ACE Structural Engineering Applications LLC
ACE FrameWorks Utilities
Embedded Plates for FWP Members/Solids Documentation

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Embedded Plates for FWP Members/Solids (ACE_EP.MA)

(Versions - FWP 3.1.x.x/3.2.x.x rel 2.0.2 & FWP 7.0.x.x rel 7.0.2 & FWP 7.1/7.2/7.3 rel 6.0.2 & FWP 8.0.x.x rel 8.0.2 & FWP 9.0.x.x rel 9.0.2 & FWP 10.0.x.x rel 10.0.2 & FWP 11.0.x.x rel 11.0.2 & FWP 12.0.x.x rel 12.0.2)

The *Embedded Plates for FWP Members/Solids* application simplifies the placement of plates on any FWP member or conforming solid. The plates may be placed relative to the six surface planes of any FWP member or conforming solid. A conforming solid is a solid that was created by projecting a rectangular shape a constant amount. While most plates will likely be placed inside the surface planes, the plate may be placed at locations outside the surface limits. The plate may be fully embedded, on the surface or at a defined distance from the surface. The plate being placed may be selected from a plate library (see ASCII Plate Definition file) and/or custom specified at time of placement.
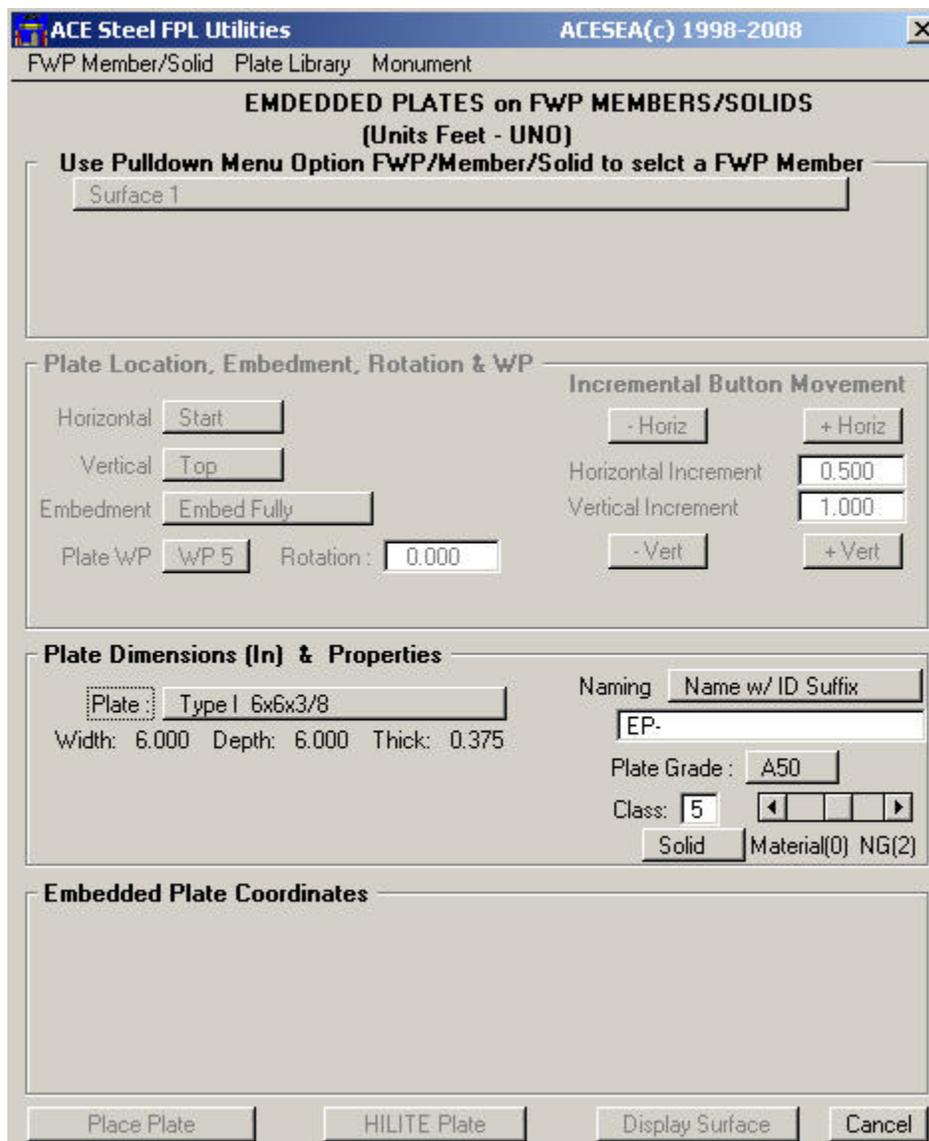
A FWP member or solid is selected using the FWP Member/Solid pull-down menu. One of the six surface faces is selected using surface option button. Next, the plate location, embedment, rotation & WP are selected/confirmed. The plate location is relative to the width and depth of the placement face. The plate may be located to preset locations with the Horizontal & Vertical option buttons and/or the horizontal & vertical distances may be specified directly. The incremental movement buttons may be utilized to shift the plate vertically and/or horizontally. The plate is either selected via the plate option button or a custom plate size may be defined. When surface face, plate location, embedment, rotation, WP & dimensions are as desired, the plate can be placed with the Place Plate button. Any parameter (face, location, embedment, rotation, WP, plate, plate library, FWP Member/Solid) may be changed at any time. This process is illustrated in the Program Operation section. FWP Members & Solids are discussed in the next section.

Embedded Plates - Primary Dialog Box w/o Member/Solid Selected

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Embedded Plates for FWP Members/Solids Documentation

FWP Solids - Conforming Criteria & Determining Type

As previously stated only conforming FWP Solids may be utilized. A conforming solid is any solid that is formed via a rectangular surface shape projected a constant distance. Thus any solid formed with arcs and/or polygons with less than or more than 4 vertices are NOT conforming. Another way to view a conforming solid is that it basically forms a brick template/shape. A conforming solid may also be viewed as a rectangular box (i.e. a rectangular surface with a constant thickness). Since FWP Solids may be defined in many ways, FWP type terminology (WALL, SLAB & SOLID) is not used. For this application FWP solids are divided into three categories: Flat Slab Solid, Vertical Wall Solid & General Solid.

To determine a category, the first step is to find which of the three face pairs has the most surface area. This surface will be termed the primary surface pair.

Conforming Flat Slab Solid

To qualify as a conforming flat slab, the primary surface must form a horizontal plane (since the pairs of surfaces are parallel, both surfaces form a flat plane).

Conforming Vertical Wall Solid

To qualify as a conforming vertical slab, the primary surface must form a vertical plane (since the pairs of surfaces are parallel, both surfaces form a vertical plane).

Conforming General Solid

Any conforming solid that is not a Flat Slab Solid or a Vertical Wall Solid is a General Solid.

FWP Members - Determining Type

A Member type is determined by the following:

Flat Beam

To qualify as a flat beam, the member must be type BEAM, the member must be flat, the member CP must be 8 and finally the member rotation must be zero.

Vertical Column

To qualify as a vertical column, the member must be type COLUMN, the member must be vertical, the member CP must be 5.

General Member

Any other member with any orientation.

The order of surface selection and horizontal & vertical directions is dependent upon the Member or Solid type. Each of the three Member & Solid types is discussed in the following pages.

Embedded Plates for FWP Members/Solids Documentation

Program Operation

Using the FWP Member/Solid top-bar menu, activate a command and select the appropriate FWP element. For this illustration, a FWP solid is selected and the dialog box shown below appears.

Information for the selected solid is displayed in an accept/reject dialog box as shown below.
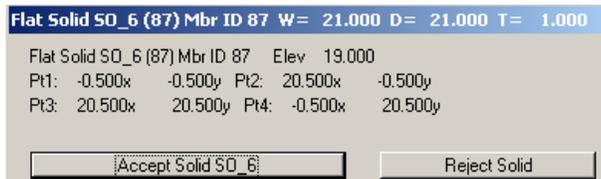
Solid Accept/Reject Dialog Box

If the solid is accepted, the primary dialog box becomes populated as shown below.
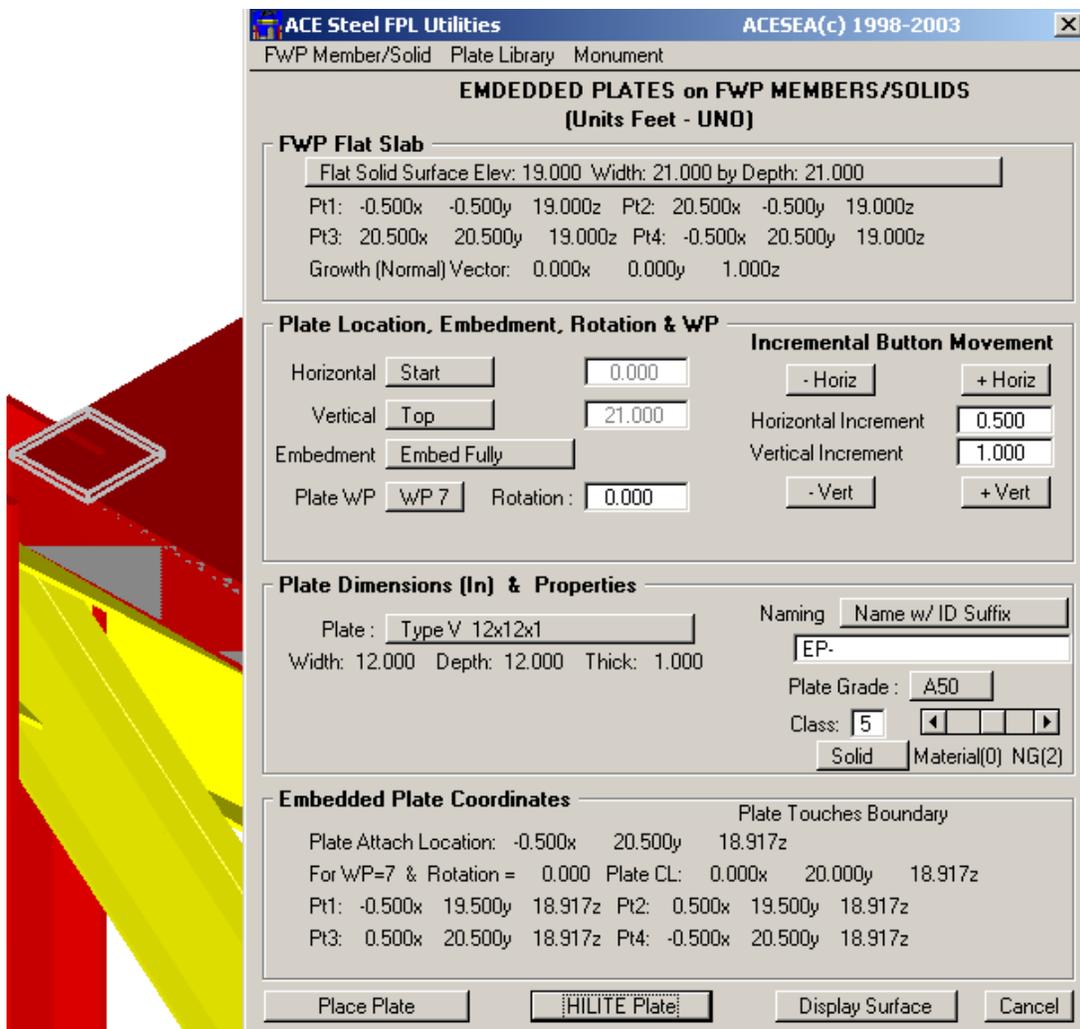
Once a FWP member or solid is selected, a plate can be placed if a valid plate is currently active, which is the case shown above. The dialog box is divided into four sections. Each section is discussed in the following pages.

Embedded Plates for FWP Members/Solids Documentation

Program Operation con'd

Section 1: Selection of FWP member or solid surface

Each FWP member or solid has 6 faces. This section has an option button to select any of the six surfaces.

FWP Flat Slab

▶ Flat Solid Surface Elev: 19.000 Width: 21.000 by Depth: 21.000
  FlatSolid Surface Elev: 18.000 Width: 21.000 by Depth: 21.000
  Edge Solid Surface 1 Width: 21.000 by Depth: 1.000
  Edge Solid Surface 2 Width: 21.000 by Depth: 1.000
  Edge Solid Surface 3 Width: 21.000 by Depth: 1.000
  Edge Solid Surface 4 Width: 21.000 by Depth: 1.000

Option Button for FWP Member/Solid Surface Selection

The selected surface is the one that the plated will be "embedded" into. For the case shown, a flat slab was selected, thus the section has been titled FWP Flat Slab. The three possible FWP solid titles are: FWP Flat Slab, FWP Vertical Wall and FWP Sloped Solid. The three possible FWP member titles are: Beam, Column, and Member. At any time the face may be changed. If a valid plate is active, the new surface & plate will be re-highlighted and ready to adjust or place. For the selected surface, the four coordinates (Pt1, Pt2, Pt3 & Pt4) and the growth vector is shown below the option button. The four points are the corner points of the selected face. The growth vector is the direction in which added plate thickness would grow.

FWP Flat Slab

Flat Solid Surface Elev: 19.000 Width: 21.000 by Depth: 21.000

Pt1: -0.500x   -0.500y   19.000z Pt2: 20.500x   -0.500y   19.000z
Pt3: 20.500x   20.500y   19.000z Pt4: -0.500x   20.500y   19.000z
Growth (Normal) Vector: 0.000x   0.000y   1.000z
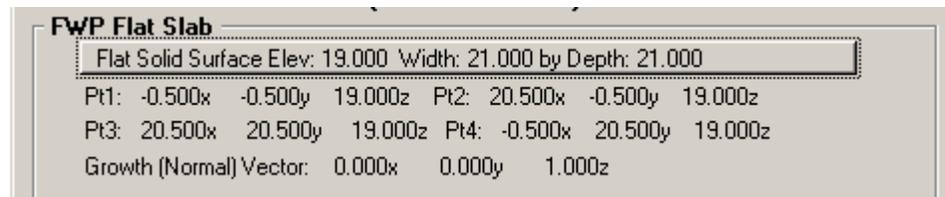
Section 1 shows the face selected, 4 corner points & growth vector

There are a total of six faces, which are made up of three parallel pairs. The six surface choices are dependent upon the FWP member type or the FWP solid type. Each situation is shown in ensuing pages and the order of the six surface options are discussed.

At any time a new FWP member or solid may be selected using the FWP Member/Solid top-bar menu. At any time the selected face may be changed. The surface of the selected face is displayed with a temporary display highlighted rectangle. The rectangle may be redisplayed at any time by pressing the "Hilite Surface" button.

Embedded Plates for FWP Members/Solids Documentation

Program Operation con'd

Section 2: Plate Location, Embedment, Rotation & WP

Each of the six surfaces is simply a rectangular box with a width & a depth. In this section the box is treated as a two dimensional element (horizontal & vertical) no matter how the solid is oriented in the model. The location of the opening relative to the surface is defined in this section. The width (horizontal) and the depth (vertical) are selected with horizontal & vertical option buttons

For the horizontal option button the options are: (Start, ¼ pt, 1/3 pt, ½ pt, 2/3, ¾, End, Specify). Typically the horizontal movement is indeed a horizontal movement across the face of the member/solid. The start and end points are somewhat random for solids but are the actual start & end points for members. The distance between the start & end points is the width of that face in that direction. Whenever a selection other than specify is active, the horizontal value is shown in a disabled text box. Whenever specify is active, the horizontal value text box is enabled. When the horizontal value text box is enabled, the horizontal location may be keyed in.
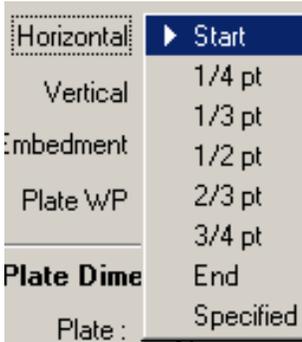
Option Button for Horizontal Location
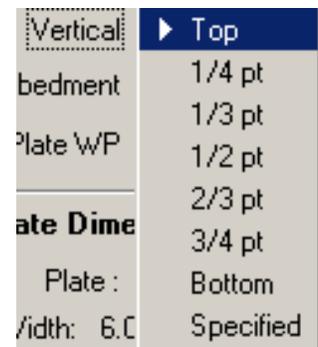
For the vertical option button the options are: (Top, ¾ pt, 2/3 pt, ½ pt, 1/3, ¼, Bottom, Specify). Typically the vertical movement is indeed a vertical movement across the face of the solid. The top is where possible the higher elevation and the bottom is the lower. The distance between the top & bottom points is the width of that face in that direction. Of course for flat slabs, the vertical direction is actually the other horizontal direction. Whenever a selection other than specify is active, the vertical value is shown in a disabled text box. Whenever specify is active, the vertical value text box is enabled. When the vertical value text box is enabled, the vertical location may be keyed in.

Option Buttons for Vertical Location
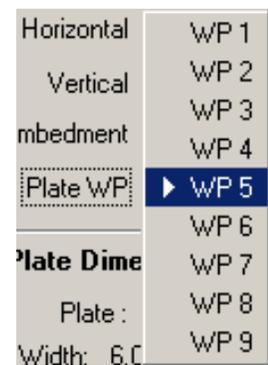
The WP for the plate is the attachment point of the plate. The attachment point is synonymous with the CP of a rectangular member. Thus the WP is an integer value from 1 to 9 (bottom-left, bottom-center, bottom-right, center-left, center-center, center-right, top-left, top-center, top-right). A WP of 5 will place the plate by the center. Note that the plate rotation will take place about the WP of the plate. Any of the above items can be changed at any time. When an item changes, the location of the plate will change. If a plate is active, the surface & plate will be highlighted and the plate can be placed with the "Place Plate" button. At this point the plate can be placed, further locations changed may be made, plate dimension may be changed, surface may be changed or new FWP member/solid may be selected.

Option Buttons for Vertical Location

The plate's embedment is controlled by the embedment option button. For the embedment option button the options are: (Embed Fully, None- On Surface, Specific Amount).

Option Buttons for Embedment

Embedded Plates for FWP Members/Solids Documentation

Section 2: Plate Location, Embedment, Rotation & WP con'd

To the right of this section is the Incremental Button Movement. In this area, the increment of movement for a button push can be defined. The plate can be moved both horizontally and/or vertically with the four buttons (+HORIZ, -HORIZ, +VERT & -VERT). Whenever a button is pushed, the option for that direction becomes "specify" and the increment is added to the current value. The plate may be moved with the buttons and/or by keying in desired coordinates.
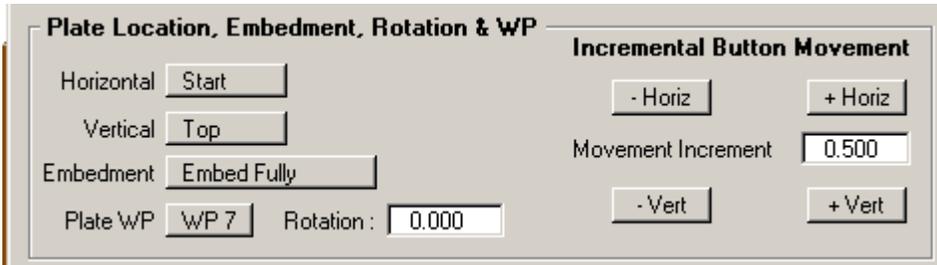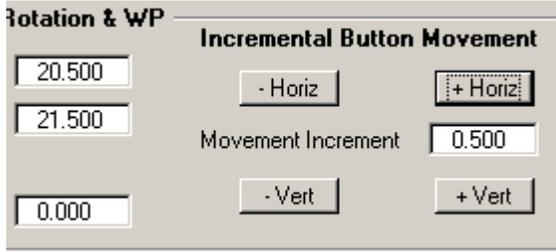
Section 2 shows the Vertical & Horizontal location, Embedment, WP & Rotation

Any of the above items can be changed at any time. When an item changes, the location of the plate will change. If a plate is active, the surface & plate will be highlighted and the plate can be placed with the "Place Plate" button. At this point the plate can be placed, further locations changes may be made, plate dimension may be changed, surface may be changed or new FWP Member/Solid may be selected.

MONUMENT Member/Line/Grid - Pulldown Menu & Section 2

The coordinate system for the locating of the embedded plate is defined by the rectangular sides of the FWP solid or member surface. The two dimensions are referred to as HORIZ & VERT and are somewhat arbitraty. A Monument Member/Line/Grid may optionally be defined for the active surface. A Monument Member/Line/Grid can be quite valuable in precisely locating plates relative to known plant locations (monuments). The Monument line must intersect the active surface with an orthogonal intersection. The HORIZ & VERT distances are then relative to the monument line (intersection point) if the monument toggle is turned on. To select a Monument Member/Line/Grid, use the Monument pull-down menu option "Select Member/Line/Grid Monument**.**

The options "Display Monument" & Monument Data" are disabled until a Monument is selected. For this example a monument member (column) is selected to illustrate the monument concept.

Embedded Plates for FWP Members/Solids Documentation

MONUMENT Member/Line/Grid - Pulldown Menu & Section 2 con'd

The command is issued and the column is selected which is 3 feet East of the HORIZ start & VERT Top, then the following accept/reject dialog box appears.
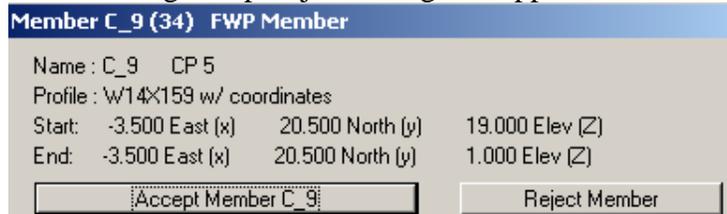
Member C_9 (34) FWP Member

Name : C_9   CP 5
Profile : W14X159 w/ coordinates
Start: -3.500 East (x)   20.500 North (y)   19.000 Elev (Z)
End: -3.500 East (x)   20.500 North (y)   1.000 Elev (Z)

Accept Member C_9	Reject Member

If the monument member is accepted, the monument is highlighted and section 2 appears as follows.

Plate Location, Embedment, Rotation & WP   **Incremental Button Movement**
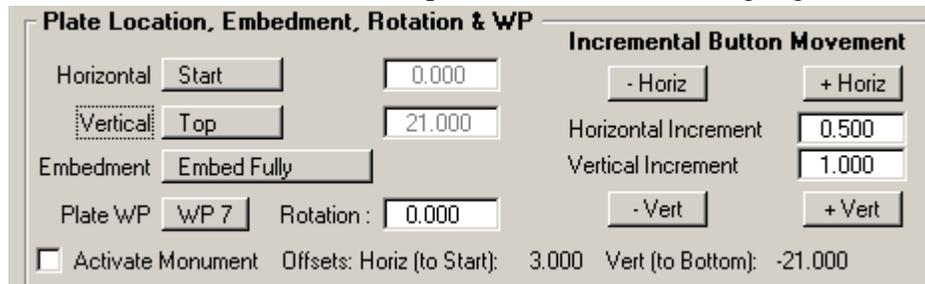
Horizontal   Start   0.000   - Horiz   + Horiz
Vertical   Top   21.000   Horizontal Increment   0.500
Embedment   Embed Fully   Vertical Increment   1.000
Plate WP   WP 7   Rotation :   0.000   - Vert   + Vert
☐ Activate Monument   Offsets: Horiz (to Start):   3.000   Vert (to Bottom): -21.000

The monument will remain inactive until the Activate Monument toggle is turned on. If the Activate Monument toggle is toggled on, the plate will jump to the monument. The plate can then be located relative to the monument with horizontal/vertical locations or keyins or using the incremental button movement. When the toggle is turned on section 2 appears as follows. Note that the plate is now on the monument.

Plate Location, Embedment, Rotation & WP   **Incremental Button Movement**

Horizontal   Specified   0.000   - Horiz   + Horiz
Vertical   Specified   0.000   Horizontal Increment   0.500
Embedment   Embed Fully   Vertical Increment   1.000
Plate WP   WP 7   Rotation :   0.000   - Vert   + Vert
☑ Activate Monument   Offsets: Horiz (to Start):   3.000   Vert (to Bottom): -21.000
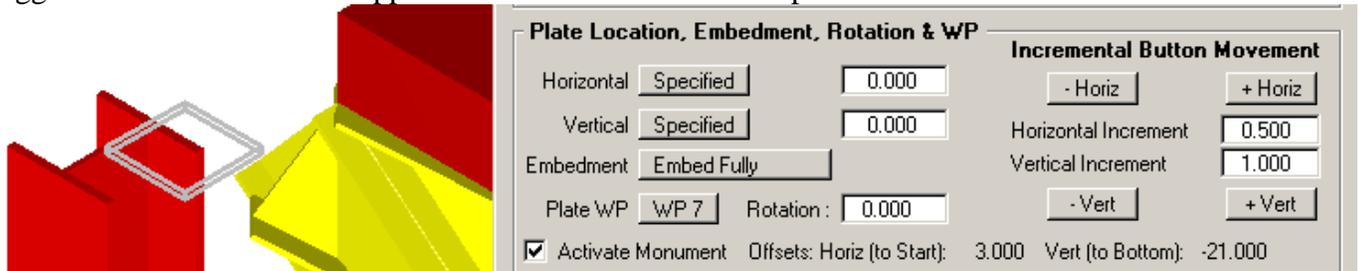
Activate Monument is Toggled on & Plate Jumps to Monument

When a monument has been defined it can be highlighted with the pull-down command "Display Monument". The monument data can also be displayed with the "Monument Data" pull-down command.
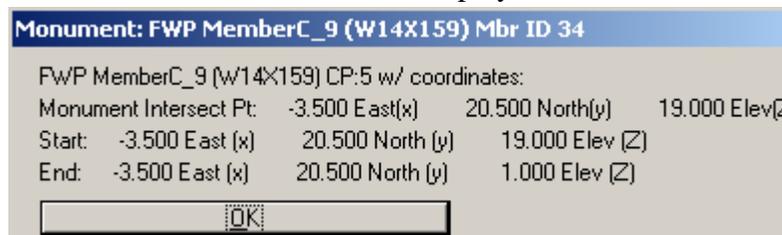
Monument: FWP MemberC_9 (W14X159) Mbr ID 34

FWP MemberC_9 (W14X159) CP:5 w/ coordinates:
Monument Intersect Pt: -3.500 East(x)   20.500 North(y)   19.000 Elev(Z
Start: -3.500 East (x)   20.500 North (y)   19.000 Elev (Z)
End: -3.500 East (x)   20.500 North (y)   1.000 Elev (Z)

OK

The monument may be toggled on or off at any time. The monument may be deselected by using the select monument command & not selecting a monument. If a surface is selected where the monument is not valid, the monument is deactivated and disabled until either a new valid monument is selected or a valid face is selected. A monument will always have two valid faces.

Embedded Plates for FWP Members/Solids Documentation

Program Operation con'd

Section 3: Plate Dimensions (units – in or mm) & Properties

This section allows the selection and definition of all plate properties.   The plate dimensions (width, depth, thickness) may be defined by selecting a plate from a plate library (see page x) or the dimensions may be specified. Plate selection is controlled by a plate option button and may be changed at any time.

Option Button for Plate Selection

In addition, the plate properties grade, type, class and naming may be specified.   The naming method is controlled by an option box with the following options: name w/ ID Suffix, name w/o ID Suffix, dynamic naming or it may be a prefix with the FrameWorks solid member ID (FWP ID) appended as a suffix.
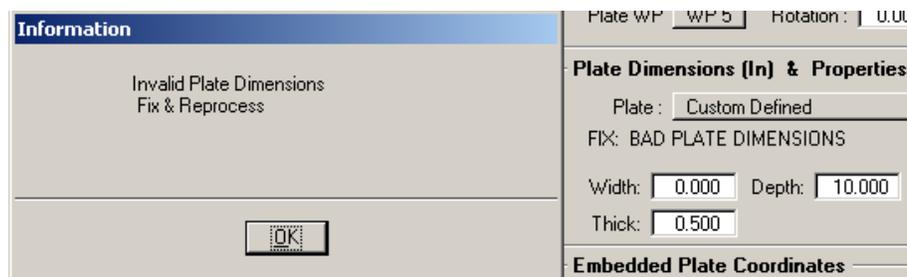
Dialog Box Indicating Bad Plate Dimensions

A new plate library may be read at any time from the top bar menu plate library category with the top-bar menu Plate Library.

Select a plate CFG file.
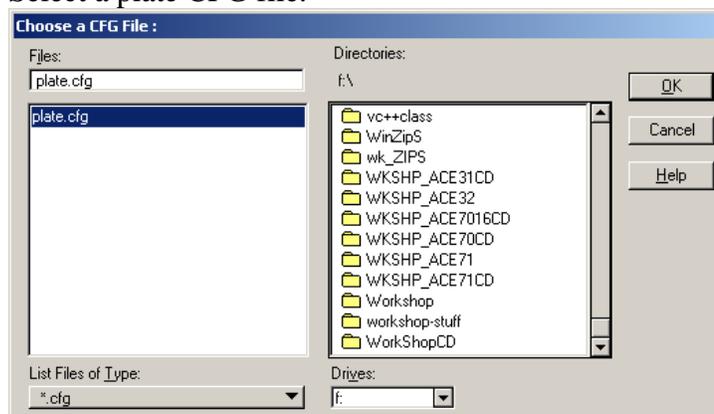
The plate data in the new file will replace that in the old.

Embedded Plates for FWP Members/Solids Documentation

Program Operation con'd

Section 4: Embedded Plate Coordinates

This section shows the plate coordinates when a FWP Member/Solid is selected and a valid plate is active. This section displays plate status - whether plate is inside, outside, straddling or bordering the surface outline. The coordinates of the plate attach location are displayed. In addition the plate corner coordinates and the plate center point both at embedment location are displayed. Note that the growth vector in section 1 is utilized to "grow" the plate to it's required thickness. At any time the FWP Member/Solid, surface, plate location data or plate dimensions/properties may be changed. The plate can be placed by pressing the "Place Plate" button when the plate is as desired.

```
Embedded Plate Coordinates                    Plate Touches Boundary
   Plate Attach Location:  -0.500x      20.500y     18.969z
   For WP=7 & Rotation =   0.000  Plate CL:   0.000x     20.000y     18.969z
   Pt1:  -0.500x   19.500y   18.969z  Pt2:   0.500x   19.500y   18.969z
   Pt3:   0.500x   20.500y   18.969z  Pt4:  -0.500x   20.500y   18.969z

   [ Place Plate ]        [ HILITE Plate ]       [ Display Surface ]   [ Cancel ]
```
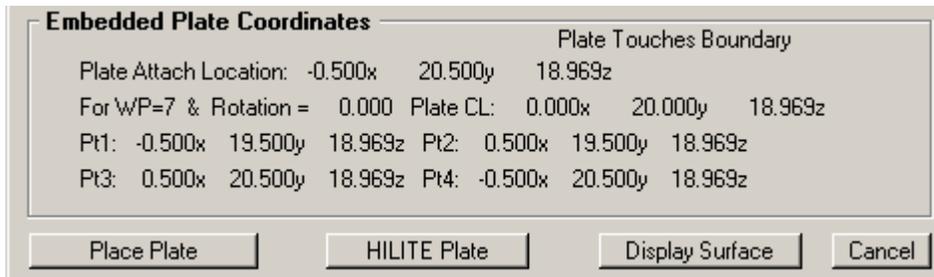
Section 4 shows Plate Attach Location, CL, Embed Coordinates & Status

When the place plate button is pressed, the plate is placed and the following dialog box appears.

```
Information

        Plate Type I
        FWP Name: EP-00059 (FWP ID 59)
        Has Been  Placed



                    [ OK ]
```
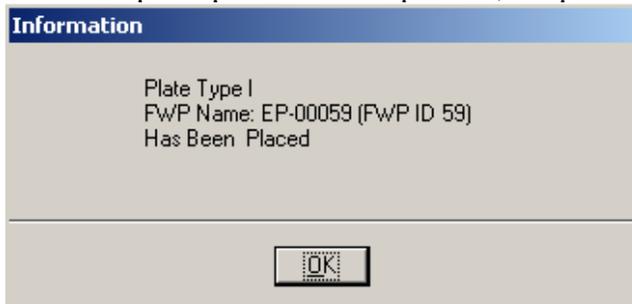
Once OK is pressed, the populated dialog box reappears. At of the parameters (FWP Member/Solid, surface, plate location data or plate dimensions/properties) may be changed and additional plates may be placed.

Embedded Plates for FWP Members/Solids Documentation

Flat Beam

To qualify as a conforming flat beam, the FWP member must be flat member with a CP of 8 and no rotation. The following dialog boxes appear when a conforming FWP beam is selected

Beam B_2 (6)

Name : B_2   Elevation TOS -   18.000   CP 8
Profile : W18X65   Width   7.590   Depth   18.350   Length   20.000
Coordinates :   0.000 East (x)   0.000 North (y)   18.000 Elev (Z)
Coordinates :   20.000 East (x)   0.000 North (y)   18.000 Elev (Z)

[Accept Beam B_2]   [Reject Beam]

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FWP Member/Solid   Plate Library

EMDEDDED PLATES on FWP MEMBERS/SOLIDS
(Units Feet - UNO)

FWP BEAM Surfaces

[Horiz Bm Top Surface Elev: 18.000   Width: 0.632 by Length: 20.000]

Pt1: 19.684x   0.000y   18.000z   Pt2: 19.684x   20.000y   18.000z

Pt3: 20.316x   20.000y   18.000z   Pt4: 20.316x   0.000y   18.000z

Growth (Normal) Vector: 0.000x   0.000y   1.000z

Plate Location, Embedment, Rotation & WP

Incremental Button Movement

Horizontal [Start]

Vertical [Top]   [- Horiz]   [+ Horiz]

Embedment [Embed Fully]   Movement Increment   [0.500]

Plate WP [WP 7]   Rotation : [0.000]   [- Vert]   [+ Vert]

Plate Dimensions (In) & Properties

[Plate :] [Type I 6x6x3/8]   Naming [Name w/ ID Suffix]

Width: 6.000   Depth: 6.000   Thick: 0.375   [EP-]

                     Plate Grade : [A50]

                     Class: [5]   [◄][   ][   ][   ][►]

                     [Solid] [Material(0) NG(2)]

Embedded Plate Coordinates

                              Plate Touches Boundary

Plate Attach Location: 20.316x   0.000y   17.917z

For WP=7 & Rotation =   0.000 Plate CL: 20.066x   0.250y   17.917z

Pt1: 19.816x   0.000y   17.917z Pt2: 19.816x   0.500y   17.917z

Pt3: 20.316x   0.500y   17.917z Pt4: 20.316x   0.000y   17.917z

[Place Plate]   [HILITE Plate]   [Display Surface]   [Cancel]

(Note that the look of this dialog box has changed slightly in released version (monument, Horiz & Vert Keyins & movement – see page 3)

FWP BEAM Surfaces

> Horiz Bm Top Surface Elev: 18.000   Width: 0.632 by Length: 20.000
  Horiz Bm Bottom Surface Elev: 16.471   Width: 0.632 by Length: 20.000
  Horiz Bm Vertical Surface 1 Depth: 1.529 by Length: 20.000
  Horiz Bm Vertical Surface 2 Depth: 1.529 by Length: 20.000
  Horiz Bm Start End Surface Depth: 1.529 by Length: 0.632
  Horiz Bm End End Surface Depth: 1.529 by Length: 0.632

For a flat beam the surfaces (1 through 6) are determined as follows: 1) highest elevation flat flange surface; 2) lowest elevation flat flange surface; 3) vertical depth surface 1; 4) vertical depth surface 2 (parallel to 3); 5) Beam Start end surface (normal to 1-4); 6) Beam End end Surface (parallel to 5).

Embedded Plates for FWP Members/Solids Documentation

Vertical Column

To qualify as a conforming vertical column, the FWP member must be a vertical member with a CP of 5. The following dialog boxes appear when a conforming FWP column is selected


```
Column C_2 (2)   Width     15.565 Depth     14.980

Name : C_2 iCP 5 Elevations BOS -   0.000 TOS -   18.000
Profile : W14X159  Width    15.565 Depth    14.980 Length    18.000
Coordinates :   20.000 East (x)    20.000 North (y)

        Accept Column C_2              Reject Column
```

```
ACE Steel FPL Utilities                    ACESEA(c) 1998-2003        [x]

FWP Member/Solid   Plate Library

              EMDEDDED PLATES on FWP MEMBERS/SOLIDS
                        (Units Feet - UNO)
─FWP COLUMN Surfaces──────────────────────────────────────
    Column Vertical Surface 1  Width: 1.297 by Depth: 18.000

   Pt1:  0.124x   19.851y   19.000z   Pt2:  0.124x   19.851y    1.000z
   Pt3:  0.124x   21.149y    1.000z   Pt4:  0.124x   21.149y   19.000z
   Growth (Normal) Vector:  1.000x    0.000y    0.000z

─Plate Location, Embedment, Rotation & WP────────────────
                              Incremental Button Movement

   Horizontal  Start              - Horiz          + Horiz

   Vertical    Top
                              Movement Increment      0.500
   Embedment   Embed Fully

   Plate WP  WP 7   Rotation :  0.000       - Vert          + Vert

─Plate Dimensions (In) & Properties───────────────────────
                              Naming   Name w/ ID Suffix
   Plate :  Type I  6x6x3/8
                                     EP-
   Width:  6.000  Depth:  6.000  Thick:  0.375
                              Plate Grade :   A50

                              Class:  5    [◄][  ][  ][►]

                              Solid | Material(0) NG(2)

─Embedded Plate Coordinates───────────────────────────────
                              Plate Touches Boundary
   Plate Attach Location:   0.093x     19.851y     1.000z

   For WP=7 & Rotation =   0.000  Plate CL:   0.093x     20.101y     1.250z

   Pt1:  0.093x   19.851y   1.500z  Pt2:  0.093x   20.351y   1.500z
   Pt3:  0.093x   20.351y   1.000z  Pt4:  0.093x   19.851y   1.000z

     Place Plate        HILITE Plate      Display Surface    Cancel
```

(Note that the look of this dialog box has changed slightly in released version (monument, Horiz & Vert Keyins & movement – see page 3)

```
─FWP COLUMN Surfaces──────────────────────────────
  ► Column Vertical Surface 1  Width: 1.297 by Depth: 18.000
    Column Vertical Surface 2  Width: 1.297 by Depth: 18.000
    Column Vertical Surface  3  Width: 1.248 by Depth: 18.000
    Column Vertical Surface  4  Width: 1.248 by Depth: 18.000
    Column Start End Surface Width: 1.248 by Depth: 1.297
    Column End End Surface Width: 1.248 by Depth: 1.297
```

For a vertical column the surfaces (1 through 6) are determined as follows: 1) vertical flange surface 1 (parallel flanges); 2) vertical flange surface 2 (other flange parallel to 1); 3) vertical surface 3 (parallel web by depth); 4) vertical surface 4 (parallel to 3); 5) Column Start end surface (normal to 1-4); 6) Column End end Surface (parallel to 5).

Embedded Plates for FWP Members/Solids Documentation

General Member (nonconforming flat beam or vertical column)

The following dialog boxes appear when a general FWP member is selected.

Member B_9 (37) General Member

Name : B_9   CP 8
Profile : W18X65 Width   7.590 Depth   18.350 Length   34.125
Coordinates :   -0.500 East (x)   20.500 North (y)   18.000 Elev (Z)

[Accept Member B_9]   [Reject Member]

ACE Steel FPL Utilities   ACESEA(c) 1998-2003   ×

FWP Member/Solid   Plate Library

EMDEDDED PLATES on FWP MEMBERS/SOLIDS
(Units Feet - UNO)

FWP Member Surfaces

    Member Surface 1 Width: 0.632 by Depth: 34.125

Pt1: -0.276x   20.724y   18.000z Pt2: 20.224x   0.224y   0.000z
Pt3: 19.776x   -0.224y   0.000z Pt4: -0.724x   20.276y   18.000z
Growth (Normal) Vector: 0.373x   -0.373y   0.850z

Plate Location, Embedment, Rotation & WP

Incremental Button Movement

Horizontal [Start]   [- Horiz]   [+ Horiz]
Vertical [Top]   Movement Increment   [0.500]
Embedment [Embed Fully]
Plate WP [WP 5]   Rotation : [0.000]   [- Vert]   [+ Vert]

Plate Dimensions (In) & Properties

Plate : [Type I 6x6x3/8]   Naming [Name w/ ID Suffix]
Width: 6.000   Depth: 6.000   Thick: 0.375   [EP-]

                                   Plate Grade : [A50]
                                   Class: [5]   [◄][   ][   ][►]
                                   [Solid] [Material(0) NG(2)]

Embedded Plate Coordinates

                         Plate Extends Boundary
Plate Attach Location: 20.212x   0.235y   -0.027z
For WP=5 & Rotation =   0.000 Plate CL: 20.212x   0.235y   -0.027z
Pt1: 20.239x   0.562y   0.105z Pt2: 19.885x   0.209y   0.105z
Pt3: 20.185x   -0.092y   -0.158z Pt4: 20.539x   0.262y   -0.158z

[Place Plate]   [HILITE Plate]   [Display Surface]   [Cancel]

(Note that the look of this dialog box has changed slightly in released version (monument, Horiz & Vert Keyins & movement – see page 3)

FWP Member Surfaces

▶ Member Surface 1 Width: 0.632 by Depth: 34.125
  Member Surface 2 Width: 0.632 by Depth: 34.125
  Member Surface 3 Width: 1.529 by Depth: 34.125
  Member Surface 4 Width: 1.529 by Depth: 34.125
  Member Start End Surface Width: 1.529 by Depth: 0.632
  Member End End Surface Depth: 1.529 by Depth: 0.632

For a general the surfaces (1 through 6) are determined as follows: 1) Member Surface 1 (parallel to flange); 2) Member Surface 2 (parallel to 1); 3) Member Surface 3 (parallel to web); 4) Member Surface 4 (parallel to 3); 5) Member Start end surface (normal to 1-4); 6) Member End end Surface (parallel to 5).

Embedded Plates for FWP Members/Solids Documentation

FWP Member Slab

To qualify as a conforming wall, the FWP member must be a flat solid (i.e. create a horizontal plane). The following dialog boxes appear when a conforming FWP slab is selected

```
Flat Solid SL_1 (1) Mbr ID 1  W= 21.000  D= 21.000  T=  1.000

Flat Solid SL_1 (1) Mbr ID 1    Elev   19.000
Pt1:   -0.500x      -0.500y  Pt2:  20.500x      -0.500y
Pt3:   20.500x      20.500y  Pt4:  -0.500x      20.500y

        Accept Solid SL_1                    Reject Solid
```

```
ACE Steel FPL Utilities            ACESEA(c) 1998-2003       [X]
FWP Member/Solid   Plate Library

           EMDEDDED PLATES on FWP MEMBERS/SOLIDS
                     (Units Feet - UNO)
  FWP Flat Slab
       Flat Solid Surface Elev: 19.000  Width: 21.000 by Depth: 21.000

      Pt1:  -0.500x   -0.500y   19.000z   Pt2:  20.500x   -0.500y   19.000z
      Pt3:  20.500x   20.500y   19.000z   Pt4:  -0.500x   20.500y   19.000z
      Growth (Normal) Vector:   0.000x     0.000y     1.000z

  Plate Location, Embedment, Rotation & WP
                                      Incremental Button Movement
    Horizontal  [ Start ]
                                        [ - Horiz ]      [ + Horiz ]
    Vertical   [ Top ]
                                   Movement Increment    [ 0.500 ]
    Embedment  [ Embed Fully ]
                                        [ - Vert ]       [ + Vert ]
    Plate WP  [ WP 5 ]   Rotation : [ 0.000 ]

  Plate Dimensions (In)  &  Properties
                                      Naming   [ Name w/ ID Suffix ]
    Plate :  [ Type I  6x6x3/8 ]
                                      [ EP- ]
    Width:  6.000   Depth:  6.000   Thick:  0.375
                                      Plate Grade :   [ A50 ]
                                      Class: [ 5 ]   [◄][ ][ ][ ][►]
                                      [ Solid ]  Material(0)  NG(2)

  Embedded Plate Coordinates
                               Plate Extends Boundary
    Plate Attach Location:  -0.500x    20.500y    18.969z
    For WP=5 &  Rotation =   0.000   Plate CL:   -0.500x    20.500y    18.969z
    Pt1:  -0.750x   20.250y   18.969z   Pt2:  -0.250x   20.250y   18.969z
    Pt3:  -0.250x   20.750y   18.969z   Pt4:  -0.750x   20.750y   18.969z

    [ Place Plate ]      [ HILITE Plate ]    [ Display Surface ]   [ Cancel ]
```

(Note that the look of this dialog box has changed slightly in released version (monument, Horiz & Vert Keyins & movement – see page 3)

```
FWP Flat Slab
  ► Flat Solid Surface Elev: 19.000  Width: 21.000 by Depth: 21.000
    FlatSolid Surface Elev: 18.000  Width: 21.000 by Depth: 21.000
    Edge Solid Surface 1  Width: 21.000 by Depth: 1.000
    Edge Solid Surface 2  Width: 21.000 by Depth: 1.000
    Edge Solid Surface 3  Width: 21.000 by Depth: 1.000
    Edge Solid Surface 4  Width: 21.000 by Depth: 1.000
```

For a flat slab solid, the surfaces (1 through 6) are determined as follows: 1) highest elevation flat surface (surface with most area); 2) lowest elevation flat surface (parallel to 1); 3) edge solid surface 1; 4) edge solid surface 2 (parallel to 3); 5) edge solid surface 3 (normal to 1-4); 6) edge solid surface 4 (parallel to 5).

Embedded Plates for FWP Members/Solids Documentation

FWP Member Wall

To qualify as a conforming wall, the FWP member must be a vertical solid (i.e. create a vertical plane). The following dialog boxes appear when a conforming FWP wall is selected

Vert Solid SO_5 (13) Mbr ID 13 W= 20.000 D= 18.000 T= 2.000

Pt1:	0.000 East (x)	0.000 North (y)	0.000 Elev (Z)
Pt2:	20.000 East (x)	0.000 North (y)	0.000 Elev (Z)
Pt3:	20.000 East (x)	0.000 North (y)	18.000 Elev (Z)
Pt4:	0.000 East (x)	0.000 North (y)	18.000 Elev (Z)

[Accept Solid SO_5]   [Reject Solid]

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FWP Member/Solid   Plate Library

EMDEDDED PLATES on FWP MEMBERS/SOLIDS
(Units Feet - UNO)

FWP Vertical Wall

[Vertical Solid Surface Width: 20.000 by Depth: 18.000]

Pt1: 0.000x   0.000y   0.000z   Pt2: 20.000x   0.000y   0.000z
Pt3: 20.000x   0.000y   18.000z   Pt4: 0.000x   0.000y   18.000z
Growth (Normal) Vector: 0.000x   -1.000y   0.000z

Plate Location, Embedment, Rotation & WP

Incremental Button Movement

Horizontal [Start]   [- Horiz]   [+ Horiz]

Vertical [Top]   Movement Increment [0.500]

Embedment [Embed Fully]

Plate WP [WP 5] Rotation : [0.000]   [- Vert]   [+ Vert]

Plate Dimensions (In) & Properties

[Plate :] [Type I 6x6x3/8]   Naming [Name w/ ID Suffix]

Width: 6.000   Depth: 6.000   Thick: 0.375   [EP-]

Plate Grade : [A50]

Class: [5]   [◄] [   ] [   ] [►]

[Solid] [Material(0) NG(2)]

Embedded Plate Coordinates

Plate Extends Boundary

Plate Attach Location: 0.000x   0.031y   18.000z
For WP=5 & Rotation = 0.000 Plate CL: 0.000x   0.031y   18.000z
Pt1: -0.250x   0.031y   17.750z   Pt2: 0.250x   0.031y   17.750z
Pt3: 0.250x   0.031y   18.250z   Pt4: -0.250x   0.031y   18.250z

[Place Plate]   [HILITE Plate]   [Display Surface]   [Cancel]

(Note that the look of this dialog box has changed slightly in released version (monument, Horiz & Vert Keyins & movement – see page 3)

FWP Vertical Wall

▸ Vertical Solid Surface Width: 20.000 by Depth: 18.000
Vertical Solid Surface Width: 20.000 by Depth: 18.000
Top Edge Solid Surface Width: 20.000 by Depth: 2.000
Bottom Edge Solid Surface Width: 20.000 by Depth: 2.000
Side Edge Solid Surface 1 Depth: 18.000 by Width: 2.000
Side Edge Solid Surface 2 Depth: 18.000 by Width: 2.000

For a vertical wall solid, the surfaces (1 through 6) are determined as follows: 1) vertical solid surface 1 (surface with most area); 2) vertical solid surface 2 (parallel to 1); 3) top edge solid surface 1; 4) bottom edge solid surface 2 (parallel to 3); 5) side edge solid surface 3 (normal to 1-4); 6) side edge solid surface 4 (parallel to 5).

Embedded Plates for FWP Members/Solids Documentation

FWP Solid – General Case

If a solid does not qualify as a conforming slab or wall, it is a general solid.

Solid SO_1 (4) Mbr ID 4 W= 20.000 D= 17.493 T= 1.000

Pt1:	-0.908 East (x)	0.092 North (y)	9.408 Elev (Z)
Pt2:	-0.908 East (x)	20.092 North (y)	9.408 Elev (Z)
Pt3 :	-15.908 East (x)	20.092 North (y)	0.408 Elev (Z)
Pt4 :	-15.908 East (x)	0.092 North (y)	0.408 Elev (Z)

Accept Solid SO_1   Reject Solid

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FWP Member/Solid   Plate Library

EMDEDDED PLATES on FWP MEMBERS/SOLIDS
(Units Feet - UNO)

FWP Solid

Sloped Solid Surface Width: 20.000 by Depth: 17.493

Pt1: -15.908x   0.092y   0.408z   Pt2: -15.908x   20.092y   0.408z

Pt3: -0.908x   20.092y   9.408z   Pt4: -0.908x   0.092y   9.408z

Growth (Normal) Vector: -0.908x   0.092y   0.408z

Plate Location, Embedment, Rotation & WP

Incremental Button Movement

Horizontal   Start

Vertical   Bottom

Embedment   Embed Fully

Plate WP   WP 5   Rotation : 0.000

- Horiz   + Horiz

Movement Increment   0.500

- Vert   + Vert

Plate Dimensions (In) & Properties

Plate :   Type I 6x6x3/8

Width: 6.000   Depth: 6.000   Thick: 0.375

Naming   Name w/ ID Suffix

EP-

Plate Grade :   A50

Class: 5   ◄ | | | ►

Solid   Material(0) NG(2)

Embedded Plate Coordinates

Plate Extends Boundary

Plate Attach Location: -15.880x   0.089y   0.395z

For WP=5 & Rotation = 0.000 Plate CL: -15.880x   0.089y   0.395z

Pt1: -16.094x   -0.161y   0.267z   Pt2: -16.094x   0.339y   0.267z

Pt3: -15.665x   0.339y   0.524z   Pt4: -15.665x   -0.161y   0.524z

Place Plate   HILITE Plate   Display Surface   Cancel

(Note that the look of this dialog box has changed slightly in released version (monument, Horiz & Vert Keyins & movement – see page 3)

FWP Solid

▶ Sloped Solid Surface Width: 20.000 by Depth: 17.493

Sloped Solid Surface Width: 20.000 by Depth: 17.493

Sloped Edge Solid Surface 1 Width: 20.000 by Depth: 1.000

Sloped Edge Solid Surface 2 Width: 20.000 by Depth: 1.000

Sloped Edge Solid Surface Depth: 17.493 by Depth: 1.000

Sloped Edge Solid Surface Depth: 17.493 by Depth: 1.000

For a general solid, the surfaces (1 through 6) are determined as follows: 1) sloped solid surface 1 (the first rectangle read); 2) vertical solid surface 2 (parallel to 1); 3) sloped edge solid surface 1; 4) sloped edge solid surface 2 (parallel to 3); 5) sloped edge solid surface 3 (normal to 1-4); 6) sloped edge solid surface 4 (parallel to 5).

Embedded Plates for FWP Members/Solids Documentation

Embedded Plates Variables and Options

The Embedded Plates application, ACE_EP.MA, has been designed to allow greatly facilitate the placement of plates on FWP members & solids. Virtually all items shown on the primary dialog boxes can be controlled through the definition files. The following items are controlled through the both the dialog box & definition file (unless noted otherwise).

- Top-bar menu with FWP Member/Solid & Plate Library
- Option Button to select 1 of 6 surface faces
- Option Buttons to select placement location
    - Horizontal Location
    - Vertical Location
    - Embedment
    - WP for plate
- Monument Toggle (controlled via dialog box only)
- Buttons to control horizontal & vertical incremental movement
- Keyin field increment
- Option Button to select Grade
    - up to 10 choices
    - may be user defined
- Slider/Keyin to select class (0 to 9)
- Keyin field plate rotation
- Option Button to select plate type
- Keyin fields for Custom Plate Dimensions
- Naming Option Parameters
    - Toggle for Mbr_ID suffix
    - Name Input

The lone items that are only controllable through the definition file is the LOCK option & material for the plate. If the LOCK is specified, only plates from the Plate Configuration file may be placed.

Embedded Plates for FWP Members/Solids Documentation

Plate Configuration File

The Plate configuration file defines "standard plates". The file is an ASCII file which has a defined suffix of CFG. Each base plate configuration is defined on a single line (record). A base plate configuration consists of: a Name (32 char max); a Description 64 char max; a width; a depth and a thickness. The Plate configuration file is limited to 99 entries. The Plate configuration file must be pointed to in the definition file and upon loadup of the application an option button with the name/desc label is populated with entries. If a file is not specified, only custom base plates may be placed. If LOCK is specified on the GEN command in the definition file, custom base plates may not be placed.

The philosophy behind the application is that a company and/or project will create a Plate configuration file. Such a file will encourage standardization and hopefully help eliminate excessive plate configurations. The application may be configured to require placement of standard plates only, to allow only custom plates or to allow the combination of both of the above.

The Plate configuration file has two types of records. The format for the Plate configuration file is as follows:

UNIT Command - Units Command (optional command)

UNIT   {UNITTYPE}

where :

       {UNITTYPE} May be ENGlish or METric

         All input for the application is in inches for English units and mm for metric units.

         If units is not specified it is assumed that the units match the current model units.

         Units may be changed at any time but be aware that the properties (in attached primary or user section library) for the member specified must match the current model units.

PLATe Command - Plate Configuration Definition

PLAT   "name"   width   depth   thickness   "desc"

where :   NOTE : (English - inches - Metric - mm)

name	:	Plate name - enclosed in "" marks - 24 characters maximum
width	:	Plate width
depth	:	Plate depth (parallel to column orientation vector – **see orientation notes**)
thick	:	Plate thickness
desc	:	Plate description - enclosed in "" marks - 64 characters maximum

Sample Plate Configuration File

```
UNIT    ENGlish
PLATE   "Type I"  6.0  6.0  .375  " 6x6x3/8"
PLATE   "Type II" 6.0  8.0  .5   " 6x8x1/2"
PLATE   "Type III" 9  9.0  .5   " 9x9x1/2"
UNIT    MET
PLATE   "Type IV"  152.4  406.4  25.4  " 6x16x1"
UNIT    ENG
PLATE   "Type V"  12  12  1  " 12x12x1"
```

Embedded Plates for FWP Members/Solids Documentation

Definitions File

Due to the dissimilar nature of the variables in the steel utilities, each steel utility has a separate definition (DEF) file. While each file is distinctly different, each file is similar in the basic method of definition. Each definition file may optionally be controlled with either of two environment variables. Thus a project specific definition file for each project may be easily specified. The environment variables may be specified in numerous ways (similar to any MicroStation variable), however the utilization of a project.pcf is highly recommended. Environment variable definition is discussed in detail in the installation notes provided with the ACE FrameWorks utilities. The default name and location for the definition file for this utility are: C:\ACE_EP.DEF.   A directory for the definition file may be specified with the environment variable ACE_DEF_PATH (will look in specified path for file ACE_EP.DEF).   A complete name and location of a definition file may be also specified with the environment variable ACE_EP_DEF.   The first valid definition file found is utilized. The search for a definition file happens in the following order or priority:

1. If the variable ACE_EP_DEF is specified, the named file at this location will be used if found.
2. If the variable ACE_DEF_PATH is specified and ACE_EP.DEF is found in this directory, it is used.
3. If there is a c:\ace_ep.def file it is utilized.
4. If none of the above, internal program defaults are utilized – a warning message will be displayed.

(if environment variables in 1 and/or 2 above are specified and corresponding DEF file is not found, a warning is displayed)

A sample default file is provided in later sections of this document. Toward the end of this document, the commands for the definition file are outlined in detail.

Due to the complex nature of the variables, the steel definition files allow the specification of units (either Metric (mm) or English (inch)). Thus a given default file may be utilized in either a Metric or English project. The units may be changed throughout the definition file. If units are not specified, it is assumed that the definition file units match the units of the model (feet/inch-English & meters/mm-Metric). If units are defined and they do not match the model, the variables after the units command are converted to match the model units.

Sample Definitions File

```
UNI   ENG
PLA   A50   5 SOL    0    10.0   10.0   .5    0.0    NOLOCK
LOC     0    0    0    0    5    5.0   0.25   .025   .5
GRA        4     A36    A42     A50    A272
FIL   c:\Plate.cfg
NGP     2
NAM   SPE   EP–
```

Embedded Plates for FWP Members/Solids Documentation

Definitions File - Command Definition

- **Valid Primary Keyword Commands : (UNI, LOC, GRA, PLA, FIL, NGP, NAME)**
- **Each record must begin with a valid primary keyword or it is ignored**
- **All records that start with a blank are considered comments**
- **The commands/keywords (records) may be placed in any order however the order is significant**
- **All values for a given command must be defined in order shown above. If default values are acceptable, only the changed values must be given. However all values up to that point must be defined whether changed or not.**
- **The components of a given command (record) must all be present and in the order shown**
- **The units command is special and my be repeated and located as required. While commands may be in any order, it should be obvious that the location of the units command is extremely important.**
- **By default application looks for C:\ACE_EP.DEF definition file**
- **Definition file path may be defined with environment variable ACE__DEF_PATH**
- **ACE_DEF_PATH=d:\mydir**
     (the DEF file ACE_EP.DEF will be looked for in the directory d:\mydir)
- **Definition file may be defined with environment variable ACE_EP_DEF**
- **ACE_EP_DEF = d:\mydir\mydef_file** *(highest priority definition)*
     (the DEF file mydef_file will be looked for in the directory d:\mydir)
- **NOTE : Components shown in bold may only be specified in the definitions file**

UNIT Command - Units Command (optional command)

UNIT   {UNITTYPE} {UNIT}

   where :

{UNITTYPE}	May be ENGlish (feet) or METric (meters).
	If units is not specified it is assumed that the units match the current model units.
{UNIT}	Must be FEEt or INCh for ENGlish (default feet) or must be METer or MM for METric (default meters).
	If unit is not specified, it is assumed that the units are feet for English & meters for metric.

PLA Command - General Command defines plate parameters

PLA   sGrade   iClass sSolidType iMaterial fWidth   fDepth   fRotation sLockStatus

  where :

sGrade	: plate grade
iClass	: 9 >= class >= 0
sSolidType	: SOL for solid, SLA for slab or WAL for wall
iMaterial	: plate material (Default 0 Steel)
	0 - Steel
	1 - Concrete
fWidth	: plate width (IN or MM) - used for starting specify value
fDepth	: plate depth (IN or MM) - used for starting specify value
fThick	: plate thickness (IN or MM) - used for starting specify value
fRotation	: Plate Rotation (0 to 360) Pos counterclockwise
sLockStatus	: LOCK or NOLOck (Lock option for plate file)

GRA Command - Grade Command defines grades options

GRA   iGrades   sGrade1   ...   sGraden

  where

iGrades	:	The number of grades (default value - 3)
sGrades1	:	Grade definition (24 character max - should also be defined in FrameWorks)
sGraden	:	Last grade definition (10 maximum).

Embedded Plates for FWP Members/Solids Documentation

Definitions File - Command Definition (con'd)

LOC Command - Plate Location Startup Values Command

LOC   iSurface iHoriz iVert iEmbed fHoriz fVert fEmbed fIncrement

ISurface   : 7 >= iHoriz >= 0
                              0-Surface 1
                              1-Surface 2
                              2-Surface 3
                              3-Surface 4
                              4-Surface 5
                              5-Surface 6

iHoriz   : 7 >= iHoriz >= 0
                              0-Top
                              1-1/4 pt
                              2-1/3 pt
                              3-1/2 pt
                              4-2/3 pt
                              5-3/4 pt
                              6-End pt
                              7-Specified

iVert   : 7 >= iVert >= 0
                              0-Top
                              1-3/4 pt
                              2-2/3 pt
                              3-1/2 pt
                              4-1/3 pt
                              5-1/4 pt
                              6-Bottom
                              7-Specified

iEmbed   : 2 >= iEmbed >= 0
                              0-Fully Embeded
                              1-On Surface
                              2-Specified

iWP   : Starting WP plate setting 9 >= iWP >= 1
                              1-WP1
                              2-WP2
                              3-WP3
                              4-WP4
                              5-WP5
                              6-WP6
                              7-WP7
                              8-WP8
                              9-WP9

fHoriz   : Horizontal Offset value - used for starting specify value
fVert   : Vertical Offset value - used for starting specify value
fEmbed   : Embed Offset value - used for starting specify value
fIncrementHor   : Starting value of horizontal increment for plate button movement
fIncrementVer   : Starting value of vertical increment for plate button movement

Embedded Plates for FWP Members/Solids Documentation

Definitions File - Command Definition (con'd)

FIL Command - Plate Command defines location of plate file

FIL   sPlateFile

where
  sPlatefile   :   Path & name of plate file

NGP Command - Named Group Command defines namedgroups
(Optional command to define named groups)

NGP   iNGP_plate
  where

  iNGP_plate   **:** Named group for Plates (default -1 which is none)

NOTE: Namedgroups are defined globally for a project. The iNGP_xxx value is an integer value that corresponds to the index of the global namedgroups. The first namedgroup is 0, the next is 1 and so on up to a maximum integer value of the number of namedgroups minus one. If a name group does not exist for the integer value specified, the member type in question will simply not be placed in a named group. A value of –1 specifies that the member type in question is not to be put in a namedgroup. In FWP namedgroups are specified by an alpha name so be careful when selecting integers. **SOLID NAMEDGROUPS ARE FUNCTIONAL with FWP version 7.00.00.17 and later.**

NAME Command - Name Command defines method of naming components

NAME {NAME_OPTION} name_prefix
  where
    {NAME_OPTION}   : Keyword - must be AUT or SPE or DYN or CON
          SPEcified   : Use the supplied name and append the member ID for Plate solid
                    Thus each Plate will have a different name
                    (This is the default option with the name "EP")

          DYNamic   : At placement time will display last name used with following options
                    1) option to supply a new name
                    2) option to request that member ID for Plate placed be appended
                         Thus each Plate will have a different name
                    3) option to abort placement

          AUTo   : FrameWorks assigns names by type and sequence number
                     (name_prefix not required or utilized)
          CONstant   : Use this name for all Plates

Embedded Plates for FWP Members/Solids Documentation

LOG FILES

All applications can write log files if the environment variable ACE_DUMP is set to 1. There have been reports that some sites lock the C root drive and under certain conditions a locked C drive can cause a system fault 5.

All applications have been modified to warn of a locked drive/file and then gracefully exit. All applications now look for the environment variable ACE_LOG_PATH. If it is found, that is the directory where the log files will be placed.   If the directory is locked or non-existent or if file is locked a warning will be given and the C drive will be tried. If it is locked or the file is locked a warning will be given and application will gracefully exit.

Usage of the variable ACE_LOG_PATH to control log file locations is similar to ACE_DEF_PATH to control DEF files. However there is one very important difference: ACE_LOG_PATH should NEVER point to a network drive (this is highly recommended for ACE_DEF_PATH). Everyone writes to the same named log file and if they are on a network drive there will be bad consequences. ALWAYS point ACE_LOG_PATH to a local drive (perhaps a temp off C root).