STAAD.Pro-to-E3D/PDMS

User's Manual
Server Version 2.xx

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1. Introduction

STAAD.Pro-to-E3D/PDMS: STAAD.Pro-to-E3D/PDMS Translator (STPRO2PDMS) program is a stand-alone program, which shall be used for transferring section geometry, their properties, boundary condition, etc. from STAAD.Pro to E3D/PDMS Software.

The sequence of this Translator operation is shown Graphically in Figure 1-1.

```
┌─────────────────────────┐
│       STAAD.Pro         │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│   STAAD.Pro Input File  │
└─────────────────────────┘
             │
             ▼
┌─────────────────────┐        ┌──────────────┐
│     STPRO2PDMS      │ ◄───── │  Mapping DB  │
└─────────────────────┘        └──────────────┘
             │
             ▼
┌─────────────────────┐
│     Macro File      │
└─────────────────────┘
             │
             ▼
┌─────────────────────────┐
│   E3D/PDMS Software     │
└─────────────────────────┘
```
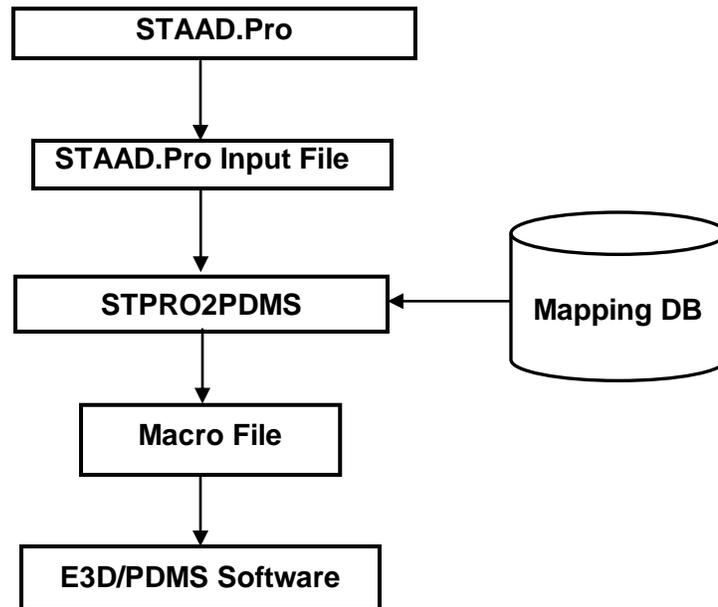
Figure 1-1

It is assumed that the user is already familiar with the principles of E3D/PDMS Software Structural Application and the practices followed in E3D/PDMS Structural catalogue and specifications. It is also assumed that the user has used E3D/PDMS Software to generate structures by using available facilities in E3D/PDMS Software and the user is familiar with STAAD.Pro. At this stage it is essential to know that E3D/PDMS Software and STAAD.Pro use different world coordinate systems; so, it is recommended that the user should check the E3D/PDMS model coordinates after the model import.

How the Translator works?

1.1 The sections modeled in STAAD.Pro leads to the generation of the STAAD.Pro input command file or the data can be entered manually through the STAAD EDITOR.

1.2 The windows executable STPRO2E3D/PDMS.exe reads this STAAD.Pro input file and maps it against Section mapping DB to identify the valid E3D/PDMS Software section name that corresponds to the STAAD.Pro section Specification. This executable finally generates macro file (*.mac), by running this file in E3D/PDMS Software, the corresponding model can be viewed.

2.0 Installing the Program

Refer Section 1 in SST License Manager User's Manual for details.

3. Loading Catalogues and Specifications

In E3D/PDMS, the instances of the section (profiles) geometry in design are generated through catalogue reference. In other words, the section profiles are created/defined as a catalogue component in E3D/PDMS Paragon module before the same being used in E3D/PDMS Design Module. Hence it is necessary for the user to make sure that the Catalogues for various Standards that are available in STAAD.Pro software is also available in E3D/PDMS. If the catalogues corresponding to STAAD.Pro are available in E3D/PDMS, then the names of that catalogue component should be mapped with STAAD.Pro catalogue through a Mapping DB supplied along with the Translator. On the other hand, if the catalogues corresponding to STAAD.Pro are not available in E3D/PDMS, then the user has to create the same in E3D/PDMS Paragon and Map using the Mapping DB supplied along with the Translator.

The catalogues and the Specification in E3D/PDMS format corresponding to those that are available in STAAD.Pro standard tables are supplied with the current version of the Translator. The Mapping DB corresponding to the above said is also supplied along with the Translator. User can load these catalogues and specifications into E3D/PDMS paragon following the procedure given below, if they are not available in E3D/PDMS.

1. Launch E3D/PDMS and login to paragon module with username and password, which has read/write access.

2. Load the file "AmericanCata.dat" and "AmericanSpwl.dat available in "STPRO2E3D/PDMS_Installed_dir\Catalogues\AISC" through the command line of E3D/PDMS Paragon Module. Similarly, load all the files available under the folder BRITISH, EUROPEAN and USER. Assuming the STPRO2E3D/PDMS application path as "E:\stpro2E3D/PDMS", type

   $m /E:\ st2E3D/PDMS\catalogues\AmericanCata.dat

   Similarly run all the files, as mentioned above.

3. Save the work by typing "Savework" in command line.

4. For testing the Translator, few sample models are supplied along with the product. These models are available in "STPRO2E3D/PDMS_Installed_dir\samples".

Note: Refer Appendix A on creating and mapping the Catalogues and Specifications in E3D/PDMS for the User Defined STAAD.Pro Sections.

4. Limitations

The present version of the Translator has the following limitations.

1) General sections defined in STAAD.Pro will be transferred to E3D/PDMS as SCTN without Graphics as they do not have a geometrical shape. On the other hand, other properties such as AX, AY, AZ, Ix, Iy, Iz, YD, ZD, YB, and ZB will be transferred to E3D/PDMS via UDAs. Definition of these properties are explained below,

AX = Cross sectional area of the member.

AY = Effective shear area in local y-axis.

AZ = Effective shear area in local z-axis.

IX = Torsional constant.

IY = Moment of inertia about local y-axis.

IZ = Moment of inertia about local z-axis (usually major).

If any of the above six (6) parameters are not input in STAAD.Pro then it may be calculated using YD, ZD, YB, and/or ZB dimensions.

YD = Depth of the member in local y direction. (Diameter of section for circular members)

ZD = Depth of the member in local z direction. If ZD is not provided and YD is provided, the section will be assumed to be circular.

YB = Depth of stem for T-section.

ZB = Width of stem for T-section or bottom width for TRAPEZOIDAL section.
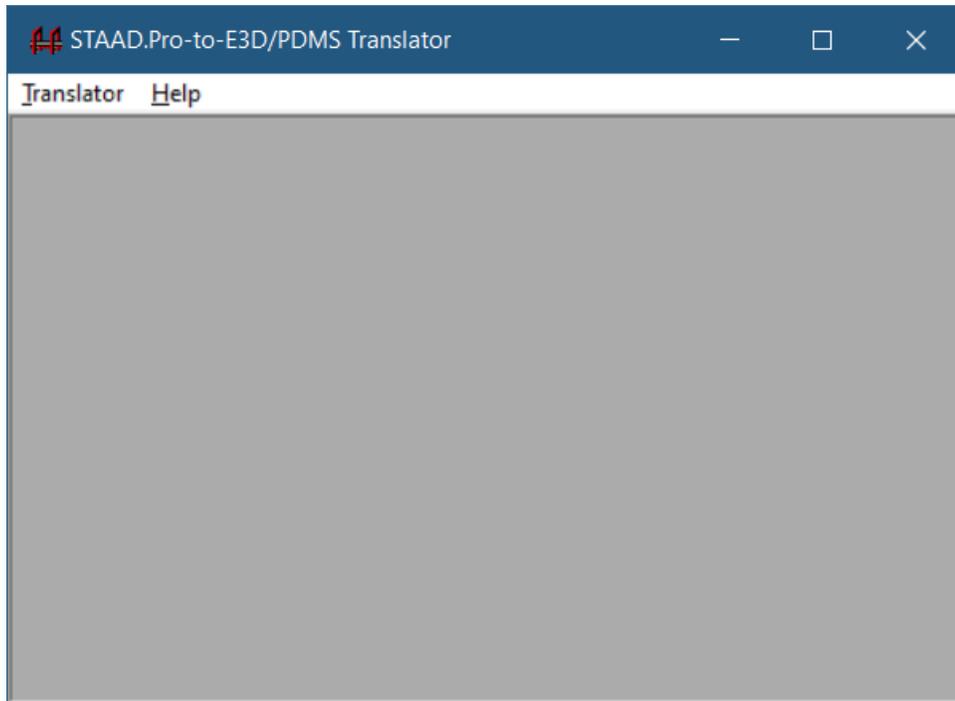
Except the Geometry, all other information's are transferred to the sections.

2) The composite sections (CM) are not transferred from the STAAD.Pro to E3D/PDMS.
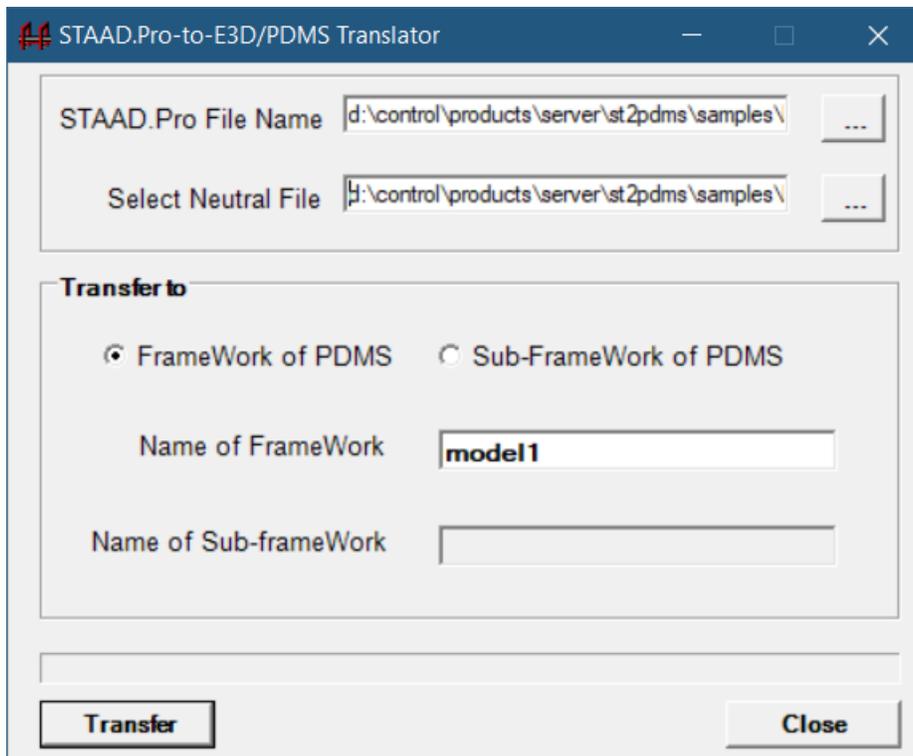
The 'CM' (composite) parameter can be assigned to I-shaped sections only. A 'CM' (composite) section is one obtained by considering a portion of a concrete slab to act in unison with the I-shaped steel section. For more information about Composite Section, refer the STAAD.Pro Technical Reference Manual.

5. Working Procedure

5.1 On launching the program the below form will appear.

5.2 From the menu "Translator", click "STPRO2PDMS". A form will be displayed as shown below.


5.3 Selection of STAAD.Pro Input Command File can be done in two ways viz. by entering the name of the STAAD.Pro Input Command File along with the valid path in the text box provided or by navigating through the corresponding button.

5.4 Similarly, enter the name of the Macro file as explained in Step 5.3

5.5 User can transfer the Model under the hierarchy of framework or sub framework. By Default, the name of the framework or sub framework will be displayed in the form or the user can enter the name of the Framework or sub framework manually.

5.6 Click the button "Transfer" to transfer model to Macro file format. Upon successful transfer, user gets the message box as shown below.
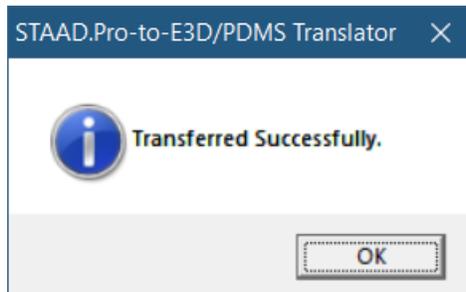
After conversion, run the macro file with proper path name in E3D/PDMS Design module. So that the corresponding model will appear in the E3D/PDMS Design module. For e.g.

$m D:\staadpro\sample_model11\structure1.mac

Note: When transferring the models from STAAD.Pro to E3D/PDMS, check the hierarchy. If the model is transferred under the hierarchy of FRAMEWORK, then create the hierarchy as mentioned below

WORLD -> SITE -> ZONE -> STRU

If the model is transferred under the hierarchy of sub framework, then create the hierarchy as mentioned below

WORLD -> SITE -> ZONE -> STRU -> FRMW

6.Reference

This section describes in details, the methodology used for transferring the information's of sections from STAAD.Pro to E3D/PDMS.

6.1 COMMENTS

STAAD SPACE

START JOB INFORMATION

ENGINEER DATE 20-Nov-06

END JOB INFORMATION

INPUT WIDTH 79

The STAAD SPACE command initiates the STAAD run, allows the user to specify the type of the structure and an optional title. Any STAAD input command file has to start with the word STAAD.

START JOB INFORMATION

ENGINEER DATE 20-Nov-06

END JOB INFORMATION

The above lines indicate the date at which the input command file (job) is created.

The INPUT WIDTH commands may be used to specify the width(s) of the lines of input/output file(s). The user may specify the required input/output width, as required, using this command. For INPUT width, 79 are always used.

Since above information's doesn't contain any valid data, this information's are not transferred from STAAD.Pro to E3D/PDMS

6.2 GLOBAL DIRECTION

In STAAD.Pro, two Global directions are there,

SET Z UP

SET Y UP

By default, the Y-axis is the vertical axis. However, the **SET Z UP** commands may be used to model situations where Z-axis represents the vertical axis (direction of gravity load) of the structure. This situation may arise if the input geometry is created through some CAD software. But in E3D/PDMS always SET Z UP.

This Translator identifies, whether the Global direction is set, SET Z UP or SET Y UP. If SET Z UP then the following condition is used.

X = X

Y = Y

Z = Z

And the models are transferred without interchanging the Joint co-ordinate of the each section.

If SET Y UP then the following condition is used.

X = X

Y = -Z

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Z = Y

And the Joint co-ordinate of the each section is interchanged. And the model is transferred accordingly to the E3D/PDMS.

6.3 UNIT

This command allows the user to specify or change length and force units for input and output. The UNIT command can be specified any number of times in the STAAD.Pro input command file. In STAAD.PRO the units used are "MMS", "CM", "DME", "METER", "KM", "INCH", and "FEET". This Translator converts the "CM", "DME", "METER", "KM", "INCH", or "FEET" into the "MMS" (Millimeter). Since in E3D/PDMS millimeter is recommended.

6.4 JOINT COORDINATES

These commands allow the user to specify and generate the coordinates of the Joints of the structure. The JOINT COORDINATES command initiates the specification of the coordinates. The joint coordinates command specifies the Cartesian co-ordinate system. Joints are defined using the global X, Y and Z co-ordinates. The JOINT COORDINATES of the STAAD.Pro are transferred as 'primary nodes' (PNOD) in E3D/PDMS.

6.5 MEMBER INCIDENCES

MEMBER INCIDENCES is used to specify Members by defining connectivity between JOINTS (primary nodes) .The position start of the section in E3D/PDMS is equal to the node number (1st) of STAAD.Pro member incidence. The position end of the section in E3D/PDMS is equal to the node number (2nd) of STAAD.Pro member incidence.

6.6 ELEMENT INCIDENCES SHELL

ELEMENT INCIDENCES SHELL is used to specify Shell Elements by defining the connectivity between Joints (primary nodes). Each Shell element incidence must be defined such that the model developed represents one shell structure only, and not two or more separate shells.

Element incidence shell must be provided immediately after MEMBER INCIDENCES (if any) are specified. If MEMBER INCIDENCE is provided, Elements number must not coincide with any MEMBER number. The Clockwise or counterclockwise joint numbers represents element connectivity.

The Shell or Plate elements are transferred as Panel (PANE) elements in E3D/PDMS. The Joints of the element shall be transferred as Panel Vertex Element (PAVE).

For more Details about Panels and plates refer the Technical reference manual **Structural Design Using E3D/PDMS.**

6.7 ELEMENT PROPERTY SPECIFICATION

ELEMENT PROPERTY SPECIFICATION is used to specify the properties of plate finite elements. Elements of uniform or linearly varying thickness may be modeled using this command.

The plate thickness is assigned to the Height attribute of the Panel Loop Element (PLOO) in E3D/PDMS.

6.8 MEMBER PROPERTY

DEFINE MATERIAL START

ISOTROPIC STEEL

E 2.05e+008

POIS0SON 0.3

DENSITY 76.8195

ALPHA 1.2e-005

DAMP 0.03

END DEFINE MATERIAL

The above lines indicate the material properties of the section and these lines are omitted, when transferring the information's from STAAD.Pro to E3D/PDMS, because the Material Properties can be obtained from the specification reference of the sections.

This command initiates the specification of member property. Following are the various options available:

1. Specification from built in steel tables

2. Specification from USER PROVIDED TABLES

3. Specification by assigning profiles

4. Specification of PRISMATIC properties

5. Specification of TAPERED members

1. Specification from built in steel tables

The following commands are used for specifying section properties from built-in steel table(s).

a. **ST** specifies single section from the standard built-in tables.
b. **RA** specifies single angle with reverse Y-Z axes
c. **D** specifies double channel.
d. **LD** specifies long leg, back to back, double angle.
e. **SD** specifies short leg, back to back, double angle.
f. **T** specifies tee section cut from I shaped beams.
g. **TC** specifies beams with top cover plate.
h. **BC** specifies beams with bottom cover plate.
i. **TB** specifies beams with top and bottom cover plates.

a. ST (single section from the standard built-in tables)

ST stands for single section from the standard built-in table. The following are the different types of Single Section.

a) Angle

b) Channel

c) I-Section

Consider the example listed below for better understanding.

MEMBER PROPERTY AMERICAN

1 TABLE ST W6X25

In the above example, the word "AMERICAN" represents the AMERICAN standard, 1 represents the "Member Index", ST represent "Single Section" and W6X25 represent the "Staad.Pro Section Name"

The Translator check whether the member belongs to AMERICAN, BRITISH, or EUROPE etc standard, in the above example the member belongs to the AMERIACN standard, then it goes to AMERIACN standard table and Search for the E3D/PDMS section name. Since, we know the STAAD.Pro section name (W6X25), the corresponding E3D/PDMS section name and also Section Type can be obtained from the mapping database (AMERICAN STANDARD TABLE). Since E3D/PDMS section name is known, the

corresponding geometry is obtained by assigning the E3D/PDMS section name to the SPREF (specification reference) attribute of the member, whose section start and end is known by the Joint Coordinates.

By the section type, user can get the section belongs to Angle, Channel or I-section and the corresponding beta angle is calculated. For more information about calculating the beta angle refer the APPPENDIX B.

b. RA (specifies single angle with reverse Y-Z axes)

RA stands for the 'single angle with reverse Y-Z axes'.

For more details about the RA, refer the STAAD.Pro Technical Reference 5.20.1, Type Specs and Additional Specs for assigning the properties from the Steel Table.

A typical example for RA section is shown below.

MEMBER PROPERTY AMERICAN

1 TABLE RA L804012

In the above example,

AMERICAN -> AMERICAN standard

1 -> Member index

RA -> single angle with reverse Y-Z axes

L804012 -> STAAD.Pro Section name

For RA, the procedure is same as explained above for ST ('single section from the standard built-in table).

c. D (specifies double channel)

The procedure used for creating the double channel is explained below.

1) Create section that specification reference equal to the standard section from the mapping database and create another section of same specification reference and place it at a distance specified in the input command file as SP (SPACE BETWEEN CHANNEL) exactly opposite to each other.

2) The P-Lines are used to calculate the distance between the channels and placing the channels opposite to each other.
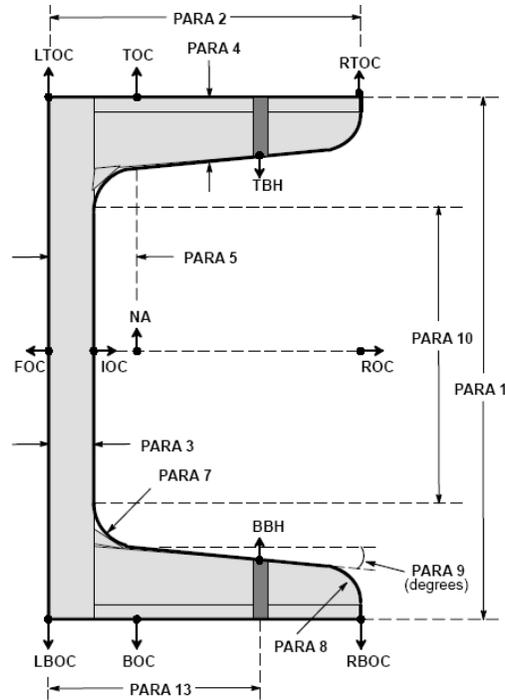
The P-lines are used for calculating the Distance between the Channels is

NA

IOC

FOC

The Channel with their P-lines is shown below.

A typical example for the Double channel is shown below.

MEMBER PROPERTY AMERICAN

1 TABLE D C3X4 SP 0.25

D stands for Double channel

C3X4 is the STAAD.Pro Section name.

SP is the Space between the Channels.

d. LD (specifies long leg, back to back, double angle)

The procedure used for creating the long leg back-to-back double angle is,
1) Create section that specification reference equal to standard section from the mapping database and create another section of same specification reference and place it at a distance specified in the input command file as SP (SPACE BETWEEN ANGLE).
2) The P-Lines are used to place the angle opposite to each other and to calculate the distance between the angles.

The P-lines are used in placing the angles opposite of each other is,
1) NA
2) NAL
3) NAR

The angle with their P-lines is shown below.

A typical example for the long leg back-to-back double angle is shown below.

MEMBER PROPERTY AMERICAN

1 TABLE LD L20202 SP 0.25

D stands for long leg back-to-back double angle

L20202 is the STAAD.Pro Section name.

SP is Space between the angles.

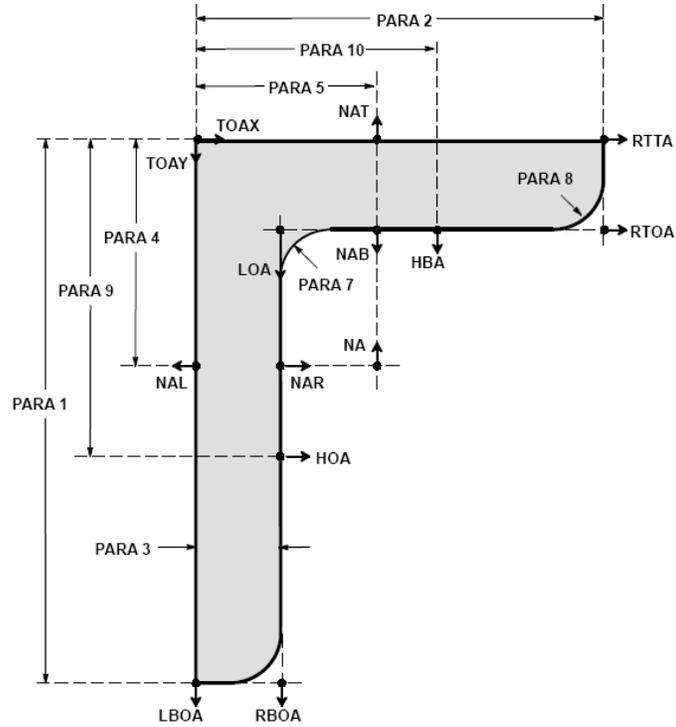**e. SD (specifies short leg, back to back, double angle)**

The procedure used for creating the short leg back-to-back double angle is,

1) Create section that specification reference equal to standard section from the mapping database and create another section of same specification reference and place it at a distance specified in the input command file as SP (SPACE BETWEEN ANGLE).

2) The P-Lines are used to calculate the distance between the angle and also placing the angle opposite to each other.

The P-lines are used for placing the short leg back-to-back double angle opposite to each other is,

1) NA

2) NAB

3) NAT

The angle with their P-lines is shown below.

MEMBER PROPERTY AMERICAN

1 TABLE SD L20202 SP 0.25

D stands for short leg back-to-back double angle

L20202 is the STAAD.Pro Section name.

SP is Space between the angles.

f. T (specifies tee section cut from I shaped beams)
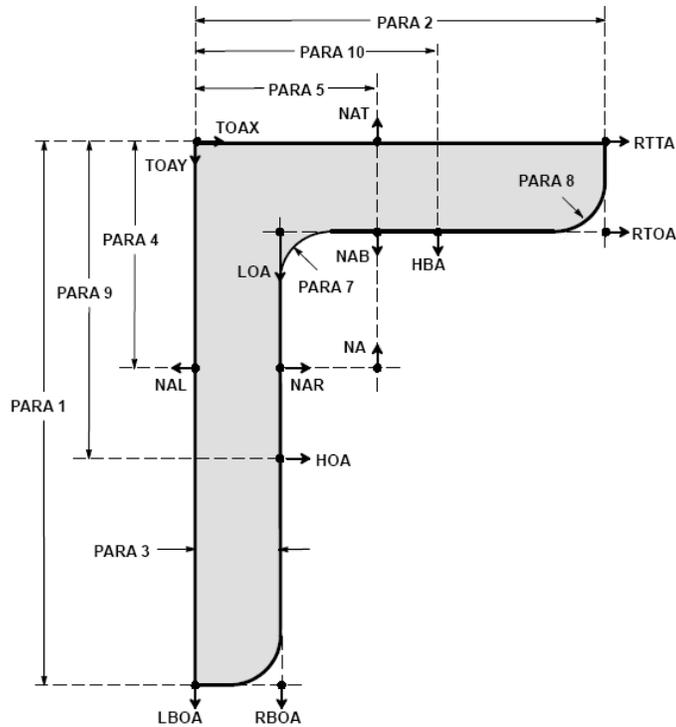
The 'T' parameter stands for a T-shaped section obtained by cutting an I-shaped section at exactly its mid height level along the web. Hence, the area of a T shape is exactly half the area of the corresponding I shape. The depth of a T shape is half the depth of the I shape it was cut from.

If this Translator identifies the member as 'T' section, since the Translator knows the STAAD.Pro section name, it gets the corresponding E3D/PDMS section name from mapping database and assign it to the SPREF (specification reference) attribute of the section to get the corresponding geometry.

A typical example for the T section is,

MEMBER PROPERTY AMERICAN

1 TABLE T M6X20

T specifies tee section cut from I shaped beams

M6X20 is the STAAD.Pro Section name.

g. TC (specifies beams with top cover plate)

The procedure used for creating the top cover plate is,

1) Create section whose specification reference is equal to the standard section from the mapping database and create box from the plate information provided in the input command file and place it above the I-section.

2) For placing the box above the I-section, the following p-lines are used.

      a) NA

      b) TOS

      c) RTOS

By using these p-lines, calculating the direction of the boxes and placing it exactly above the I-section.

A typical example for the beams with top cover plate is,

MEMBER PROPERTY AMERICAN

1 TABLE TC M6X20 WP 250 TH 50

TC specifies beams with top cover plate

M6X20 is the STAAD.Pro Section name.

WP is the width of the plate.

TH is the thickness of the plate.

The I-section with P-lines is shown in the figure 6.6.

h. BC (specifies beams with bottom cover plate)

The procedure used for creating the bottom cover plate is,

1) Create section whose specification reference is equal to the standard section from the mapping database and create box from plate information provided in the input command file and place it below the I-section.

2) For placing the box below the I-section, the following p-lines are used.

      a) NA

      b) BOS

      c) RBOS

By using these p-lines, calculating the direction of the boxes and placing it exactly below the I-section.

A typical example for the beams with bottom cover plate is,

MEMBER PROPERTY AMERICAN

1 TABLE BC M6X20 WP 250 TH 50

BC specifies beams with bottom cover plate

M6X20 is the STAAD.Pro Section name.

WP is the width of the plate.

TH is the thickness of the plate.

The I-section with P-lines is shown in the figure 6.6.

I. TB (specifies beams with top and bottom cover plates)

The procedure used for creating the top and bottom cover plate is,

1) Create section whose specification reference is equal to the standard section from the mapping database and create box from plate information provided in the input command file and place it above and below the I-section.

2) For placing the box above and below the I-section, the following p-lines are used.

      1) NA

      2) TOS

      3) BOS

      4) RBOS

      5) RTOS

By using these p-lines, calculating the direction of the boxes and placing it exactly above and below the I-section.

A typical example for the beams with top and bottom cover plate is

MEMBER PROPERTY AMERICAN

1 TABLE TB M6X20 WP 250 TH 50

TB specifies beams with top and bottom cover plates

M6X20 is the STAAD.Pro Section name.

WP is the width of the plate.

TH is the thickness of the plate.

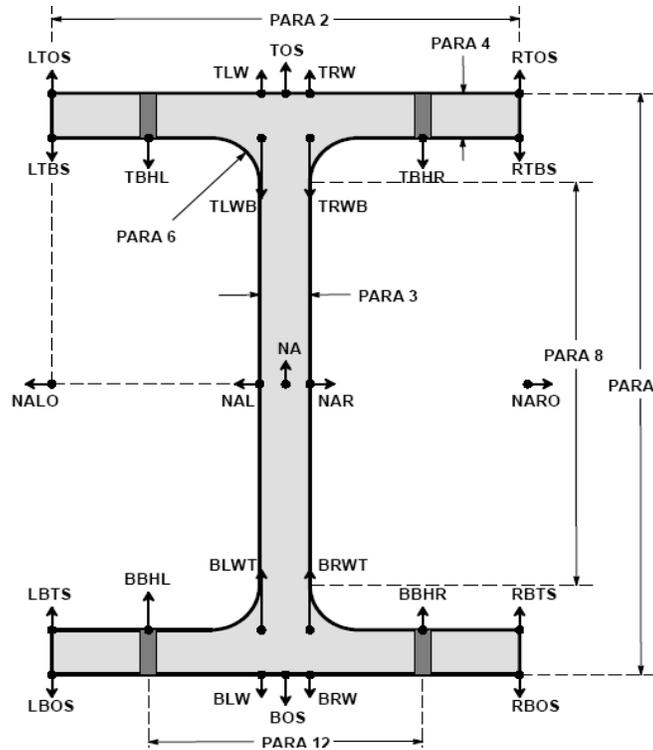The I-section with their P-lines is shown below.

FIGURE 6.6 I-SCTN WITH P-LINES

2. Specification from USER PROVIDED TABLES

If the Translator identifies the UPTABLE in the MEMBER PROPERTY in input command file, it collects the section specification and maps it against the mapping database and get the corresponding E3D/PDMS section name. Since the E3D/PDMS section name is known, the corresponding geometry is obtained by assigning the E3D/PDMS section name to the SPREF (specification reference) of the section, that section start and end is known by the Joint Coordinates.

For more details about the USER PROVIDED TABLE refer the Technical Reference 5.20.4 Property Specification from User Provided Table

3 Specification by assigning profiles

The ASSIGN command may be used to instruct the program to assign a suitable steel section to a frame member based on the profile-specification shown below.

BEAM

COLUMN

CHANNEL

ANGLE

DOUBLE-ANGLE

This section doesn't exist in E3D/PDMS. Hence, these sections are created in paragon and mapped it against the mapping database. If the Translator identifies the ASSIGN in the MEMBER PROPERTY in the input command file, it collects the profile-specification and maps it against the mapping database and get the corresponding E3D/PDMS section name. Since E3D/PDMS section name is known, the corresponding geometry is obtained by assigning the E3D/PDMS section name to the SPREF (specification reference) of the section, that section start and end is known by the Joint Coordinates.

For more details about creating the sections refer the E3D/PDMS →STRUCTURAL DEIGN USING E3D/PDMS.

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4 Specification of PRISMATIC properties

The prismatic properties are the non-standard sections. In prismatic properties there are different types

a) Circle

b) Rectangle

c) Tee

d) Trapezoidal

e) Tapered Tube

d) General

In Tapered tube there are different types

        Round

        HexDecagonal

        DoDecagonal

        Octagonal

        Hexagonal

        Square

The circle, rectangle, trapezoidal, Tapered Tube etc section doesn't exist in E3D/PDMS. Hence these sections are created in paragon and mapped against the mapping database. If the Translator identifies the section as circle, rectangle, Tee, Tapered Tube or Trapezoidal, it gets the corresponding E3D/PDMS section name from the mapping database and assigned it to the section and the corresponding values are passed as a Design Parameter to the section. Corresponding to the Design Parameter values, geometry will be assigned. As mentioned in limitations, General sections are not transferred. The corresponding message you can get it in LOG file.

For more details about the Tapered Tube sections, refer the STAAD.Pro Technical reference manual, 5.20.2.1 Prismatic Tapered Tube Property Specification.

5 Specification of TAPERED members

The TAPERED member is a non-standard I- section. If the Translator identifies the TAPERED in the MEMBER PROPERTY in the input command file, it collects the section specification and maps it against the mapping database and gets the corresponding E3D/PDMS section name from the mapping database and assigned it to the section and the corresponding values are passed as a Design Parameter to the section. Corresponding to the Design Parameter values, geometry will be assigned.

6.9 MEMBER TRUSS

When transferring the information from STAAD.Pro to E3D/PDMS, if truss member exist, that values are assigned to the 'FUNCTION' attributes of the section element (SCTN).

6.10 MEMBER RELEASE

When transferring the data from STAAD.Pro to E3D/PDMS, if member release exists, that values are assigned to the 'SRELEASE' or 'ERELEASE' attributes of the section Element (SCTN).

6.11 CONSTANTS

The constant keyword is used for assigning the beta angle to the section. The orientation is taken care through the BETA angle. For more details about orientation refer APPENDIX B

6.12 SUPPORTS

When transferring the data from STAAD.Pro to E3D/PDMS, if member support exists, that values are assigned to the 'FIXITY attribute of PNOD'.

Syntax for filling FIXITY attribute of PNOD is

a. FIXED

b. PINNED

c. FIXED BUT <Release-Spec> [Spring-SPEC]

Release-Spec

FX, FY, FZ, MX, MY & MZ

Spring-Spec

KFX <f1>, KFY <f2>, KFZ <f3>, KMX <f4>, KMY <f5> & KMZ <f6>

Examples

FIXED BUT FX MZ

FIXED BUT MZ KFX 50.0 KFY 75. For more details about Fixity and primary node refer the APPENDIX E

Appendix A

STAAD.Pro-to-E3D/PDMS Section Mapping

The ST2E3D/PDMS Translator reads the member properties from the STAAD.Pro input file. The properties read from the STAAD.Pro input file may be Standard or Non standard section. This Translator maps it against the mapping database and gets the corresponding E3D/PDMS section name.

If a member belongs to the Standard sections, the Translator gets the specification reference from the standard section-mapping database. On the other hand, If a member belongs to the non-standard section, the Translator gets the specification reference from the User defined section-mapping database.

The details on mapping sections are described below.

For mapping sections from STAAD.Pro to E3D/PDMS software two mapping DBs are provided namely StandardSection.mdb and UserdefinedSection.mdb as specified above.

StandardSection.mdb contains tables which are named after specific standards e.g. The table named "American" represents the AISC standard, the table named "British" represents British standard so on and so forth. Each table contains five fields viz. "CATREF", "SPREF"," STAADNAME","SECTIONTYPE" and "TANALPHA". As the names suggest CATREF contains the name of the section in the Catalogue of E3D/PDMS, SPREF contains the specification reference name in E3D/PDMS software; STAADNAME is the corresponding name of the section in STAAD.pro.The SECTIONTYPE is used to identify the member type e.g. The member belongs to the type of channel, angle or I-section. While mapping a section from STAAD.Pro to E3D/PDMS, the Specification reference is used. TANALPHA is the arctan of the angle (tan α) between the principal Axis system for second moment of area and local y-z axis system of the section.

Sample Table in StandardSection.mdb

CATREF	STAADNAME	SECTIONTYPE	SPREF	TANALPHA
S10x25.4	S10X25	I	AISC-SPEC/S10x25.4	0
S10x35	S10X35	I	AISC-SPEC/S10x35	0
S12x31.8	S12X31	I	AISC-SPEC/S12x31.8	0
S12x35	S12X35	I	AISC-SPEC/S12x35	0
S12x40.8	S12X40	I	AISC-SPEC/S12x40.8	0

User defined mapping database:

In user-defined section mapping database each table contains three fields viz. CATREF", "SPREF" and "SECTIONTYPE". As the names suggest CATREF contains the name of the section in the Catalogue of E3D/PDMS, SPREF contains the specification reference name E3D/PDMS software. As the name suggests SECTIONTYPE is used to identify the member type e.g. the member may belongs to the type of rectangle, circle, Tee etc.

Sample Table in Userdefinedsection.mdb

SPREF	SECTIONTYPE	CATREF
DESPAR-SEC/Rectagle_with_design_parameters	RECTAGLE	Rectagle_with_design_parameters
DESPAR-SPEC/Circle_with_design_parameters	CIRCLE	Circle_with_design_parameters
DESPAR-SPEC/Tee_with_design_parameters	TEE	Tee_with_design_parameters
DESPAR-SPEC/Tube_with_design_parameters	TUBE	Tube_with_design_parameters
DESPAR-SPEC/Trapez_with_design_parameters	TRAPEZOIDAL	Trapez_with_design_parameters

Appendix B

Orientation

The orientation is taken care through the beta angle of the E3D/PDMS, because the beta angle definition in both STAAD.Pro and E3D/PDMS are equal.

1. SET Z UP and section is not along the vertical axis

        ST ANGLE = (beta angle of STAAD.Pro) - 90 + alpha – 180

        RA ANGLE = (beta angle of STAAD.Pro) + alpha – 180

        CHANNEL = beta angle of STAAD.Pro + 0

        I-SCTN and TAPERED SCTN = (beta angle of STAAD.Pro) + 0

2. SET Z UP and section is along the vertical axis

        ST ANGLE = (beta angle of STAAD.Pro) + alpha – 180

        RA ANGLE = (beta angle of STAAD.Pro) + alpha – 90

        CHANNEL = beta angle of STAAD.Pro + 90

        I-SCTN and TAPERED SCTN = (beta angle of STAAD.Pro) + 90

3. SET Y UP and section is not along the vertical axis

        ST ANGLE = (beta angle of STAAD.Pro) - 90 + alpha

        RA ANGLE = (beta angle of STAAD.Pro) + alpha

        CHANNEL = beta angle of STAAD.Pro + 180

        I-SCTN and TAPERED SCTN = (beta angle of STAAD.Pro) + 0

4. SET Y UP and section is along the vertical axis

        ST ANGLE = (beta angle of STAAD.Pro) + alpha

        RA ANGLE = (beta angle of STAAD.Pro) + alpha

        CHANNEL = beta angle of STAAD.Pro – 90

        I-SCTN and TAPERED SCTN = (beta angle of STAAD.Pro) + 90

Appendix C

Error messages

"Enter all the necessary data and proceed."

Description: Either the textbox for neutral file (*.mac) or STAAD.Pro input file (*.std) or both is not filled.

"STAAD.Pro file does not exist."

Description: The STAAD.Pro file name filled in the textbox for STAAD.Pro file does not exist.

"Mac file path does not exist."

Description: The path filled in the textbox for Macro input file is not valid.

"Server not found. SSTLM Service is not running in Server or COMPUTER_NAME in SSTLM Environmental variable is wrong."

Description: Server for the STAAD.Pro not specified. Refer, security.pdf and Install.hlp files for more details on specifying environmental variable "SSTLM".

LOG FILE:

In log file, the following messages may be appear.

1) "The Geometry of the General sections <Sections ID> is not transferred". This type of messages appears in the log file only when the general sections exist in the MEMBER PROPERTY.

2) "SPREF is not available for section <Section ID>". This type of messages appear in the log file, when the specification reference of the section is not available in the mapping database due to mismatch of the sections in the mapping database or that section doesn't exist in the mapping data base.

Appendix D

STAAD.Pro anomaly

1) To orient the section members in space STAAD.Pro uses the concept of β (beta) angle. The definition of the β angle is stated below as given in STAAD.Pro (2004) manual. It should be noted that the set of rules given below are applicable when global Z-axis direction is set "UP" in STAAD.Pro.
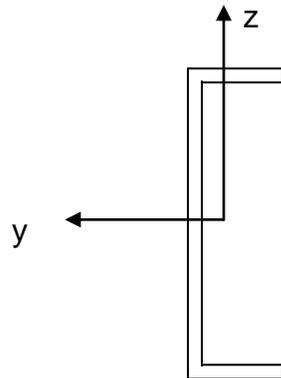
When the local x-axis is parallel to the global Y-axis, as in the case of a column in a structure, the beta angle is the angle through which the local z-axis has been rotated about the local x-axis from a position of being parallel and in the same positive direction of the global Z-axis.

When the local x-axis is not parallel to the global Y-axis, the beta angle is the angle through which the local coordinate system has been rotated about the local x-axis from a position of having the local z-axis parallel to the global X-Z plane and the local y-axis in the same positive direction as the global Y-axis.

However it is noticed that there are certain section profiles and directions for which the rendered view in STAAD.Pro does not conform to the rules stated above. Two examples are given below to illustrate the problem.
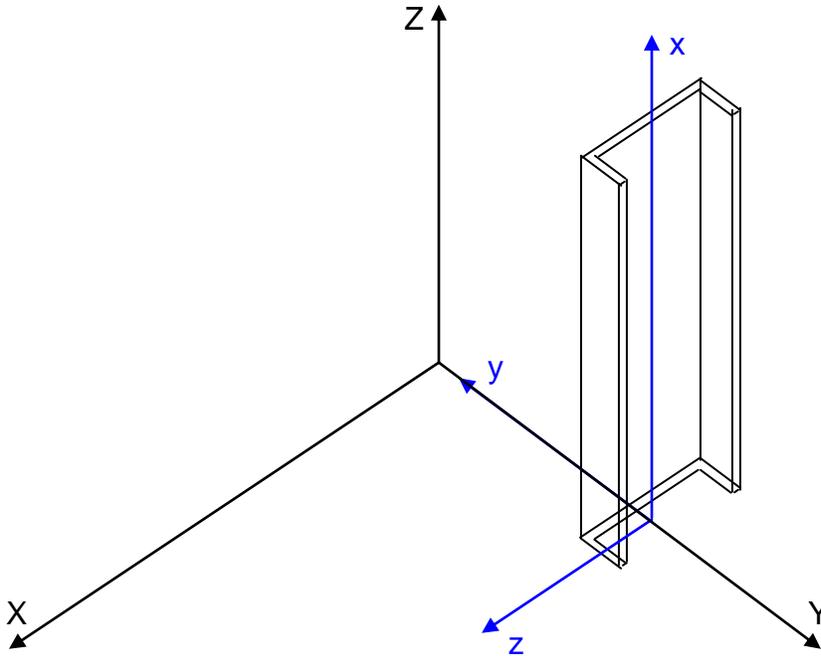
Example 1

The figure shown below shows the STAAD.Pros local axis convention for a channel section when global Z-axis is set "UP".

Channel – ST
(Local x-axis goes into the

The figure below shows the positioning of the channel section in STAAD.Pro when the local x-axis of the channel section is parallel to the global Z-axis.

As the local x-axis of the section is not parallel to the global Y-axis the 2nd part of the definition stated in the previous page will hold good. So for $\beta = 0$ according to the definition the local y-axis should be in the same direction as the global Y-axis direction, but as the figure above suggests the local y-axis is pointing towards the opposite direction of global Y-axis.

The STAAD.Pro commands for the input file for the above problem are given below.

STAAD.Pro Commands for the input file

**STAAD SPACE

START JOB INFORMATION

ENGINEER DATE 07-Jun-06

END JOB INFORMATION

INPUT WIDTH 79

SET Z UP

UNIT METER KN

JOINT COORDINATES

1 0 0.5 0; 2 0 0.5 4;

MEMBER INCIDENCES

1 1 2;

DEFINE MATERIAL START

ISOTROPIC STEEL

E 2.05e+008

POISSON 0.3

DENSITY 76.8195

ALPHA 1.2e-005

DAMP 0.03

END DEFINE MATERIAL

MEMBER PROPERTY AMERICAN

1 TABLE ST C8X11

CONSTANTS

MATERIAL STEEL MEMB 1

FINISH

****

The example given above is not a singular case where STAAD.Pro graphical view errs. It is found that the error is noticeable for unsymmetrical sections like channel, and angle section. Given below is another example for the user's interest.

Example 2

STAAD.Pro Commands for the input file

****

STAAD SPACE

START JOB INFORMATION

ENGINEER DATE 07-Jun-06

END JOB INFORMATION

INPUT WIDTH 79

SET Z UP

UNIT METER KN

JOINT COORDINATES

1 0 0 0.5; 2 4 0 0.5;

```
MEMBER INCIDENCES
1 1 2;
DEFINE MATERIAL START
ISOTROPIC STEEL
E 2.05e+008
POISSON 0.3
DENSITY 76.8195
ALPHA 1.2e-005
DAMP 0.03
END DEFINE MATERIAL
MEMBER PROPERTY AMERICAN
1 TABLE ST C8X11
CONSTANTS
MATERIAL STEEL MEMB 1
FINISH
*****************************************************************************************
```

Appendix E

Technical reference

1) Structural profile section

The paragraphs below give an account of the attributes of the section (SCTN) element, which are used in assigning the values, when transferring the data from STAAD.Pro to E3D/PDMS.

1.1 Design Parameter (Desparam)

This attributes holds the physical dimensions of the section (SCTN) element, which are set in the design module.

1.2 Function

To identify members, which can carry only axial load e.g. bracing members, truss members etc. The function attribute can be set as "Bracing member" or "Truss member".

1.3 Start Release and End Release (SRelease and Erelease)

This provides the member release condition at the end node and start node of the section (SCTN) element.

2) Primary node

These node define the start node, end node, and intermediate nodes of sections

2.1 Fixity

This attribute provides information about external support.

3) Plate/Shell finite element

The Plate/Shell finite element is based on the hybrid element formulation. The element can be 3-noded (triangular) or 4-noded (quadrilateral). If all the four nodes of a quadrilateral element do not lie on one plane, it is advisable to model them as triangular elements. The thickness of the element may be different from one node to another.

 "Surface structures" such as walls, slabs, plates and shells may be modeled using finite elements.