



ACE Structural Engineering Applications LLC

ACE FrameWorks Utilities

Automated Base Plate Holes Documentation

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Automated Base Plate Holes Documentation (ACE_AHB.MA)

(Versions - FWP 3.1.x.x/3.2.x.x rel 2.0.1 & FWP 7.0.x.x rel 7.0.1 & FWP 7.1 /7.2./7.3 rel 6.0.1 & FWP 8.0.x.x rel 8.0.1 & FWP 9.0.x.x rel 9.0.1 & FWP 10.0.x.x rel 10.0.1 & FWP 11.0.x.x rel 11.0.1 & FWP 12.0.x.x rel 12.0.1)

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” (see page 2). 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.

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.

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Base Plate Search

A Base Plate is a FWP Solid which conforms to specific criterion. Base Plates may be located by searching model(s) (main model and/or attached models) or a selection set may define the search. If holes are to be punched, only the main model solids may be utilized. To qualify as a Base Plate, the FWP solid must pass both a required properties test and any additional criterion specified.

Required Properties for Base Plates

To qualify as a Base Plate, the FWP solid primary surface must form a horizontal plane (since the pairs of surfaces are parallel, both surfaces form a flat plane). The FWP solid type must be SLAB or SOLID.

Additional Criterion for Base Plates

Base Plates may be located by searching model(s) (main model and/or attached models) or a selection set may define the search. The Base Plate search may be restricted to model file, attached models or model file & attached models. The Base Plate search may be restricted to type SLAB, SOLID, SLAB or SOLID. The Base Plate search may be restricted to material STEEL or Any Material. The Base Plate search may be restricted to FWP solid shapes Square/Rectangular or Square/Rectangular/Octagonal.

Anchor Bolt Search

An anchor bolt is a FWP member which conforms to specific criterion. Anchor Bolts are located by searching model(s) (main model and/or attached models). To qualify as an Anchor Bolt, the FWP member must pass both a required properties test and any additional criterion specified.

Required Properties for Anchor Bolts

To qualify as an anchor bolt, the member must be vertical, the member CP must be 5 and the member must be a solid round profile.

Additional Criterion for Anchor Bolts

The Anchor Bolt search may be restricted to model file, attached models or model file & attached models. The Anchor Bolt search may be restricted to type COLUMN, BEAM, VBRACE, HBRACE or any type. The Anchor Bolt may be further restricted to solid rounds members with a specific extended attribute type.

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Automated Base Plate Holes Variables and Options

The *Automated Base Plate Holes* application, ACE_AHB.MA, has been designed to allow greatly facilitate the placement of plates (or fictitious holes) in base plates. Virtually all items shown on the primary dialog boxes can be controlled through the definition files. The following items are controlled through the both the dialog box & definition file (unless noted otherwise). The dialog box is divided into three areas, namely; Hole/Rod Member Data; Base Plate Data and Anchor Bolt Data.

Hole/Rod Member Data

- Holotype Option button (punched or fictitious members)
 - Rod Member Holes
 - Punched Holes

Hole Data (appears when a Hole is to be punched)

- Hole Size Option button
 - Hole AB size plus specified oversize
 - Hole is AB size
 - Hole size specified by ABH file
- Hole oversize keyin option when Hole AB size plus specified oversize is selected
- File select button when Hole size specified by ABH file is selected
- Show file button when ABH file is selected & exists

Rod Member Data (appears when a Rod member is to be placed as fictitious hole)

- Hole Size Option button
 - Rod member profile to match AB profile
 - Rod member profile specified by ABR file
- File select button when Hole size specified by ABR file is selected
- Show file button when ABR file is selected & exists
- Class Keyin & Slider for Rod member
- Hole member Grade Option button for Rod member
 - ➔ GRA values specified in DEF file provided as options
- Hole member Type Option button for Rod member
 - COLUMN
 - BEAM
 - VBRACE
 - HBRACE

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Automated Base Plate Holes Variables and Options (con'd)

Base Plate Data

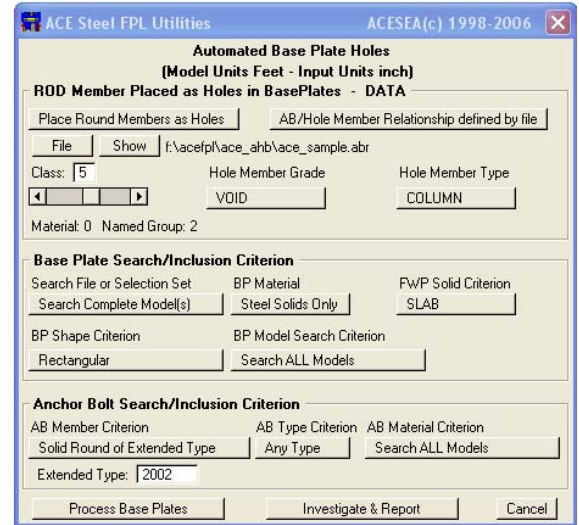
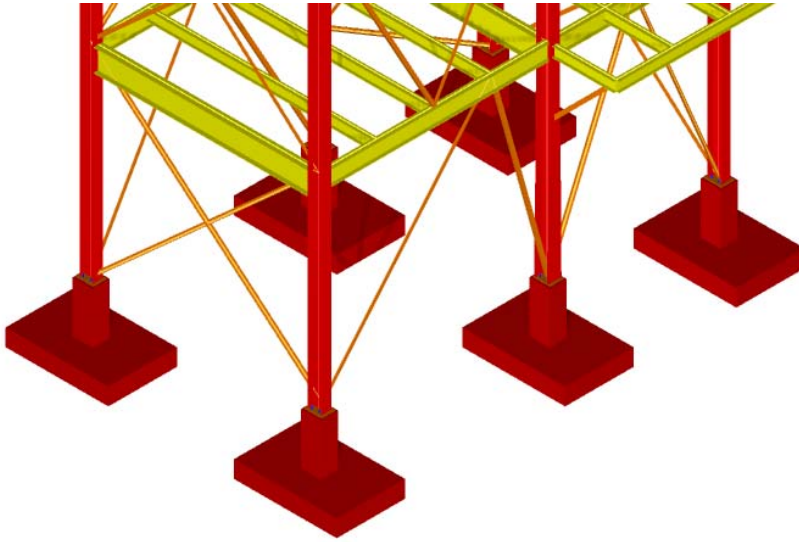
- Base Plate Search Method Option button
 - Search entire file(s)
 - Search through selection set
- Base Plate Material Option button
 - Steel Only
 - Any Material
- Base Plate FWP Solid Type Criterion Option button
 - SLAB
 - SOLID
 - SLAB or SOLID
- Base Plate Shape Criterion Option button
 - Rectangular or Square
 - Rectangular or Square or octagonal
- Base Plate Model Search/Inclusion Criterion (for Rod Member option only) Option button
 - Search Only This ModelSearch Only Attached Models
 - Search ALL Models

Anchor Bolt Data

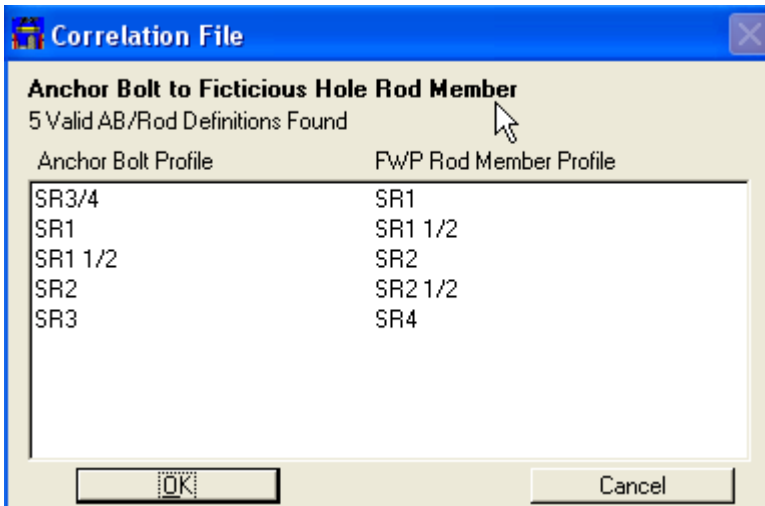
- Anchor Bolt Member Criterion Option button
 - Any Solid Rod Member
 - Solid Rod Member of Extended Type
- Extended Type keyin option when Solid Rod Member of Extended Type is selected
- Anchor Bolt Type Criterion Option button
 - Any Type
 - COLUMN
 - BEAM
 - VBRACE
 - HBRACE
- Base Plate Model Search/Inclusion Criterion Option button
 - Search Only This Model
 - Search Only Attached Models
 - Search ALL Models

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Operation Placing Rod Members as Holes



The model above has 6 steel base plates (type slab) on 6 concrete (type SOLID) pedestals. Each base plate has 4 - 1" anchor bolts (profile "SR1"). The Rod Member as Hole mode will be used to place Rod members as AB holes. The option of AB/Hole Member Relationship defined by file has been selected and the file, ace_sample.abr, is being used (see page 10). The Rod members will be placed a class 5, material type 0, named group 2, grade will be void & the member type will be VBRACE. The contents of the ace_sample.abr file can be seen by pressing the Show button and is shown below.



As can be seen from this Correlation file "SR1 1/2" Rod members will be placed whenever a "SR1" AB penetrates a base plate.

Note that a metric sample is also provided with this application (ace_sampleM.abr)

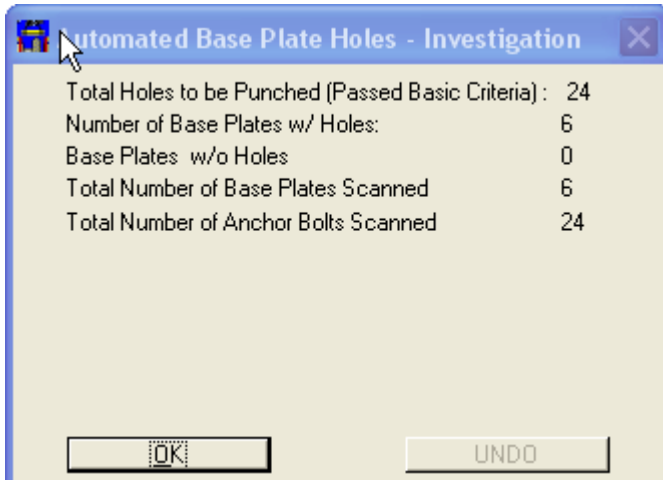
The Base Plate Search/Inclusion Criterion has been set as follows: Search Complete Models, use Steel solids only, use solids of type SLAB only, use rectangular (or square) solids only and search all models.

The Anchor Bolt Search/Inclusion Criterion has been set as follows: Use only solid round members w/ extended type 2002 (this was set using the place AB's on Fdn application), use members of any type and search all models.

The Investigate & Report option can be utilized to see how many base plates are selected, how many anchor bolts are selected and how many Rod members (holes) will be placed. Pressing the Investigate & Report yields:

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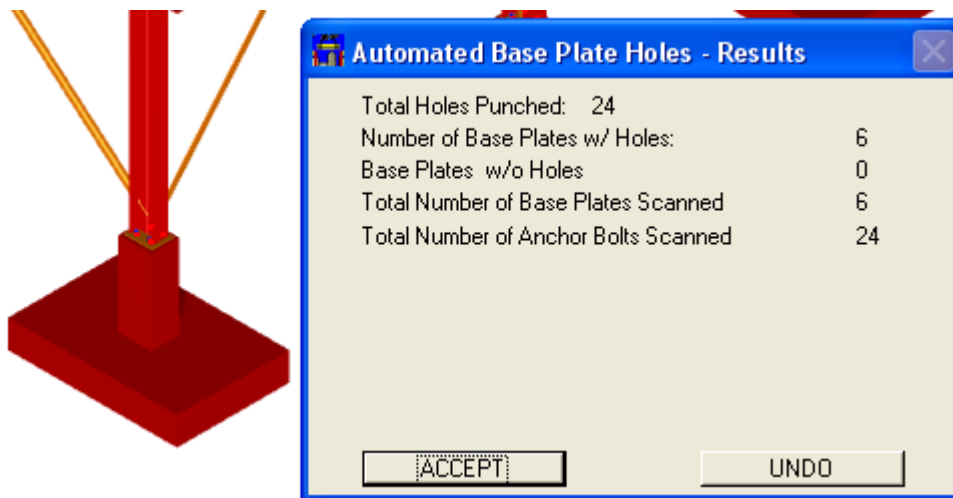
Operation Placing Rod Members as Holes (con'd)



The report left indicates that 24 Rod members will be placed. Six (6) base plates were scanned and all six will have rod members. A total of 24 anchor bolts were scanned for each base plate. There were no base plates w/o anchor bolt penetrations and all 24 anchor bolts were found in the correlation file (a message would show how many anchor bolts were not found if this were not the case. We dismiss this dialog box by pressing OK.

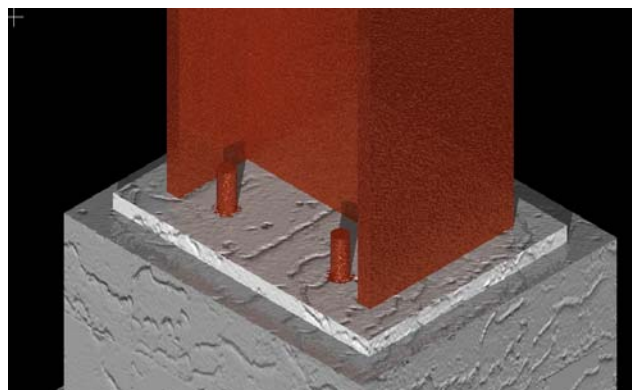
The Rod Members may be placed by pressing Process Base Plates. Pressing this button yields:

Investigation & Report Dialog Box



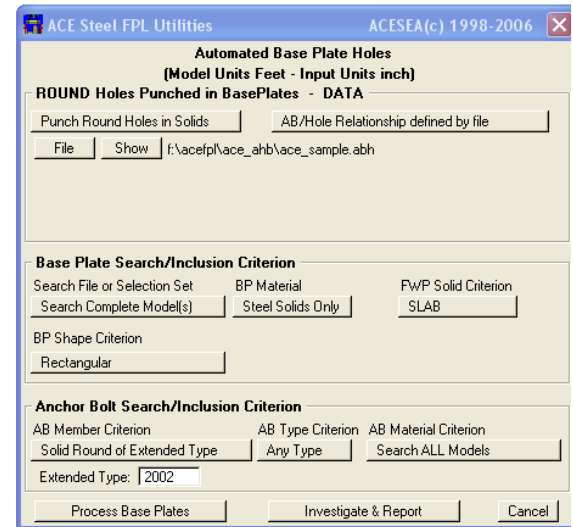
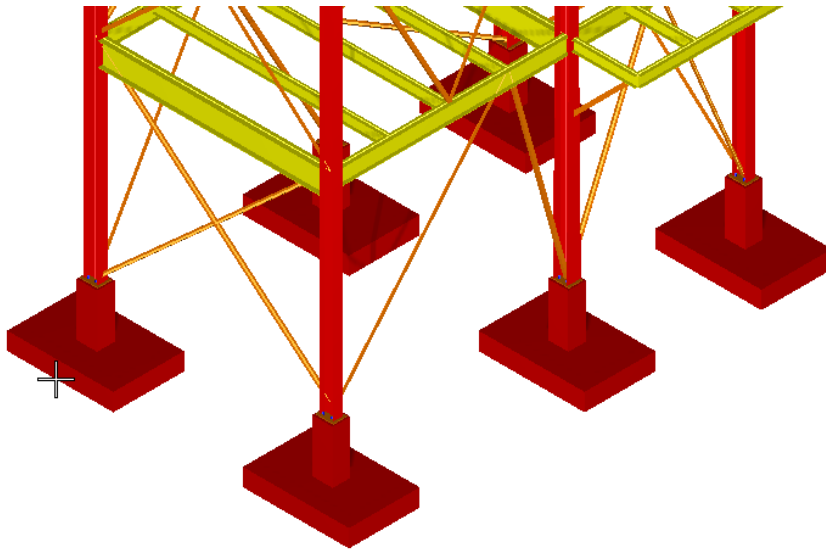
Results Dialog Box

As was indicated by the investigation, 24 Rod members were placed. The placement option (for both Rod members and punched holes) offers an immediate UNDO option. A closeup of a base plate rendered image is shown below.

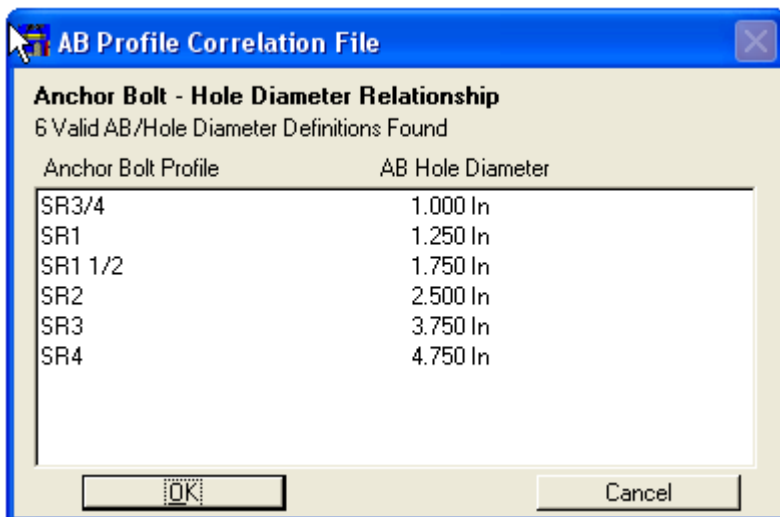


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Operation Punching Holes in Base Plates



The model above has 6 steel base plates (type slab) on 6 concrete (type SOLID) pedestals. Each base plate has 4 - 1" anchor bolts (profile "SR1"). The Punch Round Holes in Solids mode will be used to place AB holes in base plates. The option of AB/Hole Member Relationship defined by file has been selected and the file, ace_sample.abh, is being used (see page 9). The contents of the ace_sample.abh file can be seen by pressing the Show button and is shown below.



As can be seen from this Correlation file a 1.25 inch diameter hole will be punched whenever a "SR1" AB penetrates a base plate.

Note that a metric sample is also provided with this application (ace_sampleM.abh)

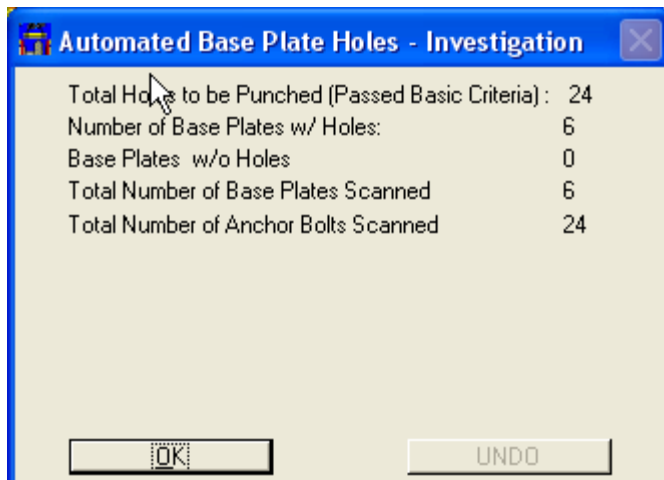
The Base Plate Search/Inclusion Criterion has been set as follows: Search Complete Models, use Steel solids only, use solids of type SLAB only, use rectangular (or square) solids only. (model search option is not present as holes can only be placed in solids in this model).

The Anchor Bolt Search/Inclusion Criterion has been set as follows: Use only solid round members w/ extended type 2002 (this was set using the place AB's on Fdn application), use members of any type and search all models.

The Investigate & Report option can be utilized to see how many base plates are selected, how many anchor bolts are selected and how many holes will be punched. Pressing the Investigate & Report yields:

Automated Base Plate Holes Documentation

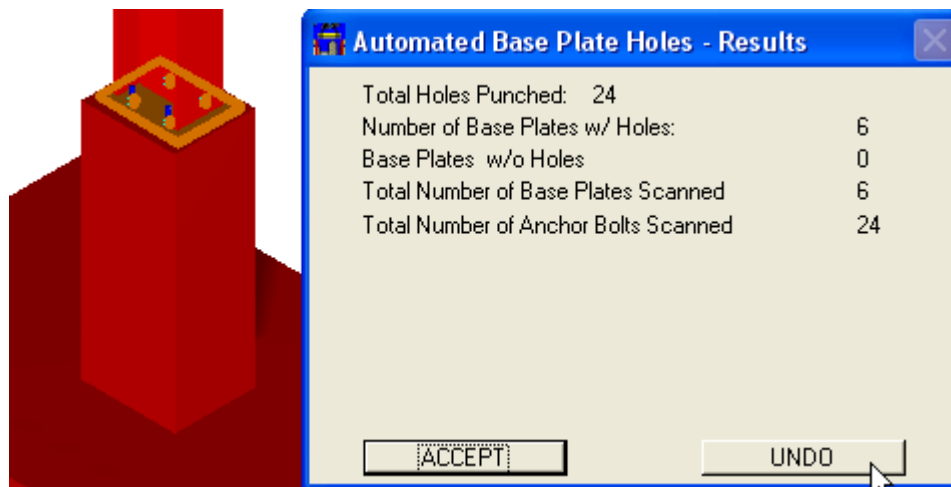
Operation Punching Holes in Base Plates (con'd)



The report left indicates that 24 holes will be punched. Six (6) base plates were scanned and all six will have rod members. A total of 24 anchor bolts were scanned for each base plate. There were no base plates w/o anchor bolt penetrations and all 24 anchor bolts were found in the correlation file (a message would show how many anchor bolts were not found if this were not the case). We dismiss this dialog box by pressing OK.

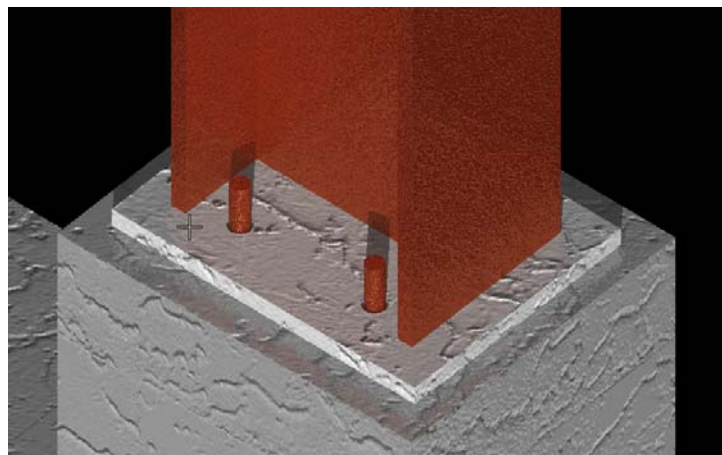
The holes may be punched by pressing Process Base Plates. Pressing this button yields:

Investigation & Report Dialog Box



Results Dialog Box

As was indicated by the investigation, 24 holes were punched. The placement option (for both Rod members and punched holes) offers an immediate UNDO option. A closeup of a base plate rendered is shown below.



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Anchor Bolt to Hole Size Correlation File (ABH file)

The Anchor Bolt to Hole Size Correlation file defines the relationship between a Anchor Bolt profile and the size of hole to punch for this AB profile. The file is an ASCII file which has a defined suffix of ABH. The file defines the hole size to utilize for each anchor bolt profile. The file recognized two commands: UNI & ABH. The UNI command is provide so that the hole diameter may be specified in desired units (if units not specified – model units are assumed). Each ABH command defines a anchor bolt profile and the corresponding hole to punch in the base plate. NOTE: If the anchor bolt profile is NOT found in the ABH file, the hole diameter of the anchor bolt profile is punched in the base plate.

UNIT Command - Units Command (optional command)

UNIT {UNITTYPE} {UNIT}

where :

{UNITTYPE} May be ENGLISH (feet) or METRIC (meters).

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

{UNIT} Must be FEET or INCH for ENGLISH (default feet) or must be METER or MM for METRIC (default meters).
If unit is not specified, it is assumed that the units are feet for English & meters for metric.

ABH Command - Anchor Bolt – Rod Member Correlation

ABH "AB Profile" fHoleSize

where :

AB Profile : AB profile name - enclosed in "" marks - 24 characters maximum
fHoleSize : Diameter for Hole Size

Sample ABH File w/ English Units & Profiles (AB Profile to Hole Size Correlation File)

(All records that start with a blank are comments)

UNI	ENG	INCH
ABH	"SR3 / 4 "	1 . 00
ABH	"SR1 "	1 . 25
ABH	"SR1 1 / 2 "	1 . 75
ABH	"SR2 "	2 . 5
ABH	"SR3 "	3 . 75
ABH	"SR4 "	4 . 75

Sample ABH File w/ Metric Units & Profiles (AB Profile to Hole Size Correlation File)

(All records that start with a blank are comments)

UNI	MET	MM
ABH	"R16"	25.0
ABH	"R25"	31.0
ABH	"R37"	40.0
ABH	"R50"	60.0
ABH	"R75"	90.0
ABH	"R100"	120.0

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Anchor Bolt to Rod Member Correlation File (ABR file)

The Anchor Bolt to Rod Member Correlation file defines the relationship between a Anchor Bolt profile and the Rod member profile to be used as the fictitious hole. The file is an ASCII file which has a defined suffix of ABR. The file defines the Rod member profile to utilize for each anchor bolt profile. Each ABR command defines a anchor bolt profile and the corresponding Rod member profile which will be utilized as the hole. NOTE: If the anchor bolt profile is NOT found in the ABR file, the anchor bolt profile is used as the ROD member profile.

ABR Command - Anchor Bolt – Rod Member Correlation

ABR *"AB Profile" "Rod Member Profile"*

where :

AB Profile : AB profile name - enclosed in "" marks - 24 characters maximum
Rod Member Profile : Rod Member profile name - enclosed in "" marks - 24 characters maximum

Sample ABR File w/ English profiles (AB to FWP Rod member Correlation File)

(All records that start with a blank are comments)

ABR	"SR3 / 4 "	"SR1 "
ABR	"SR1 "	"SR1 1 / 2 "
ABR	"SR1 1 / 2 "	"SR2 "
ABR	"SR2 "	"SR2 1 / 2 "
ABR	"SR3 "	"SR4 "

Sample ABR File w/ Metric profiles (AB to FWP Rod member Correlation File)

(All records that start with a blank are comments)

ABR	"R16"	"R25"
ABR	"R25"	"R31"
ABR	"R37"	"R40"
ABR	"R50"	"R60"
ABR	"R75"	"R90"

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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_AHB.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_AHB.DEF). A complete name and location of a definition file may be also specified with the environment variable ACE_AHB_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_AHB_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_AHB.DEF is found in this directory, it is used.
 3. If there is a c:\ace_ahb.def file it is utilized.
 4. If none of the above, internal program defaults are utilized – a warning message will be displayed.
- (if environment variables in 1 and/or 2 above are specified and corresponding DEF file is not found, a warning is displayed)

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

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

Sample Definitions File

```
UNI      ENG      INCH
GEN      0      0      0      0      2      0      0      0      2      0
PUN      0      .5
GRA      3      VOID      A36      FC_3
ROD      1      5      0      HB      VOID
ABR      c:\ace_sample.abr
ABH      c:\ace_sample.abh
NGP      2
```

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Definitions File - Command Definition

- Valid Primary Keyword Commands : (UNI, GEN, GRA, PUN, ROD, ABH, ABR, NGP)
- 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.
- By default application looks for C:\ACE_AHB.DEF definition file
- Definition file path may be defined with environment variable ACE_DEF_PATH
- ACE_DEF_PATH=d:\mydir\
(the DEF file ACE_AHB.DEF will be looked for in the directory d:\mydir)
- Definition file may be defined with environment variable ACE_EP_DEF
- ACE_AHB_DEF = d:\mydir\mydef_file (highest priority definition)
(the DEF file mydef_file will be looked for in the directory d:\mydir)
- NOTE : Components shown in bold may only be specified in the definitions file

UNIT Command - Units Command (optional command)

UNIT {UNITTYPE} {UNIT}

where :

{UNITTYPE} May be ENGLISH (feet) or METRIC (meters).

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

{UNIT} Must be FEET or INCH for ENGLISH (default feet) or must be METER or MM for METRIC (default meters).
If unit is not specified, it is assumed that the units are feet for English & meters for metric.

GRA Command - Grade Command defines grades options

GRA iGrades sGrade1 ... sGraden

where

iGrades	:	The number of grades (default value - 3)
sGrade1	:	Grade definition (24 character max - should also be defined in FrameWorks)
sGraden	:	Last grade definition (10 maximum).

ROD Command - Rod Command defines rod member properties

ROD iROverSizeOpt, iRodClass, iRodMaterial, sRodType, sRodGrade

where :

iROverSizeOpt	:	Startup for profile option for placed Rod Holes 0- The AB profile is utilized as the Rod Hole (default) 1- Rod Hole profile is defined in file correlating AB Profile to Rod Profile
iRodClass	:	The starting value of class for the rod hole member (0 =< class < 10)
iRodMaterial	:	The material for the rod hole member (0 =< material < 10)
sRodType	:	The starting value of type for the rod hole member (BE,CO,VB,HB)
sRodgrade	:	The starting value of grade for the rod hole member (i.e. A36 etc)

Definitions File - Command Definition (con'd)

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GEN Command - General Command defines startup values

Note that all startup values specified with the GEN command are option buttons that can be controlled through the primary dialog box with the exception of iABExtendedMemberID which is a keyin value which can also be controlled with the dialog box.

GEN iHoleTypeOpt, iBPSelectionOpt, iBPSolidTypeOpt, iBPShapeOpt, iBPModelSearchOpt, iBPMaterialOpt, iABMemberOpt, iABTypeOpt, iABModelSearchOpt, iABExtendedMemberID

where :

iHoleTypeOpt	: Startup for type of base plate hole 0- Place Rod Member as Hole - FWP member (default) 1- Punch Hole in BP (FWP Solid)
iBPSelectionOpt	: Startup for baseplate selection option 0- Search entire File (default) 1- Use Selection Set
iBPSolidTypeOpt	: Startup for base plate types to include 0- FWP SLAB Only (default) 1- FWP SOLID Only 2- FWP SLAB or SOLID
iBPShapeOpt	: Startup for type of base plate shape to include 0- Rectangular/Square Shape Only (default) 1- Rectangular and/or Octagonal Shape only
iBPModelSearchOpt	: Startup for Models to search for BP's 0- This Model Only (default) 1- Attached Models Only 2- This Model & Attached Models
iBPMaterialOpt	: Startup for type of base plate hole 0- Solids of Steel Material only (default) 1- Any Material
iABMemberOpt	: Startup for type of Anchor Bolt to Utilize 0- Any Solid Round FWP member (default) 1- Solid Round FWP Member w/ specific Extended Member Type
iABTypeOpt	: Startup for type of AB to include 0- Any Type FWP member (COLUMN, BEAM, VBRACE or HBRACE) (default) 1- COLUMN only 2- BEAM only 3- VBRACE only 4- HBRACE only
iABModelSearchOpt	: Startup for Models to search for AB's 0- This Model Only (default) 1- Attached Models Only 2- This Model & Attached Models
iABExtendedMemberID	: Starting Value for Extended Member AB value

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Definitions File - Command Definition (con'd)

PUN Command - Punch Command defines startup values for punched holes

PUN iPOverSizeOpt, fOverSize

where

iPOverSizeOpt : Startup for oversize option for punched holes
0- Hole diameter is AB Diameter + fOverSize (default)
1- Hole diameter is AB Diameter
2- Hole diameter is defined in file correlating AB Profile to Hole Diameter

fOverSize : Startup value for Hole Oversize (1/2 inch is default)

ABH Command - Command defines location of ABH file

ABH *sPunchFile*

where

sPunchFile : path & name of punch correlation file (can include logicals definitions)
(sPunchFile may not contain spaces - however logical variable may)

ABR Command - Command defines location of ABR file

ABR *sRodFile*

where

sRodFile : path & name of rod correlation file (can include logicals definitions)
(sRodFile may not contain spaces - however logical variable may)

TOL Command - TOL Command defines tolerances

TOL fUORtol

where

fUORtol : The number of UORS to use in tolerance calculations (default value is 2 UORS)
The tolerance may range from 0 to the number of positional units (PU). In most cases the default of 2 UORS (approx .001 inch or .025 mm) is sufficient.

NGP Command - Named Group Command defines namedgroups

(Optional command to define named groups)

NGP *iNGP_rod*

where

iNGP_rod : Named group for Rod members (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.

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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).