



# ACE Structural Engineering Applications LLC

## ACE FrameWorks Plus FPL Utilities

Feb 20, 2017

ACE FrameWorks Plus FPL Utilities were originally released January 1, 1999. The initial release of the ACE FrameWorks utilities contained 17 FPL utilities covering three categories, namely: steel, foundation and general. Currently the ACE FrameWorks utilities contain 41 FPL utilities covering four categories, namely: steel, gusset plates, foundation and general. The utilities are leased on a yearly basis and are under constant support and maintenance. When bugs are found or reported, the application is investigated & revised as necessary and a new version is distributed. When new versions of FrameWorks are released, necessary changes, if any, are made to the utilities. Client suggestions are welcomed and encouraged, many with new features & enhancements are continuously added to the existing FPL applications. In addition to the constant support & maintenance for the existing utilities, new utilities are frequently added. Since the initial release, fifteen new utilities have been added. Powerful new features such as the Immediate UNDO Capability, Dynamic Naming, Named Groups, Global Origin and stronger English/Metric units handling have been incorporated into the original utilities and carried into the new utilities.

Documentation & release information for all of the utilities is constantly available on the ACESEA web site ([www.ACESEA.com](http://www.ACESEA.com)). Software for all supported versions is continuously available to all clients via the ACESEA Software Web Delivery Page. Training documents, FWP files & PPS demo's w/ embedded AVI's are continuously available to all clients via the ACESEA Training Web Page.

### ACE FrameWorks Plus FPL Utilities

The ACE FrameWorks suite of FPL's includes 41 utilities in the categories: Steel utilities, Gusset Plate (GP) utilities, Foundation utilities and General utilities. All utilities support both English and Metric units. The utilities



are FPL/MDL applications, which run on top of Intergraph's FrameWorks Plus, which runs on top of Bentley's MicroStation. Currently nine (9) sets of Utilities are available: one for FWP versions 3.1.x.x & 3.2.x.x; one for FWP 7.00.00.16 & earlier; one for FWP 7.00.00.19 & later; one for FWP versions 7.1.x.x/7.2.x.x/7.3.x.x; and one for FWP 8.0.x.x, and one for FWP 9.0.x.x, and one for FWP 10.0.x.x, and one for FWP 11.0.x.x and one for FWP 12.0.x.x (nine separate versions are necessary due to underlying database or FPL function differences between the various versions). ACE Utilities for FWP 3.x.x.x & FWP 7.0.x.x are compatible with MicroStation versions 95, SE and J. ACE Utilities for FWP 7.1.x.x/7.2.x.x/7.3.x.x & FWP 8.0.x.x & FWP 9.0.x.x & FWP 10.0.x.x & FWP 11.0.x.x & FWP

12.0.x.x are compatible with MicroStation J. The FWP version is checked to ensure that mismatch between FPL and FWP version does not occur.

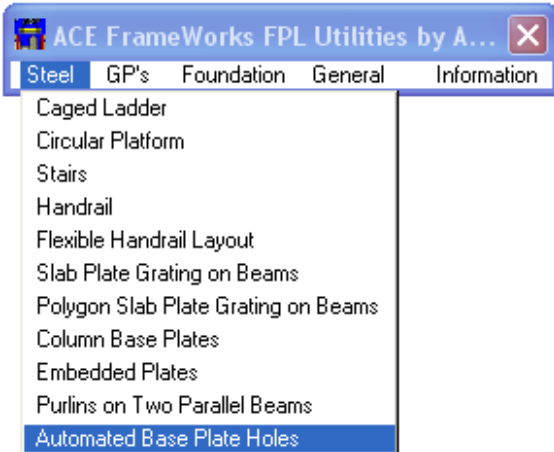
The ACE FrameWorks Utilities may be utilized with Windows XP for all versions FWP 3 thru FWP 12. Windows 7 & Windows 10 may be utilized for FWP 11 & FWP 12 only. Note that when starting FWP with a batch (.bat) file, the batch file must be initiated "Run as Administrator" (this can be accomplished by right clicking the batch file and selecting Run as Administrator), if not environment will not be properly passed to FWP.

The utilities are under constant revision with the addition of new utilities and the enhancement of existing ones. Current release information as well as the documentation to the utilities is available on the Web Site ([www.ACESEA.com](http://www.ACESEA.com)). Each of the four categories: steel, gusset plates, foundation and general have a section in the ensuing pages. Each utility is briefly discussed in this document under the applicable category.

# ACE FWP FPL Utilities – Feb 20, 2017

## Steel Utilities

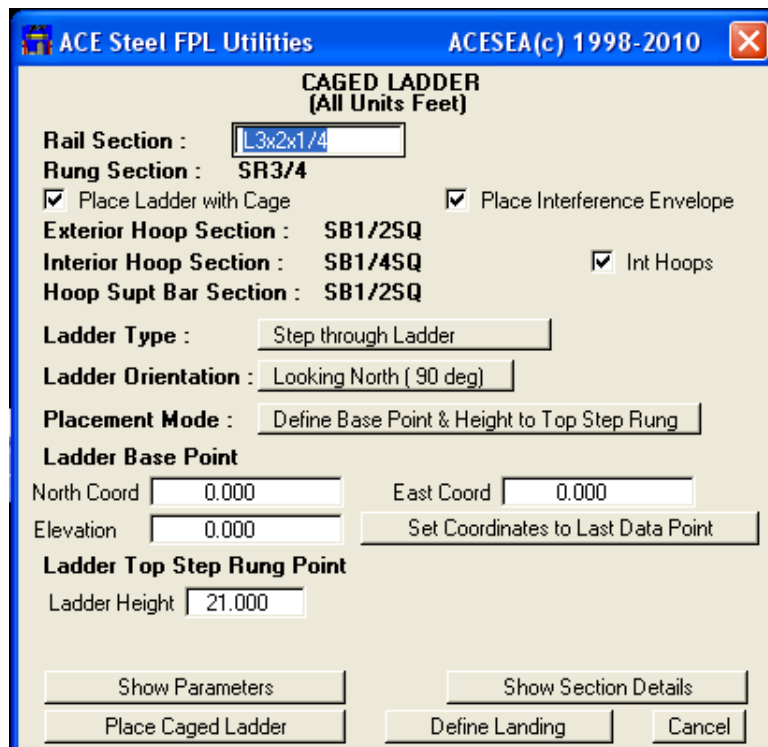
There are currently 11 steel utilities. The steel utilities include the following applications: Caged Ladder, Circular Platform, Stairs, Handrail, Flexible Handrail Layout, Column Base Plates, Slab Plate & Grating on Beams, Polygon Slab Plate & Grating on Beams, Embedded Plates for FWP Members/Solids, Purlins on Two Parallel Beams and



Automated Base Plate Holes. Two noteworthy features, which have been incorporated into all the steel utilities, are: Immediate Undo Capability and Dynamic Name Definition. The Immediate Undo Capability has been warmly received as it allows FrameWorks members, arcs & solids to be immediately removed after placement if so desired. Dynamic naming allows a name to be selected at placement time with the option to append the FWP ID of the first handrail place. All steel utilities support all FrameWorks models units (feet, inch, meters & mm). Finally all steel utilities, which have handrail, may have single, double or triple rail. Each steel utility is described in the ensuing pages.

## Caged Ladder

The caged ladder program facilitates the placement of ladders with or without cages. Both step through and side step



ladders can be placed at any orientation normal to the XY plane. The resultant ladder is always parallel to the Z-axis (vertical) but can be at any angle rotated about the Z-axis. An option is given to place FrameWorks solids as interference envelopes. The caged ladder utility supports both English (ft/in) or Metric (m/mm) units. The caged ladder application also supports an immediate undo option after placement. The utility has internal defaults for ladder and cage section sizes, types, classes and grades. Ladder & cage dimensions also have internal default values. In addition all input parameters shown in the dialog box shown on the left page have default values. Definition files (containing user defined defaults) may be utilized to override internal defaults.

Ladders may be placed by: specifying a base point and a ladder height; specifying a base point and a elevation; specifying a top point and base elevation or alternately specifying top and bottom points. This utility also features the “Last Data Point”

technique, where a coordinate of a previous data point may be selected. This application features the optional variable rail profile capability wherein the rail profile depends upon the ladder height. Another powerful optional feature in this utility is the “landing capability” where up to 10 intermediate landings can be defined with or without bounding hoops. An option also exists to place intermediate hoops at defined spacings (if not exercised two top hoops, a transition hoop and a base hoop are placed). For a given caged ladder, all components are given the same name by concatenating the FWP ID to a prefix. Other naming options include 1) a constant specified name for all ladders, 2) dynamic naming where the ladder name with or without FWP\_ID appended is defined at placement time or 3) FrameWorks normal naming for individual components.

## ACE FWP FPL Utilities – Feb 20, 2017

### Steel Utilities (continued)

#### Stairs

The stairs program facilitates the placement of stairs. The stairs consists of two stringers with treads and may

The screenshot shows the 'ACE Steel FPL Utilities' dialog box, titled 'ACESEA(c) 1998-2008'. The main section is 'STAIRS (All Units Feet - UNO)'. It contains several input fields and checkboxes for defining stair parameters. The 'Stringer' is set to 'C12X25', 'Top Offset' is '0.996 in', 'Base Offset' is '0.000 in', and 'Tread' is 'C10X30'. There are checkboxes for 'Standard Tread' and 'Standard Stair Width', both of which are checked. The 'Handrail on Left and Right' and 'Handrail on Top of Riser' options are also present. Below these are fields for 'HR Toprail: P2STD', 'Midrails: P2STD', and 'Post: P2STD'. The 'Stair Width' is set to '2.500'. A section titled 'WP DEFINITION: Top Elev, Base WP, Orientation w/ Std Tread Rise & Run' contains 'Top Elevation Definition' and 'Base WorkPoint Definition' sections. The 'Top Elevation Definition' includes 'North Coord: 18.582', 'East Coord: 0.000', and 'Elevation: 40.000'. The 'Base WorkPoint Definition' includes 'North Coordinate: 0.000', 'East Coordinate: 0.000', and 'Elevation: 25.000'. There are buttons for 'Set Coordinates to Last Data Point' in both sections. At the bottom, there are fields for 'Std Tread Rise: 0.670' and 'Std Tread Run: 0.830', a button for 'Stair Faces North (90 Deg)', and summary statistics: 'Total Rise: 15.000', 'Total Run: 18.582', 'Stair Angle = 38.9 Deg', 'Number of Stair Treads: 22', and 'Actual Riser Distance: 8 1/8 inches'. The dialog box has buttons for 'Place Stair', 'Compute', 'Detailed Stair Info', and 'Cancel'.

optionally be placed with or without handrails and/or top and base landings. The handrail (pipe or angle sections) can be supported on the top or side of the stringer. In addition, handrail may be placed on the left side only, right side only, left & right side or neither side. The handrail may consist of a single rail, two rails or three rails. An additional “Handhold” rail, which is inset from the handrail, may be specified. The top of the stringer may be vertical (flush) cut or mitered with a landing. The base of the stringer may be horizontal cut, vertical (flush) cut or mitered with a landing. The stairs rise from the XY plane at any desired angle. If a tread inset (nosing) is desired, six methods are provided to define an option inset. An option is given to place FrameWorks solids as interference envelopes. The stairs application also supports an immediate undo option after placement.

Numerous techniques (thirteen total) are provided to define the stair coordinates & orientation. The stairs are placed by center top and bottom workpoints. The method of

defining the top and bottom WP’s is dependent upon the stair definition technique chosen. This utility also features the “Last Data Point” technique, which can be utilized to place the last data point coordinates into the dialog keyin boxes.

After stair coordinate data is provided, pressing the “Compute” button will display stair data, which includes: number treads, stair angle, total rise, total run and actual riser distance. If the computed values are satisfactory, the stair can then placed with the “Place Stair” button.

The utility has internal defaults for stringer, tread and handrail section sizes, types, classes and grades. Stair & handrail dimensions also have internal default values. In addition all input parameters shown in the dialog box shown above have default values. The defaults may be overridden with user defined defaults by using a definition file. This utility also features limit values and standard value definitions for stairs. In all cases the resultant stairs will be with the acceptable limits set in the definitions file.

For a given stair, all components are given the same name by concatenating the FWP ID to a prefix. Other naming options include 1) a constant specified name for all stairs, 2) dynamic naming where the stair name with or without FWP\_ID appended is defined at placement time or 3) FrameWorks normal naming for individual components.

Stair component profiles (stringer, tread and handrail components (post, top rail & midrail)) can be based on stair length (actual or horizontal) if the optional Variable Stair Capability is utilized.

# ACE FWP FPL Utilities – Feb 20, 2017

## Steel Utilities (continued)

### Vessel Circular Platform

The vessel circular platform program facilitates the placement of circular platforms for vertical vessels. The

The screenshot shows the 'ACE Steel FPL Utilities' dialog box, titled 'INDUSTRIAL VESSEL CIRCULAR PLATFORM (All Units Feet - UNO)'. The dialog is organized into several sections with input fields and checkboxes. The top section includes 'Define Platform Angles' with fields for 'Platform TOS' (25.000), 'Ladder Start Angle' (90.000), 'Platform End Angle' (220.000), 'Platform Inside Diameter' (12.000), and 'Platform Width' (3.000). Below this, 'Ladder Offset' is set to 1.330 and 'Start Inside Angle' is 102.807. A section for 'Support Start & End Angle & Max Angle Defined' contains fields for 'Start Angle' (30.000), 'End Angle' (105.000), and 'Max Angle' (40.000). Material specifications include 'Member' (W8X18), 'Class-2 Grade A-36 CP-8 (NG: 1)', 'Inside Supt. Ext.' (1.000), and 'Outside Supt. Ext.' (0.250). Checkboxes for 'Interactive Support Review Option' and 'Grating Edge Clearance' (0.050) are present. A 'Single Platform Mode' button and a 'Set Coordinates to Last Data Point' button are also shown. The 'North Coordinate' is 1025.000 and the 'East Coordinate' is 850.000. The 'Handrail, Toe Plate/Arc Support Beam & Grating Information' section includes checkboxes for 'Place All Handrail' and 'Handrail Posts Match Support Beams', and fields for 'HR Interference Envelope' (Env Height: 6.000), 'HR Post' (L2X2X1/4 Class-4 (A-36) (NG: 3)), 'Max Post Spacing' (3.25), 'HandRail' (L2X2X1/4 Class-3 (A-36) (NG: 4)), 'Handrail Height' (3.75), 'MidRail(s)' (L2X2X1/4 Class-1 (A-36) (NG: 5)), 'Mid Rail Height' (2.50), 'Third Rail Height' (1.25), 'Toe Plate & Arc Support Beam' (L6X4X1/2 Class-5 (A-36) (NG: 2)), 'Grating Thickness' (1.250 inches), 'Grating' (Class-6 Grade A-36 Material: 0 (NG: 6) Type: Solid), and 'HR Interference Env.' (Class: 8 Grade: ACCESS Material: 2 (NG: 7)). At the bottom are 'Place Platform' and 'Cancel' buttons.

platform may form a complete circle around the vessel or a partial circle with defined start and end angles. Angle specification for this utility is based on plant coordinate system (0 degrees is due North w/ positive clockwise movement). For partial circular platforms, a ladder may be specified at the start and/or end of the platform. If a ladder is specified, a special end landing is provided and the actual end of the platform is computed considering a specified ladder offset value. The platform may have handrails of either pipe or angles and grating may be optionally specified. The handrail may consist of a single rail, two rails or three rails. The platform utilizes a angle "L" section as both the curved girder support and the toe plate. If a ladder is specified, the end angle is turned down. Six methods are provided for placement of the radial support members. The six radial support placement methods will produce a set of equally spaced support beams. If the interactive support option is toggled on, each individual support may be adjusted before placement. Grating (solid FWP slab element) is placed on the platform. Thickness options, grade, material, class and named group of the grating may be specified. For FWP ver 7.1.x.x and later, the grating solid may be specified as FWP type (SALB, SOLID, WALL). In addition, the grating may be constructed with arc/line or

multi-line surfaces.

The utility allows either single or multiple platform placement. The vessel circular platform application also supports an immediate undo option after placement.

Platform coordinates are specified as the platform center point, which is coincident with the vessel center point. The coordinates may be keyed in to a dialog keyin box or the "Last Data Point" technique may be utilized. This technique allows the values of the last datapoint to be put into the dialog keyin box.

Handrail posts may be placed using minimum spacing and matching platform extents or handrail posts may be placed to match support beams. If the handrail posts match support beams, the arc distance between them is computed and if that distance is less than hr\_post\_space an additional post is placed between support members.

The utility has internal defaults for platform, handrail & grating section sizes, types, classes, named groups and grades. Platform and handrail dimensions also have internal default values. In addition, all input parameters shown in the dialog box shown above have default values. The defaults may be overridden with user defined defaults by using a definition file.

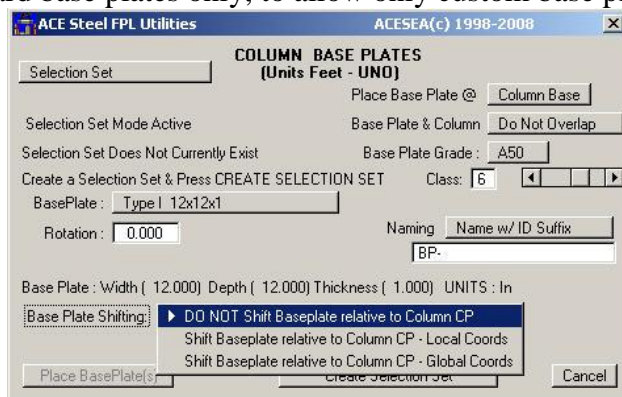


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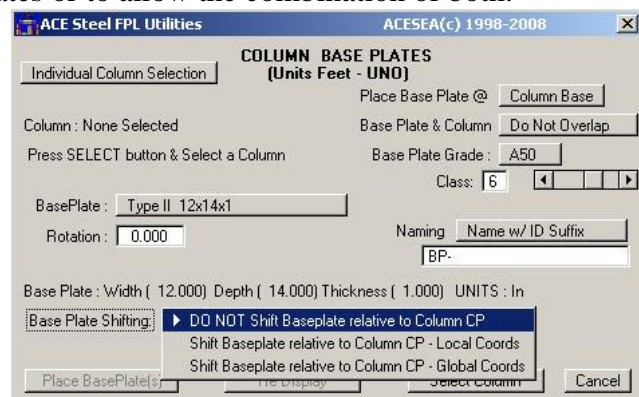
## Steel Utilities (continued)

### Column BasePlates Utility

The Column *BasePlates* application simplifies the placement of base plates on either bottom and/or top ends of vertical (parallel to z-axis) columns. The plate may be placed at the ends of the column or overlapping the ends. In addition to placing plates at top and/or bottom of column, the application optionally trims columns with the overlapping option (provided plate & column are in same model). The baseplate application can work in either an interactive individual placement mode or a selection set mode. The baseplates being placed may be selected from a baseplate library (ASCII Baseplate Definition file) and/or custom specified. The BasePlate configuration file defines “standard base plates”. It is an ASCII file which has a defined suffix of .CFG. Each base plate configuration is defined on a single line. A base plate configuration consists of: a Name, a Description, a width, a depth and a thickness. The philosophy behind the application is that a company and/or project will create a BasePlate configuration file. Such a file will encourage standardization and hopefully help eliminate excessive baseplate configurations. The application may be configured to require placement of standard base plates only, to allow only custom base plates or to allow the combination of both.



Selection Set Mode

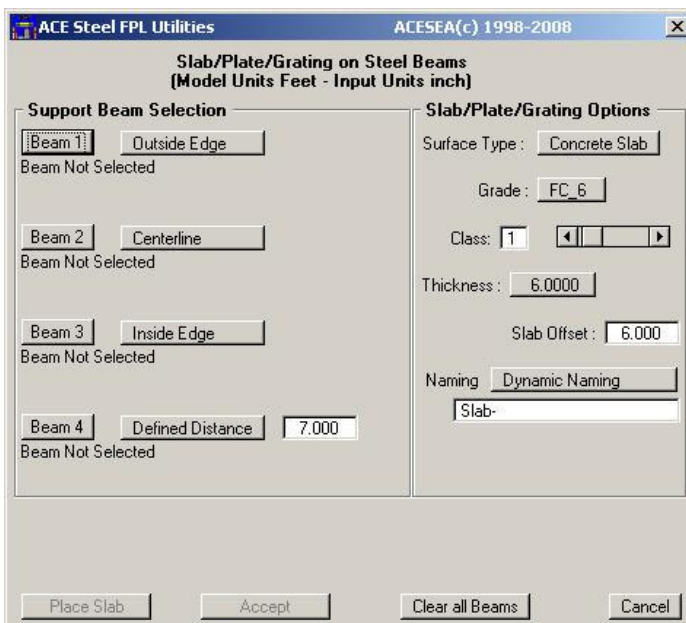


Interactive Mode

In the selection set mode, an entire selection set of columns is processed at a time. In the interactive move, columns are selected one at a time.

### Slab, Plate & Grating on Steel Beams/Grids Utility

The *Slab Plate Grating on Steel Beams/Grids* application simplifies the placement of surfaces which can be a concrete slab, steel plate or steel grating represented by a FrameWorks “slab element”. The utility allows four beams and/or grids to be selected as a boundary definition for the surface. The inset or outset from the beam/grid centerline to the edge of the surface may be to the edge of the steel beam flange (for beams only) or may be a defined distance for beams or grids. A positive definition will cause the slab surface area to increase. The beams and/or grids must be horizontal (flat). The four beams/grids should be picked in either clockwise or counter clockwise order. The slab may be offset from the TOS point of the beams/grids. The application assumes that beams are placed by cardinal point 8 (top center). The beams/grids must all be at the same elevation and every beam must intersect it's neighboring beams. The surface placed consists of one FrameWorks solid (slab type) element and may be named depending upon the naming option selected.

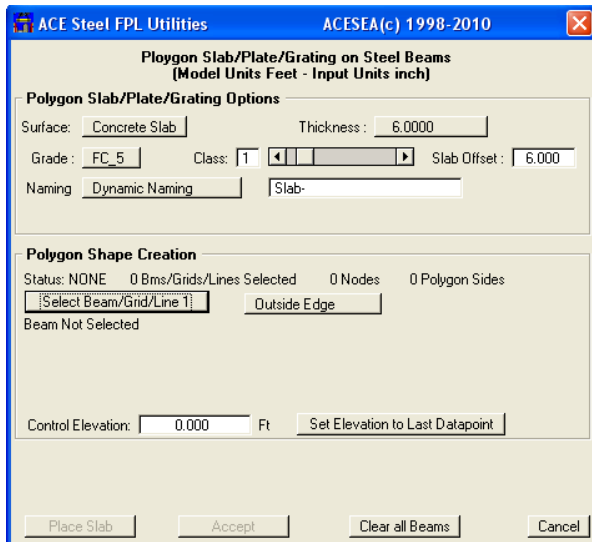


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## Steel Utilities (continued)

### Polygon Slab Plate & Grating on Beams

The *Polygon Slab, Plate & Grating on Beams*

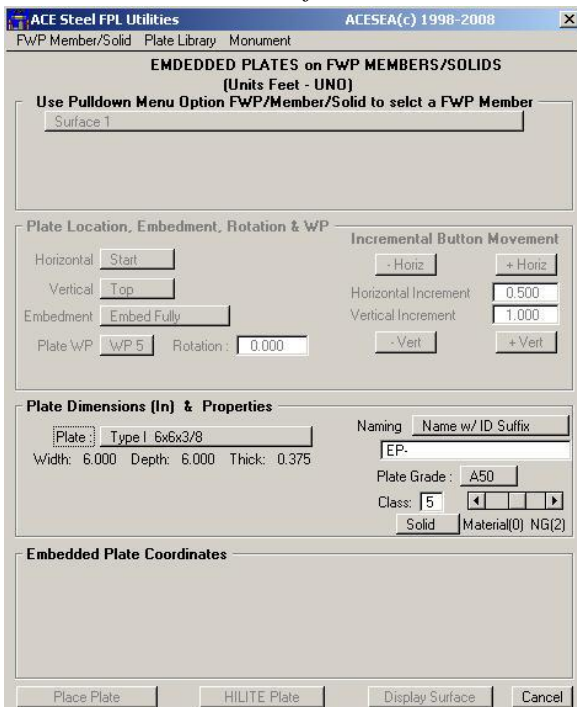


application simplifies the placement of a polygon surface with from 3 to 30 sides. The polygon surface may be a concrete slab, steel plate or steel grating represented by a FrameWorks “slab element”. The utility allows as few as 3 and as many as 30 beams (any non vertical FWP member) and/or FWP grids and/or MicroStation lines (type 3 lines not linestrings) to be selected to define a polygon boundary for the surface. For FWP members w/ CP=8, the surface extent (inset or outset from the beam centerline/CP line) may be to the inside or outside edge of the steel beam flange. For all beams/grids/lines, the surface extents may be at the CP line or a defined distance from it. A positive distance or outside edge will cause the slab surface area to increase. The beams/grids/lines (termed “elements”) may be horizontal (flat) or sloped but may not be vertical. The elements must be picked in successive order. The elements are projected to the control elevation and every element must intersect the neighboring element(s). The first

element defines the Control Elevation, however the elevation may be changed at any time by keyin or “last data point”. The polygon is formed by selecting intersecting elements (either clockwise or counterclockwise) successively until a closed polygon is formed. As each new element is selected, the intersection point (a polygon node) and any formed polygon sides are displayed temporarily in the view. When an option to close the polygon exists, a dialog close option will appear on the accept element dialog box. The polygon is formed by toggling the close polygon box and accepting. The slab may be offset from the Control Elevation. The surface placed consists of one FrameWorks solid (slab type) element and may be named depending upon the naming option selected.

### Embedded Plates for FWP Members/Solids

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 and/or custom specified at time of placement.

The dialog box shown left is the one seen when the program is started. A FWP Member/Solid is selected using the FWP Member/Solid pull-down menu and a face is selected using surface option button. Next, the plate location, embedment, rotation & WP are selected/confirmed. The plate is either selected via option button or a custom plate size is defined. When all is 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.

# ACE FWP FPL Utilities – Feb 20, 2017

## Steel Utilities (continued)

### Handrail Utility

The handrail application facilitates the placement of straight runs of handrail. The handrail can be either pipe handrail or angle handrail and may be oriented to the left or right (side on which the toe plate resides). A handrail run consists of handrail posts, top rail, optional mid rail, optional third rail, optional toe plate (with vertical offset option) and in certain cases optional partial closing posts. The handrail (pipe or angle sections) can be mounted on the top or side, can be placed by several cardinal point options, can be flat or sloped. An option is given to place a FrameWorks solid as an interference envelope.

The screenshot shows the 'ACE Steel FPL Utilities' dialog box, titled 'ACESEA(c) 1998-2008'. The main section is 'Straight Pipe Handrail (All Units Feet)'. It includes several input fields and checkboxes: 'Handrail Mounted on Top' (selected), 'Edge/Center', 'Start Post w/ Defined Spacing', 'Toe Plate on Right', 'Post Spacing' (4.000), 'Maximum Post Spacing = 4.75', 'Close Overhangs' (checked), 'Toe Plate' (checked), 'Place Interference Envelope' (unchecked), 'ACE FWP Point Mode', 'Flat Handrail', 'Elevation is the base location of Toe Plate', 'Elevation' (0.000), 'Set Elevation via Member Point Locator', 'Start Point for Handrail', 'North Coordinate' (0.000), 'East Coordinate' (0.000), 'Set Coordinates via Member Point Locator', 'End Point for Handrail', 'North Coordinate' (0.000), 'East Coordinate' (20.000), 'Set Coordinates via Member Point Locator', and a list of components: 'Post P2STD', 'Toprail P2STD', 'Midrail P1 1/2STD', 'Toepl TOEPL'. At the bottom are buttons for 'Place Handrail', 'Handrail Info', and 'Cancel'.

which may optionally have start and/or end posts. The elevation point is the base of the toe plate (at start & end locations) which in cases where the handrail is mounted on top is coincident with the base of the full post (if one exists at start and end locations).

The method of defining the top and bottom WP's utilizes dialog keyin boxes for North, East and elevation coordinates and is dependent upon whether the handrail run is flat or sloped.

This utility also features the "Last Data Point" technique, which can be utilized to place the last data point coordinates into the dialog keyin boxes. After handrail coordinate data is provided, the handrail can then placed with the Place Handrail button. As with all steel utilities, this utility features an Undo option immediately after handrail placement.

The utility has internal defaults for toe plate and handrail section sizes, types, classes and grades. Handrail dimensions: top rail height, mid rail height, third rail height and maximum post spacing also have internal default values. In addition all input parameters shown in the dialog box have default values. The defaults may be overridden with user defined defaults by using a definition file.

Handrail component profiles (post, toprail, midrail & toeplate) can be based on handrail run length (actual or horizontal) if the optional Variable Handrail Capability is utilized.

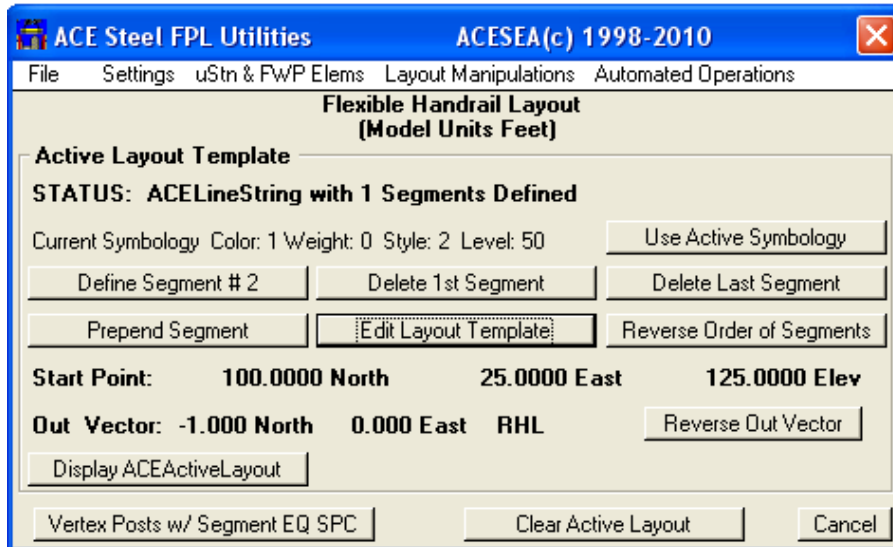


# ACE FWP FPL Utilities – Feb 20, 2017

## Steel Utilities (continued)

### Flexible Handrail Layout Utility

The Flexible Handrail Layout application facilitates the placement of continuous line and/or arc segments of handrail. The application places handrail FrameWorks elements into the FWP model file with a two-step process.



First, a layout template is generated and optionally manipulated until acceptable layout template is obtained. When complete, the accepted layout template is processed using the desired set of Layout Template Processing Rules to create the initial handrail layout (can be final layout). The active handrail layout can be generated using any one of the three sets of Layout Processing Rules available, each with various configurable options. The handrail layout may then be further manipulated if desired. Handrail layout manipulation allows precise placement of handrail components. Another feature this application allows is one entry

opening per segment defined interactively. When complete, the handrail layout FrameWorks elements (post, rail, toe plate, and interference envelope) may be placed into the FWP model (an option exists to place dumb graphics into model to represent handrail). The application can process two types of special uStn design file elements (Smart ACELineString & Smart ACEComplexString) and two types external ACE binary files in an automated mode. Layout Template operations and Handrail layout operations are discussed in the subsequent paragraph.

### Layout Template

A layout template is made up of continuous line and/or ARC handrail segments. In reality, the layout template is the Cardinal Point (CP) line of the handrail rail projected to the HR base (non-offset) elevation. The handrail segments may be flat or sloped. The handrail layout template may be open or closed. The layout template can be completely defined interactively or it may be initiated from specific MicroStation (uStn) elements (type 4, 6, 12, 16), FWP Slab, FWP member or FWP arc elements or read from two ACE binary file formats. The active handrail layout template may be continuously manipulated until the desired layout template is achieved. Manipulations include, adding segments, deleting segments, editing layout template, reversing segment order, translating or rotating template. Once the desired layout template is achieved, the layout template may be processed to produce a handrail layout. Additionally, the layout template may be: 1) saved as either Smart ACELineString (or Smart ACEComplexString if ARCs present) into the design file; and/or 2) saved as a ACELayoutTemplate external binary file. The layout template is displayable.

### Handrail Layout

Once a layout template accepted, the active Layout Template Processing Method (Rule) is used to process the template and generate a Handrail Layout. Three Layout Template Processing Methods (Rules) are available and each has configurable options. Once the handrail layout is generated it can be interactively manipulated (posts moved, posts deleted, posts added, elevations modified, CP modified, profiles modified, entry openings (one per segment) added). The handrail layout may be translated or rotated if desired. Interactively only, one entry can be defined per handrail segment. If an entry is defined, posts or partial posts at either end of the entry may be defined. The handrail layout may be displayed at any time. Once the handrail layout is satisfactory, it can be: 1) placed into the FrameWorks model as FrameWorks members or 2) saved as an ACEHandrailLayout external binary file. The handrail layout is displayable.

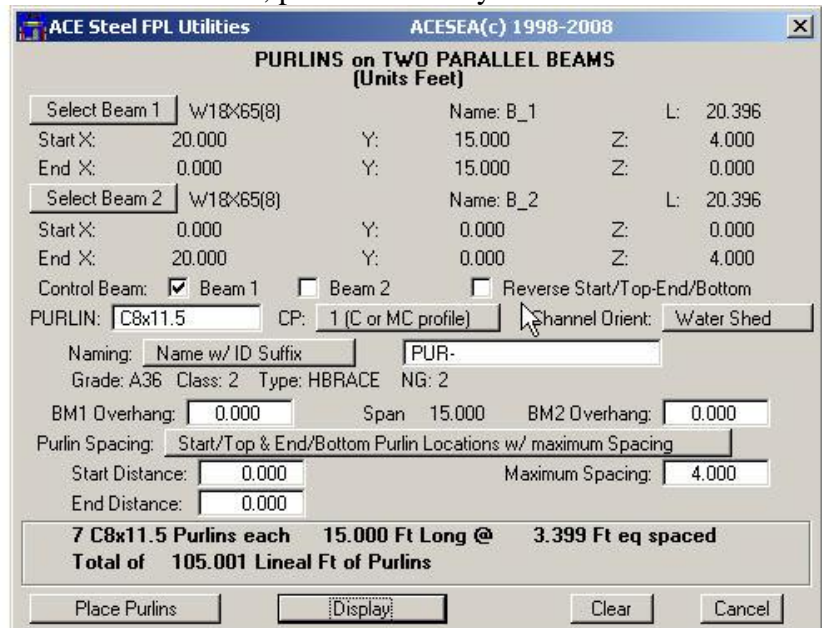
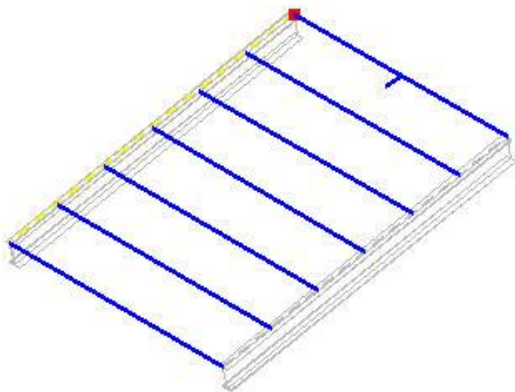


# ACE FWP FPL Utilities – Feb 20, 2017

## Steel Utilities (continued)

### Purlins on Two Parallel Beams

The *Purlins on Two Parallel Beams* application simplifies the placement roof purlins on two parallel FWP beam members. This application is especially useful for the case where the beams are sloped. Purlins may be C, MC, I, WF or HP shapes. For C & MC sections, the purlin CP line may be 1 or 7 and there is an option to control flange direction (Channel Orient). For WF, I or HP sections, the purlin CP line may be 2 or 8. The purlins may overhang beam 1 and beam 2 by specified distances. There are six methods available to determine purlin layout. Once two beams are selected, the purlin arrangement is displayed by temporary graphics. In addition, both beam 1 & beam 2 are highlighted. The controlling point on the control beam (beam 1 or beam 2) is graphically illustrated with an active point. This application places purlins on the CP of the FWP beams. If the CP for the beams is other than 7,8 or 9 and/or the beam is rotated, poor results may be obtained.



Beam 1 & Beam 2 Selected

A FWP BEAM member is first selected using the Select Beam 1 (or 2) button (must be non-vertical). Then the second beam (must be parallel) is selected using the other select beam button. Either beam 1 or beam 2 may be utilized as the control beam (beam used to determine roof purlin placement). Purlin placement is relative to the Start/Top of the control beam (termed control point). If the beam is sloped, the Top (highest Z elevation) is the control point. If the beam is flat, the beam start coordinate is used as the control point. The control point may be switched at any time with the “Reverse Start/Top-End/Bottom” toggle. The control beam may be switched at any time with the Control Beam toggle.

Once two parallel roof beams are selected, the following happens. Both beams are highlighted. The control point is displayed as a active point (color & weight are controllable – default is red weight 6). The purlins are displayed (color & weight are controllable – default is blue weight 2). The control point & the purlins are displayed with temporary graphics. If the purlin is a C or MC profile, the flange direction is illustrated with a line from the center of the first purlin toward the flange edge. If the purlins are as desired they may be now placed. If not any or all of the following may be changed: Control Beam, control point, purlin profile, purlin CP, if purlin C or MC orientation, purlin naming method and data and any spacing parameters. The new few images will show the effect on the dialog box and display for various changes. When the layout is a desired, press “Place Purlins”. The purlins will be placed as displayed and the immediate undo option will be presented. If the purlin placement is not correct, press cancel. If correct, accept the placement.

# ACE FWP FPL Utilities – Feb 20, 2017

## Steel Utilities (continued)

### Automated Base Plate Holes Documentation

The *Automated Base Plate Holes* application can be utilized to rapidly place anchor bolt holes in Base Plates. The holes may be punched through the solid Base Plates or they may be placed as FWP Rod members “fictitious holes via rod members” which represent anchor bolt holes in Base Plates. This automated application first searches for all Base Plates which conform to the “Base Plate Search/Inclusion Criterion”. Subsequently the application searches for all Anchor Bolts which conform to the “Anchor Bolt Search/Inclusion Criterion”. Once all conforming base plates & anchor bolts are found, each base plate is investigated to see which if any of the anchor bolts pass through it. Whenever an anchor bolt passes through a base plate, depending upon the mode of operation a hole will be punched or a rod member will be placed. The startup condition of all option buttons may be set in the definition file. The default conditions are shown in the dialog box below.

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**Automated Base Plate Holes**  
(Model Units Feet - Input Units inch)

**ROD Member Placed as Holes in BasePlates - DATA**

Place Round Members as Holes AB/Hole Member Relationship defined by file

File Show c:\ace\_sample.abr

Class: 5 Hole Member Grade VOID Hole Member Type HBRACE

Material: 0 Named Group: 2

**Base Plate Search/Inclusion Criterion**

Search File or Selection Set BP Material FWP Solid Criterion

Search Complete Model(s) Steel Solids Only SLAB

BP Shape Criterion BP Model Search Criterion

Rectangular Search ALL Models

**Anchor Bolt Search/Inclusion Criterion**

AB Member Criterion AB Type Criterion AB Material Criterion

Any Solid Round Member Any Type Search ALL Models

Process Base Plates Investigate & Report Cancel

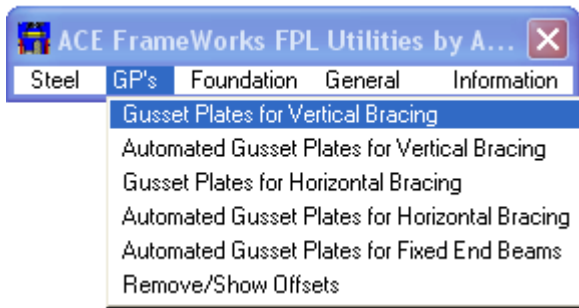
### Automated Base Plate Holes- Primary Dialog Box

The dialog box shown above is divided into three areas, namely: Rod Member or Hole Data; Base Plate Search/Inclusion Criterion and Anchor Bolt Search/Inclusion Criterion. The Rod Member or Hole Data defines whether hole is to be a Rod member or a punched hole. For a punched hole, this section defines the size of punched hole. For a Rod member, this section defines the properties of the Rod member. The Base Plate Search/Inclusion Criterion section defines how base plates are found and the Anchor Bolt Search/Inclusion Criterion defines how anchor bolts are found. The Rod Members as Holes mode of operation is active in the dialog box shown above. The mode of operation can be changed with the option button in the Hole Data area.

# ACE FWP FPL Utilities – Feb 20, 2017

## Gusset Plate Utilities

Currently there are 6 gusset plate utilities. The first two gusset plate utilities were released in May 2000. Since



that time four additional gusset plate utilities have been added. The gusset plate utilities are: Gusset Plates for Vertical Bracing; Automated Gusset Plates for Vertical Bracing; Gusset plates for Horizontal Bracing; Automated Gusset plates for Horizontal Bracing; Automated Gusset Plates for Fixed End Beams & Remove/Show Offsets. The placement techniques used in the vertical & horizontal bracing utilities are outlined in the ACESEA specifications “Modeling Vertical Bracing Gusset Plates for Interference Detection” & “Modeling Horizontal

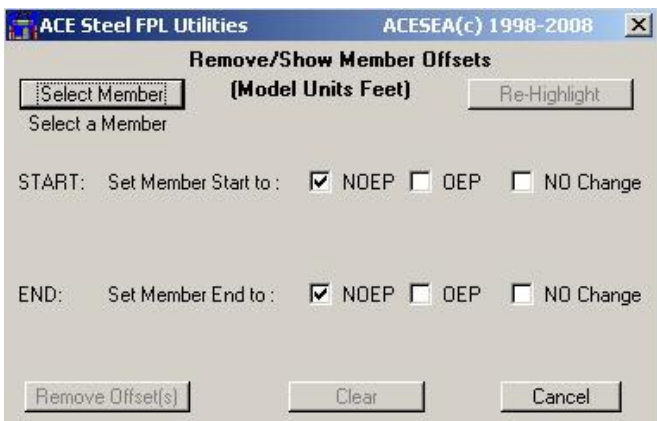
Bracing Gusset Plates for Interference Detection” respectively. The interactive applications allow connection members to be selected and then an appropriate gusset plate is sized. The sized gusset plate may be manipulated (move and/or size changed) until final result is achieved whereupon the GP may be placed as a FWP solid into the model file. The automated applications allow literally 1000's of GP's to be placed in a minute. The automated applications study each appropriate brace and connecting members and select a connection type, which is sized and placed into the FWP model. The sizing is based on the specification documents, which utilize a configurable set of connection variables.

The automated gusset plate applications support a concept of a connection specification file. A HCS or VCS or BCS (horizontal or vertical or beam connection specification file) may be specified in the definitions file if so desired. A HCS/VCS/BCS set is a set of connection variables (also parameters), which will be utilized if the brace (beam for BCS) in question meets the condition. The conditions may involve the brace's (beam's) class, area, profile or name. For a given brace (beam), the sets are investigated from top to bottom and the first one that meets specified criteria is utilized. If none meet the criteria, the default definition set is utilized.

Gusset plates are sized & placed for the purpose of interference detection - NOT FOR THE PURPOSES OF CONNECTION DESIGN.

## Remove/Show Offset Utility

The *Remove/Show Member Offsets* application is a useful tool for removing and/or showing/understanding



member end workpoint offsets of FrameWorks vertical braces, horizontal braces, columns and/or beams. This utility is provided as a companion utility for the ACE family of gusset plate utilities. Member end WP offsets are a very useful capability, which enables member connectivity while allowing bracing member workpoints to be properly represented. Member connectivity is necessary for the gusset plate applications. The ACE gusset plate applications rely on the intersection between brace ends and other connection component member (columns & beams) end points or cardinal point lines. End WP offsets allow the braces to be placed as they will be

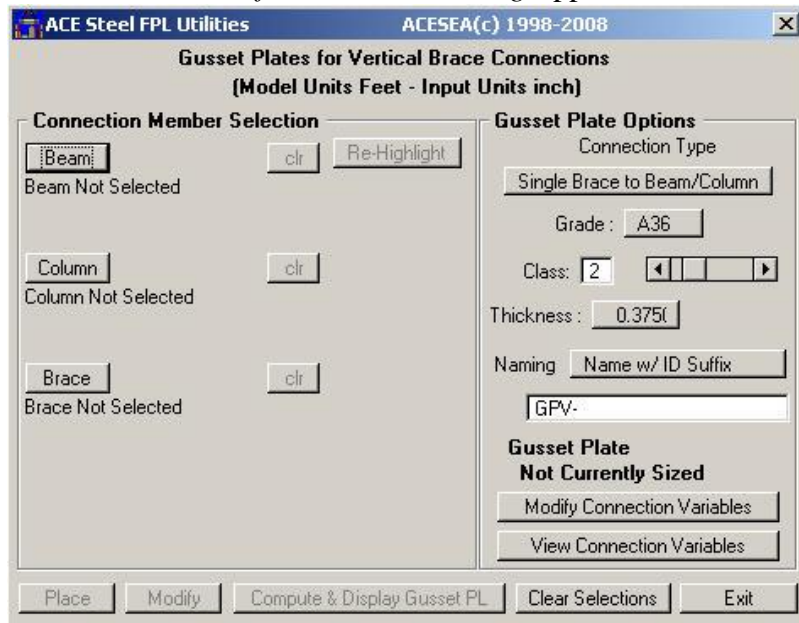
fabricated thereby enabling realistic interference detection, visual representation, gusset plate sizing and connection information. This application facilitates easy removal of end WP offsets offering options to reframe to either the non-offset end point (NOEP) or the offset end point (OEP) for either or both ends of the member. Once the WP offset is removed, repositioning the member is an easy operation with the FrameWorks **Modify Member End** command. Subsequently a member end WP offset can easily be applied if so desired with the FrameWorks **Modify Work Point Offset** command.

# ACE FWP FPL Utilities – Feb 20, 2017

## Gusset Plate Utilities (con'd)

### Gusset Plates for Vertical Bracing

The *Gusset Plates for Vertical Bracing* application both sizes and greatly simplifies the placement of gusset

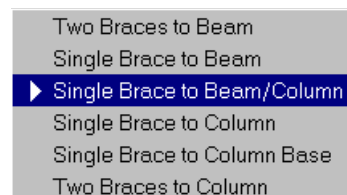


plates for vertical bracing framing. The resulting gusset plate is always rectangular and is represented by FrameWorks steel solid shape (type solid, slab or wall element may be specified). Gusset plates are sized & placed for the purpose of interference detection - NOT FOR THE PURPOSES OF CONNECTION DESIGN. The connection rules and gusset plate sizing techniques are outlined in detail in the companion reference document “Modeling Vertical Bracing Gusset Plates for Interference Detection”. The reference document outlines the detailed rules for the various connection types and precisely defines gusset plate size and location for a given connection type with a specific set of user defined connection variables. Configurable connection variables

provide a means to “tune gusset plate sizing”. As mentioned in the reference document, beams must be FrameWorks beams, columns must be FrameWorks columns and braces must be FrameWorks vertical braces. The connection end of a non-offset brace endpoint must either intersect a beam or column cardinal point (CP) line or intersect a beam or column endpoint. These and many other very important rules are discussed in the reference document - PLEASE READ THE REFERENCE DOCUMENT. This application also provides the option to create a SDNF (steel detailing neutral) file, which can be transmitted to fabricator to define allowable gusset plate limits. Gusset plate naming options include: dynamic naming at placement time; a constant specified name; or FrameWorks normal naming for individual components. Dynamic naming allows the name to be selected at placement time with or without appending the FWP ID to the name.

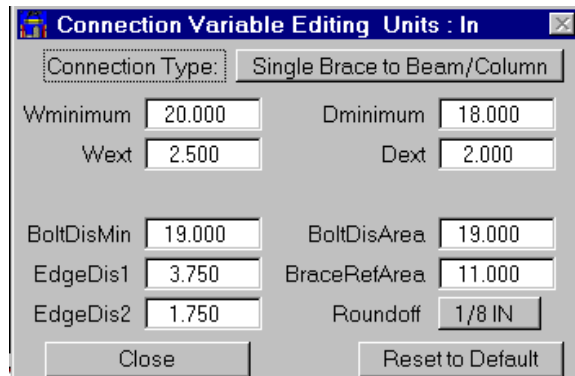
**Connection Types:** This utility currently supports six connection types

- Type 1 - Two Brace to Beam
- Type 2 - Brace to Beam
- Type 3 - Brace to Beam-Column
- Type 4 - Brace to Column
- Type 5 - Brace to Column Base
- Type 6 - Two Brace to Column



### Configurable Connection Variables

Each connection type has a set of connection variables. The connection variables should be defined in the application definition file. This interactive placement application allows editing the connection variables on the fly, enabling rapid gusset plate “connection variable tuning”. Once appropriate variables are determined for specific company or project standards, the variables should be entered into a definition file. Different definition files can easily be utilized for different projects



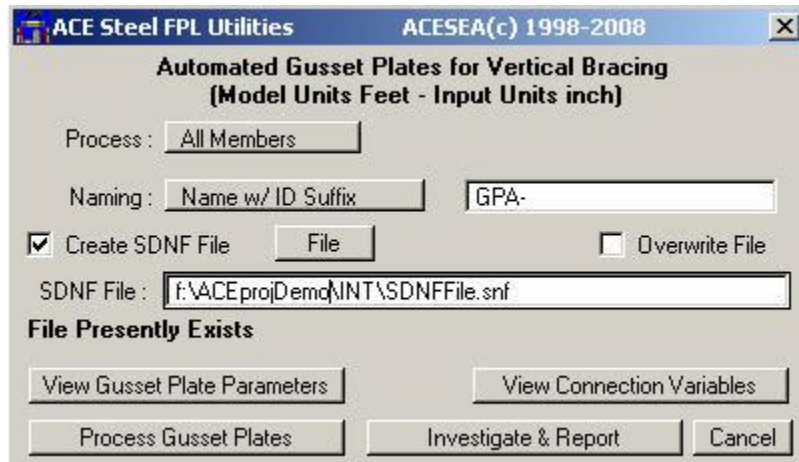


# ACE FWP FPL Utilities – Feb 20, 2017

## Gusset Plate Utilities (continued)

### Automated Gusset Plates for Vertical Bracing Utility

The *Automated Gusset Plates for Vertical Bracing* application both sizes and places gusset plates at each



vertical brace (VBRACE) end for the entire model (includes FWP attached models) or subset of the model defined by a selection set. The resulting gusset plate is always rectangular and is represented by FrameWorks steel solid shape (type solid, slab or wall elements). Gusset plates are sized & placed for the purpose of interference detection - NOT FOR THE PURPOSES OF CONNECTION DESIGN. The connection rules and gusset plate sizing techniques are outlined in detail in the companion reference document “Modeling Vertical Bracing Gusset Plates for Interference

Detection”. The reference document outlines the detailed rules for the various connection types and precisely defines gusset plate size and location for a given connection type with a specific set of user defined connection variables. Configurable connection variables provide a means to “tune gusset plate sizing”. As mentioned in the reference document, beams must be FrameWorks beams, columns must be FrameWorks columns and braces must be FrameWorks vertical braces. The connection end of a non-offset brace endpoint must either intersect a beam or column cardinal point (CP) line or intersect a beam or column endpoint. These and many other very important rules are discussed in the reference document - PLEASE READ THE REFERENCE DOCUMENT. This application and Gusset Plates for Vertical Bracing (ACE\_GPV) utilize the same connection types and sizing techniques. This utility allows defining a set of connection variable files with the VCS/VCV capability. The ACE\_GPV is an excellent tool to determine values for the configurable connection variables, to create VCV files and to study connection behavior in general. This automated application is designed to place large numbers of gusset plates in one fell swoop. This application also provides the option to create a steel detailing neutral (SDNF) file which can be transmitted to fabricator to define allowable gusset plate limits. This utility currently supports the following six vertical bracing connection types

- Type 1 - Two Brace to Beam (priority 9)
- Type 2 - Brace to Beam (priority 6)
- Type 3 - Brace to Beam-Column (priority 10)
- Type 4 - Brace to Column (priority 5)
- Type 5 - Brace to Column Base (priority 7)
- Type 6 - Two Brace to Column (priority 8)

Each vertical brace is studied (random order) to determine potential connections. Highest priority connections are attempted first and then lower priority connections are attempted until a connection is created or all options are exhausted. A vertical brace may have only one connection per end. The maximum number of gusset plates that can be placed is equal to twice the number of vertical braces. The number actually placed is generally much less due to the two brace to beam or column connections.

The gusset plate name may be a constant name or it may be a prefix with the FrameWorks solid member ID (FWP ID) appended as a suffix or FrameWork’s autaname may be selected. The default prefix is GPA, however a different prefix may be specified in the definition file or supplied at runtime.

# ACE FWP FPL Utilities – Feb 20, 2017

## Gusset Plate Utilities (continued)

### Gusset Plates for Horizontal Bracing

The *Gusset Plates for Horizontal Bracing* application both sizes and

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**Gusset Plates for Horizontal Brace Connections**  
(Model Units Feet - Input Units inch)

**Connection Member Selection**

Beam: Beam Not Selected  
Brace: Brace Not Selected

**Connection Type/GP Options**

One Horiz Brace to a Beam

Thickness: 0.375  
VER: TOS w/ Offset -4.000  
HOR: Specified Offset  
Grade: A36 3.250  
Class: 2  
Naming: Name w/ ID Suffix  
GPH-  
Gusset Plate  
Not Currently Sized

Modify Connection Variables  
View Connection Variables

Place Modify Compute & Display Gusset PL Clear Selections Exit

greatly simplifies the placement of gusset plates for horizontal bracing framing. The resulting gusset plate is typically rectangular (provisions for special warped case included) and is represented by FrameWorks steel solid shape (type solid, slab or wall elements). Gusset plates are sized & placed for the purpose of interference detection - NOT FOR THE PURPOSES OF CONNECTION DESIGN. The connection rules and gusset plate sizing techniques are outlined in detail in the companion reference document “Modeling Horizontal Bracing Gusset Plates for Interference Detection”. The reference document outlines the detailed rules for the various connection types and precisely defines gusset plate size and location for a given connection type with

a specific set of user defined connection variables. Configurable connection variables provide a means to “tune gusset plate sizing”. As mentioned in the reference document, beams must be FrameWorks beams, and braces must be FrameWorks horizontal braces. The connection end of a non-offset brace endpoint must either intersect a beam cardinal point (CP) line or intersect a beam endpoint. These and many other very important rules are discussed in the reference document - PLEASE READ THE REFERENCE DOCUMENT. This application also provides the option to create a SDNF (steel detailing neutral) file, which can be transmitted to fabricator to define allowable gusset plate limits.

The utility has internal defaults for all the items shown on the dialog box above. The defaults may be overridden with user defined defaults by using a definition file.

This utility currently supports four connection types:

- Type 1 - One Horizontal Brace to Two Beam
- Type 2 - Three Horizontal Braces to Beam
- Type 3 - Two Horizontal Braces to Beam
- Type 4 - One Horizontal Brace to Beam

One Horiz Brace to Two Beams  
▶ Three Horiz Braces to a Beam  
Two Horiz Braces to a Beam  
One Horiz Brace to a Beam

### Configurable Connection Variables

Connection Variable Editing Units : In

Import or Save HCV File

Connection Type: One Horiz Brace to Two Beams

Wminimum: 24.000  
Wext: 2.500

BoltDisMin: 19.000 BoltDisArea: 19.000  
EdgeDis1: 3.750 BraceRefArea: 11.000  
EdgeDis2: 1.750 Roundoff: 1/8 IN

Close Reset to Default

Current Data Source DEF File - Unmodified

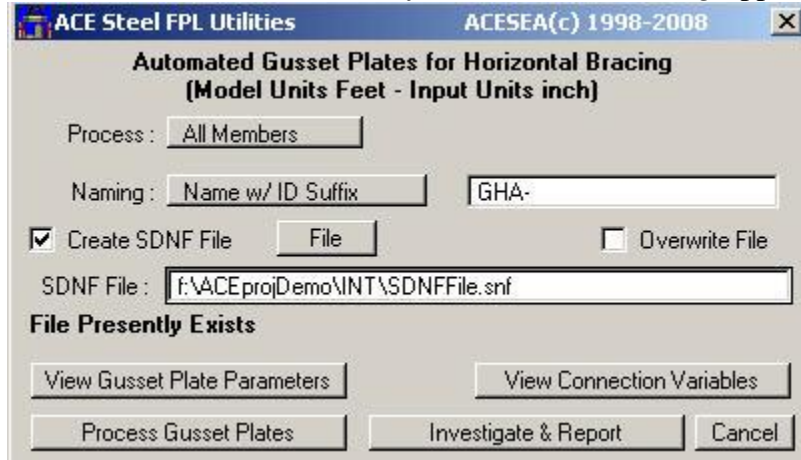
Each connection type has a set of connection variables. The connection variables should be defined in the application definition file. This interactive placement application allows editing the connection variables on the fly, enabling rapid gusset plate “connection variable tuning”. Once appropriate variables are determined for specific company or project standards, the variables should be entered into a definition file. Different definition files can easily be utilized for different projects. HCV connection files may be imported or exported.

# ACE FWP FPL Utilities – Feb 20, 2017

## Gusset Plate Utilities (continued)

### Automated Gusset Plates for Horizontal Bracing

The *Automated Gusset Plates for Horizontal Bracing* application both sizes and places gusset plates at each



horizontal brace (HBRACE) end for the entire model (includes FWP attached models) or subset of the model defined by a selection set. The resulting gusset plate is usually rectangular (warped plate possible w/ brace to two beam connection) and is represented by FrameWorks steel solid shape (type solid, slab or wall elements). Gusset plates are sized & placed for the purpose of interference detection - NOT FOR THE PURPOSES OF CONNECTION DESIGN. The connection rules and gusset plate sizing techniques are outlined in detail in the companion reference document "Modeling

Horizontal Bracing Gusset Plates for Interference Detection". The reference document outlines the detailed rules for the various connection types and precisely defines gusset plate size and location for a given connection type with a specific set of user defined connection variables. Configurable connection variables provide a means to "tune gusset plate sizing". As mentioned in the reference document, beams must be FrameWorks beams and braces must be FrameWorks horizontal braces. The connection end of a non-offset brace endpoint must either intersect a beam cardinal point (CP) line or intersect a beam endpoint. These and many other very important rules are discussed in the reference document - PLEASE READ THE REFERENCE DOCUMENT. This application and Gusset Plates for Horizontal Bracing (ACE\_GPH) utilize the same connection types and sizing techniques. This utility allows defining a set of connection variable files with the HCS/HCV capability. The ACE\_GPH is an excellent tool to determine values for the configurable connection variables, to create HCV files and to study connection behavior in general. This automated application is designed to place large numbers of gusset plates in one fell swoop. This application also provides the option to create a steel detailing neutral (SDNF) file which can be transmitted to fabricator to define allowable gusset plate limits.

The utility has internal defaults for all the items shown on the dialog box above. The defaults may be overridden with user defined defaults by using a definition file.

### Connection Types

This utility supports the following four horizontal bracing connection types

- |   |               |
|---|---------------|
| Type 1 - One Horizontal Brace to Two Beam | (Priority 10) |
| Type 2 - Three Horizontal Braces to Beam  | (Priority 9)  |
| Type 3 - Two Horizontal Braces to Beam    | (Priority 8)  |
| Type 4 - One Horizontal Brace to Beam     | (Priority 7)  |

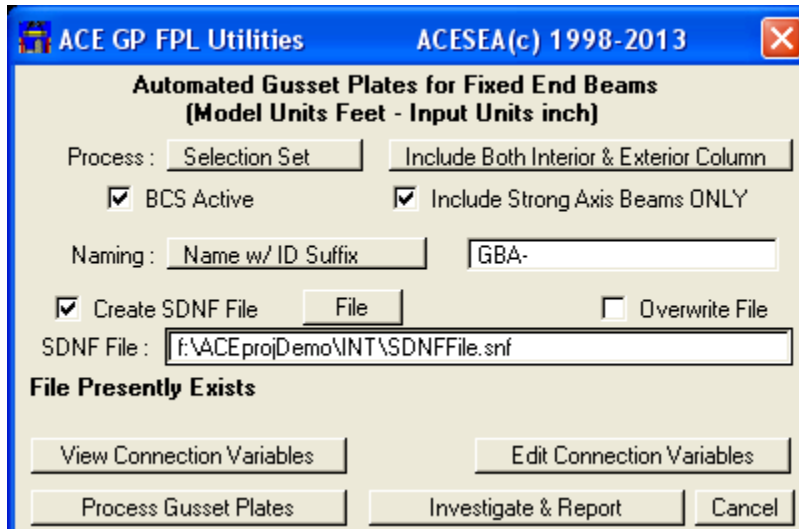
Each horizontal brace is studied (random order) to determine potential connections. Highest priority connections are attempted first and then lower priority connections are attempted until a connection is created or all options are exhausted. A horizontal brace may have only one connection per end. The maximum number of gusset plates that can be placed is equal to twice the number of horizontal braces. The number actually placed is generally much less due to the two brace to beam or three brace to beam connections.

# ACE FWP FPL Utilities – Feb 20, 2017

## Gusset Plate Utilities (continued)

### Automated Gusset Plates for Fixed End Beams

The *Automated Gusset Plates for Fixed End Beams* application places top and/or bottom plates at each beam



fixed end for the entire model (includes FWP attached models) or subset of the model defined by a selection set. A configurable set of top and bottom gusset plate variables are utilized to size the plate. A constant set of variables may be utilized for all connections or optionally the configuration may be based upon beam characteristics for the beam involved in the connection. This utility allows the option using a single set of connection variables (defined in definition file) or also defining a set of connection variable files with the BCS/BCV capability (see pages 4 & 16). The resulting gusset plate(s) is either triangular, rectangular, four sided or 5 sided and is represented by

FrameWorks steel solid shape (type solid, slab or wall elements). Gusset plates are sized & placed for the purpose of interference detection - NOT FOR THE PURPOSES OF CONNECTION DESIGN. The connection end of a beam endpoint (beam endpoint must have rotation about local Z axis restrained) must either intersect a column cardinal point (CP) line or intersect a column endpoint. The ACE\_GBA application is designed to place large numbers of gusset plates in one fell swoop. This application also provides the option to create a steel detailing neutral (SDNF) file which can be transmitted to fabricator to define allowable gusset plate limits.

### Connection Types

This gusset plate utility is limited to a single connection type. This utility will place top and/or bottom gusset (stiffener) plates on the fixed end of flat beams framing into column ends or interior. Each beam is studied (random order) to determine potential for connections. A beam may have only one connection per end. The maximum number of gusset plates that can be placed is equal to four times the number of beams.

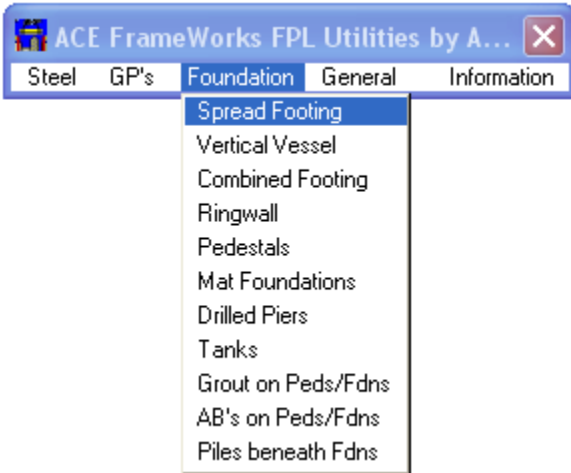
This Automated Gusset Plate application features simple but powerful operation. Ideally this (and all gusset plate applications) application should be operated on a “gusset plate only model” which has the structure attached as a model partition(s). Placing gusset plates directly into the model will work, but solid elements tend to be quite slow and the gusset plate solids will pose an enormous performance penalty for large structures. Gusset plates produced by this application can be considered throw-away files which can be easily recreated using the latest model(s). Thus immediately prior to interference detection investigation, existing gusset plates be deleted and a new set of gusset plates can be placed with this application.



# ACE FWP FPL Utilities – Feb 20, 2017

## Foundation Utilities

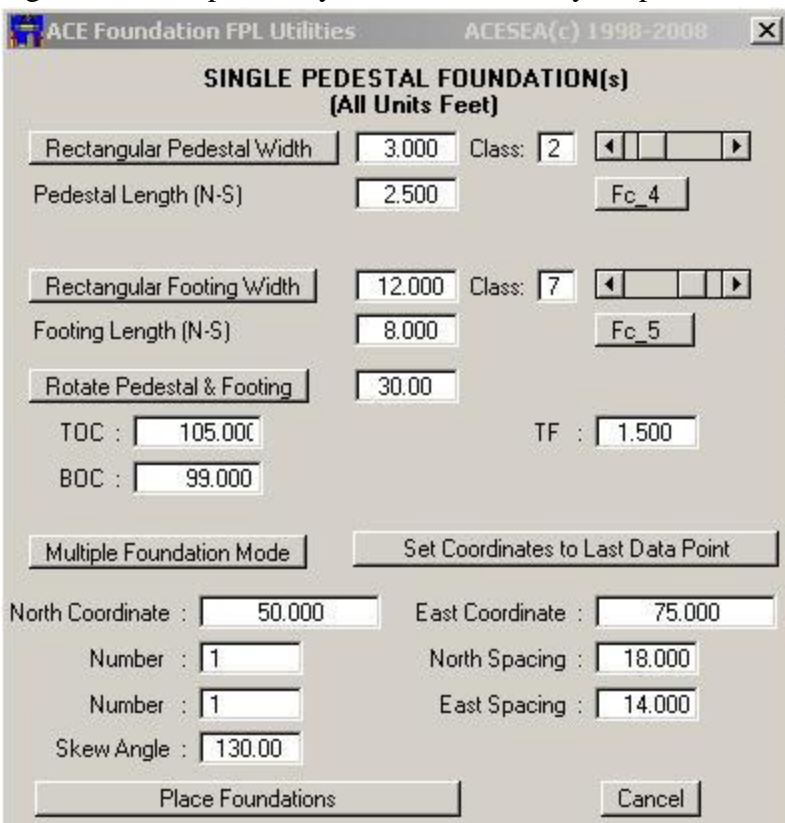
There are eleven foundation utilities. The foundation utilities include: Spread Footing; Vertical Vessel;



Combined Footing; Ringwall; Pedestals; Mat Foundations, Drilled Piers, Tank Foundations, Grout Pads on Peds/Fdns, AB Groups on Peds/Fdns & Pile Groups beneath Foundations. The Dynamic Name Definition feature has been incorporated into all foundation utilities. The Immediate Undo Capability is also supported by the Foundation utilities. This capability allows FrameWorks solids (foundation components) to be immediately removed after placement. In addition, all foundation utilities support all FrameWorks models units (feet, inch, meters & mm). Each utility is briefly discussed in the ensuing pages.

## Spread Footing Foundation

The single pedestal foundation program allows for the rapid placement of rectangular or square spread footings with a single rectangular, square or round concentric pedestal. The pedestal and/or footing may be rotated together or independently. Foundations may be placed in a single or multiple placement mode. In the single



placement mode, foundations are placed one at a time. In the multiple placement mode a rectangular grid is specified by number North/South and North spacing and number East/West and East spacing. A skew angle for the rectangular grid may be specified in cases where the grid is not aligned with N/S & E/W coordinates. Foundation coordinates are specified to the center and may be keyed in or may be selected as the “last data point”.

This foundation utility has internal defaults for all values shown in dialog box, however, user defined defaults may be specified using a foundation definition file. The foundation definition file applies to all 11 foundation types and format for this file is presented and discussed in detail at the end of this document. A sample foundation default file (ACE\_FDN.DEF) is distributed with the software.

For a given foundation the pedestal and footing are given the same name concatenating the FWP

ID to a prefix. The default prefix is SPF, however a different prefix may be specified in the definition file. Other naming options include a 1) constant specified name for all spread footing foundations, 2) dynamic naming at placement time or 3) FrameWorks normal naming for solids (autoname). Dynamic naming is a powerful feature that displays the last name (prefix) and allows it to be changed as a foundation is about to be placed. An option exists to append a FWP ID to the prefix. An abort option is also available when dynamic naming is active.

# ACE FWP FPL Utilities – Feb 20, 2017

## Foundation Utilities (continued)

### Combined Footing Foundation

The combined footing foundation program allows for the rapid placement of rectangular or square spread

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**COMBINED FOOTING FOUNDATION(s)**  
(All Units Feet)

Two Pedestal Foundation Class: 2 Fc\_3

Octagonal Pedestal Diameter 3.000

Fdn CL to Ped1 CL (North +): -2.500 Ped 1 TOC 106.000

Circular Pedestal Diameter 2.000

Ped1 CL to Ped2 CL (North +): 5.000 Ped 2 TOC 107.000

Rectangular Footing Width 9.000 Class: 7 Fc\_3

Footing Length (N-S) 15.000

Rotate Pedestals & Footing 0.00

BOC : 99.000 TF : 1.500

Single Foundation Mode Set Coordinates to Last Data Point

North Coordinate : 100.000 East Coordinate : 200.000

Place Foundation Cancel

footings with two (or one) rectangular, square, octagonal or round one-way non-concentric pedestals. The pedestals and/or footing may be rotated together or independently. Foundations may be placed in a single or multiple placement mode. In the single placement mode, foundations are placed one at a time. In the multiple placement mode, a rectangular grid is specified by number North/South and North spacing and number East/West and East spacing. A skew angle for the rectangular grid may be specified in cases where the grid is not aligned with N/S & E/W coordinates. Foundation coordinates are specified to the center of the footing and may be keyed in or may be selected as the “last data point”. This foundation utility has internal defaults for all values shown in dialog box, however, user defined defaults may be specified using a foundation definition file. The foundation definition file applies to all 11 foundation types and format for this file is presented and discussed in detail at the end of this document. A sample foundation default file (ACE\_FDN.DEF) is distributed with the software and is also presented in this document.

For a given foundation the pedestal(s) and mat are given the same name by concatenating the FWP ID to a prefix. Other naming options

include a 1) constant specified name for all combined footing foundations, 2) dynamic naming at placement time or 3) FrameWorks normal naming for solids. Dynamic naming is a powerful feature that displays the last name (prefix) and allows it to be changed as a foundation is about to be placed. An option exists to append a FWP ID to the prefix. An abort option is also available when dynamic naming is active.

# ACE FWP FPL Utilities – Feb 20, 2017

## Foundation Utilities (continued)

### Vertical Vessel Foundation

The vertical vessel foundation program allows for the rapid placement of vertical vessel foundations. The

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AB Pattern File

**AB Group on Pedestals & Foundations**  
(All Units Feet - UNO)

Select Pedestal or Foundation Method: Individual Select

**Pedestal/Foundation Data**  
Select a Foundation or Pedestal to Receive AB Group

**Anchor Bolt Group Data**

Standard ACESEA Bolt Patterns 1AB

SR1 1/2 AB Proj: 3.500 in AB SubType: 2002

1 Bolt Pattern: Bolt may be offset in either the NS and/or EW directions

E-W Spc: 9.000 in N-S Spc: 9.000 in AB Grp Rot: 0.000

Grade: A193 Class: 3 HB(NG: 2)

Dynamic Naming ABs

**FOUNDATION MUST BE SELECTED**

Place AB Group Display Cancel

pedestal (optional) may be square or octagonal and the footing may be square or octagonal. The pedestal and/or footing may be rotated together or independently. Foundations may be placed in a single or multiple placement mode. In the single placement mode, foundations are placed one at a time. In the multiple placement mode a rectangular grid is specified by number North/South and North spacing and number East/West and East spacing. A skew angle for the rectangular grid may be specified in cases where the grid is not aligned with N/S & E/W coordinates. Foundation coordinates are specified to the center (pedestal & footing are concentric) and may be keyed in or may be selected as the “last data point”.

This foundation utility has internal defaults for all values shown in dialog box, however, user defined defaults may be specified using a foundation definition file. The foundation definition file applies to all 11 foundation

types and format for this file is presented and discussed in detail at the end of this document. A sample foundation default file (ACE\_FDN.DEF) is distributed with the software and is also presented in this document..

For a given foundation the pedestal and footing are given the same name by concatenating the FWP ID to a prefix. Other naming options include a 1) constant specified name for all vertical vessel foundations, 2) dynamic naming at placement time or 3) FrameWorks normal naming for solids (autoname). Dynamic naming is a powerful feature that displays the last name (prefix) and allows it to be changed as a foundation is about to be placed. An option exists to append a FWP ID to the prefix. An abort option is also available when dynamic naming is active.

# ACE FWP FPL Utilities – Feb 20, 2017

## Foundation Utilities (continued)

### Ringwall Foundation

The ringwall foundation program allows for the rapid placement of ringwall foundations. Ringwall foundations

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**RINGWALL FOUNDATION(s)**  
(All Units Feet)

Wall Defined by OD & ID Class: 5

Wall OD : 75.000 Wall ID : 72.000 Fc\_4

Ringwall Thickness = 1.500 Ringwall Centerline = 73.500

Wall Defined by TOC & BOC

TOC : 101.000 Ringwall Height = 4.000

BOC : 97.000

Single Foundation Mode Set Coordinates to Last Data Point

North Coordinate : 225.000 East Coordinate : 75.000

Place Foundation Cancel

may be placed in a single or multiple placement mode. In the single placement mode, foundations are placed one at a time. In the multiple placement mode a rectangular grid is specified by number North/South and North spacing and number East/West and East spacing. A skew angle for the rectangular grid may be specified in cases where the grid is not aligned with N/S & E/W coordinates. Ringwall foundation coordinates are specified to the center and may be keyed in or may be selected as the “last data point”. Ringwall diameters may be specified by: Wall OD & ringwall thickness, Wall ID & ringwall thickness or Wall OD & Wall ID. Ringwall dimensions may be specified by: BOC & ringwall height, TOC & ringwall height or TOC & BOC.

This foundation utility has internal defaults for all values shown in dialog box, however, user defined defaults may be specified using a foundation definition file. The foundation

definition file applies to all 11 foundation types and format for this file is presented and discussed in detail at the end of this document. A sample foundation default file (ACE\_FDN.DEF) is distributed with the software and is also presented in this document.

For a given foundation the foundation is named by concatenating the FWP ID to a prefix. Other naming options include a 1) constant specified name for all ringwall foundations, 2) dynamic naming at placement time or 3) FrameWorks normal naming for solids (autoname). Dynamic naming is a powerful feature that displays the last name (prefix) and allows it to be changed as a foundation is about to be placed. An option exists to append a FWP ID to the prefix. An abort option is also available when dynamic naming is active.



# ACE FWP FPL Utilities – Feb 20, 2017

## Foundation Utilities (continued)

### Mat Foundations

The mat foundation program allows for the rapid placement of square, rectangular, octagonal or circular mat

The screenshot shows the 'MAT FOUNDATION(s)' dialog box. It includes fields for 'Circular Mat Diameter' (20.000), 'Class' (7), and 'Fc\_3'. There are buttons for 'No Rotation' and 'Thickness Defined by TOC & BOC'. The 'TOC' field is 103.000 and 'BOC' is 99.000, with a 'Mat Thickness = 4.000' label. At the bottom, there are buttons for 'Single Foundation Mode' and 'Set Coordinates to Last Data Point', and input fields for 'North Coordinate' (200.000) and 'East Coordinate' (125.000). 'Place Foundation' and 'Cancel' buttons are at the bottom.

foundations. The mat foundation may be rotated. Foundations may be placed in a single or multiple placement mode. In the single placement mode, foundations are placed one at a time. In the multiple placement mode a rectangular grid is specified by number North/South and North spacing and number East/West and East spacing. A skew angle for the rectangular grid may be specified in cases where the grid is not aligned with N/S & E/W coordinates. Foundation coordinates are specified to the center and may be keyed in or may be selected as the “last data point”. The mat foundation utility in conjunction with the pedestal utility can create virtually any desired foundation.

This foundation utility has internal defaults for all values shown in dialog box, however, user defined defaults may be specified using a foundation definition file. The foundation definition file applies to all 11 foundation types and format for this file is presented

and discussed in detail in the documentation. For a given foundation the foundation is named by concatenating the FWP ID to a prefix. Other naming options include a 1) constant specified name for all mat foundations, 2) dynamic naming at placement time or 3) FrameWorks normal naming for solids. Dynamic naming is a powerful feature that displays the last name (prefix) and allows it to be changed as a foundation is about to be placed. An option exists to append a FWP ID to the prefix. An abort option is available when dynamic naming is active.

### Pedestals

The pedestal foundation program allows for the rapid placement of rectangular, square, octagonal or round

The screenshot shows the 'PEDESTAL FOUNDATION(s)' dialog box. It includes fields for 'Rectangular Pedestal Width' (2.500), 'Class' (1), and 'Fc\_3'. There are buttons for 'Pedestal Length (N-S)' (2.000) and 'Rotate Pedestal' (0.00). The 'Pedestal Defined by TOC & BOC' section has 'TOC' (106.000) and 'BOC' (101.000) fields, with a 'Pedestal Height = 5.000' label. At the bottom, there are buttons for 'Multiple Foundation Mode' and 'Set Coordinates to Last Data Point', and input fields for 'North Coordinate' (70.000), 'East Coordinate' (75.000), 'Number' (1), 'North Spacing' (25.000), 'East Spacing' (20.000), and 'Skew Angle' (30.00). 'Place Foundations' and 'Cancel' buttons are at the bottom.

pedestals. The pedestal may be rotated. Pedestals may be placed in a single or multiple placement mode. In the single placement mode, pedestals are placed one at a time. In the multiple placement mode, a rectangular grid is specified by number North/South and North spacing and number East/West and East spacing. A skew angle for the rectangular grid may be specified in cases where the grid is not aligned with N/S & E/W coordinates. Pedestal coordinates are specified to the center and may be keyed in or may be selected as the “last data point”. Pedestals may be specified by: BOC & height, TOC & height or TOC & BOC. The pedestal utility combined with the mat utility can create virtually any foundation. This foundation utility has internal defaults for all values shown in dialog box, however, user defined defaults may be specified using a foundation definition file.

# ACE FWP FPL Utilities – Feb 20, 2017

## Foundation Utilities (continued)

### Pedestal Foundations (continued)

The foundation definition file applies to all 11 foundation types and format for this file is presented and discussed in detail at the end of this document. For a given foundation the foundation is named by concatenating the FWP ID to a prefix. Other naming options include a 1) constant specified name for all pedestal foundations, 2) dynamic naming at placement time or 3) FrameWorks normal naming for solids (autoname). Dynamic naming is a powerful feature that displays the last name (prefix) and allows it to be changed as a foundation is about to be placed. An option exists to append a FWP ID to the prefix. An abort option is also available when dynamic naming is active.

### Drilled Pier Foundations

The drilled foundation program allows for the rapid placement of drilled shaft pier foundations, which may

The screenshot shows the 'ACE Foundation FPL Utilities' dialog box, titled 'ACESEA(c) 1998-2008'. The main section is 'DRILLED PIER FOUNDATION(s) (All Units Feet)'. It has a tab 'Pedestal & Drilled Shaft'. The 'Rectangular Pedestal Width' is 2.000, 'Pedestal Length (N-S)' is 1.500, and 'Rotate Pedestal' is 0.000. The 'Pedestal Defined by TOC' is 105.000, and 'Pedestal Height' is 6.000. The 'Shaft TOC' is 99.000, 'Shaft BOC' is 87.000, and 'Shaft Diameter' is 3.000. The 'Class' is 2 for the pedestal and 7 for the shaft. There are buttons for 'Fc\_3' and 'Fc\_6'. At the bottom, there is a 'Multiple Foundation Mode' section with 'Set Coordinates to Last Data Point' checked. It shows 'North Coordinate' as 100.000, 'East Coordinate' as 125.000, 'Number' as 1, 'North Spacing' as 15.000, 'East Spacing' as 20.000, and 'Skew Angle' as 0.000. There are 'Place Foundations' and 'Cancel' buttons.

optionally include pedestals (rectangular, square or round) and/or bell bottoms. The pedestal may be rotated. Drilled pier foundations may be placed in a single or multiple placement mode. In the single placement mode, foundations are placed one at a time. In the multiple placement mode a rectangular grid is specified by number North/South and North spacing and number East/West and East spacing. A skew angle for the rectangular grid may be specified in cases where the grid is not aligned with N/S & E/W coordinates. Foundation coordinates are specified to the center and may be keyed in or may be selected as the “last data point”. Several input options are available for both pedestal & bell bottom definition.

This foundation utility has internal defaults for all values shown in dialog box, however, user defined defaults may be specified using a foundation definition file. The foundation definition file applies to all 11 foundation types and format for this file is presented and discussed in detail at the end of this document.

For a given foundation the foundation components (pedestal, shaft & bell) are given the same name by concatenating the FWP ID to a prefix. Other naming options include a 1) constant specified name for all drilled pier foundations, 2) dynamic naming at placement time or 3) FrameWorks normal naming for solids (autoname). Dynamic naming is a powerful feature that displays the last name (prefix) and allows it to be changed as a foundation is about to be placed. An option exists to append a FWP ID to the prefix. An abort option is also available when dynamic naming is active.

# ACE FWP FPL Utilities – Feb 20, 2017

## Foundation Utilities (continued)

### Tanks Utility

The concrete tank/foundation program allows for the rapid placement of rectangular, square, or round concrete tanks with or without a top and with or without a base. The base may be oversized and a rectangular base may

ACE Foundation FPL Utilities ACESEA(c) 1998-2008

**TANK FOUNDATION(s)**  
(All Units Feet)

Tank w/ Top tk = 1.500 Class: 6

Circular Tank Wall tk = 1.250 Fc\_4

Tank Width 15.500

TOC : 101.000 BOC : 84.000

Tank w/ Larger Base tk = 2.25 Class: 5

☐ Rectangular Base Fc\_4

Base Width 18.000

Single Foundation Mode Set Coordinates to Last Data Point

North Coordinate : 300.000 East Coordinate : 75.000

Place Foundation Cancel

be placed beneath a circular tank. A top is optional and is always the same size and configuration as the tank if a top is requested. Tanks may be placed in a single or multiple placement mode. In the single placement mode, tanks are placed one at a time. In the multiple placement mode a rectangular grid is specified by number North/South and North spacing and number East/West and East spacing. A skew angle for the rectangular grid may be specified in cases where the grid is not aligned with N/S & E/W coordinates. Tank coordinates are specified to the center and may be keyed in or may be selected as the “last data point”.

This foundation utility has internal defaults for all values shown in dialog box, however, user defined defaults may be specified using a foundation definition file. The foundation definition file applies to all 11 foundation types and format for this file is in the sample default file provided with this utility. The sample foundation default file (ACE\_FDN.DEF) is

distributed with the software.

For a given foundation the foundation components (top, tank walls & base) are given the same name by concatenating the FWP ID to a prefix. Other naming options include: constant specified name for all tank foundations; dynamic naming at placement time; or FrameWorks normal naming for solids (autoname). Dynamic naming is a powerful feature that displays the last name (prefix) and allows it to be changed as a foundation is about to be placed. An option exists to append a FWP ID to the prefix. An abort option is also available when dynamic naming is active

# ACE FWP FPL Utilities – Feb 20, 2017

## Foundation Utilities (continued)

### Grout Pads on Pedestals/Foundations

The Grout Pads on Pedestals/Foundations application allows

for the rapid placement grout pads on pedestals, foundations or specific locations. A pedestal/foundation is any flat FWP solid of rectangular, square, circular or octagonal shape. A single pedestal/foundation may be selected or a selection set of pedestals/foundations may be utilized. In the selection set mode, the pedestal/foundation data is displayed for acceptance or rejection. Once accepted all identical shapes in the original selection set will be processed. The grout pad may match the shape of the foundation or the grout pad may be rectangular, square, circular or octagonal. The grout pad may be placed as a FWP solid type SOLID or SLAB. If the grout pad matches the foundation, a grout pad edge clearance may be specified. When placing grout pads at specific location (good for slabs or foundations where pad is not centered on foundation), the grout pad may be rectangular, square, circular or octagonal. In cases where the grout pad shape is specified, an optional rotation angle for the pad

may be specified. The specific location is specified with coordinates at the center of the grout pad and may be keyed in or may be selected as the “last data point”. A section titled “Coordinate System for Foundation Programs” is presented later in this document which covers the coordinate system nomenclature and foundation orientation notes.

Once a foundation is selected or a location is selected, the grout pad is displayed in temporary graphics – providing grout pad is valid. A grout pad is valid if it does not overlap the foundation and if the size of the pad allows placement of grout pad according to thickness, edge clear & rise/run.

This foundation utility has internal defaults for all values shown in dialog box, however, user defined defaults may be specified using a foundation definition file. The foundation definition file applies to all 11 foundation types and format for this file is presented and discussed in detail at the end of this document.

A grout pad may be named several ways. The grout pad naming options include: 1) Named the same as the solid to which it is applied, 2) Named by concatenating the FWP ID to a prefix (default GRT), 3) Constant specified name for all grout pads, 4) Dynamic naming at placement time or 5) FrameWorks normal naming for solids (autoname). Dynamic naming is a powerful feature that displays the current name (prefix) and allows it to be changed as a grout pad is about to be placed. An option exists to append a FWP ID to the prefix. An abort option is also available when dynamic naming is active.



# ACE FWP FPL Utilities – Feb 20, 2017

## Foundation Utilities (continued)

### Anchor Bolt Groups on Pedestals/Foundation

The Anchor Bolt Groups on Pedestals/Foundation application allows for the rapid placement Anchor Bolt

Groups on pedestals, foundations or at specific locations. A pedestal/foundation is any flat FWP solid of rectangular, square, circular or octagonal shape. A single pedestal/foundation may be selected or a selection set of pedestals/foundations may be utilized. In the selection set mode, the pedestal/foundation data is displayed for acceptance or rejection. Once accepted all identical shapes in the original selection set will be processed. The Anchor Bolts Group may be from a set internal patterns or from an external user supplied Anchor Bolt Group Pattern file. The internal patterns are 1, 2, 4, 6 & 8 bolts patterns in various configurations or a circular bolt pattern. The spacing & size of the anchor bolts is specified via keyin fields and option buttons for internal patterns. External pattern files specify the spacing & may specify bolt size which can be overridden from dialog box. External patterns may consist of the standard internal patterns or may be defined as

random or symmetric patterns (see pages 40 thru 42). The AB group is placed at the center of the foundation but may be rotated relative to the foundation. The BOS for the AB is the TOC for the foundation and the TOS is determined by the AB projection. If specific location option is utilized, the selected point is the center of the AB group and also the BOS. A section titled “Coordinate System for Foundation Programs” is presented later in this document which covers the coordinate system nomenclature and foundation orientation notes.

Once a foundation is selected or a location is selected, the Anchor Bolt Group is displayed in temporary graphics. An anchor bolt group cannot be placed if it overlaps the foundation and/or impinges on edge clearance specification.

This foundation utility has internal defaults for all values shown in dialog box, however, user defined defaults may be specified using a foundation definition file. The foundation definition file applies to all 11 foundation types and format for this file is presented and discussed in detail at the end of this document.

An anchor bolt group may be named several ways. The anchor bolt group naming options include: 1) Named the same as the solid to which it is applied, 2) Named by concatenating the FWP ID to a prefix (default ABG), 3) Constant specified name for all anchor bolt groups, 4) Dynamic naming at placement time or 5) FrameWorks normal naming for solids (autoname). Dynamic naming is a powerful feature that displays the current name (prefix) and allows it to be changed as a anchor bolt group is about to be placed. An option exists to append a FWP ID to the prefix. An abort option is also available when dynamic naming is active.

# ACE FWP FPL Utilities – Feb 20, 2017

## Foundation Utilities (continued)

### Pile Groups beneath Foundations

The Pile Groups beneath Foundations application allows for the rapid placement Pile Groups beneath foundations or at specific locations. A foundation is any flat FWP solid of rectangular, square, circular or octagonal shape. A single foundation may be selected or a selection set of foundations may be utilized. In the selection set mode, the foundation data is displayed for acceptance or rejection. Once accepted all identical shapes in the original selection set will be processed. The Pile Group may be from a set internal patterns or from an external user supplied Pile Group Pattern file. The internal patterns are 1, 2, 4, 5, 6, 8, 9, 12, 15 & 16 pile patterns in various configurations or a circular pile pattern. The spacing & size of the piles is specified via keyin fields and option buttons for internal patterns. External pattern files specify the spacing & may specify pile size which can be overridden from dialog box. External patterns may consist of the standard internal patterns or may be defined as random or symmetric patterns (see pages 43 thru 45). The Pile group is placed at the center of the foundation but may be rotated relative to the

foundation. The TOS for the pile is the BOC for the foundation plus embedment or TOS may be specified and the BOS is either specified or determined by the pile length. If specific location option is utilized, the selected point is the center of the Pile group and also considered BOC for TOS computation. A section titled “Coordinate System for Foundation Programs” is presented later in this document which covers the coordinate system nomenclature and foundation orientation notes.

Once a foundation is selected or a location is selected, the Pile Group Group is displayed in temporary graphics. A pile group cannot be placed if it overlaps the foundation and/or impinges on edge clearance specification.

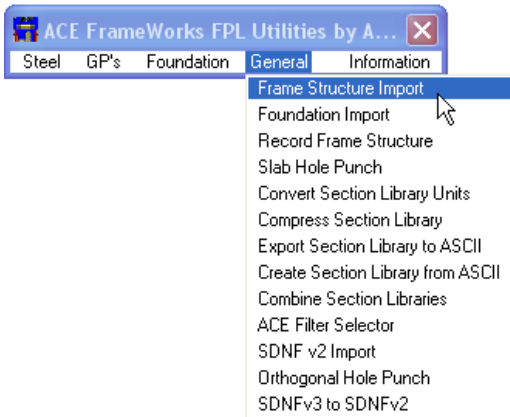
This foundation utility has internal defaults for all values shown in dialog box, however, user defined defaults may be specified using a foundation definition file. The foundation definition file applies to all 11 foundation types and format for this file is presented and discussed in detail at the end of this document.

A pile group may be named several ways. The pile group naming options include: 1) Named the same as the solid to which it is applied, 2) Named by concatenating the FWP ID to a prefix (default PIL), 3) Constant specified name for all anchor bolt groups, 4) Dynamic naming at placement time or 5) FrameWorks normal naming for solids (autoname). Dynamic naming is a powerful feature that displays the current name (prefix) and allows it to be changed as a pile group is about to be placed. An option exists to append a FWP ID to the prefix. An abort option is also available when dynamic naming is active.

# ACE FWP FPL Utilities – Feb 20, 2017

## General Utilities

There are twelve general utilities. The general utilities include: Frame Structure Import; Foundation Import; Record Frame Structure; SDNF Import, Slab Hole Punch; Orthogonal Hole Punch; ACE Filter Selector; Compress Section Library; Convert Section Library Units; Export Section Library to ASCII & Create Section Library from ASCII & Combine Section Libraries. Where applicable, all general utilities now support all FrameWorks models units (feet, inch, meters & mm). All eleven general utilities are described in ensuing pages.



## Foundation Import Program

The foundation import program can be utilized to place the twelve foundation types supported by eleven ACE



FWP FPL Foundation utilities which include: Single Pedestal Foundation, Vertical Vessel Foundation, Combined Footing Foundation, Eccentric Footing Foundation, Mat Foundation, Pedestals, Ringwall Foundation, Drilled Pier Foundation, Concrete Tank Foundation, Grout Pads on Peds/Fdns, AB Groups on Peds/Fdns & Pile Groups beneath Fdns. As with all ACE FWP FPL Utilities, the foundation utilities are MDL/FPL (MicroStation Development Language & FrameWorks Parametric Language) applications, which run under Intergraph's

FrameWorks Plus product. The foundations are all created from solid FWP shape(s) or FWP members. This program reads a defined ASCII file format (extension FDN) and places all valid foundation definitions found in the file. A sample of the FDN ASCII file (named ACE.FDN) is distributed with this application. The sample illustrates the simple format for foundation definition. The format for the FDN file is outlined later in detail in this document. All necessary FrameWorks parameters can be specified for all components in the foundation import file. The application will by default look for \*.FDN files in the c:\ directory. The starting search directory can be specified with the environment variable ACE\_FDN\_FILE. The foundation import file support a units command so that English specified FDN file can be imported into a Metric model and vice versa.

Several foundation naming options are available. First the foundation name that is specified in the ASCII file may be utilized. The second option allows new names to be generated at placement time. Under this option, all components for a given foundation are given the same name by concatenating the type and first FDN\_ID. The third option groups foundation names by type and sequence number. Finally, FrameWorks normal naming (autaname) for individual components may be specified.

This application can be extremely useful for organizations that have internally developed foundation design utilities or use commercial applications that support the FDN file format. Internally developed applications can be easily modified to create an ASCII file that can be read by this utility to FWP foundation models. The models can be utilized for interference checking, material takeoff, design review, drawing generation or any other FWP manipulation or capability.

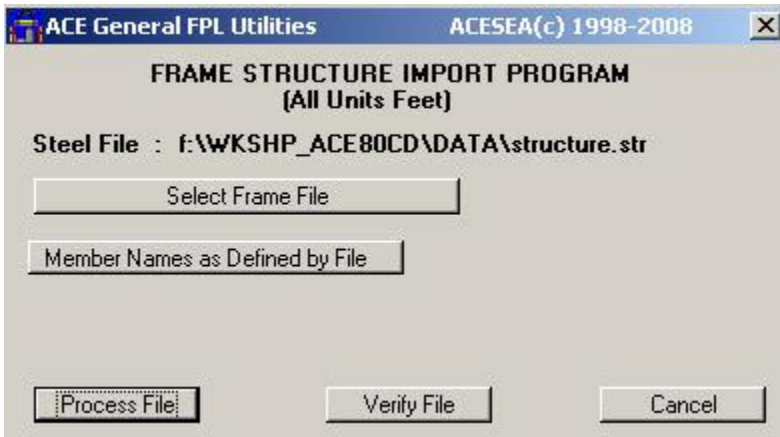


## ACE FWP FPL Utilities – Feb 20, 2017

### General Utilities (continued)

#### ACE FWP Frame Structure Import Program

The frame structure import program can be utilized to place ordinary FrameWorks tapered/non-tapered members & arcs (beams, columns, vertical & horizontal braces), which are defined by FWP section libraries. This program reads a defined ASCII file format (extension STR) and places all valid frame members found in the file. A sample ASCII file, ACE.STR, is distributed with the product, which illustrates the simple format for frame member definition. For each arc/member the following information may be specified: section size, type, class, name, end points, center point for arcs, material, grade, orientation vector, rotation, reflect status and cardinal point.

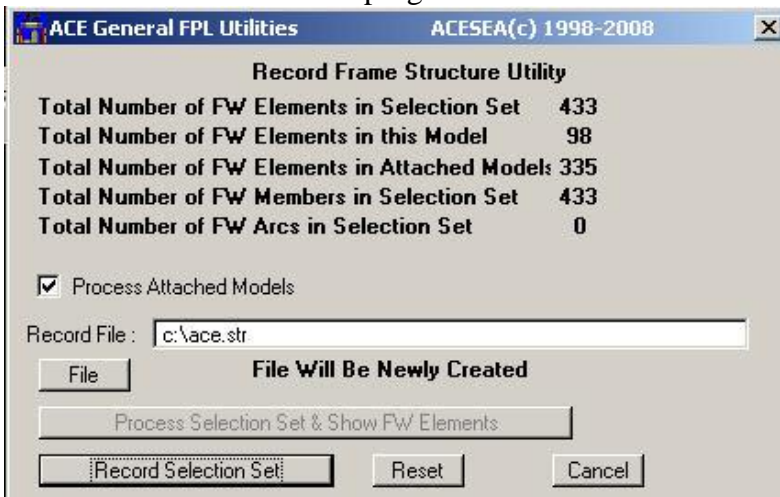


Several frame member naming options are available. First the frame member name may be specified in the ASCII file and that name may be requested as shown in the dialog box at the left. However, new names can be generated at placement time. Under this option, all components for a given member type (beam, column etc ...) are given the a name by concatenating a sequence number to a prefix (i.e. BM CO etc ...). Finally, FrameWorks normal naming for individual components (autoname) may be specified.

This program can be extremely useful for organizations that have piperack or similar design/database utilities. Inhouse utilities can be modified to create a ASCII file which can be read by this utility to create FrameWorks models which can be used for interference checking, design review, drawing generation and more.

#### ACE FWP Frame Structure Record Program

The record frame structure program can be utilized to record a selection set of ordinary FrameWorks framing arc/member (beams, columns, vertical braces, and horizontal braces). This program records/writes a defined ASCII file format (default extension STR) and places all valid (must have an attached FWP library definition) frame members found in the file. This utility produces a file that is compatible with the Frame Structure Import utility. A sample of a valid ASCII file, ACE.STR, is distributed with this application.



is exported: section size, type, class, name, end points (adjusted from offsets), center point for arcs, material, grade, orientation vector, rotation, reflect status and cardinal point.

The ASCII file for the frame import utility and the frame record utility are compatible. The rules for the ASCII file are discussed toward the end of the documentation for this utility. This program can be used to record complete structures or subsets. The ASCII file can be easily edited. The ASCII file format supports both units and offset commands. Using these capabilities English models can be converted or imported into Metric models and vice-versa. (Section Library Units Conversion Utility can be useful in such a situation).



# ACE FWP FPL Utilities – Feb 20, 2017

## General Utilities (continued)

### Slab Hole Punch Program

The slab hole punching utility facilitates easy hole punching for flat slab solids. The slab must be a horizontal flat shape (any planar shape – multi sided polygon & arcs OK). The hole can be rectangular, square, slotted or circular holes at any specified planar angle. The hole may be a complete or optionally the hole may be a partial hole punched from either the top or bottom. To operate the hole puncher first select a FWP solid. If holes are desired, press the Activate Hole Punch button. The interactive hole punch dialog box will be displayed (see below left). Select either interactive or batch mode. In the interactive mode, rectangular, square and round holes can be punched repeatedly. Simply specify the size and location and press the

Punch Hole button.

In the batch mode, an ASCII file hole specification file is selected. A sample file and the command definition are distributed with the application. A great way to utilize the batch capability is to keep track of a given slab penetrations in either a database, spreadsheet, ASCII file etc. Then when hole requirements change, the holes can be quickly re-punched with the following steps. First, delete all holes in the existing slab. Next, create the new batch file from database or whatever. Finally, run the batch capability for the Slab Hole Puncher. A large number of punched holes will take a while but not nearly as long as the old manual approach.

### Orthogonal Hole Punch

The *Orthogonal Hole Punch* application simplifies the punching of holes in conforming FWP solids (SLAB, WALL & SOLID). A conforming solid is any solid that is formed via a rectangular surface shape projected a constant distance. While such a solid will have six faces, only the two faces, original shape & projected copy, may be punched. Round, square, rectangular & slotted holes may be punched. The hole may be punched completely or partially through the solid. The opening dimensions may be defined or may be selected from a “openings library”. An opening may extend over the surface boundary. For such a case, the hole is a subset of the opening. The opening and the FWP solid surface are highlighted when FWP solid is selected and a opening is active. The dialog box left is the one seen when the program is started. A FWP solid is selected using the FWP Solid pull-down menu and a face is selected using surface option button. Next, the opening location, punch depth, rotation & WP are selected. The opening is either selected via option button or a custom opening size is defined. When all is as desired, the hole can be punched with the PUNCH HOLE button. Any parameter (face, location, punch depth, rotation, WP, opening, opening library, FWP Solid) may be changed at any time.

ACE General FPL Utilities ACESEA(c) 1998-2008

Selection Set Mode HOLE PUNCH (All Units Feet)

Slab Name: Mat  
Slab ID: 3 Slab Grade: Fc\_4  
Slab TOC Elev: 35.000  
Slab BOC Elev: 34.000  
Slab Thickness: 1.000  
North Limits Max: 40.000 Min: 10.000  
East Limits Max: 35.000 Min: 10.000

Activate Hole Punch Reset Selection Set Exit

ACE General FPL Utilities ACESEA(c) 1998-2008

Interactive Hole Puncher (All Units Feet)

Slab: Mat ID # 3 Interactive Punch Mode  
Slab BOC: 34.000 Thickness: 1.000  
Rectangular Hole Width: 2.000  
Hole Length (N-S): 3.000  
Hole Angle: 30.000  
Partial Punch from Top: 0.750 Slab TF = 1.00  
10.000 < North < 40.000 10.000 < East < 35.000  
Hole North Coord: 21.000 Hole East Coord: 27.500  
Set Coordinates to Last Data Point  
Punch Hole Redisplay Exit/Cancel

ACE General FPL Utilities ACESEA(c) 1998-2008

FWP Solid Opening Library Monument

ORTHOGONAL HOLE PUNCH (Units Feet - UND)

Use Pulldown Menu Option FWP Solid to select a FWP Solid  
Surface 1

Opening Location, Depth, Rotation & WP Incremental Button Movement  
Horizontal: Start Vertical: Top Punch Depth: Punch Fully Opening WP: W/P 5 Rotation: 0.000  
- Horiz + Horiz Horizontal Increment: 0.500  
- Vert + Vert Vertical Increment: 1.000

Opening Dimensions & Solid Properties  
Opening: Doorway  
Rectangular Width: 3.000 Depth: 6.000  
Standard Doorway

Hole Coordinates

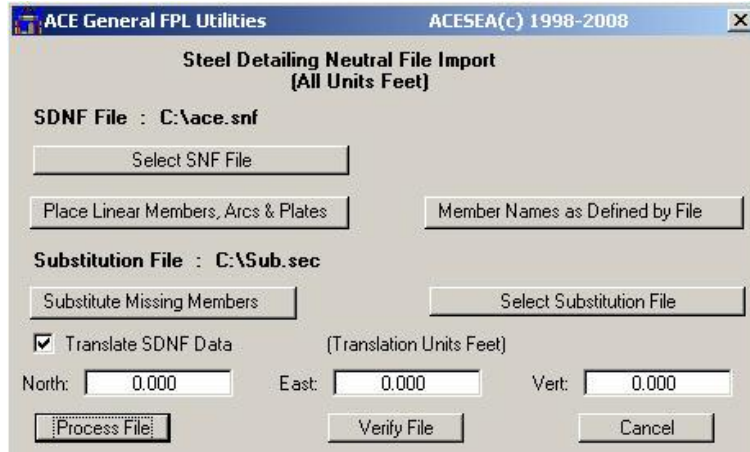
INVALID HILITE Hole Display Surface Cancel

# ACE FWP FPL Utilities – Feb 20, 2017

## General Utilities (continued)

### ACE Steel Detailing Neutral File Import Program (SDNF Import Program)

The steel detailing neutral file (SDNF) import program can be utilized to read SNDF (version 2) files created by



FrameWorks or any other application that writes the SDNF version 2 format. This SDNF Import application supports linear & arc members (tapered or non-tapered), and plate elements which are placed as solids. The following information is carried for each linear member: section size, type, class, status, name, end points, end offsets, cross section offsets, cutbacks, grade, orientation vector, rotation, reflect & mirror status and cardinal point. The following information is carried for each plate: name, class, grade, thickness, and shape vertices.

This application provides several features and options to enhance handling of SDNF files. The most

significant feature is the missing section and section substitution capabilities. If any sections are not found when a SDNF file is processed, the options is given to write an ASCII file that will contain the names of the missing sections. This missing sections file (named anything.MIS) can be easily converted into a section substitution file (named anything.SEC). The application has the ability to substitute for missing members, substitute all members or substitute no members. Thus when translating from a CAD system to FrameWorks where different section naming conventions are utilized the .MIS and .SEC files can be effectively utilized to name members. An optional feature to translate SDNF data is also available.

A second feature allows the importation of linear members and plates, linear members only or plates only. Thus, if a fabricator supplies a SDNF file with gusset plate information, this data can be read separately. Another use for this option is to put linear members and plates into separate models. The last feature involves naming of linear members & plates. Three naming options are available. First, the linear member & plate name specified in the SDNF file may be utilized. Second, new names can be generated at placement time. Under this option, all components for a given member type (member or plate) are given a name by concatenating a sequence number to a prefix (i.e. mem or pla). Third, FrameWorks normal naming for individual components may be specified.

### ACE Convert SDNF v3 File to SDNF v2 File (SDNF Conversion Program)

The convert steel detailing neutral file (SDNF) from version 3 to version 2 application can be utilized to read SNDF



version 3 files and create a SDNF version 2 file. Intergraph's FrameWorks can produce version 3 or version 2 SDNF files. This application was written to aid the situation where you receive a version 3 SDNF file and wish to import the basic SDNF components (thereby throwing away all SDNF version 3 extensions assuming they exist) into FWP utilizing the SDNF Version 2 Import (above). SDNF version 3 is a non-backward-compatible file format extension of the SDNF version 2 file format. Both file formats were developed and are maintained by Intergraph. SDNF version 3 extensions include: linear member fabricator

data & extended attribute data; round solids; complex solids; solid member fabricator data & extended attribute data; holes in solids and round-tripping capabilities. The steps for conversion are simple. First select the SDNF v3 file. The second step is selecting the SDNF v2 file name & location. Once the SNDF v3 file is defined/selected, the "Verify SDNF File" button will activate, allowing a read/verify of the SDNF v3 file. Once both the SDNFv3 file & the SDNF v2 file are selected/defined, the "Convert SDNF File" button will activate, allowing the file to be converted.

# ACE FWP FPL Utilities – Feb 20, 2017

## General Utilities (continued)

### ACE Filter Selector Utility

The ACE filter selector utility is provided facilitate the manipulation of collections of FrameWorks members. While FrameWorks currently contains both a filter capability and a locate command, the ACE filter selector is essentially another filter which provides additional grouping capabilities. The filter selector was specifically developed to aid in working with the ACE FrameWorks utilities so that utilities which produce collections of members (such as Caged Ladders, Circular Platforms, Stairs, Handrails, etc). This filter application allows the assorted components (such as rails, rungs, hoops, bars & interference envelopes for the Caged Ladder as an example) to be put into a selection set from where they can be easily manipulated as groups. This application can be useful for all of the modeling components produced with the ACE FrameWorks Utilities. This application can also be very useful in ordinary FrameWorks operations. To fully understand the uniqueness of the ACE filter selector, the filter selector along with other two native FrameWorks tools are briefly discussed & contrasted at the end of this document.



**ACE Filter Selector Dialog Box**

For the most part the filter selector capabilities are easy to understand by looking at the dialog box shown above. Each major category (Type, Component, Class & Name) may be toggled to active status. The filter is additive, that is, if a category is toggled on, the member must satisfy the criteria for that category to be included.

The Name filter allows for the inclusion of a wildcard which can be specified as either a “\*” or a “^”. The option is available to turn off the wild card capability. Wild cards may be placed at the beginning of the name, the end of the name or both. If a wildcard is placed in the center region of the name, it is treated as an ordinary character. The case of the name is relevant for this filter.



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## General Utilities (continued)

### Section Library Compression Program

The section library compression utility compresses both the library IDX (index) and DAT (data) files for any



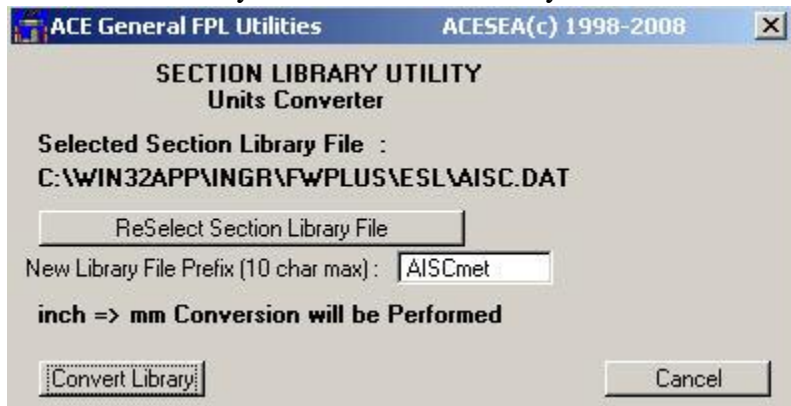
FrameWorks section library. The library may be a standard supplied library or a user created library. This utility actually creates a new library IDX and DAT files in the “compression process”. This utility will not write to or in any way change an existing library.

When members are deleted from FrameWorks libraries they are in actuality “marked for deletion”. The member remains in both the IDX and DAT file however FrameWorks will

no longer recognize the section. Deleted files can have a couple of negative effects. The primary negative effect is that of taking up extra disk space and slowing down library operations. Another negative effect can occur when a library is exported using the ACE FrameWorks utilities. The export utility works only with the DAT file and does not distinguish between deleted and undeleted sections. This can be a benefit when it is wished to “undelete” sections. This is also a great benefit when the IDX file is lost as it can be regenerated by first exporting a library DAT file and then importing the resultant ASCII file thereby generating a IDX file. In general it is recommended that a library be compressed before it is exported (unless there is a desire to retrieve deleted sections). This section library utility can be utilized with the other three ACE section library utilities to modify, combine and manage FWP section libraries.

### Section Library Units Conversion Program

The section library units conversion utility allows conversion of the units for any FrameWorks section library.



The library may be a standard supplied library or a user created library. This utility actually creates a new library in the “conversion process”. This utility will not write to or in any way change an existing library.

FrameWorks libraries have two potential units. If the library is Metric the units are mm and if the library is English the units are inches. This utility is utilized by first selecting a library to be converted. The utility recognizes the units of the existing library and if the existing library is

English the program will indicate a inches => mm conversion and conversely if the library is Metric a mm => inches conversion. A new library prefix must be supplied. The convert library button is pressed and new DAT & IDX files with converted units are generated. The new files are placed in the same location as the source library file.

Note that force related values (fyp & fyppp) are not converted but rather become zero. If these force related values are important they can be manually converted by first converting the library. Next, export the newly generated library and manually edit the force related variables. Finally, import the edited ASCII file.

This section library utility can be utilized with the other three ACE section library utilities to modify, combine and manage FWP section libraries.



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## General Utilities (continued)

### Section Library ASCII File Export Program

The section library ASCII file export utility allows the export of any FrameWorks section library. The library may be a standard supplied library or a user created library. This utility creates ASCII file (.TXT extension), which contains all the shapes in the selected source DAT file. This utility will not write to or in any way change an existing library.



This utility is utilized by first selecting a library to be exported. The utility reads each section in the existing library (deleted or active) and dumps each section to the ASCII file. An ASCII library prefix must be supplied. If the TXT file exists, an option is given to overwrite the TXT file. The Export ASCII library button is pressed and a TXT file is created. The new file is placed in the same location as the source library file. A typical section with non-zero values will produce five lines of data in the ASCII file. Each value is preceded by the property name and then the value. If a value is zero, it is not exported. The companion ASCII file import program reads the ASCII file export format to generate a new library. In addition, the properties of individual sections can be easily modified (i.e. names or section properties). Additionally, the export/import utilities can be utilized to re-create missing IDX files. Also since all section definitions in the DAT file are exported (deleted or active), deleted member information may be retrieved. Exporting deleted members can be both a benefit and a detriment depending upon the situation. The compress utility can be utilized to discard deleted members before exporting if only undeleted members are desired.

### Section Library ASCII File Import Program

The section library ASCII file import utility allows the creation of FrameWorks section library files from a ASCII file. The ASCII file must conform to a specific format. This utility creates FWP section library files (DAT & IDX extension) for each valid section in the ASCII file. This utility will not write to or in any way change an existing library or ASCII file.



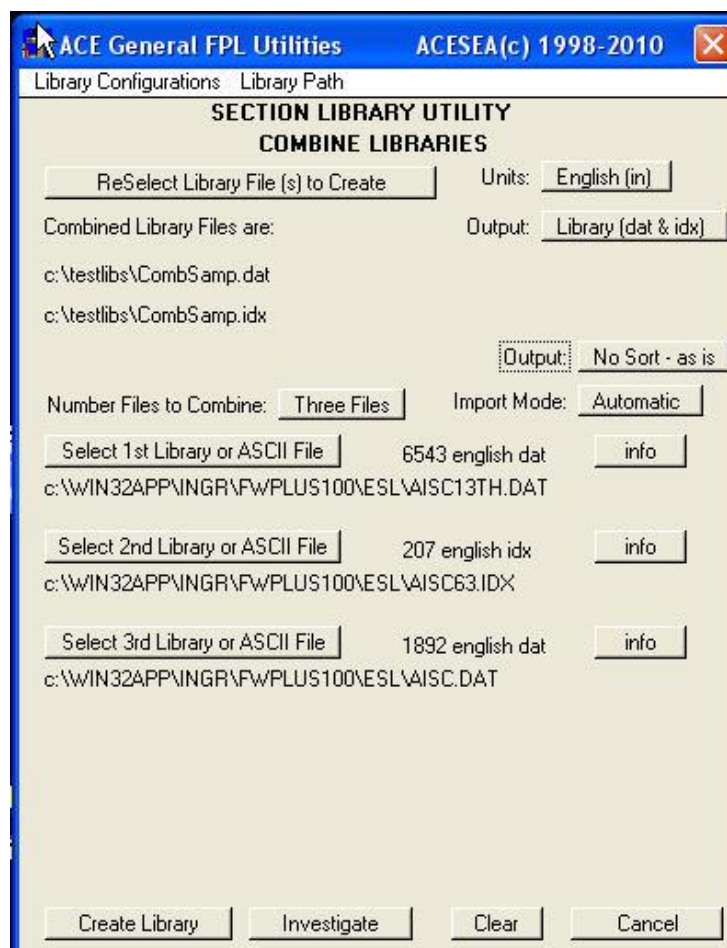
This utility is utilized by first selecting a ASCII section library file to be imported. The utility reads each section in the ASCII library file and creates a entry in both the new DAT & IDX files. A new library prefix for the resulting DAT & IDX files must be supplied. If the DAT or IDX file exists, it will not be overwritten. In this case either select a new prefix or manually delete the offending file(s). The Create Library button is pressed and new DAT & IDX files are created. The new file is placed in the same location as the source ASCII library file. The ASCII file is a free format where values (except the name & type) may be supplied in any order. Each value is preceded by the property name and then the value. The companion ASCII file export program creates valid ASCII files from existing FWP section libraries. The companion compression utility removes deleted members from FrameWorks libraries. Using these three tools, sections in libraries can be combined or compressed/deleted. In addition, the properties of individual sections can be easily modified (i.e. names or section properties). Finally, the export/import utilities can be utilized to re-create missing IDX files.

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## General Utilities (continued)

### Combine Libraries Program

The *Combine Libraries* application can be utilized to rapidly combine existing FrameWorks Plus section libraries. There can be as few as 1 library and as many as 5 section libraries. The source of each section library may be either a library file (supplied or user created), an ASCII text file (ACESEA format) or a library file w/o index file (.dat file only). The resultant combined library may be in English or Metric and may be output as either: idx, dat & txt; or txt; or .dat & idx. During the combining process the profile records are processed such that .dat and .idx files are compressed (new file with no deleted profiles). The files are always processed from the first library to the last (min 1 – max 5) library. If a same name (near match or exact match) duplicate profile is found, the later profile is discarded if the Import Mode is Automatic. If the mode is Interrogate, you must select to keep either the first profile or the second profile manually for each near match found. As the interrogate option can get very slow, there is an option to accept this profile and revert to automatic mode. Finally, the output may be ordered: as is (no sorting) or Reverse sort or Forward sort.



**Combine Libraries Utility**

This utility is utilized by first selecting from 1 to 5 libraries to be combined. Select the output units, output data file type(s), set output sorting & set import mode. The investigate option can be utilized to see what the combined file will be comprised of using the currently selected libraries & options. When ready, a combined section profile library file(s) can be output as a FWP library file (.dat & .idx ) and/or a TXT file (.txt).