A.5**

## Example 3

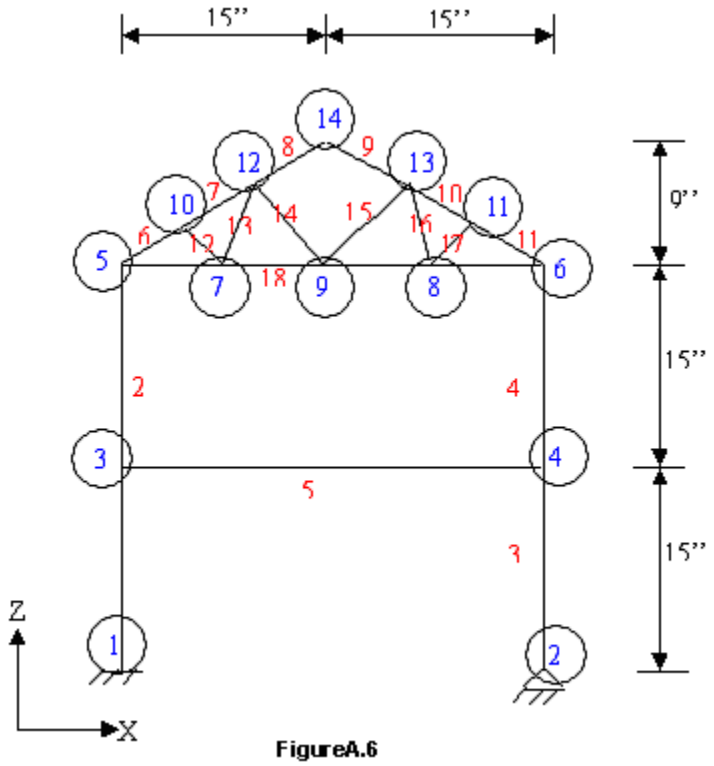
The details of the example are given below. The structure is modeled in CADMATIC without having common end point at few of the joints. The neutral file (“cadsample3.scf”) is then transferred to STAAD.Pro (“cadsample3.std”). The modified STAAD.Pro file(“cadsample3_mod”) was created then by splitting member 18 and creating common end points at proper nodes. The support conditions are added after transferring the neutral file.

**Section Details**

| Member Number | Profile Type |
|---|---|
| All | W8X40 (AISC) |

**Node details**

| Node Number | External support |
|---|---|
| 1 | Fixed |
| 2 | Fixed but MY |




FigureA.6

## Example 4

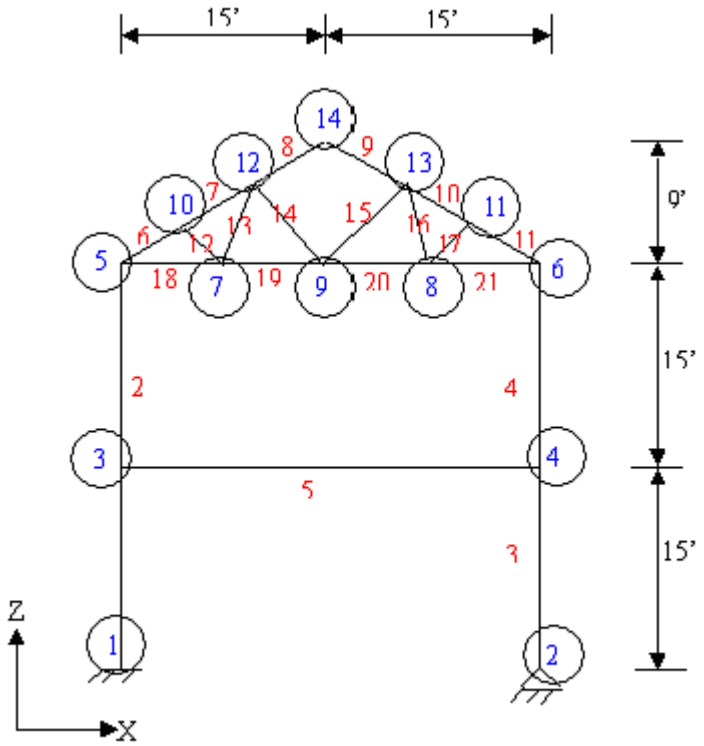
This structure is modeled in CADMATIC with common end point at few of the joints. The neutral file("cadsample4.scf") is then transferred to get the STAAD.Pro input file ("cadsample4.std") and the support conditions are added to the input file.

**Section Details**

| Member Number | Profile Type |
|---|---|
| 1 to 16 | W8X40 (AISC) |
| 18 to 21 | W8X40 (AISC) |

**Node details**

| Node Number | External support |
|---|---|
| 1 | Fixed |
| 2 | Fixed but MY |

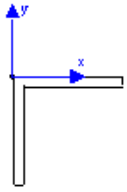



FigureA.7

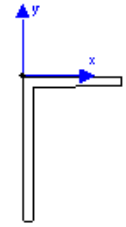
# Appendix B

## Local co-ordinate system for "BEAM" objects in CADMATIC

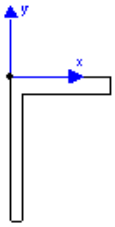
The local co-ordinate system for "BEAM" objects as given in the CADMATIC manual is reproduced below for the user's reference. *Note: Local z-axis is coming out of the page.*



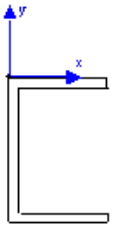

Equal Angle



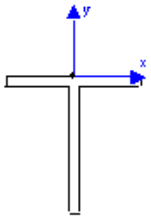

Unequal Angle



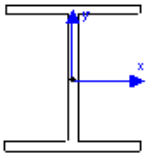

General Angle



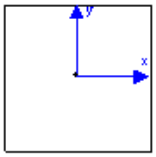

Channel



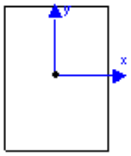

Tee




I section




Square section




Rectangular section