



# ACE Structural Engineering Applications LLC

## ACE FrameWorks Utilities

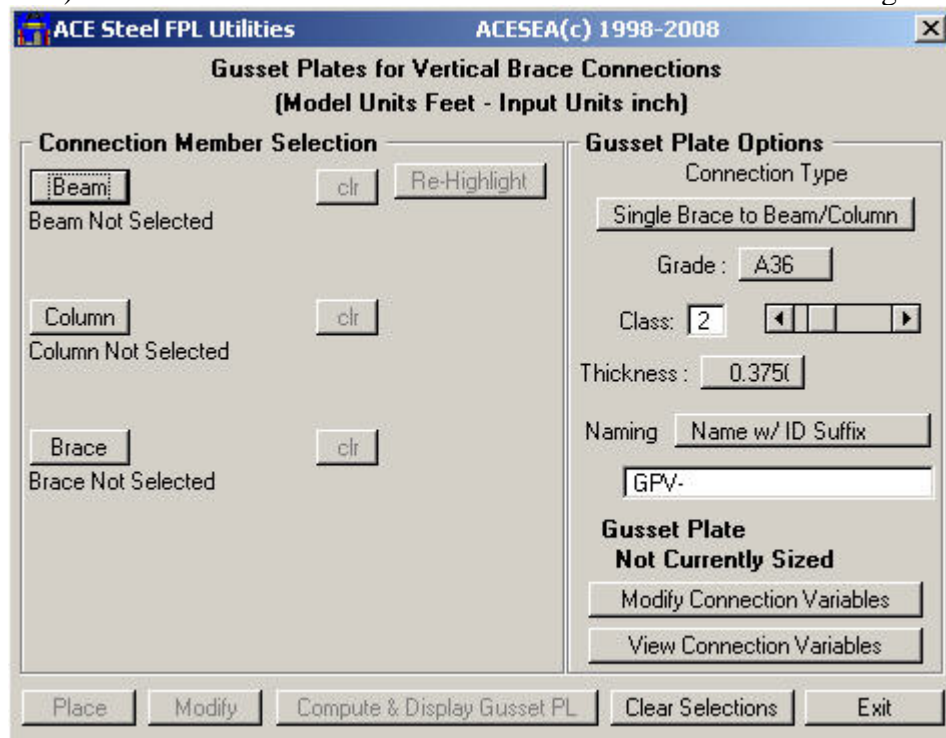
### Gusset Plates for Vertical Bracing Documentation

Mar 15, 2013

#### Gusset Plates for Vertical Bracing (ACE\_GPV.MA)

(Versions - FWP 3.1.x.x/3.2.x.x rel 2.0.8 & FWP 7.0.x.x rel 7.0.8 & FWP 7.1/7.2/7.3 rel 6.0.8 & FWP 8.0.x.x rel 8.0.8 & FWP 9.0.x.x rel 9.0.8 & FWP 10.0.x.x rel 10.0.8 & FWP 11.0.x.x rel 11.0.8 & FWP 12.0.x.x rel 12.0.8)

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 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 also provides the option to create a steel detailing neutral (SDNF) file which can be transmitted to fabricator to define allowable gusset plate limits.



#### Gusset Plates for Vertical Bracing - Primary Dialog Box

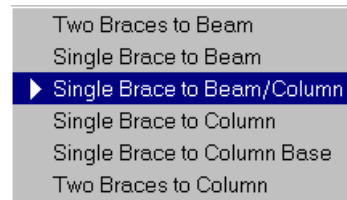
The utility has internal defaults for all the items shown on the dialog box above. The defaults may be overridden with user defined defaults by using a definition file which is discussed in detail later in this document.

# ACE Gusset Plates for Vertical Bracing Documentation

## 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



## Gusset Plates for Vertical Bracing Primary Dialog Box Features

This Gusset Plate application, ACE\_GPV.MA, has been designed to greatly facilitate both the sizing and placement of vertical bracing gusset plates. This FrameWorks Plus FPL application is limited to vertical bracing gusset plates only and features the following controls on the Gusset Plates for Vertical Bracing - Primary Dialog Box :

- Option button to select connection type
  - Buttons to select connection components (Beam and/or Column and Brace(s))
  - Button to highlight connection components
  - Button to clear a component
- Option button to select grade
  - up to 10 choices
  - may be user defined
- Option button to select thickness
  - up to 9 choices
  - may be user defined
  - may be keyed in
- Slider/Keyin to select class (0 to 9)
- Naming option Parameters
  - Option button to select naming technique
  - Name keyin field (if autaname not selected)
  - Toggle for Mbr\_ID suffix during placement (dynamic naming)
  - Name input during placement (dynamic naming)
- Button to modify connection variables
- Button to view connection variables
- Button to modify a sized gusset plate
- Display of a currently sized gusset plate
- Button to clear all selections

## Gusset Plate Naming

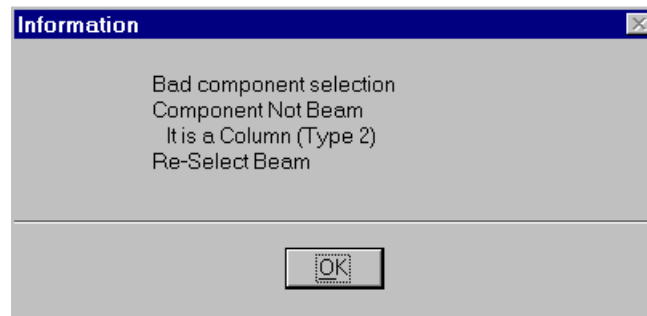
The gusset plate placed consists of one FrameWorks solid (type : solid, slab or wall - specified in definition file) element and may be named depending upon the naming option selected. The name may be a constant name or it may be a prefix with the FrameWorks solid member ID (FWP ID) appended as a suffix. The default prefix is GPV, however a different prefix may be specified in the definition file or supplied at runtime. Other naming options include : dynamic naming at placement time; a constant specified name; or FrameWorks normal naming for individual components (autaname). Dynamic naming allows the name to be selected (or remain the last name selected) at placement time with or without appending the FWP ID to the name.

## Gusset Plates for Vertical Bracing - Basic Operation

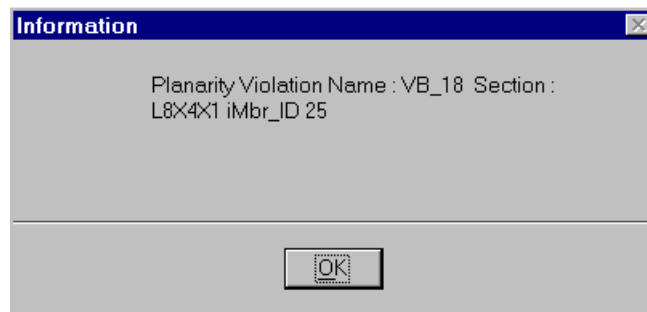
# ACE Gusset Plates for Vertical Bracing Documentation

The process of placing a gusset plate is initiated by first selecting a connection type. Once a connection type is selected, selection buttons for proper component types are activated. Whenever the connection type is changed, previously selected components and gusset plate if sized is cleared. The connection components may be selected in any order. To select a component, press the desired button and then select the FWP member with the data button. As each component is selected, a detailed set of connection checks is performed to assure rule compliance. The connection checks include both minimum general checks (described below) as well as connection type specific checks (detailed in the companion document “Modeling Gusset Plates for Interference Detection”).

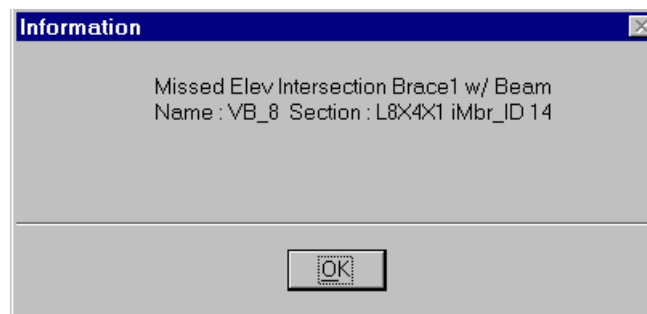
If the connection component does not pass the extensive rules checks, a message detailing the violation is displayed in an information message dialog box (typical failures are shown below)



**Incorrect Component Selection**



**Failed Planarity Check**



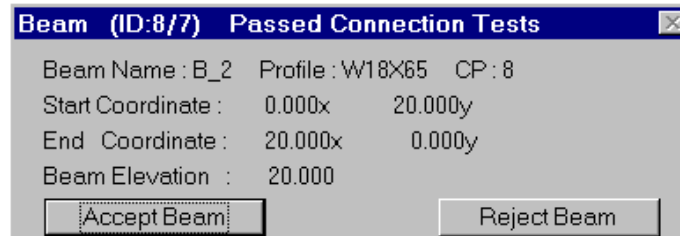
**Failed Intersection Check**

The checks each member goes through during the selection process are extensive to say the least. There are over 30 possible failure messages. The rules for connection types are outlined in detail in the reference document “Modeling Gusset Plates for Interference Detection”.

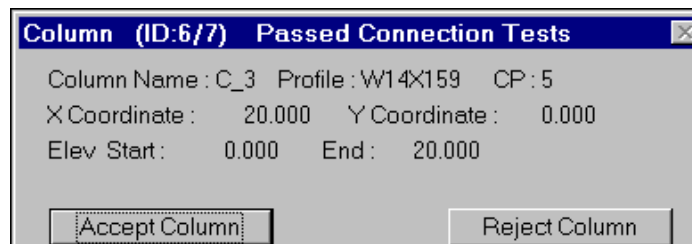
# ACE Gusset Plates for Vertical Bracing Documentation

## Gusset Plates for Vertical Bracing - Basic Operation (continued)

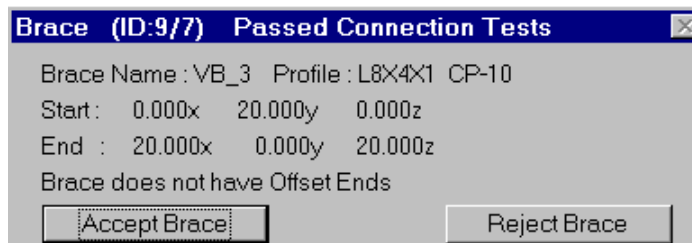
For each brace, beam or column selected which passes the rules check, the accept/reject dialog box shows it's name, profile name, FWP\_ID/model, and pertinent coordinate information. Beams display elevation and X & Y end coordinates. Columns display X & Y coordinates and start & end elevations. Brace display depends upon whether or not the brace has end point offset(s). If the brace has no end offsets, start & end coordinates are displayed along with message that there are no offsets. If the brace has offsets, the non-offset end point(s) (NOEP) are displayed along with the offset value(s). Sample for a beam, column & braces with and without offsets are shown below.



**Accept/Reject Component Dialog Box for Beam**



**Accept/Reject Component Dialog Box for Column**



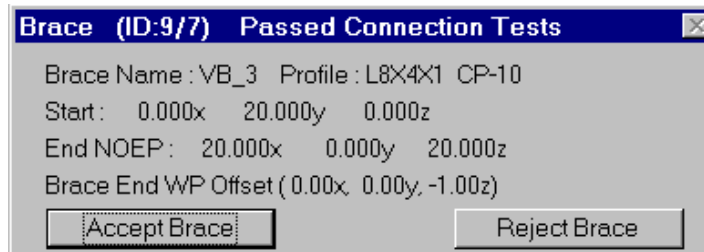
**Accept/Reject Component Dialog Box for Brace w/o Offset**

## Brace Offset Notes

The above example shows a brace where end offsets are not present. Brace end offsets can significantly affect the size and location of the resulting gusset plate. The connection point (a very important point) is not influenced by end offsets. The connection point is the original framed end point of the brace end participating in the connection. If there are no offsets, the original framed point is simply the end point of the brace. If there are end offsets, the original framed end point (also termed theoretical end point or non-offset end point (NOEP)) is the connection point and is computed as the sum of the displayed end point and the offset vector. The FWP command "Review Member" will show the displayed end points and the offset vectors. The visual location of the brace end is the offset end point (OEP). The ACE FrameWorks utility, Remove/Show Offsets (ACE\_OU), can be helpful in understanding and/or removing end offsets. End offsets are discussed at length in the documentation for this utility. The next dialog box shows a brace with end offsets. The offset brace was the brace utilized in the ensuing sample. The non-offset brace (above) was included in attempt to clarify the difference between offset and non-offset braces.

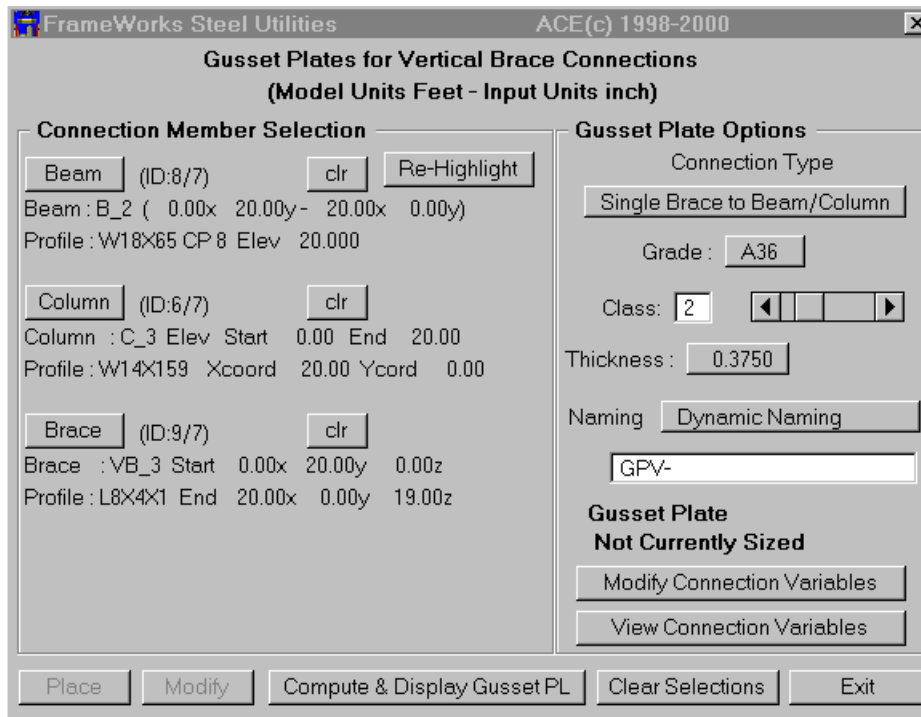
# ACE Gusset Plates for Vertical Bracing Documentation

## Gusset Plates for Vertical Bracing - Basic Operation (continued)



**Accept/Reject Component Dialog Box for Brace w/ Offset**

The following dialog box illustrates the situation once all necessary components for a specific connection type have been selected and accepted. Note that in the dialog box below the visual end point for the brace (in this case an offset end point - OEP for the brace end) is shown. This dialog box always displays the visual end point for braces (i.e. the visually displayed end point as opposed to the original framed or theoretical end point).



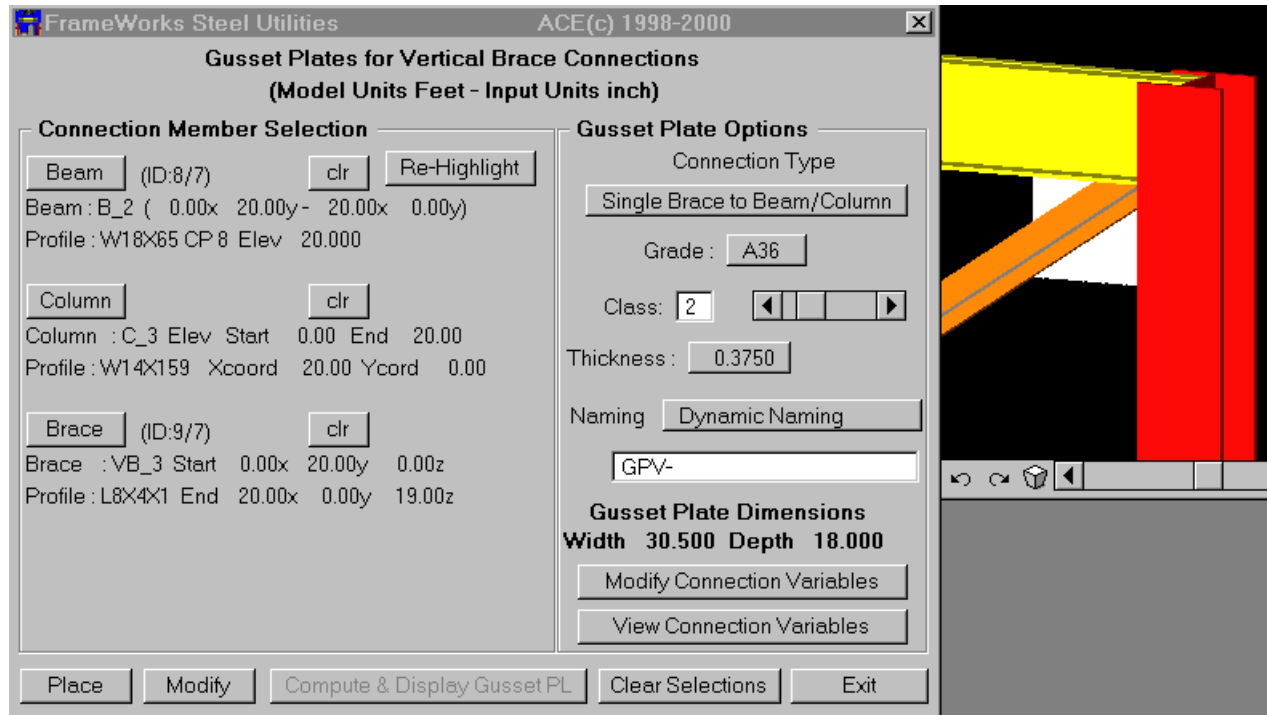
**Gusset Plate for Connection Type 3 - Components Selected - Ready for Sizing**

In the figure above, a gusset plate for connection type 3 is being sized. Proper components (two beams and a column) have been selected (all components have passed both minimum and detailed checks). Once proper connection components have been selected, the "Size & Display GP" button activates as shown above. At this point, the grade, class, thickness, naming, or connection variables may be changed and the connection components will remain selected. If the connection type is changed (even momentarily), all components will be cleared (same effect as pressing the "Clear Selections" button). An individual component may be cleared by pressing the corresponding "clr" button. A selected component may be reselected, however the rule checking will often require clearing other components first.

If the "Compute & Display Gusset PL" button is pressed, a gusset plate will be sized and displayed as shown in the next figure.

# ACE Gusset Plates for Vertical Bracing Documentation

## Gusset Plates for Vertical Bracing - Basic Operation (continued)



### Gusset Plate for Connection Type 3 - Ready for Place or Modify or Changes

As mentioned, when the Size & Display GP button is pressed, the gusset plate is sized and a MicroStation element is temporarily placed and displayed. The gusset plate size is shown on the primary dialog box and the “Place” & “Modify” buttons are activated (un-dimmed). The gusset plate size is dependent upon the connection variables. At this point, the gusset plate can be placed or modified or changed.

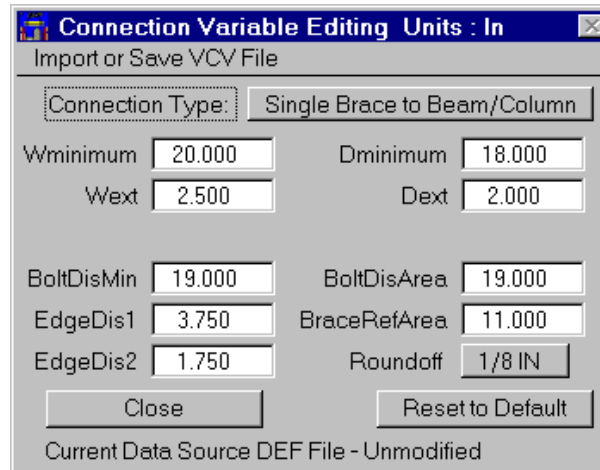
The changes can be non-destructive, semi-destructive or destructive. Non-destructive changes are items on the dialog box that may be modified without changing the connection. For instance the following items may be changed: grade, class and name. Semi-destructive changes require that the gusset plate be re-sized. The thickness of the connection may be modified prior to placement, however this will cause the “Place” button to deactivate, the element to be deleted and the “Size & Display GP” button to activate. Pressing the “Size & Display GP” button will resize and display the new gusset plate. Another semi-destructive change would be a change in the connection variables. When connection variables are changed, the gusset plate must be re-sized. The connection variables may be changed “on the fly” by pressing the “Edit Connection Variables” button (provided this feature is not locked). NOTE : Changing the connection type (even momentarily) is a destructive change ( same as pressing the “Clear Selections” button).

# ACE Gusset Plates for Vertical Bracing Documentation

## Gusset Plates for Vertical Bracing - Basic Operation (continued)

### Editing the Connection Variables

When the Modify Connection Variables button is pressed, the following dialog box appears.



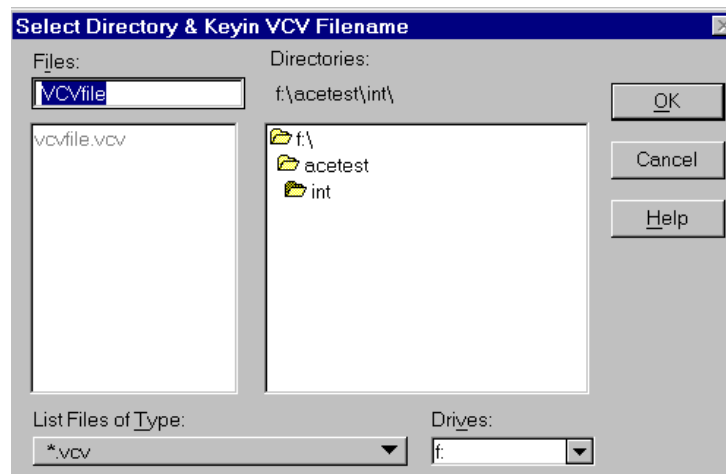
The dialog box is titled "Connection Variable Editing Units : In". It has a tab labeled "Import or Save VCV File". Below the tab, there is a "Connection Type:" dropdown menu set to "Single Brace to Beam/Column". The dialog contains several input fields for numerical values: Wminimum (20.000), Dminimum (18.000), Wext (2.500), Dext (2.000), BoltDisMin (19.000), BoltDisArea (19.000), EdgeDis1 (3.750), BraceRefArea (11.000), EdgeDis2 (1.750), and Roundoff (1/8 IN). At the bottom, there are "Close" and "Reset to Default" buttons. A status bar at the very bottom reads "Current Data Source DEF File - Unmodified".

**Dialog Box for Editing Connection Variables**

All of the values may be edited by simply changing the values in the text input boxes. All six of the connection types may be edited from this dialog box. The original definition file (or internal program defaults) connection variables may be reinstated by pressing the button "Reset to Default". The text at the bottom of the dialog box tells the source of the data and whether or not it has been modified. If the source is a definition file or a VCV file, the name of the file is displayed in the MicroStation message area. If a definition file is initially read, the default data is the data contained in the definition file. If a definition file was not read, internal program values are the default. It is highly recommended that custom definition files be used for this application. It is highly unlikely that internal program values will produce optimum results.

### Importing/Saving VCV Files

The edit dialog box also allows importing and/or saving VCV files. VCV files are essentially subset definition files that contain connection parameters, which include: connection variables for all six connection types, thickness, grade, class and solid type. These files are discussed in detail at the end of this document. VCV files can be utilized effectively with the automated Vertical Gusset Plate application to further control gusset plate sizing and placement. To save a VCV file, select "Save VCV File" from the "Import or Save VCV File" pulldown menu. The following dialog box will appear:



The dialog box is titled "Select Directory & Keyin VCV Filename". It has two main panes. The left pane, labeled "Files:", shows a list of files with "VCVfile" selected. The right pane, labeled "Directories:", shows a tree view of directories including "f:\acetest\int\". On the right side of the dialog are "OK", "Cancel", and "Help" buttons. At the bottom, there are dropdown menus for "List Files of Type:" (set to "\*.vcv") and "Drives:" (set to "f:").

**SAVE VCV File Dialog Box**



# ACE Gusset Plates for Vertical Bracing Documentation

## Gusset Plates for Vertical Bracing - Basic Operation (continued)

Simply keyin a desired VCV file name and press enter. By default the VCV file will be saved in the directory defined by the environment variable ACE\_GPV\_VCV if defined or if not defined the project INT directory. If desired, a different directory may be selected. If a VCV extension is not on the filename, an VCV extension will be added to the filename. After an VCV file is saved, the edit connection variables dialog box will indicate that connection values are from that VCV file with no modifications. To import an VCV file, select “Import VCV File” from the “Import or Save VCV File” pulldown menu. The following dialog box will appear:



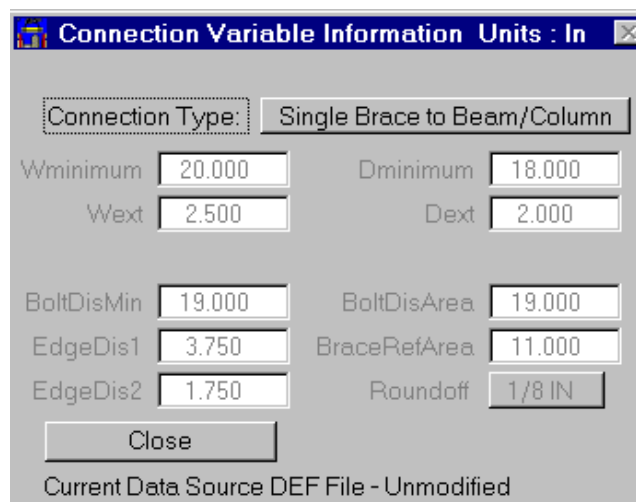
**IMPORT VCV Dialog Box**

The application will check to see if environment variable ACE\_GPV\_VCV is defined. If it is, that directory will be displayed. If not, the project INT directory will be displayed. Select the desired VCV file and press OK. The VCV file will be read and the new connection variables and parameters will be displayed in appropriate dialog boxes. After an VCV file is imported, the edit connection variables dialog box will indicate that values are from that VCV file with no modifications.

Whenever the connection variables are modified, the gusset plate element is deleted and the “Compute and Display GP” button is re-activated. A revised gusset plate can be sized and displayed by pressing the button. At this point the gusset plate may be modified or placed.

## Viewing Connection Variables

The connection variables may be displayed at any time by pressing the “View Connection Variables”. Displaying the connection variables will not alter the current status (i.e. no changes will occur).



**Dialog Box for Viewing Connection Variables**

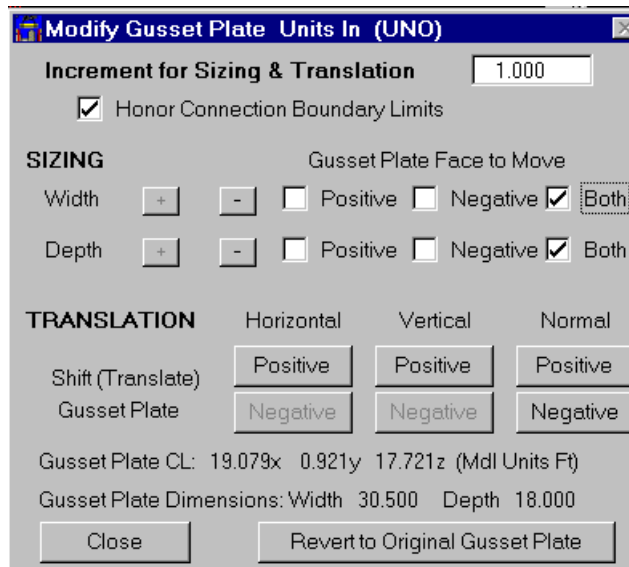


# ACE Gusset Plates for Vertical Bracing Documentation

## Gusset Plates for Vertical Bracing - Basic Operation (continued)

### Modifying a Sized Gusset Plate

When the “Modify” button is pressed, the following dialog box appears.



**Dialog Box for Modifying Gusset Plate**

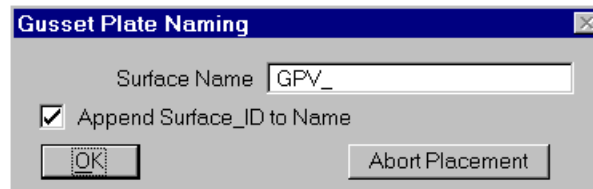
The modify capability allows resizing and/or moving the gusset plate. The modify dialog box has a toggle option “Honor Connection Boundary Limits”. If it is toggled on, the gusset plate cannot grow or translate into connection boundaries. At any time, the original connection may be obtained by pressing the “Revert to Original Gusset Plate” button. Once the gusset plate modification is finished, the dialog box should be closed and the gusset plate may then be placed. At that point, the gusset plate could again be modified by pressing the modify button. Once changed, the modified connection geometry remains active unless either the “Revert to Original Gusset Plate” button is pressed or the connection data is altered and the gusset plate re-sized and displayed.

# ACE Gusset Plates for Vertical Bracing Documentation

## Gusset Plates for Vertical Bracing - Basic Operation (continued)

When the “Place” button is pressed, a FrameWorks solid element (slab, solid or wall type - specified only in definition file - solid is the default) will be placed, the MicroStation elements will be deleted and connection components as well as other data will be cleared on the primary dialog box. Before placement, many of the items on the dialog box may be modified without changing the connection. For instance the following items may be changed: grade, class and name. The thickness of the connection may be modified prior to placement, however this will cause the “Place” button to de-activate, the element to be deleted and the “Size & Display GP” button to re-activate. Pressing the “Size & Display GP” button will resize and display the new gusset plate. If the gusset plate was previously modified, the modifications will again be necessary. When the “Place” button is pressed, a gusset plate will be placed as a FrameWorks solid (slab, solid or wall element).

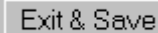
If dynamic naming has been selected as the naming option, the following dialog box is displayed when “Place” is pressed.



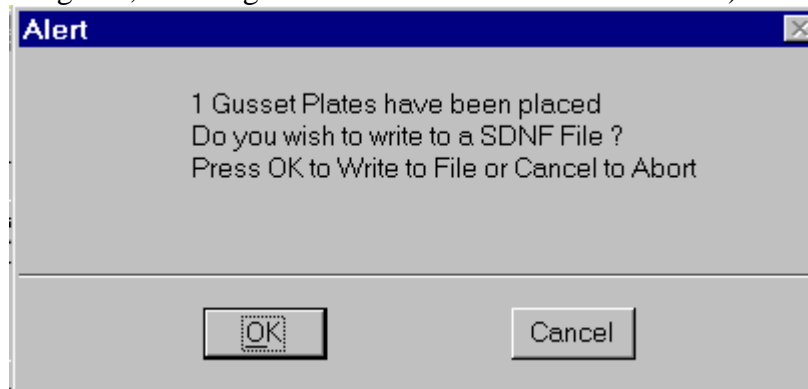
**Dynamic Naming Dialog Box**

If “OK” is pressed, the gusset plate will be placed. If “Abort Placement” is pressed, the placement process is terminated and the situation prior to pressing place will be restored (i.e. gusset plate will still be sized and all connection components will be highlighted).

After the first gusset plate is placed during a session, the “Exit” button changes to

A button labeled "Exit & Save".

If gusset plate(s) have been placed, the following alert occurs upon exit (either from “Exit & Save” or other method such as closing dialog box, selecting another model or the new command).



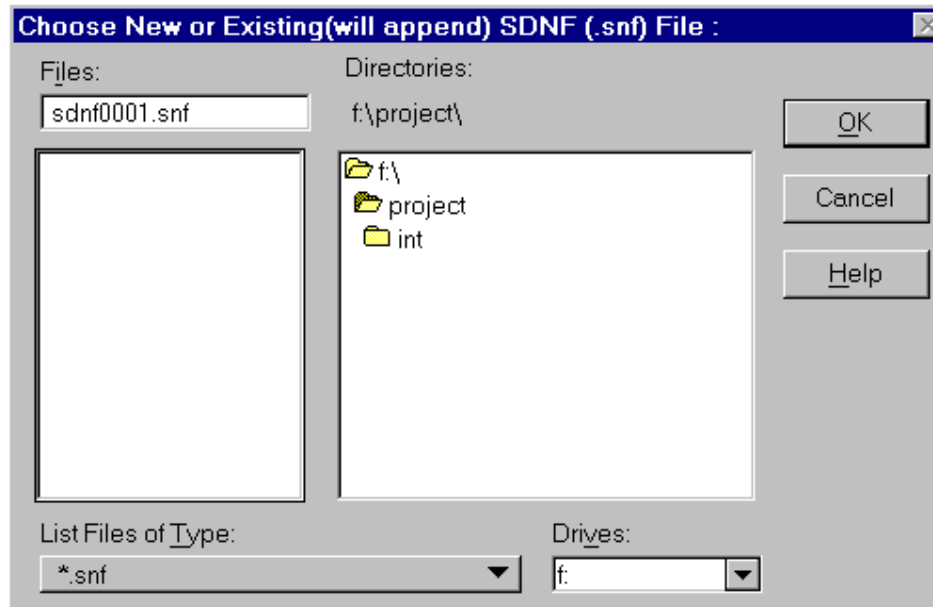
**Option to Write SDNF File**

If cancel is pressed, the application will be exited without writing a SDNF file. Note however that a binary history file is always written (if it exists – appended) for each model. This file is placed in the project INT directory and is named ModelName.ACE.

# ACE Gusset Plates for Vertical Bracing Documentation

## Gusset Plates for Vertical Bracing - Basic Operation (continued)

If OK is pressed, a dialog box requesting name and location for SDNF file appears



**SDNF File Location Dialog Box**

By default the SDNF file will be pointed to the project INT directory. The directory can be changed if desired. Key in a valid file name (extension not required – SNF will be used) and press enter, the file will be written and the application will be terminated after successful write message. Note that an existing file may be selected. If an existing file is selected, new SDNF data will be appended to the existing file.

### Planarity, Colinearity, Connection Plane, Orientation & Intersection Checks - minimum checks

All rules and requirements are outlined in the companion reference document “Modeling Gusset Plates for Interference Detection”. The basic framing and connectivity requirements are also outlined below:

1. The connection plane must form a vertical plane (parallel to z axis)
2. Braces may have end-offsets
3. Braces with offsets may not form a non-vertical place when any 3 of the 4 endpoints are considered
4. Beams must be flat (lie in xy plane) and may not have end offsets
5. Columns must be vertical (parallel to z-axis) and may not have offsets
6. Braces (both offset & non-offset) and beam and/or column members must lie in the same vertical plane
7. None of the members may be colinear
8. Brace framed endpoint must lie on a column or beam CP line (generally a endpoint is acceptable). The brace framed endpoint is also termed the theoretical or resolved endpoint. The framed endpoint is the original endpoint before a brace offset is placed.

In addition to the above minimum checks, connection specific detailed checks are performed each time a member is selected for a specific connection type. The detailed checks and rules for each connection type are outlined in detail in the recently modified companion reference document “Modeling Vertical Bracing Gusset Plates for Interference Detection”. ***The new modification now allows brace to beam column connections where the beam runs over the top of the column (previously this was not allow by specification).***

# ACE Gusset Plates for Vertical Bracing Documentation

## Definitions File

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

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

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

Due to the complex nature of the variables, the steel definition files allow the specification of units (either Metric (mm) or English (inch)). Thus a given default file may be utilized in either a Metric or English project. The FrameWorks model may be in any valid FrameWorks units. The units may be changed throughout the definition file. If units are not specified, it is assumed that the definition file units match the units of the model (if model units are feet or inch – definition file is in inches (English) & if model units are meters or mm – definition file is assumed mm (Metric)). If units are defined and they do not match the model, the variables after the units command are converted to match model units (i.e. inches for English models & mm for Metric models). A sample definition file is shown on this page. Toward the end of this document, the commands for the definition file are outlined in detail

## Sample Definitions File

### Typical Definition File :

```
UNI  ENG
GEN  3   A42      2      .375 NOLOCK  SLAB
GRA  PLA  3      A36      A42      A50
TKS  PLA  3      .25     .375      .5
CON  1     18.    2. 20.  2.5 19.0 3.75  1.75  19.0  11.0 16
CON  2     18.    2. 20.  2.5 19.0 3.75  1.75  19.0  11.0 8 45.0  0.0  3.1
CON  3     18.    2. 20.  2.5 19.0 3.75  1.75  19.0  11.0 8
CON  4     18.    2. 20.  2.5 19.0 3.75  1.75  19.0  11.0 8 45.0  2.6
CON  5     18.    2. 20.  2.5 19.0 3.75  1.75  19.0  11.0 8 0.0  2.6  0.5
CON  6     18.    2. 20.  2.5 19.0 3.75  1.75  19.0  11.0 16
NAM  DYN  GPV-
```

# ACE Gusset Plates for Vertical Bracing Documentation

## Definitions File - Command Definition

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

## UNIT Command - Units Command (optional command)

**UNIT** {UNITTYPE}

where :

{UNITTYPE} May be ENGLISH or METRIC

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

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

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

## GEN Command - General Command defines general parameters

**GEN** *iConnection\_type sGrade iClass fThick sLOCK sSolidType*

where :

iConnection\_type: Connection Type 1 thru 6 (default 1) - Initial Value

1 - Two Brace to Beam

2 - Brace to Beam

3 - Brace to Beam-Column

4 - Brace to Column

5 - Brace to Column Base

6 - Two Brace to Column

sGrade : Grade value for Gusset Plate (default A36) - Initial Value

iClass : 9 >= class >= 0 (default 2) - Initial Value

fThick : Thickness value (inch or mm units) - Initial Value

**sLOCK** : LOCK - locks interactive connection variable editing (default not locked)

**sSolidType** : SOL for solid, SLA for slab or WAL for wall (default solid)

## Definitions File - Command Definition (con'd)

<i>CON</i>	<i>iConnection_type</i>	<i>fDminimum</i>	<i>fDext</i>	<i>fWminimum</i>	<i>fWext</i>	<i>fBoltDisMin</i>
		<i>fEdgeDis1</i>	<i>fEdgeDis2</i>	<i>fBoltDisArea</i>	<i>fBraceRefArea</i>	
		<i>iRound</i>	<i>fMinAngle</i>	<i>fDexts</i>	<i>fWexts/fDgapmin</i>	

<b>fDexts</b>	:	Gusset Plate extension for Depth start for Connection Type 4 or 5 (inch or mm units)
<b>fWexts/fDgapmin:</b>		fWexts - Gusset Plate extension for Width start for Connection Type 2 (inch or mm units)
		fDgapmin - specifies minimum allowable gap between Column Base (BOS) and the bottom of the Gusset Plate for Connection Type 5 (inch or mm units)

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# ACE Gusset Plates for Vertical Bracing Documentation

## Definitions File - Command Definition (con'd)

### TKS Command - Thickness Command defines thickness options

**TKS** *iTks sTks1 ... sTksn*

where

**iTks** : The number of thickness for each surface type (default value - 3,2,2 depending upon surface)  
**fTks1** : First thickness definition definition (all thickness values must be greater than 0)  
**fTksn** : Last thickness definition (9 maximum).

### TOL Command - Tolerance Command defines connectivity tolerance

**TOL** *fUORtol*

where

**fUORtol** : The number of UORS to use in tolerance calculations (default value – 2 UORS)  
Exact computations will work with perfect situations & precise framing. However, a small tolerance is generally required for correct computations. Generally the default value of 2 UORS should be adequate for most situations. For an English model with working units of: (Ft, In, 2032 PU), 2 UORS is equivalent to 2/2032 inch or 1 thousandth inch. For Metric models with: (M, MM, 80 PU), 2UORS is equivalent to 2/80 mm or 1 thousandth of an inch. For loose framing with irrational endpoint coordinates, increasing the tolerance may be beneficial. In many case changes from 2 to 4 UORS may be very beneficial. The value of fUOTtol may range from 0 to the number of positional units (PU). Thus for English the high end is typically 2032 and for Metric 80. Extremely large number are not generally required nor recommended. If fUORtol is specified larger than PU, fUORtol is set to PU.

### NGP Command - Named Group Command defines namedgroups

(Optional command to define named groups)

**NGP** *iNGP\_solid iNGP\_slab iNGP\_wall*

where

**iNGP\_solid** : Named group for GP's placed as type SOLID ( default -1 which is none)  
**iNGP\_slab** : Named group for GP's placed as type SLAB ( default -1 which is none)  
**iNGP\_wall** : Named group for GP's placed as type WALL ( default -1 which is none)

NOTE: Namedgroups are defined globally for a project. The iNGP\_xxx value is an integer value that corresponds to the index of the global namedgroups. The first namedgroup is 0, the next is 1 and so on up to a maximum integer value of the number of namedgroups minus one. If a name group does not exist for the integer value specified, the member type in question will simply not be placed in a named group. A value of –1 specifies that the member type in question is not to be put in a namedgroup. In FWP namedgroups are specified by an alpha name so be careful when selecting integers. **SOLID NAMEDGROUPS FOR THIS APPLICATION ARE FUNCTIONAL with FWP version 7.1.x.x and later and should not be used with any other FWP versions.**



# ACE Gusset Plates for Vertical Bracing Documentation

## Definitions File - Command Definition (con'd)

**NAME Command - Name Command** defines method of naming Gusset Plates  
(defines the initial value display & values - changeable in primary dialog box)

**NAME {NAME\_OPTION} name\_prefix**

where

{NAME_OPTION}	: Keyword - must be AUT or SPE or DYN or CON
SPEcified	: Use the supplied name and append the member ID for surface placed Thus each gusset plate will have a different name (This is the default option with the name "GPV")
DYNamic	: At placement time will display last name used with following options 1) option to supply a new name 2) option to request that member ID for each gusset plate placed be appended Thus each gusset plate will have a different name 3) option to abort placement
AUTo	: FrameWorks assigns names by type and sequence number (name_prefix not required or utilized)
CONstant	: Use this name for all gusset plates

# ACE Gusset Plates for Vertical Bracing Documentation

## VCV File

The VCV file carries basic gusset plate sizing & type information. The primary function of this file is to allow extreme flexibility in the automated application for vertical gusset plates. The automated application allows for the utilization of specific VCV files for specific brace criteria. Brace criteria can be: section size, name, class, or cross-sectional area. Cross-section area and class may be specified as ranges, greater than or less than. Section profile and name may be specified as matching or “like”. The interactive application is a great tool for experimenting with connection variables and creating VCV files.

When the VCV file is processed (read), existing connection variable & parameter values are replaced by valid values found in the VCV file. If a VCV specifies only a subset of the information (i.e. for instance CON 1) only that specific variable information is replaced.

## Sample VCV File (this sample created by this application)

(Note: This file has been edited to fit single line – some zeros removed)

**VCV file created on Sat Nov 04 11:51:55 2000**

**UNITs ENGLISH**

**PAR ALL 0.375000 2 A42 SLAB**

CON 1	18.00	2.00	24.00	2.50	19.00	3.75	1.75	19.00	11.00	8	0.00	0.00	0.00
CON 2	18.00	2.00	20.00	2.50	19.00	3.75	1.75	19.00	11.00	8	45.00	0.00	3.10
CON 3	18.00	2.00	20.00	2.50	19.00	3.75	1.75	19.00	11.00	8	0.00	0.00	0.00
CON 4	18.00	2.00	20.00	2.50	19.00	3.75	1.75	19.00	11.00	8	45.00	2.60	0.00
CON 5	18.00	2.00	20.00	2.50	19.00	3.75	1.75	19.00	11.00	8	0.00	0.00	0.00
CON 6	18.00	2.00	20.00	2.50	19.00	3.75	1.75	19.00	11.00	8	0.00	0.00	0.00

# ACE Gusset Plates for Vertical Bracing Documentation

## VCV File - Command Definition

- Valid Primary Keyword Commands: (UNI, CON, PAR)
- Each record must begin with a valid primary keyword or it is ignored
- All records that start with a blank are considered comments
- The commands/keywords (records) may be placed in any order however the order is significant
- All values for a given command must be defined in order shown above. If default values are acceptable, only the changed values must be given. However all values up to that point must be defined whether changed or not.
- The components of a given command (record) must all be present and in the order shown
- The units command is special and may be repeated and located as required. While commands may be in any order, it should be obvious that the location of the units command is extremely important.
- All input values are either in INCHES (ENGLISH) or MM (METRIC)
- By default application looks in the project INT directory for VCV files
- VCV file directory may be defined with environment variable ACE\_GPV\_VCV
- ACE\_GPV\_VCV = d:\my\_vcv\_files\

The **UNI & CON** commands are identical to the definition file and are not presented in detail here (see definition file for complete command details).

**UNIT** {UNITTYPE}

**CON**    *iConnection\_type*   *fDminimum*   *fDext*   *fWminimum*   *fWext*   *fBoltDisMin*   *fEdgeDis1*  
          *fEdgeDis2*    *fBoltDisArea*   *fBraceRefArea*   *iRound*   *fMinAngle*  
          *fDexts*        *fWexts/fDgapmin*

## PAR Command - Parameters Command defines general parameters

(this command pertains only to the VCV file)

**PAR**   *sCon*        *fThick*    *iClass*    *sGrade*        *sSolidType*

where :

<i>sCon</i>	:	Connection Type 1 thru 6 or ALL - <i>sCon</i> is ignored but must be present note: the last parameter command encountered typically controls (i.e. last set of valid data)
<i>iClass</i>	:	9 >= class >= 0
<i>sGrade</i>	:	Grade value for Gusset Plate (if valid grade not found – remains unchanged)
<i>fThick</i>	:	Thickness value (inch or mm units)
<i>sSolidType</i>	:	SOL for solid, SLA for slab or WAL for wall (default solid)

# **ACE Gusset Plates for Vertical Bracing Documentation**

## **LOG FILES**

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

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

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