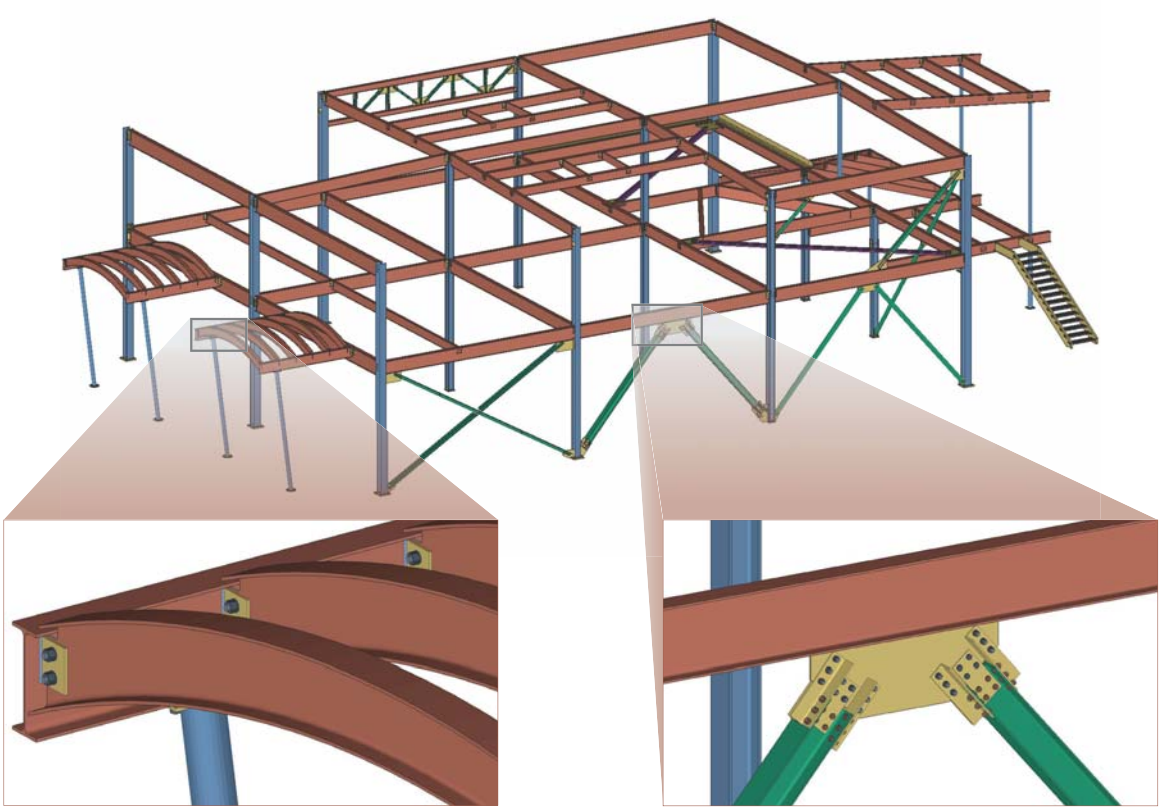
SDS/2 DESIGN DATA

Software Version 7.2

SDS/2 Detailing Basics & Step-by-Step Instructions



SDS/2 Steel Detailing System Version 7.2 is a product of Design Data Corporation.

Revision: 4/12/11

SDS/2 Detailing Basics
&
Step-by-Step Instructions

Welcome to the SDS/2 Steel Detailing System. This manual gives you a quick overview of how to set up and develop an SDS/2 Job. All information contained in this manual is also included in SDS/2's context-sensitive Help, under "Topics" (help/topic.htm) and "Step-by-Step Instructions" (help/overview.htm). For best results when using SDS/2's context-sensitive Help, employ a browser such as Navigator or Mozilla. You can do this by setting the *User Options* option "*Help browser*" to '*System*' instead of '*Built in*.' To get to SDS/2's Help, press the "*Documentation*" button on *SDS/2's Main Menu*. Or press the "*Help*" button at the bottom of almost any entry window in SDS/2.

SDS/2 Detailing Basics

Step-by-Step Instructions

A One-Page Tour of SDS/2

The SDS/2 Steel Detailing System consists of a 3D modeling program called *Modeling*, a 2D CAD program called the *Drawing Editor*, a 3D scripting program called *Parametric Modeling*, and various other supporting programs. When you start up the *Drawing Editor* or *Modeling*, SDS/2 looks to *User Options* to determine which toolbar configuration to load and whether or not, for example, scroll bars are displayed.

The SDS/2 Main Menu appears when you first start SDS/2. Certain *Utility* functions, *Parametric Modeling*, and the *Material File Editor* can be started from this menu but not from *Modeling* or the *Drawing Editor*. Other things you can do only from this menu is *Change Jobs* and start *Modeling.*

Modeling is SDS/2's 3D modeling program. To start *Modeling*:

1. Click "*Modeling*" on the *SDS/2 Main Menu*.
2. **Possibility 1:** You are shown a list of erection views of the 3D model. Double-click the view you want to open.

   Possibility 2: If erection views have not yet been created in your current Job, SDS/2 prompts you to enter the name and elevation of a new plan view.
3. Now that you are in a *Modeling* view, you can begin to construct a 3D model by creating new views and laying out members. The model is the database from which member, submaterial and erection view details are automatically generated.
4. When you are ready to exit *Modeling*, choose *File* > *Exit*.

The Drawing Editor is SDS/2's CAD (computer-aided design) program. Start up this program after you have automatically detailed members or submaterials or erection views modeled in *Modeling*. To open a drawing/sheet file:

1. Click "*Drawing Editor*" on the *SDS/2 Main Menu*.
2. A selection dialog opens. On it a list of member details that have been automatically detailed (if any have been generated).

   Alternative 1: Select one of the member details.

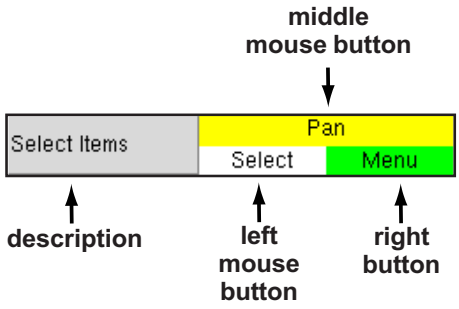
   Other alternatives: Create a new detail (by pressing the "*New ...*" button), or change to a different type of drawing/sheet (job standard details, submaterial details, detail sheets, etc.) and either create a new drawing/sheet of the type selected or choose one of the drawings/sheets that are listed.
3. To change to a different drawing in the *Drawing Editor*, choose *File* > *Open*.
4. When you are ready to exit the *Drawing Editor*, choose *File* > *Exit*.

Other parts of SDS/2 can be started from *Modeling* and the *Drawing Editor* as well as from the *SDS/2 Main Menu*.

Items Found on Toolbars

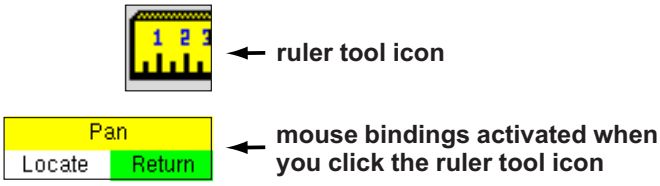
Users of SDS/2 can place items on their toolbars in *Modeling* or the *Drawing Editor* by choosing *Options > Toolbar Configuration*. Following are some examples of particular items or types of items that are on your default toolbar. Once you have configured a toolbar, you can use *User Options* to set that toolbar to be loaded each time you start up *Modeling* or the *Drawing Editor*.

Mouse bindings tell you which mouse button to click in order to, for example, activate a tool, select an object, bring up a menu, or locate a point.

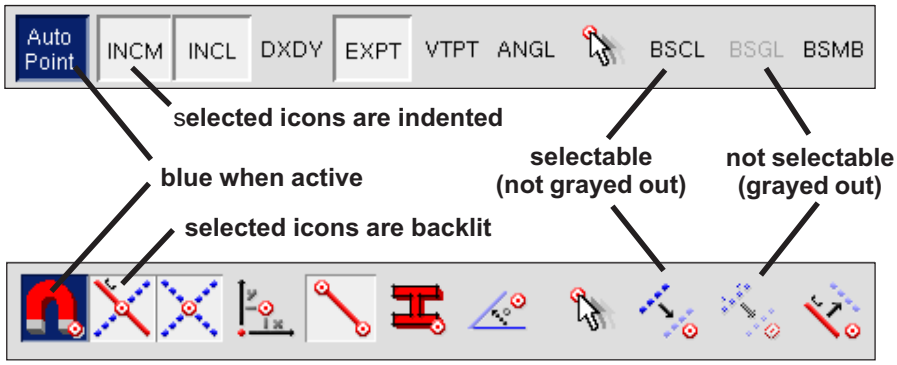


The status line displays system prompts and other information relevant to the operation being performed. For instance, at the beginning of an operation it may tell you what operation is being performed (see example below). During the operation, it prompts you to perform specific tasks in order to complete the operation. In *Select Items* mode, it tells you the name of the icon your mouse pointer is over. You can even (using *User Options*) cause it to display information about what mouse button invokes what command, much like the mouse binding reporter does.

Tool icons are an alternative to choosing a command on a menu or using a keyboard shortcut. When you click a tool icon, you activate that tool. For example, the *Ruler* is used to measure the distance between two points. When you click the ruler tool icon, SDS/2 prompts you (in the status line) to locate two points. Left-click (which corresponds to the mouse binding **Locate**) locates a point.

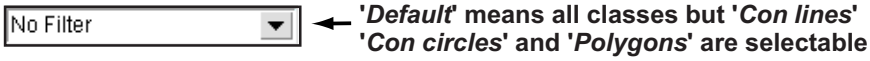


Locate icons are used for locating member points (such as member work points) for the placement of drawings lines, erection views, construction lines, etc. Two types of *Locate* icons can be placed on toolbars (using *Options* > *Toolbar Configuration*). One set shows text. The other is pictorial.



Selection count tells you the number of items that you have selected. When an item is selected, it is highlighted in another color – for example, green. To tell how many items are selected, you can either count them or look at this decoration.

Selection filter limits selectability to classes such as '*Beams*,' etc. To set multiple categories, choose '*Custom*.' This is especially useful if you select items by area box.



Layer selection tool (***Drawing Editor*** **only)** lets you select the layer that is written to (by default) when you draw an object in your current drawing. During most *Add* operations (*Add Label*, *Add Dimension*, etc.), you can change the drawing layer on the edit window that appears during the operation.

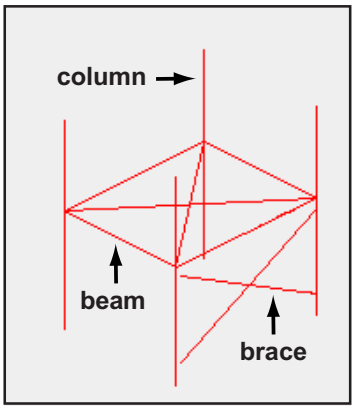
Depth check controls (***Modeling*** **only)** set the distance that you can see into or out of a particular view. Increasing the "*In*" distance lets you see farther into the screen. Increasing the "*Out*" distance lets you see farther out from the screen.

Status display toggle (***Modeling*** **only)** lets you turn on/off the color coding or masking of members according to their status (detailed, fabricated, other categories). You can also do this by choosing *Model* > *Status Display* and pressing "*OK*" (to turn status display on) or "*Cancel*" (to turn it off).

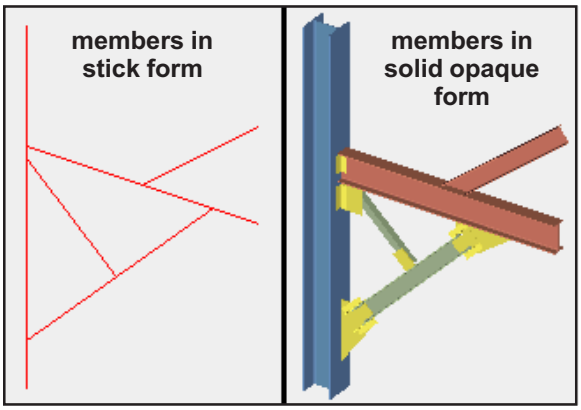
Items Found in Modeling Erection Views

Some of the items that can be displayed in a *Modeling* erection view are members, construction lines and circles, erection views (grid lines), materials, welds, holes and bolts. You can add or edit items of any of these types. This section of this manual provides an introduction to these items.

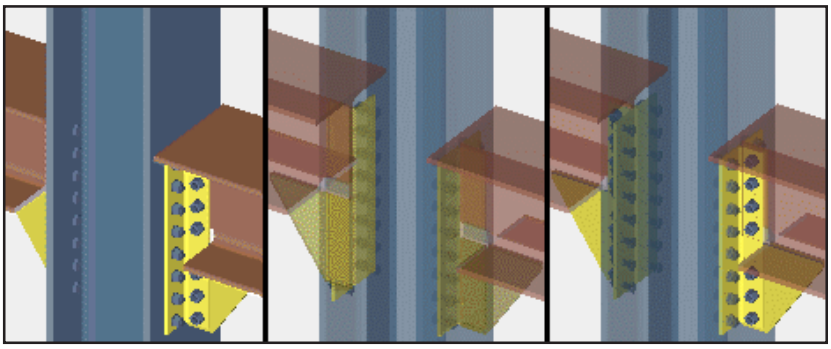
Members are made up of materials, holes, bolts and welds. Member types in SDS/2 include beams, columns, vertical braces, horizontal braces, girts, purlins, stairs and miscellaneous members. Many members can have the same member piecemark (major mark). When you *Detail Members*, all of the members with the same major mark are drawn on a single member detail.



Members can be displayed in stick form or a solid form. The materials, bolts, holes and welds that make up a member can be seen when that member is displayed in a solid form. Also, members in a solid form may be color-coded according to their type. The default member colors are blue for columns, brown for beams, green for vertical braces, yellow for connection materials. To edit a member, double-click its stick work line (in stick), or double-click its main material (in a solid form).



SDS/2 can display members in three solid forms. These forms are named solid opaque, solid transparent, and solid transparent main. After members have undergone *Process and Create Solids*, you can change members to these forms using the shortcut menu, or the *View* menu, or tool icons on your toolbar.

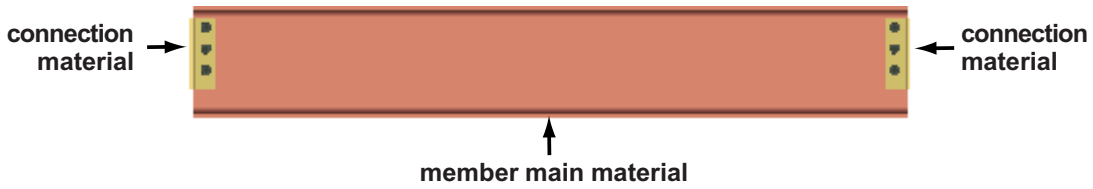


solid opaque (opaque main material & connection)

solid transparent (transparent main material & connection)

solid trans main (transparent main material, opaque connection)

Materials are shown when a member is displayed in one of the three solid forms. Member main material may be different colors (brown for beams, blue for columns, etc.). Connection materials are, by default, yellow. Specifications for materials other than plates or bar stock are set in the material file for your current Job (the "local material file"). You can edit each material independently (double-click on them). There are also ways to change a material on a member edit window. For example, "*Section size*" changes the member main material, and revise & review options can change connection materials. Details for materials are generated when you *Process > Detail Submaterial*. System materials can be generated automatically during *Process and Create Solids*. You can add user materials to members using *Model > Material > Add*.



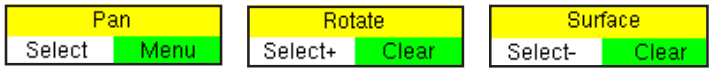
Holes, bolts and welds are generated automatically during *Process and Create Solids*. Holes and welds can also be added to materials by users using *Model > Hole > Add* or *Model > Weld > Add*. Bolts can be added through holes using *Model > Bolt > Add*. You can edit holes, bolts and welds independently (double-click on them). You can also edit holes, bolts and welds using revise & review options on member edit windows.

Erection views (grid lines) and construction lines and the point location target are other items that you might see in erection views in *Modeling*. These items and members, materials, etc. will be discussed in greater detail in the step-by-step instructions that are included in this manual.

Selecting items in SDS/2

Selecting items is done so that you can perform an operation on those items. For example, you can select members, then click on the appropriate icon to display the selected members in solid opaque form. If there is no selection or an inappropriate selection when you activate a tool, SDS/2 prompts you to make an appropriate selection.

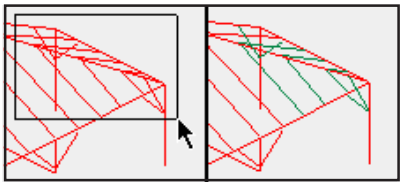
Select Items mouse bindings are for selecting items in SDS/2. Different mouse bindings are activated when you press the Ctrl key or the Shift key or no key. Shown below are the *Select Items* mouse bindings that are active in *Modeling* for selecting items before using a tool to perform an operation on those items.



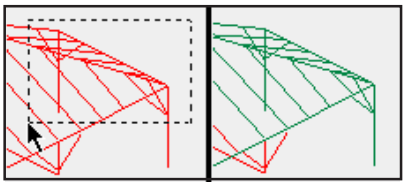
no key pressed **Shift** **Ctrl**

Selecting items by clicking on them: Left-click (**Select**) to select the item your mouse pointer is over. Shift and left-click (**Select+**) to select more than one item. Ctrl and left-click (**Select-**) to deselect the item your mouse pointer is over. To deselect all items, left-click (**Select**) with your mouse pointer in empty space.

Selecting items by area box: Hold down the left mouse button (**Select**) and drag your mouse pointer diagonally across the screen to select items within an area. Press the Shift key and hold down the left mouse button (**Select+**) to do the same. Hold down the Ctrl key and drag your mouse pointer to deselect (**Select -**) items within an area. In these examples, SDS/2 changes members from red to green when they are selected.

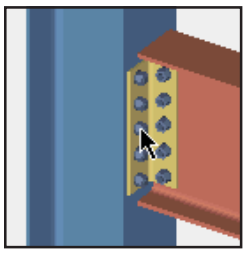


Example 1: An area box drawn from left-to-right only selects items that are entirely within the area.

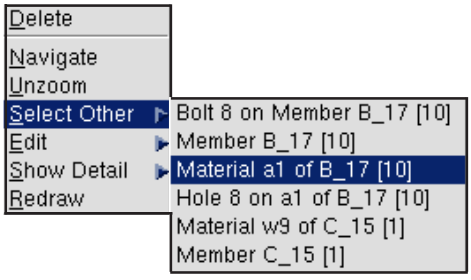


Example 2: An area box drawn from right-to-left selects items even if they are only partially in the area.

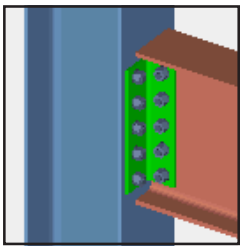
Selecting items on the shortcut menu:



Step 1. Right-click (**Menu**) with the mouse pointer over an item.



Step 2. On the shortcut menu choose *Select Other*. Items are listed in order of nearest to farthest.

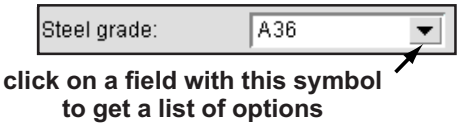


Step 3. The item (a material) is now selected (green) in the model.

Making Entries to SDS/2 Windows

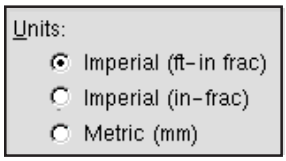
Text entry fields may require that you enter a date or distance or file name or etc. Just type the characters you want, then press the Tab key to go to the next field. If a "file" button ( ) is next to the text entry field, you can select (instead of type) the entry you want to make. Following is an example of a text entry field:

A list box lets you select a single option among many. **Tip:** Instead of using your mouse pointer, you can use up/down arrow keys to open the menu and select items on it. Press the Enter key to apply the selection to the field.

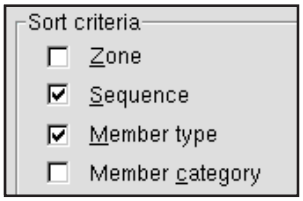


A combo box combines a list box with text entry, allowing you to either select an item from the list, or enter an item that is not on the list. In SDS/2, bolt diameter entry fields are combo boxes.

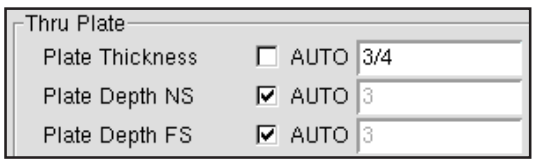
Radio buttons let you select one entry per field. For a given field, only one radio button can be selected at a time.



Check boxes allow the selection of multiple options to the same field. Checking a different check box has no effect on any check boxes that are currently checked or are not checked. Pressing the space bar when a check box has focus changes the box from checked (on) to not checked (off).



Check boxes are also used to turn options on or off. In the following example from the "*Thru Plate*" revise & review window, SDS/2 automatically calculates the value when the box for AUTO is checked. If the box for AUTO is not checked, the value that you enter is the value SDS/2 applies when designing the shear thru plate.



Entering Dates, Distances, etc.

Text entry widgets (apply when a cursor is in an entry field):

To move from one entry widget to the next on a window (from cell to cell in a setup table), use Tab or Shift+Tab.

Typing in file names: The length of an SDS/2 file name is typically limited to 61 characters. Remember when typing in the name of a file that capital and lower case letters are critical, as is any punctuation within the name. Erection views, job standard details, members, Jobs, Fabricators, submaterials, global standard details, details, sheet outlines, etc. are all given individual file names in SDS/2.

Drag and release selects a group of characters. Typing any character when a group of characters is selected replaces that group of characters with the character you type in.

Double-click selects all characters in the entry field (if the option to '*Place the cursor where I clicked*' is selected in *User Options*).

Ctrl+a or **Home** or **Ctrl+left arrow** moves the cursor to the left of all characters in the entry field.

Ctrl+b or **left arrow** moves the cursor one character to the left.

Ctrl+c "copies" text that is selected so that it can later be "pasted" into another entry field (using Ctrl+v).

Ctrl+d or **Delete** deletes the character to the right of the cursor.

Ctrl+e or **End** moves the cursor to the right of all characters in the field.

Ctrl+f or **right arrow** moves the cursor one character to the right.

Ctrl+h or **Back Space** deletes the character to the left of the cursor.

Ctrl+k or **Page Down** or **F8** deletes all text to the right of the cursor.

Ctrl+t "transposes" the letters to either side of the cursor so that the character on the right becomes the character on the left and vise-versa.

Ctrl+v "pastes" text that has been "cut" (using Ctrl+x) or "copied" (using Ctrl+c). The text is pasted to the right of the cursor **or** over the selected text.

Ctrl+x "cuts" text that is selected so that it can later be "pasted" into another entry field (using Ctrl+v).

F10 inserts "W" to the left of the cursor.
F11 inserts "PL" to the left of the cursor.
F12 inserts "L" to the left of the cursor.

Page Up deletes all characters in an entry field.

+ on keypad inserts a space to the left of the cursor.
*** on keypad** inserts "x" to the left of the cursor.

Entering dates:

Typing 'now' or 'today' or double-clicking or making the field blank enters today's date.

An entry of '0' is recorded as '**NOT SET**.'

Dates must be entered in the order of month day year with the year optional. If the year is not entered, the current year is used. The month can be numeric (1-12) or a three-letter abbreviation (jan, feb, mar, etc.). Any character or a blank space can be used to separate the month day and year.

Examples: 12/23/05, 12.23.05, Dec 23, Dec 23 2005, and 12 23 2005 are all viewed as equivalent entries by SDS/2 so long as the current year is 2005.

Entering distances:

Introduction: Other than the special characters -, /, ., spacebar and the units in, mm, GA, only numerical entry is allowed for entering distances in SDS/2. The primary dimensioning "*Units*" used on details is set under *Dimensioning Criteria* in *Fabricator Options*. No matter what dimensioning units are used, character heights (for instance, in *Drawing Cosmetics*) are always in millimeters.

If you are using metric units, entries of distances can be in millimeters and decimals thereof (example: 100 = 100 millimeters; 1.11 = 1.11 millimeters). Note that the units are not shown in the entry field when the entry is in the primary dimension "*Units*." Your entry must be a multiple of the "*Dimension precision*" that is set for those units. You can also enter other units.

If you are using imperial units, entering a distance in decimal inches then tabbing out causes the program to display the dimensional equivalent in the entry field. In this example, the user enters 120 inches:

After pressing the Tab key to exit the field, the dimensional equivalent is shown:

Your entry must be a multiple of the "*Dimension precision*" that is set for the primary dimensioning units. You can also enter other units (mm or GA) if your entry is a multiple of the "*Dimension precision*" set for those units.

Entering units other than the primary dimension units: In a Job with the primary dimensioning "*Units*" set to '*Imperial ...*', you can make entries in millimeters (135mm) to most distance-entry fields in SDS/2. If the primary dimensioning units are '*Metric*,' you can enter a fractional dimension (3/8in) or dashed dimension (1-0in) or decimal inches (5in) to specify inches. Entries of decimal inches are displayed as fractions (.5 is displayed as 1/2in). Except for entries of bolt diameters, a distance entry must be a multiple of the "*Dimension precision*" that is set for those units.

Entering angles:

0 degrees designates no rotation. An unrotated item is horizontal across the screen.

Negative degrees designates a clockwise rotation from zero degrees (from horizontal).

Positive degrees designates a counterclockwise rotation from zero degrees.

Special Keys in SDS/2

Special keys are keys on your keyboard with special SDS/2 applications. To achieve maximum productivity with SDS/2, you should be aware of what these keys do, even if you do not intend to use them on a routine basis.

, (comma) is the comma key on your keyboard. If you are, for example, on the *Column Edit* window and have changed the "*End elevation*" under "*Top end settings*," pressing the , key moves you to the "*End elevation*" field under "*Bottom end settings*."

Alt while pressing any letter on your keyboard that matches an underlined letter on one of the labels on the *Modeling* or the *Drawing Editor* menu bar opens the menu which that label identifies. You can then traverse the menu using arrow keys and invoke the selected command by hitting Enter. This same principle applies to entry windows – simply hold down the Alt key and press a key to go to whichever field has that key underlined. Alt+F4 does the same thing as clicking on the [X] button in the upper, right corner of a window – it closes the window. Alt+F9 minimizes a window.

Arrow keys are used to traverse from cell to cell on SDS/2 tables or to move within a text entry field on a window. The functionality of up/down arrow keys depends on the selection made to "*The up and down arrow keys*" in *User Options*. The left/right arrow keys can be used to select tabs in a window with tabs.

Back Space deletes the character (letter, number) to the left of the cursor when you are in a text-entry field. If text is selected (highlighted) in an entry field, Back Space deletes the text.

Ctrl modifies the functionality of a mode. For example, in *Select Items* mode (page 9), Ctrl gets you **Select(-)-Surface-Clear** mouse bindings. Within any SDS/2 window or from one window to another, you can Ctrl+x to "cut" (or Ctrl+c to "copy") text from one entry field so that it can later be "pasted" into another entry field (using Ctrl+v). On windows with tabs (for example, the *User Options* window), you can hold down the Ctrl key and left-click, middle-click or right-click to tear off a tab. Ctrl is also used for various "text entry widgets" (page 11).

Delete is available as a key on expanded keyboards. In *Select Items* mode with items selected, pressing the Delete key deletes the selected items. If text is selected (highlighted) in an entry field, Delete deletes that text. If no text is selected, Delete erases the character to the right of the cursor.

End is a key that appears on an expanded keyboard. End moves the cursor to the right of all characters in a text entry field.

Enter is the Return key on some keyboards. On most SDS/2 entry windows, you can press Enter on your keyboard instead of pressing the "*OK*" button at the bottom of that window. For multi-line "*Label text*," Enter creates a paragraph break. If you are performing an operation where you are prompted to select multiple items and you are done selecting items, pressing Enter can be used (instead of choosing "*OK* " on the shortcut menu) to log in your selections and continue to the next step of that operation.

Esc cancels an operation. It is an alternative to choosing "*Cancel*" on the shortcut menu. On a warning window, which does not have a "*Cancel*" button, Esc closes the window. On other SDS/2 windows, Esc is bound to the "*Cancel*" button (or the [X] button in the upper, right corner of the window). For example, Esc on the *Beam Edit* window closes the window without applying any changes you might have made to that window.

Function keys: F8 deletes all text to the right of the cursor. F10 inserts "W" to the left of the cursor. F11 inserts "PL" to the left of the cursor. F12 inserts "L" to the left of the cursor. Alt+F4 closes the window that is active. Alt+F9 turns a window into an icon (if it can be turned into an icon).

Keyboard shortcuts are single keys or series of keys that can be used to invoke commands in *Modeling* or the *Drawing Editor.* They are defined using *Options* > *Keyboard Configuration*. Once it has been defined, the keyboard shortcut is written on the drop-down menu next to the command it invokes. You can use the keyboard shortcut instead of the menu to invoke the command.

Keys on numerical keypad: With Num Lock on, number keys such as 1, 2, etc. insert the associated number. With Num Lock on or off, + inserts a space, * inserts "x."

Shift while certain mouse bindings are active gets you additional (previously hidden) mouse bindings. On selection dialogs that list multiple items that can be selected, holding down the Shift key lets you select a group of items that are next to one another on the list. Tab+Shift moves focus back one widget on an entry window. Shift with left-click in *Select Items* mode can be used for selecting more than one item at a time. In *Select Items* mode in the *Drawing Editor*, pressing Shift while holding down the left mouse button with the mouse pointer over a dimension label or a dimension line grabs the object so that you can move it.

Page Up & Page Down appear on expanded keyboards. Page Up deletes all characters in an entry field. Page Down deletes all characters in an entry field that are to the right of the cursor.

Tab moves focus from one widget to the next on an entry window. When you press Tab after making an entry on a window, the program validates that entry. If it finds the entry to not be valid, it may bring up a warning and/or prevent you from going on to the next option on the window. Tab+Shift moves focus back one widget.

The 3D Model

Q. What is the 3D model?

A. The 3D model is a computer representation of the actual steel framework of a building, tower or other steel structure. It is also a database of information about members that make up the steel structure.

Q. Why is it called three-dimensional?

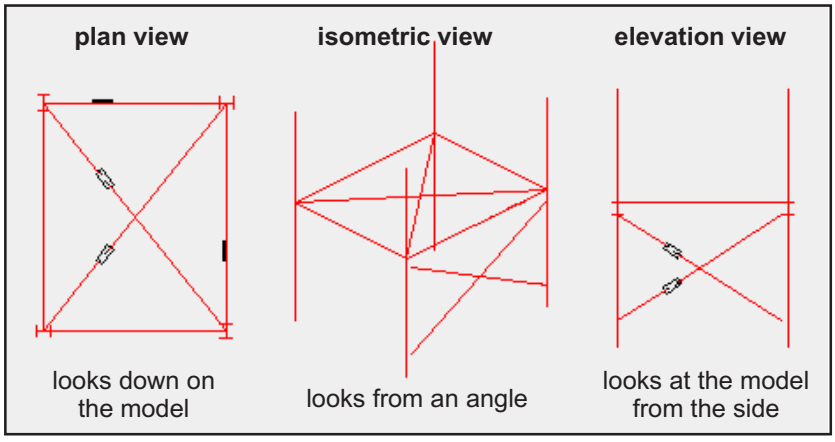
A. Because it is three-dimensional. It exists in a 3D mathematical matrix, sometimes referred to in this documentation as SDS/2's global coordinate system. Every member in the 3D model has actual physical dimensions that can be measured on screen. Each end of each member resides at a particular elevation. Each member or material work point is assigned unique X, Y and Z coordinates.

Q. Where does the 3D model come from?

A. It is created by you, the user, using options available on the *Model* menu in *Modeling*. For instance, you can use the *Member Add* tool to lay out beams, columns and braces in 3D space. For more information on 3D modeling, see "*Constructing a 3D Model*" beginning on page 40. An alternative to creating a model yourself is to import it from another program using Design Data's *DesignLINK* program.

Q How can I look at the model?

A. The obvious answer is that you can look at it on your computer screen. However, things are actually more complicated than this. The model, after all, exists in three dimensions, while your computer screen is flat and therefore can only represent 3D space in two dimensions. SDS/2 therefore allows you to create something called an erection view, which is a 2D window into the 3D model. You can create three different types of erection views in SDS/2.



By going into different erection views, you can look at the model from different perspectives, each of which provides you with information about the various members that make up the 3D model.

Q. What is the importance of the 3D model?

A. The basic theory behind SDS/2 is that if you construct the 3D model properly, then all of the information that you derive from the 3D model is accurate and up to date. All drawings that are automatically generated in SDS/2 derive their information from the 3D model. Therefore, if there is a structural problem with a SDS/2-generated detail, the way to fix it is to correct the problem in the 3D model, then redetail. Many reports that can be generated in SDS/2 also derive their information from the 3D model. Some reports are derived from member bills of material, but member bills of material are themselves derived from the 3D model. Because all information that comes from SDS/2 is ultimately derived from a single 3D model, conflicting information is minimized and the people who depend on SDS/2 – engineers, detailers, shop personnel, warehouse personnel, etc. – all get information that is crucial to their job performance from the same source.

Q. How does 3D modeling benefit actual construction of a structure?

A. With 3D modeling, you can actually see a structural framework before the structure is built. This greatly aids in your ability to troubleshoot potential problems before they become real problems. If you think that there is a problem with the way that a particular member end connection is designed, you can go to the model and look at that end connection to see how it actually appears in real life. If a beam is too short, you can see on your computer screen that it is too short. 3D modeling helps to ensure that all members are designed and fabricated to precise specifications so that members fit together exactly the way they are supposed to and actual erection of a structure at its construction site is greatly facilitated.

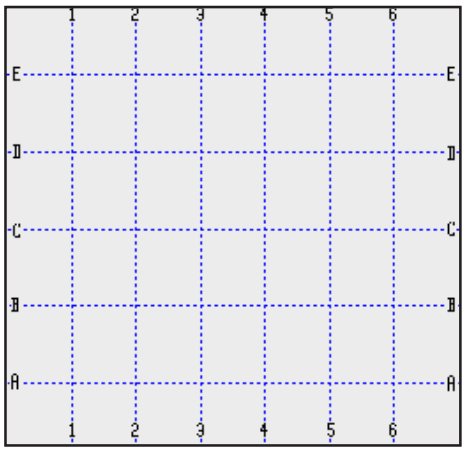
Q. Doesn't 3D modeling take longer?

A. Not really. When you do 3D modeling in SDS/2, you are also doing the ground work for creating detail drawings – which can be generated automatically (and therefore very quickly). While learning SDS/2 initially requires an investment of your time, the program quickly begins to save your organization a lot of time. SDS/2 saves you time in troubleshooting and revisions. It saves you time by ensuring that all who depend on information from the model are provided with the same information (because that information ultimately comes from the same source – the model). It saves you time by helping you to visualize potential problems before they become real problems at the actual construction site. SDS/2 also saves you the time and hassle and money associated with the back charges that 3D modeling can help to prevent.

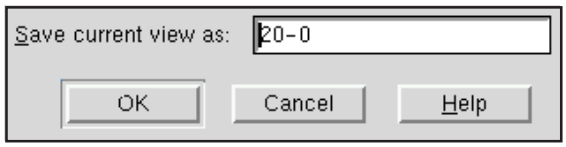
Working in Three Dimensions

Tools for working in 3D:

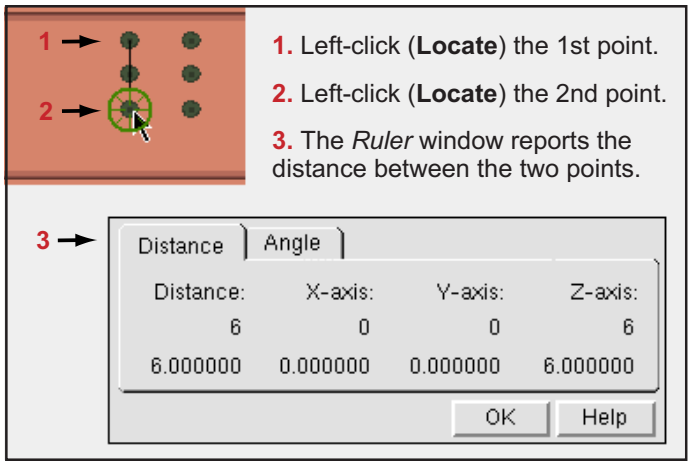
New View **and** ***Save Area*** can be used to create new views of the 3D model. These views appear as grid lines when you are in other views.



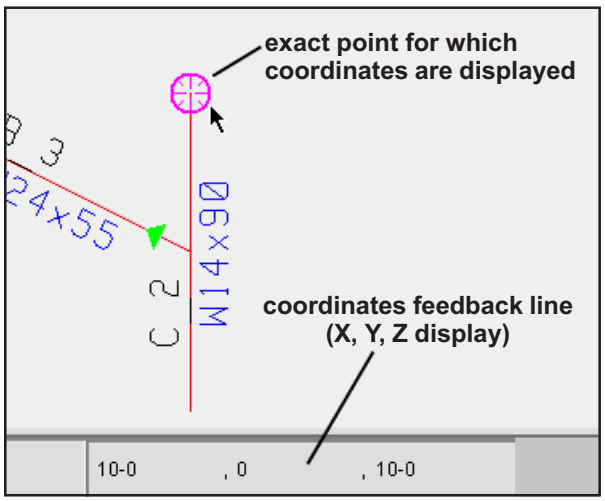
A number of other tools (including *Plan View*, *Section View* and *Isometric View*) can be used in SDS/2 to change the location of a view to give you a different perspective of the 3D model. If you then *Save* that new perspective (*File* > *Save*), you have created a new view.



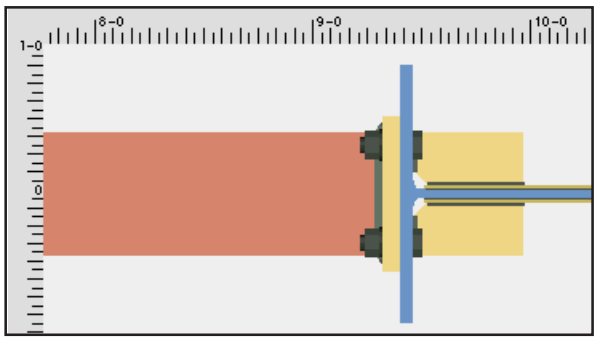
The ***Ruler*** (*Model* > *Ruler* in *Modeling*) lets you measure any linear distance in three-dimensional space by locating two points on screen.



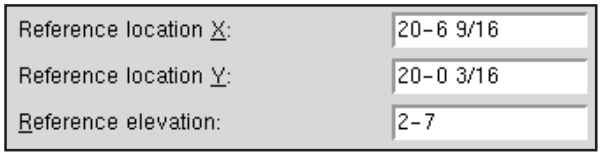
The X-Y-Z display tells you the position of specific points within SDS/2's global coordinate system.



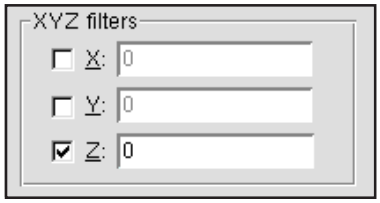
Rulers around the borders of views can be turned on in *Modeling* to provide you with a quick way to approximate distances and visualize global coordinates.



The *General Information* window provides "*Reference location X*," "*Reference location Y*" and "*Reference elevation*" settings which can be used to change a material's location in the 3D model.

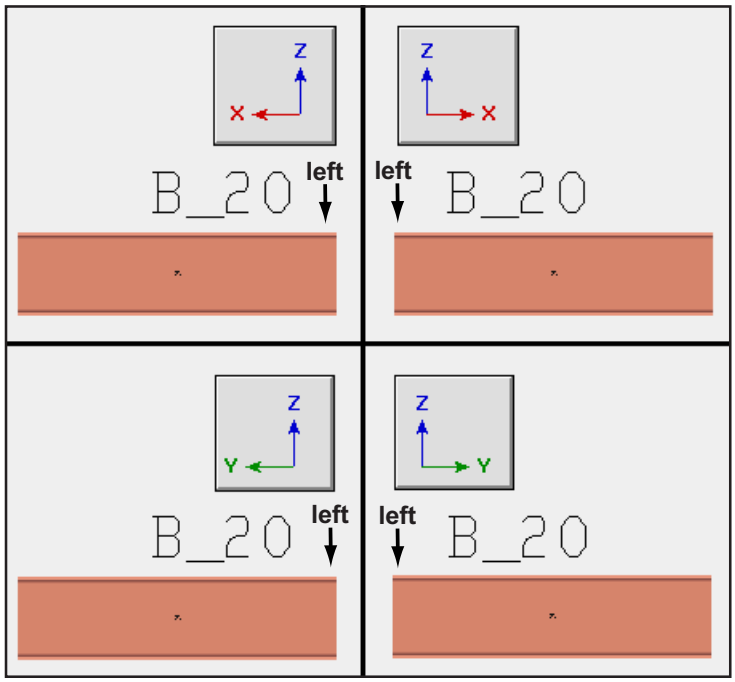


Z filtering in a *Modeling* snaps points you locate to a specific distance (Z screen axis location) in/out from your view's work plane. Choose *Locate* > *Auto Configuration*.

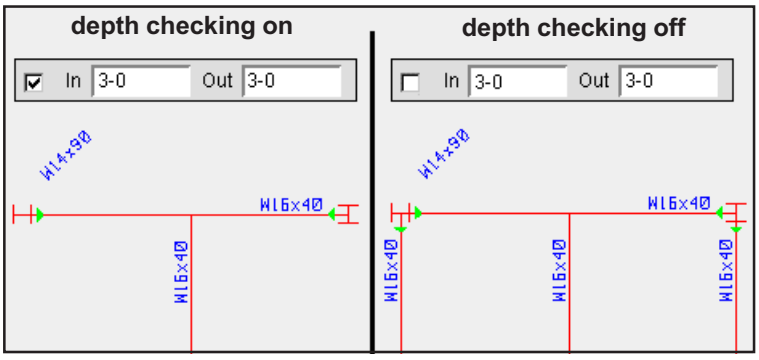


In a plan view when the "*Z*" filter is '*0*', all points translate to the reference elevation of the plan view.

An axes box can, for example, help you determine which end of a member is its left end in an elevation view.



Depth checking controls how far into and out of a screen you can see. The example below shows the same plan view of the same model. In the view to the left, depth checking is on. In the view to the right, depth checking is off. Notice that two additional beams can be seen in the view with depth checking off. This means that those two beams are more than 3-0 feet above or below the reference elevation of the plan view.

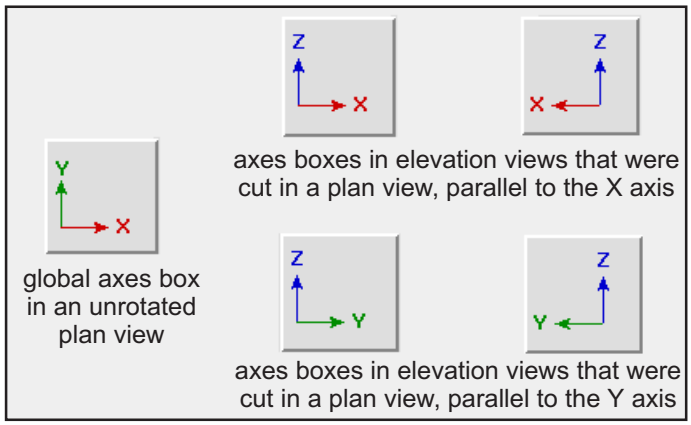


SDS/2's global coordinate system

Global coordinates are fixed. They position a member's reference point within the 3D model.

As you move around the 3D model, looking at it from different views, you may sometimes be looking at the model along the Z global axis, at other times along the Y global axis, and at other times along the X global axis. This is analogous to walking around the perimeter of a building. Sometimes you are looking at the building from the north, sometimes from the south, and sometimes from the west. As you walk around the building, the coordinate system we call north, south, east and west does not change. The only thing that changes is your position.

When you are in *Modeling*, the axes box informs you of the position of that view with respect to the global coordinate system. An axes box can optionally be added to your toolbar by choosing *Options* > *Toolbar Configuration*.



The Z axis is the elevation axis in whatever view you are in.

In a plan view, the X axis is horizontal with respect to the screen (+ is right, - is left), the Y axis is vertical with respect to the screen (+ is up, - is down), and the Z axis (elevation) is toward you out of the screen (+), or away from you into the screen (-).

In an elevation view, the Z axis (elevation) is vertical, and either the Y axis or the X axis is horizontal, depending on which side the structure is being viewed from.

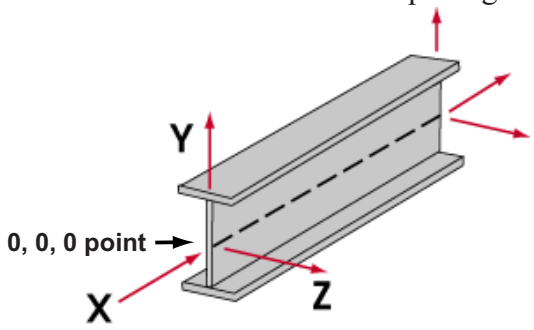
Operations that relate to global axes:

- All operations used to construct a 3D model in *Modeling* relate directly to global axes since all materials in the 3D model have precise global coordinates that position their work points with respect to global axes.
- The "*Reference location X*," *"... Y"* and *"... Z*" reported on the *General Information* window is the location of the material's reference point with respect to global axes. To get to this window, double-click on a material, then press on the "*General Information*" button on the material's edit window.
- When you set up an isometric view (*View* > *Isometric View*), the => and <= options (or your mouse wheel) rotate the view.

- When you change the *Reference Elevation* (*View* > *Reference Elevation*) of a view or its *Relative Depth* (*View* > *Relative Depth*), you are changing that view's position (moving its work plane) with respect to the 3D model's global coordinate system.
- When you *Rotate View* (*Navigate* > *Rotate View*), the global axes coordinates of individual members in your 3D model do not change. Only the view changes.
- When you create a structure in SDS/2 from a neutral file using *DesignLINK* (a program you can purchase from Design Data), members are positioned according to the global coordinates specified in the neutral file.
- When the *Ruler* tool is used (*Model* > *Ruler*), SDS/2 gives the actual distance between the points being measured. If relevant, it also gives the distance from the first point along the X, Y and Z global axes to the second point.

Member coordinates

The illustration below shows the X, Y and Z member coordinates for a wide flange column. The left end is the column's bottom end. If this were a wide flange beam, the intersection of the three axes would be at the top flange of the member.



Each member has its own coordinate system. This means that if you rotate that member, its coordinate system remains the same. The member's X axis is always along the length of the member from left to right. Its Y axis is perpendicular to the X axis along the left end of the member. Its Z axis is perpendicular to both the X and Y axes. The axes intersect at the 0, 0, 0 point.

Positive and negative directions within this coordinate system are determined with respect to the left end of the member, which includes the point of origin for the three axes (the 0, 0, 0 point of the member coordinate system). A force whose direction is from left to right along the X axis is assigned a positive value.

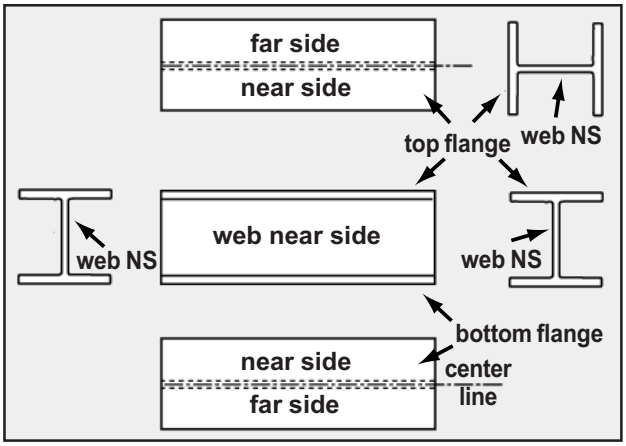
The left end of a member is defined by that member's location in the global coordinate system, not from the viewer's perspective (see page 22, "Determining a member's near side and left end"). It is possible to create views in *Modeling* that show the left end of a member on your right.

Operations that relate to member axes:

- When you double-click a member to open its edit window, the reference point (0, 0, 0 member coordinate) of the member is shown on the member's left end.
- When you do a *Rotate Material* operation (*Model* > *Material* > *Rotate*), you can optionally rotate the material with respect to member axes or to material axes.
- SDS/2's *Parametric Modeling* program uses member coordinates to record the location of the work points of a material added to a member.
- SDS/2's CNC program uses material coordinates, but for the main material of a non-miscellaneous member the material coordinates match the member coordinates.

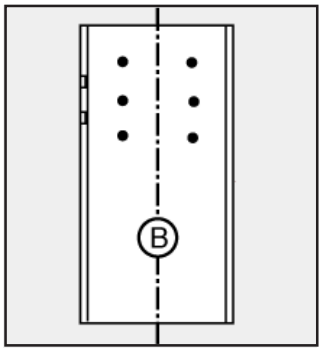
Determining a member's near side and left end

Knowing a member's left end can help you determine its near side. When looking at the near side of a non-vertical member, its left end is to your left and its right end is to your right. The left end of a member (detailed horizontal) is on the left on its detail.

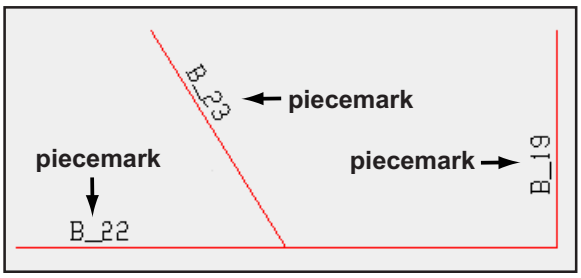


Web near side is the face shown in the main view on the member detail. When viewing a plan view in *Modeling*, the near side web of a beam, column or brace is the face that looks to the bottom or the right of the screen.

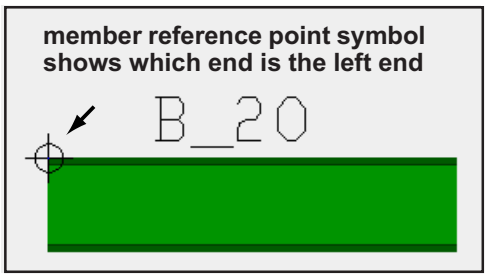
The near side of a column is always face B. The left end of a column is the end that is at the lower elevation.



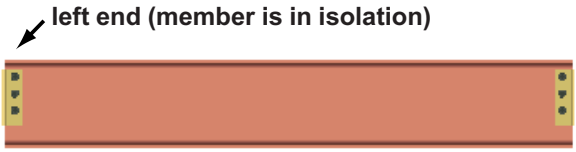
The piecemark of a member not shown as a cross section in *Modeling* is on the left end of the member (exception: if the member is relatively short or you have "*Swapped member ends*," this does not hold true).



Doing an *Edit Member* (double-click the member main material in *Select Items* mode) causes the reference point of the member to be displayed. This reference point is centered over the 0, 0, 0 member coordinate, which is on the member's left end.



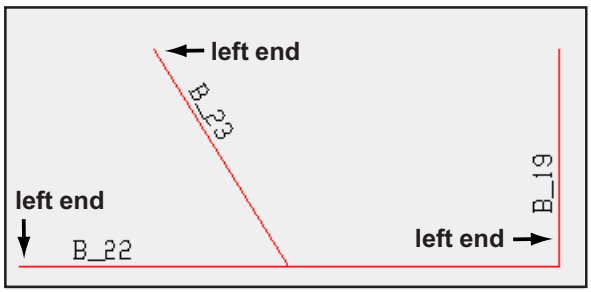
In isolation (*Model* > *Member* > *Isolate by Location*) the main member view for members other than columns is the same as that member's main view on its detail (if detailed horizontal), with its left end on the left and its near side facing toward you.



As members are input to the 3D model, each member work point is assigned global coordinates. SDS/2 determines which end is the left end of a member as follows:

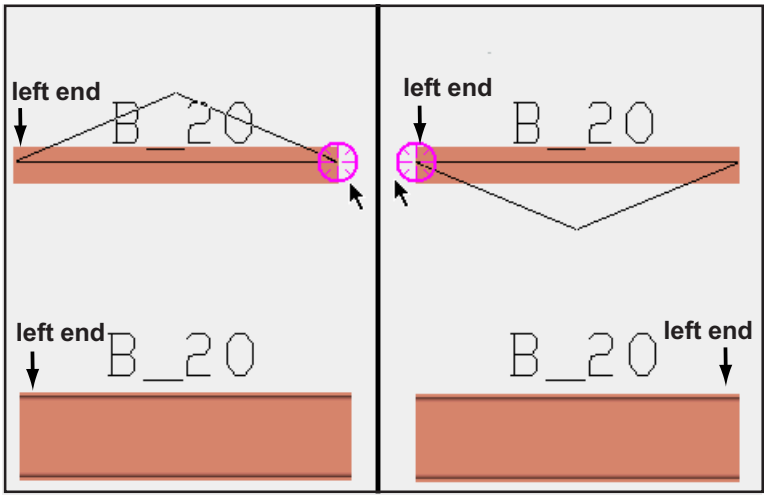
- If an X global coordinate for one work point of a member is less than the X global coordinate for the other work point, then the lesser X coordinate is the left end of the member.
- If the X global coordinate for both work points of the member are the same (this would be the case for a beam shown vertical in a plan view), then the work point with the smallest Y global coordinate is the left end of the member.
- If both the X and Y global coordinates of both work points of a member are the same (this would be the case for a perfectly vertical column), then the work point with the smallest Z global coordinate (lowest elevation) is the left end of the member. Hence the bottom end of a perfectly vertical column is its left end.

The left end of members in a plan view can be determined by observing how the members are oriented with respect to the computer screen.



- The left end of a member that is horizontal in a plan view is on the left of the member.
- For a member that is diagonal in a plan view, the most left end is the left end.
- For a member that is vertical in a plan view, the left end is the lower end.

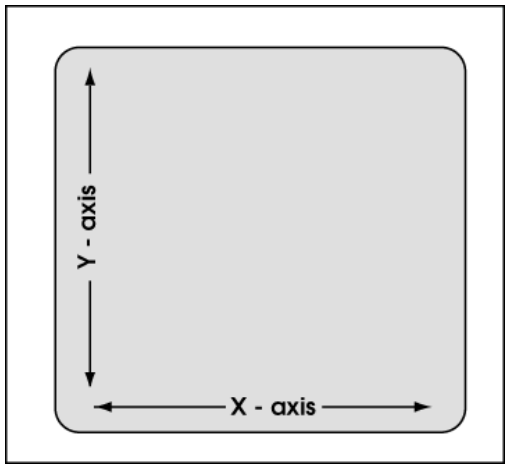
In an elevation view, determining which end of a member is its left end can be a bit more tricky. This is because erection views have directions.



- If in one elevation view the left end of a member appears on its left, then in an elevation view facing the opposite direction the left end of that same member appears on its right.
- To keep their views consistent, detailers usually lay out grid lines in a plan view so they look bottom up and right in.

Screen axes

Screen axes are yet another coordinate system that is sometimes used in SDS/2. These axes are oriented with respect to your computer screen. In a plan view, screen axes directly correspond to global axes.



No matter what view you are in:

- The X screen axis is horizontal (+ is to the right, - toward the left).
- The Y axis is vertical (+ is up, - down).
- The Z axis is perpendicular to the surface of the screen and goes into and out of the screen (+ is toward you up from the screen, - is away from you).

Operations that relate to screen axes:

- *Locate > Dx Dy Offset* (DXDY) lets you locate a point by specifying a distance from a first point or a reference point along the X, Y and/or Z screen axes.
- Rotation of graphic objects such as construction lines, weld symbols, etc. is done with respect to screen axes, with 0 degrees being horizontal across the screen.
- For *Copy Member* (*Model > Member > Copy*), X-axis and Y-axis positioning of members is done with respect to screen axes. The same applies to *Edit > Copy Objects* in the *Drawing Editor*.
- Rotation for *Model > Load Assembly* is done with respect to screen axes.
- XYZ Filters (*Locate > Auto Point Configuration*) work with respect to screen axes.
- *Locate > Center of Screen* (CNTR) finds the exact center point of your screen.
- Depth checking (*Navigate > Display Options*) controls how far into and out of a screen you can see.

Applying Connections to Individual Members

1. While in *Modeling*, choose either *Model* > *Member* > *Add* or double-click a member to bring up a beam, column, vertical brace, horizontal brace or joist edit window. Remember that most SDS/2 connections are always applied on the left or right end of the supported member – this goes even for connections that are detailed with (and therefore shop attached to) the supporting member.

2. On the member edit window, press the "*Conn Type*" button and, for the appropriate end of the member, select the specific "*Input connection type*."

2a. If you selected '*Auto standard*' as the "*Input connection type*," go to step 2e. SDS/2 will automatically assign a connection for you based on the member's framing situation and the choices made to "*Auto Standard Connections*" setup in *Job Options*.

2b. If you selected '*User defined*' as the "*Input connection type*," you now need to enter the name of the "*User defined connection*" that you want.

2c. If you selected a connection type other than '*Auto standard*' or '*User defined*' press the "*Conn Spec*" button and fill out additional connection settings.

2d. If you are on a *Beam Edit* window and the "*Input connection type*" you selected is a '*Clip angle*,' '*End plate*,' '*Shear*' or '*Beam splice plate*,' you can optionally press the "*Moment*" button and add moment options.

2e. Press the "*OK*" button to close the member edit window.

3. If in step 2 you made changes to a member and the 3D model contains other members with the same piecemark, SDS/2 opens a yes-no dialog with the question, "*Do you want to change all members with this piecemark*."

Alternative 1: Press the "*Yes*" button to change all members with the same piecemark so that they have the same settings as the member you just edited.

Alternative 2: Press "*No*" to change only the one member you just edited.

4. Choose *Process* > *Process and Create Solids* to cause SDS/2 to actually design the connection you have specified. In the design of connections, SDS/2 takes into account loading conditions, AISC guidelines, particular framing conditions, and choices made in *Job Options* and *Fabricator Options*.

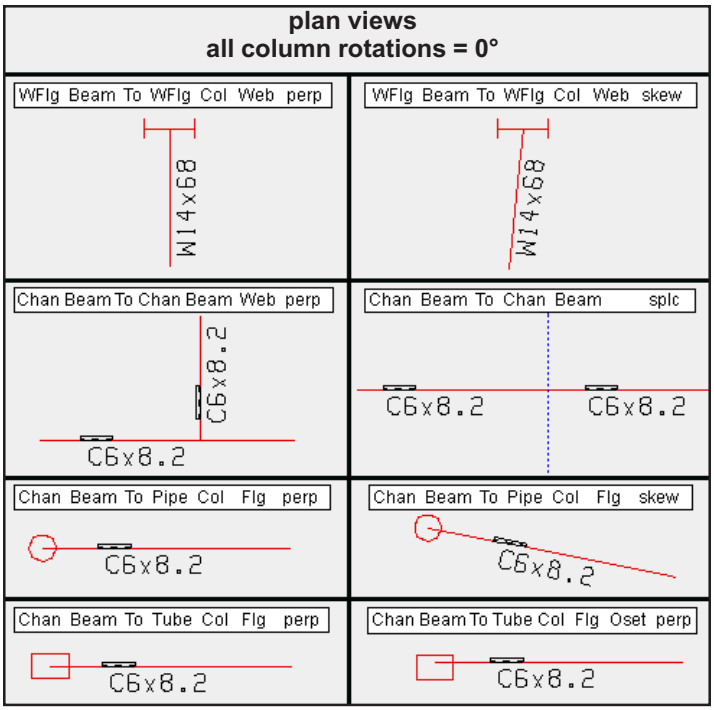
Note: Once you have generated a connection on the end of a member, you can modify that connection by making it '*User*' or by adding materials, holes, etc.

Auto Standard Connections

What are auto standard connections?

Auto standard connections are system connections that have been defined according to particular framing conditions using *Auto Standard Connections* in *Job Options* (setup). They make SDS/2 automatically design similar connections for similar framing conditions.

Examples of framing conditions:



When to use auto standard connections:

It is strongly recommended that users of SDS/2 apply auto standard connections wherever possible, as this will save time, minimize the total number of shop drawings that are required in a Job, and ensure consistency of design.

You CANNOT define the following types of connections as auto standard:

- moment connections
- vertical brace gusset plates
- horizontal brace gusset plates
- beam-to-beam splice plates

Auto standard connections save time:

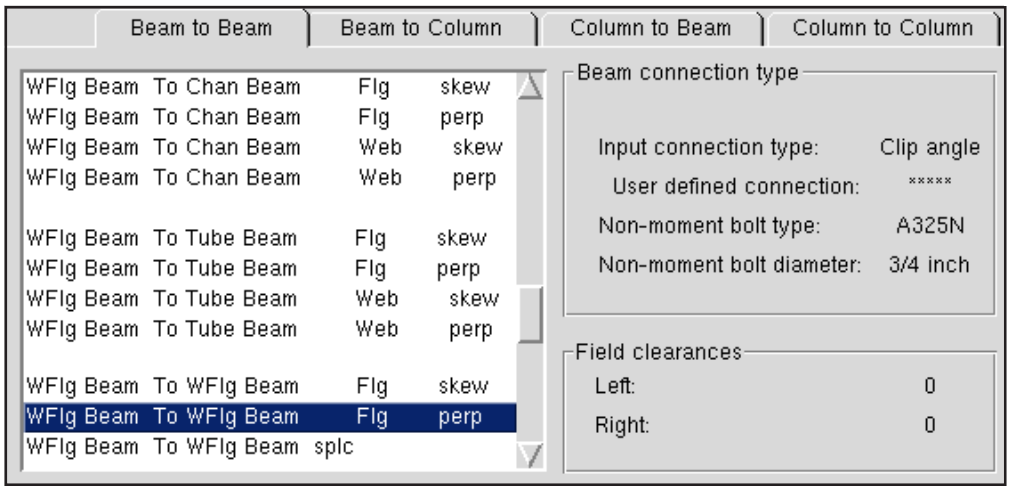
- It's usually a lot faster to define auto standard connections than to define connections on each end of a member independently. The larger the Job, the more time auto standard connections are likely to save.

Auto standard connections ensure design consistency:

- The total number of different connection designs needed to complete a job is minimized.
- This also means that the total number of member and submaterial details is minimized and shop activity is thus streamlined.
- As with other automatically generated connections, SDS/2 designs auto standard connections to meet AISC specifications, to stand up to loading conditions, and to comply with *Job/Fabricator* settings.

To generate an auto standard connection:

1. Choose *Options* > *Job Options* > *Auto Standard Connections* to define the SDS/2 connection type (clip angle, bent plate, end plate, shear, seated beam, splice plate, base/cap plate) for particular framing conditions. In the example below, the condition is a wide flange beam perpendicular to the flange of a wide flange beam.



2. *Model* > *Member* > *Add* or edit (double-click the main material of) a beam or column to open the *Beam Edit* or *Column Edit* window of the member you want to apply the auto standard connection to. Remember that beam connections are applied on the left or right end of the supported member – this goes even for connections that are detailed with (and therefore shop attached to) the supporting member.

3. While on the appropriate edit window, press the "*Conn Type*" button and, for the appropriate end of the member, select '*Auto Standard*' as the "*Input connection type*." Press "*OK*" to exit the edit window.

4. During *Process and Create Solids*, SDS/2 looks to the choices you made to *Job Options* in step 1 in order to assign the auto standard connection that is appropriate for that framing condition.

User Defined Connections

What is a user defined connection?

- User defined connections have user-named file names and can be applied to the ends of as many members as you like. They allow you, the user, to enter specifications that may or may not follow AISC guidelines.
- User defined connections can be copied into your current Job from other Jobs by choosing *Utility Functions* > *Copy Job Items* from the *SDS/2 Main Menu*. You can delete user defined connections from your current Job using the *SDS/2 Utilities* option "*Delete Job Items*."

Compared to other connections:

- User defined connections adapt to different framing conditions such as the section sizes and orientation of the connecting members, just like other SDS/2 connections. This means that the same user defined connection may be designed in different ways on different members. Unlike other types of SDS/2 connections, if a user defined connection fails, 3D solids are still generated for the connection, making it unnecessary for you to '*Force*' the connection.

To create a user defined connection:

1. Under "*User Defined Connections*" in *Job Options*, set up the user defined connection and give it a file name up to 61 characters in length. Give it a name that will help you remember the connection type, the framing situation, the material type, and the web rotation (example: btb_shr_wv for a beam-to-beam shear connection where the main material of the supported beam is wide flange material with a vertical web).

2. Use *Model* > *Member* > *Add* or edit (double-click on) a beam, column or brace to bring up the edit window for that member.

2a. Confirm that the "*Section size*" on the edit window is material of the same type as the "*Material type*" selected when you defined the connection in step 1.

2b. Press the "*Conn Type*" button and, for the appropriate end of the member, select '*User defined*' as the "*Input connection type*." To "*User defined connection*," enter the name of the user defined connection you originally set up in step 1.

2c. Press the "*OK*" button at the bottom of the member edit window to save your changes and close the window.

3. *Process and Create Solids* to cause SDS/2 to design the connection.

Step-by-Step Detailing Instructions

Tips for Making Job Development Faster

Tip #1: The development of a Job in SDS/2 usually doesn't go as planned. There are usually architectural and engineering changes that will make you have to redo some of your work. Also, especially if you are a new user, you are likely to make mistakes that will later need to be corrected. One thing you can do in *Modeling* to help you track your work and ensure quality results is to use *Model > Status Display* and *Model > Update Status*. *Status* options can also help you keep track of drawing development, submission and revision. Reports generated using options on the *Reports* menu are another useful way to track members and materials through the development of a Job. The *Search* options found on the *Edit* menu are useful for finding potential problems with connections.

Tip # 2: The best way to save time when developing a Job is to use *Job Options* and *Fabricator Options* to your advantage. Pay especially close attention to options that affect connection design. When you let SDS/2 design connections for you, then you are working with the program and letting it do your most difficult work for you.

Tip #3: There's usually more than one way to do something in SDS/2. For example, you can double-check the model and drawings to see if SDS/2 has altered a connection during *Process and Create Solids*, or you can perform a *Search* for altered connections (*Edit > Search > Connections Changed by System*), or you can use *Model > Status* to display in another color all members with connections that SDS/2 has changed. It's a lot easier and quicker to use *Status* or the *Search* options.

Tip #4: Users can customize the look and performance of SDS/2 in a variety of ways. For example, you can set up keyboard shortcuts (*Options > Keyboard Configuration*) or add or remove icons on your tool bars (*Options > Toolbar Configuration*). The *Configuration Files* tab in *Options > User Options* lets you set which configuration files (containing toolbars and keyboard shortcuts) you want to be automatically loaded when you start up *Modeling* or the *Drawing Editor*.

Tip #5: Productivity can potentially be dramatically increased using Python scripts created in SDS/2's *Parametric Modeling* program or by applying adaptive details when you *Process > Detail Members*.

Tip #6: If you don't understand something in SDS/2, try using SDS/2's context-sensitive help. If you are not sure what a particular option on a window does in SDS/2, press that window's "*Help*" button. SDS/2 starts your browser and brings you to the part of the manual that discusses that window.

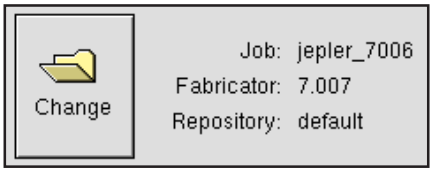
Step 1: Beginning a Job

What is a Job/Fabricator?

A Job is a file folder in your current version of SDS/2 that stores information about all members that you lay out when you build a structure (a 3D model) in SDS/2. When you change to a different Job, you change to a different 3D model. A Fabricator is a file that contains *Fabricator Options*. You can use the same *Fabricator Options* file with as many different Jobs as you like. A single set of *Job Options* is an embedded component of a particular Job and cannot be used with a different Job (although *Job Options* can be copied into different Jobs).

What is my current Job/Fabricator?

You can tell which Job is your current Job by looking at the upper, left corner of the *SDS/2 Main Menu*, just to the right of the "*Change*" button. Also shown at this location is the "*Repository*" (file folder) where your current Job is stored.



Creating/starting up a Job

The following instructions may be used to start up a Fabricator/Job that is not the last Fabricator/Job you were working on or for creating an entirely new Fabricator/Job. Skip steps 3 and 5 if all you want to do is change to a different Fabricator and Job.

1. To begin changing/creating a Job and/or Fabricator:

Method 1: On the upper, left corner of the *SDS/2 Main Menu*, press the "*Change*" button.

Method 2: If the "*Job/Fab selection method*" in *User Options* is '*Prompt*,' this routine starts up automatically when you start up SDS/2.

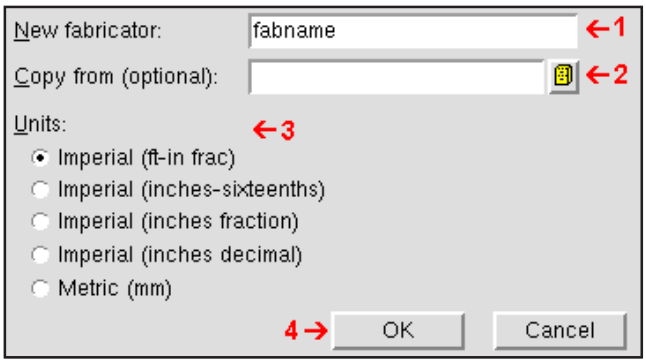
2. A selection dialog opens. On it is a list of the Fabricator files that are stored in the fabs file folder that is used by your current version of SDS/2. Do one of the following:

Alternative 1: To select a different Fabricator, double-click its name (or select its name and press "*OK*). Go to step 4.

Alternative 2: To keep your current Fabricator, press "*Cancel.*" Go to step 4.

Alternative 3: To create a new Fabricator, press "*New....*" Go to step 3.

3. Skip this step if it does not apply. If you pressed "*New ...*," the *Create New Fabricator* dialog opens:



New Fabricator (reference 1): The file name (up to 64 characters) of the new Fabricator file can be made up of letters and/or numbers with "_" or "." as optional separators.

Copy from (reference 2): The file name of the Fabricator data you want to copy to the "New Fabricator" file whose name you entered above. If you don't know the Fabricator's name, press the "file" button ( ) and select the name you want from the list. Leave this blank if you want SDS/2 to assign default setup data based on AISC guidelines and common practices in the fabrication industry.

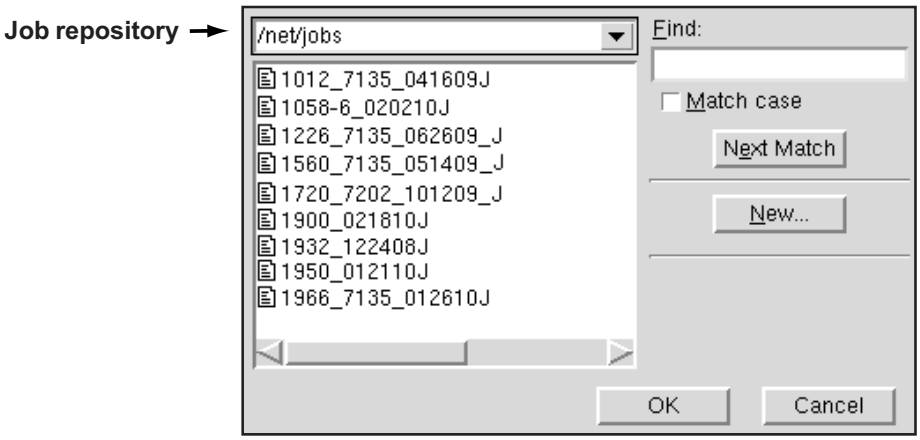
Units (reference 3): Imperial (ft-in frac) or Imperial (inches-sixteenths) or Imperial (inches fraction) or Imperial (inches decimal) or Metric (mm). This sets the primary dimensioning "*Units*" that you most commonly use when entering distances and that SDS/2 must use to show distances on drawings or in the 3D model. You will not be restricted to making entries in the units you select – you can also enter other units. This option is disabled when you "*Copy from*" another fabricator.

Units	Examples
'Imperial (ft-in frac)'	10-6 1/2 ís ten feet, six-and-a-half inches.
'Imperial (in-sixteenths)'	24-8 is two feet and a half inch.
'Imperial (inches fraction)'	14 1/4 is one foot, two-and-one-fourth inches.
'Imperial (inches decimal)'	14.25 is one foot, two-and-one-fourth inches.
'Metric (mm)'	1000 is one thousand millimeters or one meter.
Also: Imperial weights are in pounds. Imperial loads are in kips. Metric weights are in kilograms. Metric loads are in kilonewtons.	

Alternative 1: Press "*OK*" (reference 4) to create the new Fabricator. Go to step 4.

Alternative 2: Press "*Cancel*" to go back to step 2.

4. A selection dialog opens. On it is a list of all Jobs that are in the file folder in which your current Job is located. You can change to a different Job repository (file folder) and so get a different list of Jobs to choose from. Do one (1) of the following:

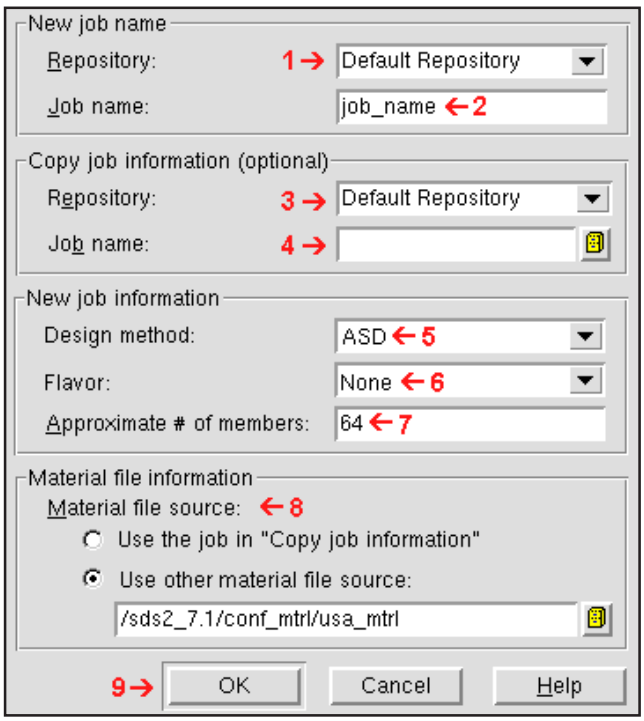


Alternative 1: Double-click the name of the Job you want to work on. Go to step 6.

Alternative 2: Press "*Cancel*" to keep working in your current Job. Go to step 6.

Alternative 3: To create a new Job to be your current Job, press "*New ...*". Go to step 5.

5. Skip this step if it does not apply. If you pressed "*New...*," the *New Job* dialog opens.



Repository (reference 1): The file folder into which the new Job you are creating will be stored. Repositories are added using "*Job Repository Management*" in *Utilities*.

(step 5 – filling out the *New Job* dialog – continues on the next page)

Job name (reference 2): The file name (up to 64 characters) of the new Job. Job file names can be made up of letters and/or numbers with "_" or "." as optional separators.

Copy job information (optional)

Tip: "*Copy job information*" can save you from having to redo the setup that you already did for another, similar Job.

Repository (reference 3): The file folder for selecting the "*Job name*" below.

Job name (reference 4): No entry or the file name of the Job you want to copy Job information from. The Job information (including *Job Options* and sheet outlines and user defined connections) is copied **from** the name you enter **to** the new "*Job name*" entered above. If you don't know the Job's name, press the "file" button () to select a name from the list. If you do not enter a "*Job name*" here, SDS/2 will create default Job setup data for your new "Job name," but will not copy sheet outlines or user defined connections.

New job information

Note: The "*Design method*" under this section is disabled (grayed-out) if you entered a "*Job name*" under "*Copy Job information*." The new Job you are creating will use whatever "*Design method*" is selected under the *Job Options* that are copied from that other Job.

Design method (reference 5): ASD13 or LRFD13 or AS 4100 or CSA or ASD9 or LRFD3. The selection made here affects how connections are designed during *Process and Create Solids*. Since the "*Design method*" is a part of *Job Options* setup (under *Design Criteria*), you can, if you so choose, change to a different "*Design method*" after the new Job is created.

Design Method	Design Specification
'ASD 13' or 'LRFD 13'	*AISC Steel Construction Manual, Thirteenth Edition*
'AS 4100'	*Australian Standard for Steel Structures, AS4100 - 1998*
'CSA'	*CISC Handbook of Steel Construction, Eighth Edition*
'ASD9'	*AISC Manual of Steel Construction, Allowable Stress Design, 9th Edition*
'LRFD3'	*AISC Manual of Steel Construction, Load and Resistance Factor Design, 3rd Edition*

(step 5 – filling out the *New Job* dialog – continues on the next page)

Flavor (reference 6): None or Default or DesignData or Other flavors are among the options that may be listed. The flavor of custom properties that is selected here is copied into the Job you are creating, where the individual schema that make up that flavor can be edited, deleted or added to using the various *Custom Properties* setup options for job schema, member schema, material schema, etc. Users can copy a custom property flavor from **any** Job using the *Copy Job Flavor to Global Flavor* utility. If users have done so, those flavors become selectable here (they are the '*Other flavors*'). The '*Other flavors*' may be one user-named flavor or any number of user-named flavors, or, if no users have used that utility, there will be no user-named flavors to choose from when a new Job is created.

Selection	Effect on your New Job
'None'	results in no custom property schema being available in this new Job you are creating.
'Default'	starts your new Job with a set of custom property schema that was originally developed by Design Data. SDS/2 **does not** overwrite the *'Default'* flavor when you update your current version of SDS/2. Conseqently, any changes you make to schema using setup options will be maintained across each fresh installation.
'DesignData'	same as '*Default*,' except that SDS/2 **overwrites** the *'DesignData*' flavor when you install a new version of SDS/2. A new install **does not** affect schema currently in use -- even if the schema were copied from the '*DesignData*' flavor.
'Other Flavors'	can be selected here if they have been saved using the *Copy Job Flavor to Global Flavor* utility.

Approximate number of members (reference 7): A whole number that represents the estimated number of members you expect to have in this Job plus an extra 10% to 30% for good measure. Up to 150,000 members can be allocated. The program calculates how much memory it needs for the number of members you have specified and allocates space on the hard drive accordingly. If necessary, you can later increase your estimate using the *Change File Sizes* utility. If the initial estimate that you enter here is sufficiently large and you actively use the *Release Submaterial Marks* and *Release Deleted Members* utilities to keep your Job from growing too large, you will probably never have to use the *Change File Sizes* utility.

(step 5 – filling out the *New Job* dialog – continues on the next page)

Material file information

Material file source (reference 8): Select one of the following options for copying an existing material file for use as the local material file in the Job you are creating.

Use the job in "Copy job information" (reference 8): Selects the material file for the "*Job name*" entered under "*Copy job information*" to be copied as the local material file of the new Job you are creating.

Use other material file source (reference 8): A file path to any material file on your network. You can use the "file" button ( ) to select a file instead of manually typing in the file path. The material file is copied as the local material file for the new Job. Following are examples of some of the file paths you might enter:

Examples of file paths:	
/*/main/job_mtrl	* = file path to the Job. /main/job_mtrl is the local material file in the Job.
/*/conf_mtrl/default	* = file path to the current version of SDS/2.This file folder contains the default USA (usa_mtrl), default Canadian (can_mtrl) and default All (all_mtrl) material files. These files are automatically updated with each new version of SDS/2.
/*/conf_mtrl/usa_mtrl /*/conf_mtrl/can_mtrl /*/conf_mtrl/all_mtrl	* = file path to the current version of SDS/2. These are the USA, Canadian and All material files. Users may update these files as they please. SDS/2 does not overwrite these files when you update your current version of SDS/2.

Alternative 1: Press the "*OK*" button (reference 9) to create the new Job.

Alternative 2: Press the "*Cancel*" button (reference 9) to end the *Change* operation without creating a new Job.

6. You should now be back at the *SDS/2 Main Menu*.

6a. Note that the new Job and Fabricator you selected (or created if you did steps 3 or 5) are now listed in the upper, left corner of this menu.

Tip 1: At this time you may want to double-check your *Job*/*Fabricator Options* files as described in the next section, "*Double Checking Setup Options*."

Tip 2: If you didn't already do so during this procedure, you may at this time want to use the *Copy Job Items* utility to copy standard details, sheet outlines, user defined connections, assemblies or etc. from other Jobs.

Step 2: Double Checking Setup Options

Setup options (*Job/Fabricator Options*) let you customize SDS/2 to meet the special needs of particular fabricators or of particular construction projects. These options also help speed the input of a Job and ensure consistency in the use of materials and the application of design principles.

Key concepts for understanding setup

Key #1: You can get to setup options from the *SDS/2 Main Menu* by clicking on "S*etup Job or Fabricator Options*." In *Modeling* or the *Drawing Editor*, choose *Options* > *Job Options* or *Options* > *Fabricator Options*.

Key #2: Setup information is divided into two sections: *Job Options* & *Fabricator Options*. *Job Options* generally relate to the engineering standards defined for a particular construction project. *Fabricator Options* generally pertain to the shop practices of fabricators. **Tip:** To print a report on selected *Fabricator Options*, select "*Print Fabricator Data*" on the bottom of the *Setup Job Or Fabricator Options* menu. For a report on selected *Job Options*, select "*Print Job Data*."

Key #3: Setup options affect different parts of SDS/2. Certain setup options affect member input, while others affect *Process and Create Solids*. Still other setup options are applied during *Detail Members*.

Key #4: Ideally you setup *Job/Fabricator Options* one time per Job, usually when you start a Job. A little time spent setting up *Job/Fabricator Options* can save you a great deal of time inputting a Job.

Key #5: *Fabricator Options* and *Job Options* files are stored on disk (your hard drive or server). You can use *SDS/2 Utilities* to copy "*Job Setup Info*" or "*Fabricator Setup Info*" from other Jobs to your current Job. You can also import *Job Options* and *Fabricator Options* as you create a new Job or Fabricator (see "*Beginning a Job*," steps 3 and/or 5).

Key #6: If you change *Job/Fabricator Options*, you may need to *Process* members again. One way to do this is to choose *Process* > *Process Members Only*, then select all members that you want redesigned according to the your new setup choices. Or you can choose *Model* > *Member* > *Mark for Processing* and select the members you want changed, then *Process* > *Process and Create Solids*. Please note, however, that *Processing* is not necessary for all setup options; for many *Fabricator Options*, you only need to *Process* > *Detail Members* to see your setup changes applied.

Options to look at before entering member and material settings:

Some *Job Options* and *Fabricator Options* set up the options you can select on windows for members and materials in *Modeling*. For example, the first line on many setup tables sets the default selection that is automatically applied to members or materials as they are newly added in *Modeling*.

Setup Options that Affect Entry Choices to SDS/2 Windows		
Option	**Location**	**Effect on Available Entry Choices**
"*Units*"	Drawing Cosmetics in Fabricator	Sets units of measure used as the default for entry of distances in SDS/2.
"*Dimension precision*"	Drawing Cosmetics in Fabricator	Sets precision for entry of distances. You need to set the precision for all "*Units*" you plan to use.
"*Custom Properties*"	'*Job*' '*Member*' '*Material*' etc.	Schema should be set up so that the desired custom properties are applied to members and materials as they are added. How much setup is needed depends on the "*Flavor*" selected at Job creation time.
steel grades for W, plates, T, C, L, pipe & tube material	separate tables in Job Options	Set the grades that you can select as the*"Steel Grade*," for example, on material edit windows and member edit windows.
"*Maximum Sequences*"	Revision Level, Zone and Sequence in Job Options	Sets the number of sequences your Job is to be divided into. By default, these sequences are numerical (1, 2, 3, etc.), but you can give them names if you choose.
Sequence Names	Revision Level, Zone and Sequence in Job Options	Sets the names of sequences on the selection list that appears when you assign a sequence to a member. If you don't set up names, the sequences appear as numbers (1, 2, 3, etc.).
Bolt Schedule	Job Options	Sets the bolt types that are available for selection while adding or editing beams, columns or braces.
Plate Definition Schedule	Job Options	Sets base/cap plates that the SDS/2 user can apply to columns.
User Defined Connections	Job Options	Specific connections users can apply to beams, columns or braces by selecting '*User Defined*' as the "*Input connection type*."
Stair Tread Definition Schedule	Fabricator Options	Sets stair treads that users can apply when adding stairs.
User Routing Definitions	Fabricator Options	Affect selection options that users can choose from during *Status Review* or *Status Update*.

Job/Fabricator Options to look at before Process and Create Solids:

Setup Options that Affect Process & Create Solids		
Option	**Location**	**Effect on Process & Create Solids**
Auto Standard Connections	Job Options	Set up of a method for applying connections according to the framing situation.
Non Auto Standard Field Clearances	Job Options	Set field clearances for connections that are not applied using the "auto standard" method.
Standard Fabricator Connections	Fabricator Options	Set hole spacing and gages that are applied during *Process & Create Solids*.
lists of tees, angles, flats	Standard Fabricator Connections	List connection materials that may be applied to certain types of connections during *Process & Create Solids*.
Center Marking, Position/Match Marking	Fabricator Options	Affect where CNC marks are placed on members during *Process & Create Solids*.
Member and Material Piecemarking	Fabricator Options	Affect the naming of member and submaterial piecemarks that takes place during *Solids Creation*.
Minimums for Structural Members	Job Options	Set the number of rows of holes on clip angle, bent plate, end plate and beam-to-beam splice plate connections.
Minimums for Single-Plate Shear Connections	Job Options	Set bolt diameter, number of rows and plate thicknesses for shear tab connections.
Design Criteria	Job Options	Dramatically affect connection design. For example, you can set the "*Connection design method*" to '*ASD13*' or '*LRFD13.'*
Washer Criteria	Job Options	Define the number and types of washers assigned to particular bolt types applied in the shop or field.
Weld Design Criteria	Job Options	Specifications for the design of welded connections, including welds on base/cap plates and moment connections.
Plate Design Criteria	*Job Options*	Apply to the design of beam stiffener plates and brace gusset plates.
Moment Plate Design Criteria	*Job Options*	Apply to the design of column web doublers, bolted moment flange plates, and column stiffeners.

Job/Fabricator Options to look at before automatic detailing:

Automatic detailing is the automatic production of member details, submaterial details and erection plans. SDS/2 users can produce these three types of drawings automatically, without your ever having to manually draw a line. Control over the appearance of these drawings is accomplished mostly through *Fabricator Options*.

SDS/2 bases its drawings on the physical dimensions of actual members and materials in the 3D model found in *Modeling*. For this reason, when you make changes to members in *Modeling*, you need to auto detail the affected members again so that the new set of drawings accurately reflects the model. You also have to auto detail again if you make changes to drawing options in *Fabricator Options* (for instance, to options under *Drawing Cosmetics*).

Setup Options that Affect Automatic Detailing		
Option	**Location**	**Effect on Automatic Detailing**
Dimensioning Criteria	Fabricator Options	Set the types of dimensions to be drawn on beam, column and brace details.
Drawing Cosmetics	Fabricator Options	Set the sizes of characters and the plotter pen numbers of graphic objects that appear on details.
"Units"	Drawing Cosmetics	The "*Units*" for primary dimensions affect not just details but all specifications related to dimensions reported on details.
General Detailing Options	Standard Fabricator Connections	Define the scale of details and affect the appearance of details in other ways.
Job North	Job Options	Sets the direction the A face on a column detail is marked to face.
Bolt Detailing Options	Fabricator Options	Set how and where bolt information is identified on member details.
Member and Material Piecemarking Options	Fabricator Options	Let you choose how materials are called out on member details and how submaterials are named.
Member Detailing/ Fabricaton Options	Fabricator Options	Options are categorized by member type and include settings for including end elevations and load information on details.
Erection View Detailing Options	Fabricator Options	Give you options for the automatic dimensioning and labeling of members in erection view details.
Detailing Symbol Options	Fabricator Options	Let you define the general appearance of items such as weld symbols and bevel symbols.

Options for special cases:

Data that is output from an SDS/2 Job is usually derived from the 3D model or from member bills of material (which are derived from the 3D model but can be modified by the user). To output information from a Job, the SDS/2 user can plot sheets or print reports or use special programs for exporting files (such as *Drawing Conversion, Design Link* and *Kiss Export*). The following table lists some of the *Fabricator Options* that can be used to customize the form and content of information that can be derived from an SDS/2 Job.

Setup Options for Special Applications		
Option	**Location**	**Effect**
Drawing Pen Setup	Fabricator Options	Sets the line thickness (width) and color for HP-GL/2 plotter pens.
ABM Report Criteria	Fabricator Options	Set the defaults for which types of materials will be listed in the database that an Advance Bill of Material (ABM) is derived from.
ABM Report Layout	Fabricator Options	Lets you configure the appearance of the following reports: *Original ABM*, *Current ABM*, *ABM Drop Report*, *ABM Add Report*, *ABM Material Information Report*.
Bill of Material Layout	Fabricator Options	Sets the layout of the member bill of material that is plotted on detail sheets.
"*Shop bill weight*"	General Detailing Options in Fabricator Options	Lets you set whether you want the weights of materials that are reported in a member bill of material to be based on the actual member shipping weight or the weight of the raw material before copes, etc.
"Field bolts listed on which members"	Bolt Detailing Options in Fabricator Options	Sets whether field bolts are listed for the supported member or the supporting member.This applies during *Processing* to field bolt reports and member details (if field bolts are listed in the member bill).
Category *Definitions*	Fabricator Options	Can be applied to members on their *Status Review* windows and later used as categories for organizing the *Advance Bill of Material* or the *Sheet Loading Report*.
Member and Material Piecemarking Options	Fabricator Options	Control how SDS/2 assigns piecemarks. Some options are applied during *Process and Create Solids*. Others affect auto detailing.
Sheet Loading Criteria	Fabricator Options	Sets the defaults for which member details will be grouped together on detail sheet during *Detail Sheet Autoloading*.

Step 3: Constructing a 3D Model

Adding members to the 3D model is done in *Modeling*. To start up *Modeling* from the *SDS/2 Main Menu*, click on "*Modeling*." If you are in a newly created Job with no erection views, SDS/2 prompts you to enter the name and elevation of a new erection view, then brings you into a plan view at that elevation. Note that an intersecting pair of construction lines cross at the 0, 0, 0 global coordinate in this newly created view. These can be used to base other construction lines off of.

General instructions:

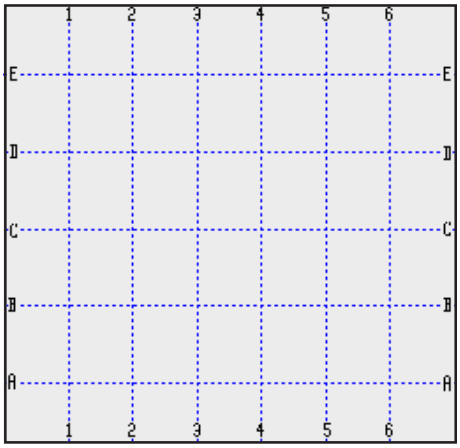
Laying out members is a three-step process for most members, a four-step process for miscellaneous members:

1 - select the member type
2 - locate the member's work points
3 - specify the member settings
4 - rotate the member (optional for miscellaneous members)

Before laying out members:

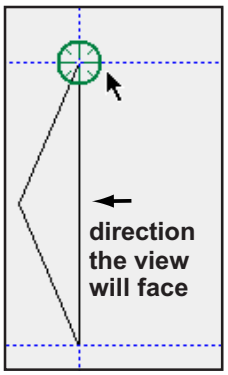
Create a plan view of every floor in the structure. Beams, columns and horizontal braces are easiest to lay out in a plan view. The top flange of a beam laid out using *INCL* (intersection construction line) will be at the elevation of the plan view. You can create permanent plan views – which you can later *File > Open View* – by using *View > Plan View* followed by *File > Save View As*. Name the plan views for the elevation they are at. For example, name the plan view "100-0" if it is for the floor which is at an elevation of hundred feet.

Lay out a grid of erection views (grid lines) or construction lines to provide you with *INCL* points for the locating of member work points in plan views. Grid lines are preferred since they also serve as views that you can *File > Open* for viewing the model. However, to lay out the grid lines, you will first have to lay out at least a few construction lines. Use *File > New View* to add grid lines.



A grid line should be laid out along each column line. When you start a new Job and first enter *Modeling*, SDS/2 automatically generates a pair of construction lines through the 0,0 global coordinate. Use *Model* > *Construction LInes* > *Add Grid* to add a grid of construction lines with the 0, 0 coordinate as a starting reference point. Then use *File* > *New View* to add grid lines by locating *INCL* points at desired locations where the construction lines intersect.

Notice when you are laying out erection views (grid lines) that an arrowhead appears. This arrowhead points in the direction that the view will be facing when you *Open* that view (by selecting *File* > *Open* then selecting that view on the list).



Erection views should be laid out in a consistent way. Most users prefer to lay out erection views (grid lines) in a plan view so that they face either upward or toward the left. This ensures that members that are horizontal in the view are oriented with their left ends on the left.

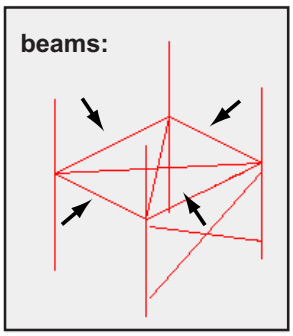
Select the member type:

Members are individual shipping pieces typically consisting of a single piece of member main material to which connection materials are welded or bolted in the shop. SDS/2 assigns all exactly alike members the same member piecemark and details them together on the same drawing. Exception: If members that are otherwise exactly the same are in different sequences and the user has checked the box for "*Break major marks apart by sequence*" in *Member and Material Piecemarking Options*, those members are assigned different piecemarks.

SDS/2 member types are beams, columns, vertical braces, horizontal braces, girts, purlins, stairs and miscellaneous members. Beams and columns have a specific set of connection types which you can specify for SDS/2 to design. SDS/2 designs brace connections according to the brace's framing situation. In SDS/2, connections other than column end connections are applied on the supported member (e.g. beam-to-column shear plates are added on the *Beam Edit* window). Be aware, however, that connections may be shop attached to the supporting member or the supported member, depending on the type of connection (e.g. beam-to-column shear plates are typically welded in the shop to, and therefore detailed on, the column).

Members of the following types may be added to the 3D model:

A beam is a structural member whose primary function is to carry loads transverse to its longitudinal axis. Beams are typically the most commonly used members in a structural model.

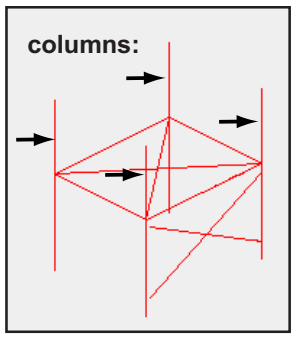


Beams in SDS/2 may be horizontal, skewed or sloping. SDS/2 is able to generate connections for wide flange, tube, welded plate wide flange, S shape and channel beams.

A larger number of connection types can be applied to beams than to other types of members. For example, clip angle, bent plate, end plate, shear, beam seat or beam splice connections can be applied to the ends of supported beams.

If you select '*Clip angle*,' '*End plate*,' '*Shear*' or '*Splice plate*' as your "*Connection Type*" for the end of a beam, you can also apply moment options.

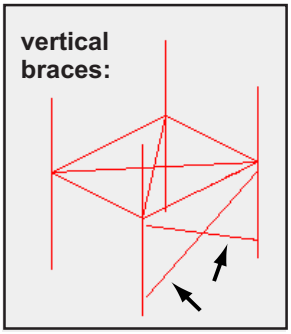
A column is typically a relatively long vertical member whose primary function is to carry compression loads parallel to its longitudinal axis. SDS/2 can design connections to sloping columns as well as to columns that are perfectly vertical.



Column main material can be any section that is listed in the local material file of your current Job. However, SDS/2 is only able to generate connections for wide flange, welded plate wide flange, S shape, welded plate box, pipe or tube columns.

SDS/2 can automatically design column splice or auto base/cap plate or user base/cap plate connections on a column.

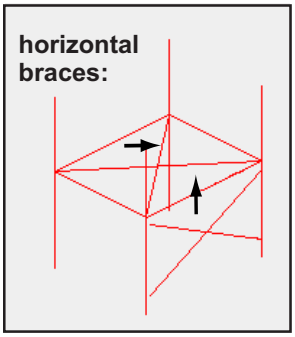
A vertical brace is a brace that is sloping and whose gusset plates are vertical.



Shown above are two vertical braces. Vertical braces can be perfectly vertical or perfectly horizontal as well as sloping. Vertical braces in any of these orientations can share a gusset with another vertical brace.

SDS/2 can automatically design gusset plates on a vertical brace made of angle, channel, wide flange, S shape, welded plate wide flange (with equal flanges), tube, pipe, W tee or S tee material. SDS/2 allows you to enter double angles (back to back or in star configurations) or double channels (back to back only) to provide additional bracing strength.

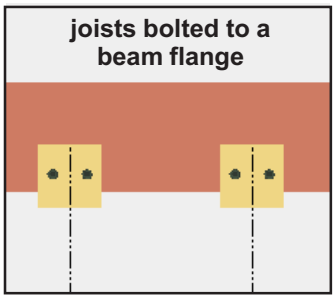
A horizontal brace is a brace that is perfectly horizontal or sloping and whose gusset plates are parallel with the flanges of the beam being framed to.



Horizontal braces handle torsional or twisting loads on the structure. A horizontal brace that is sloping may slope up to 30 degrees. SDS/2 can design connections for angle, W tee, S tee, pipe, tube, wide flange or S shape horizontal braces.

Locate work points for non-sloping horizontal bracing while in a plan view. You can later adjust the work points' elevations by changing the left/right "*End elevation*" on the *Horizontal Brace Edit* window (both elevations must be the same). To lay out a sloping horizontal brace, go to a view in the plane of the beams you want to frame the brace to. Example: Use *Navigate* > *Snap to Surface* and click on the top flange of a beam, then use *View* > *Relative Depth* if you want to move the work plane of the view to another position parallel with the beam's flange.

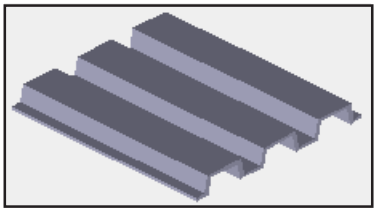
Joists can only be represented in stick form, and SDS/2 does not automatically generate details for joists. SDS/2 assumes that a joists is ordered from a joist manufacturer and will not be shop fabricated.



A *Joist Report* can serve as a bill of material for ordering joists. Joist settings are entered on the *Joist Edit* window. SDS/2-designed joist seats and top chord supports for joists are drawn on the detail for the supporting column or beam.

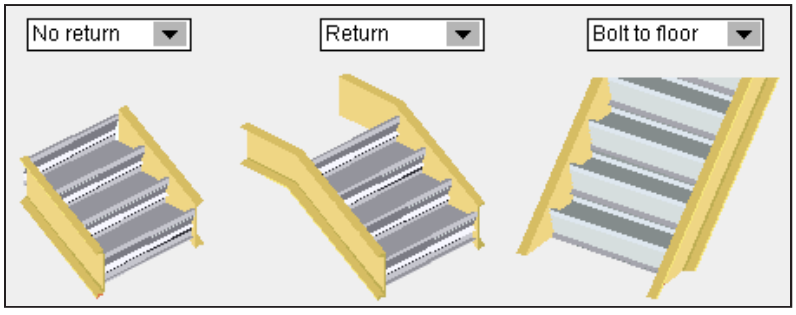
Girts and purlins are members for which automatic connections are not yet supported.

A miscellaneous member can be created from any type of material that you can add in SDS/2. Shown below is decking, one of the types of material you can add to the model as a miscellaneous member.



Work point layout is different for different miscellaneous member material types. Connections **are not** automatically designed on miscellaneous members. Users need to *Model* > *Material* > *Add* or *Model* > *Load Assembly* or *Model* > *Parametric* > *Run* to add connection materials to a miscellaneous member.

A stair can be added by locating two work points. On the *Stair Edit* window, on which you can also designate whether the stair has a bottom and/or top return.



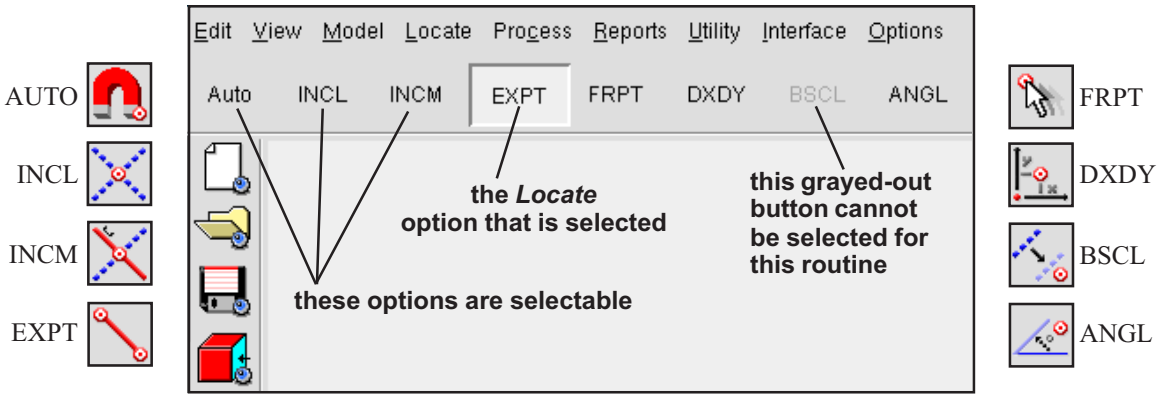
Custom member types currently available in SDS/2 are handrail, embed plates and anchor rods. Since these member types are developed from parametric Python code, they are relatively easy to develop, and more types are likely to become available.

Lay out members of the same type at the same time

For example, begin with columns. Lay out columns that are exactly the same as one another first, then go on to columns that are slightly different, then to other columns that are slightly different still. This saves time because once you enter a particular setting to a member's edit window, that same setting is applied to each subsequently added member of the same type until you change that setting (or until you exit and restart *Modeling*). Also, laying out like members together facilitates the use of the **Repeat** mouse binding (middle-click).

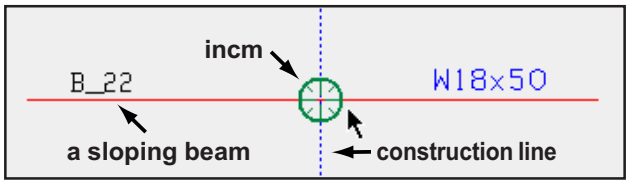
Locate the member's work points:

Use *Locate* options when locating work points. These points define the spatial geometry (work line, elevation, framing situation, etc.) of a member in the 3D model.



INCL (intersection of construction lines) is the most commonly used *Locate* option. It finds points at intersections of construction lines and/or construction circles and/or grid lines. If you lay out members in a plan view using *INCL* (with Z filtering off), the elevation of the work points you locate is the reference elevation of the plan view. For a non-sloping beam, this means that its top flange is at the elevation of the plan view.

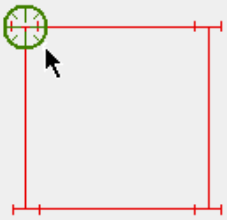
The *Locate* option *INCM* (intersection of a construction line and member) can be used to frame a beam into a sloping beam in a plan view. So long as Z filtering is off, the work point is at the elevation of the top flange of the sloping beam.



The *Locate* option *EXPT* (exact point) finds member work points. The exact points of the beam illustrated below are on columns displayed in stick form. The beam's material is set back from the columns' work lines because the beam frames to column flanges.

The *Locate* option *DXDY* (DxDy offset) is an excellent choice for laying out sloping members such as vertical braces or sloping beams in a plan view.

DXDY to add a sloping beam:

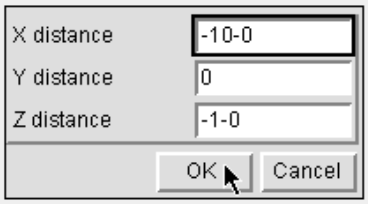


1. Place your mouse pointer so that the point location target snaps to where you want the first work point of the beam, then left-click (**Locate**).

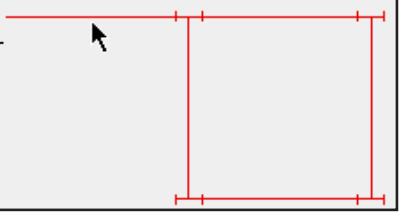
2a. Choose DXDY, then left-click (**Locate**) anywhere on screen.

2b. Enter the X, Y & Z distances from the beam's first work point to its second work point. Press "*OK*."

2c. Enter the beam's settings, then press "*OK*."

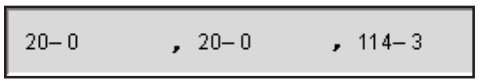


3. The sloped beam appears in your current view. Because of the entry made to "Z *distance*" in step 2b, the left work point of this beam is 1-0 foot lower than the right work point.



The point location target snaps to locatable points as you move your mouse pointer. Left-click (**Locate**) when the target is where you want the member's work point.

The X-Y-Z display is a decoration on your toolbar that shows you the global coordinates of whatever point the point location target has snapped to. The third coordinate (the Z coordinate) is the elevation of the point.



Z filtering: If you are adding members to an already developed 3D model, you may want to use Z filtering. Z filtering snaps any point you locate to a specific location with respect to the Z screen axis. You can set Z filtering using *Locate* > *Auto Configuration* while in *Modeling*.

Work points for a column: You can lay out a column in a plan view with a single work point, then set the top and bottom end elevations of the column on its edit window. In an elevation view, column layout requires two points. Sloping columns can be added in an elevation view.

Specify member settings:

- Enter settings for both the left and right ends of the member (bottom and top end for a column).
- When entering a column that has been laid out as a cross section (by locating a single work point), be sure to define the end elevations for both the top and bottom ends of the column.
- Sloping members may be laid out by specifying different elevations at the two ends of the member. In other words, you can change the elevations of work points on a member's edit window even after you have physically laid out those work points.
- Moment connections may be specified on *Beam Edit* windows; they cannot be applied as auto standard.

After the member appears in the view:

- Middle-click (**Repeat**) to lay out duplicate members. The point snapped to when you middle-click is the first work point of the repeated member.
- The *Locate* options selected for placement of the first member work point and second work point are automatically activated in the same order the next time you lay out a member of that same type (unless you exit and restart *Modeling* in the meantime).

Also note:

- *Model* > *Member* > *Copy* is as an alternative to *Model* > *Member* > *Add* for laying out the structural model.
- *Model* > *Member* > *Move/Stretch* lets you reposition members instead of having to delete them then add them again. For example, use *Move/Stretch* to relocate an entire line of columns and simultaneously lengthen or shorten beams framing to those columns. To use *Move/Stretch* to change a perfectly vertical column into a sloping column, you first need to check the box for "*Sloped column*" on the *Column Edit* window.
- When done laying out members on one floor, *File* > *Open* to go to a plan view of the next highest floor. If columns laid out earlier pass through this elevation, you will see cross sections of them in the view. Add more members in this view as needed.
- After you have laid out several floors, use *View* > *Isometric View* to create an isometric view of the entire structure. Use *View* > *Save* to give this new view a name (for example, name it "iso").

Adding Columns

Before beginning the *Add Column* operation, lay out grid lines or construction lines. The work point layout phase of *Add Column* varies slightly, depending on whether the operation is done in a plan view or an elevation view. It's easiest to add a perfectly vertical column with a single point in a plan view, then set different elevations for each end of the column in step 3. The following instructions assume you are using a 3-button mouse.

1. Choose *Model* > *Member* > *Add* > *Column*.

2. Various *Locate* options become active along with **Locate-Repeat-Return** mouse bindings. Click on the *Locate* icon you want (if it's not selected already), then move the mouse pointer so the point location target snaps to where you want the work line of the column, then left-click (**Locate**). If you are in a plan view, go to step 3. If you are in an elevation view, left-click (**Locate**) when the point location target is at the point where you want the other end of the column. This second work point can be placed so that you get a sloping column.

3. SDS/2 opens the *Column Edit* window for the column whose work point(s) you located. The default settings on this window are those of the last column added or edited. You therefore only have to change those settings which are different for this column.

3a. If you located the column in a plan view (using a single work point), you need to enter the correct "*End elevation*" for the top end and bottom end of the column.

3b. The box for "*Sloped column*" is checked automatically if the column is sloping (its two workpoints are not aligned vertically). If you added the column in a plan view, this box is not checked, and the column is perfectly vertical.

3c. "*Copy*" ( ), "*Paste*" ( ), "*Save*" ( ) and "*Load*" ( ) buttons let you quickly apply or save settings for particular sections on the *Column Edit* window. The set of these buttons at the top of the window applies to the entire window.

3d. Press the "*OK*" button when you are done making entries to the window.

4. The column whose settings you entered in step 3, and whose work point(s) you located in step 2 is now shown in stick form on screen (as a cross-section in a plan view). Newly added columns are not assigned piecemarks and cannot be displayed in a solid form until after *Process and Create Solids*. Do one (1) of the following:

Alternative 1: Move your mouse pointer and middle-click (**Repeat**) to generate a new column (like the one you just added) at the point where the point location target is at.

Alternative 2: Repeat this procedure beginning with step 2 to add a column that is slightly different than the one you just added.

Alternative 3: Right-click (**Return**) if you are done adding columns.

Adding Beams

In SDS/2, beams can be horizontal or sloping. The program can automatically design connections for wide flange, S shape, channel, welded plate wide flange and tube beams. Clip angle, bent plate, end plate, shear, beam seat or beam splice connections can be applied to the ends of beams. Moment options can be added to clip angle, end plate, shear or splice plate connections. The following instructions assume that you are using a 3-button mouse.

1. Start the *Add Beam* operation in *Modeling* with grid lines or construction lines/circles already laid out. It's a good idea to reference the elevation (Z coordinate) reported on the X-Y-Z display while locating beam work points.

Tip 1: It is usually easier to locate the work points for a non-sloping beam while in a plan view. For work points added using *INCL* with Z filtering off, the top flange of the beam is at the elevation of the plan view in which you are adding the beam.

Tip 2: To lay out a sloping beam, you may wish to open an elevation view (or you can specify different end elevations for the beam in step 4).

2. Choose *Model* > *Member* > *Add* > *Beam*.

3. **Locate-Repeat-Return** mouse bindings become active so that you can locate the beam work line. Beam work lines (stick form member lines) are drawn across the center of the top flange of a wide flange or welded plate wide flange or S shape or tube beam. For a channel beam, the work line is along the heel of the top flange of the channel.

3a. Click a *Locate* icon (e.g. *INCL*), move the mouse pointer so the point location target snaps to the column or beam you want to frame to, then left-click (**Locate**).

3b. The status line prompts, "*Locate second point:*" Position the point location target on the column or beam that you want the other end of the beam to frame to, then left-click (**Locate**).

Tip 1: *DXDY* (Dx Dy offset) is a good *Locate* option for laying out the work points of sloping beams in a plan view.

Tip 2: The *Locate* option *INCM* (intersection of a construction line and member) is good for laying out an intermediate beam between sloping beams in a plan view.

Tip 3: *EXPT* (exact point) selects a work point at the end of a member. If, for example, you want the top flange of a beam to line up with the top of a column, *EXPT* would be an excellent choice.

Tip 4: During *Processing and Create Solids*, SDS/2 automatically sets back the beam you have added from the beam/column you are framing to so that the members do not overlap and appropriate field clearances are applied.

(procedure continues on next page)

4. SDS/2 opens the *Beam Edit* window for the beam whose work points you located in step 3.

4a. The default settings on the *Beam Edit* window are those of the last beam you added or edited in this session of *Modeling*. Even if all you did was double-click a beam and press "*OK*," that beam's settings are now the defaults for this beam. You therefore only have to make changes to those settings which are different for this beam.

4b. "*Copy*" (), "*Paste*" (), "*Save*" () and "*Load*" () buttons let you quickly apply or save settings under particular sections on the *Beam Edit* window. The set of these buttons at the top of the window applies to the entire window. The set of these buttons under the "*Left end settings*" or "*Right end settings*" are for connections. You can even copy and paste settings to opposite ends on this same window.

4c. To go on to the next step entering the desired settings, press the "*OK*" button at the bottom of the *Beam Edit* window. But first please note the following:

Note 1: Many of the settings on the *Beam Edit* window apply to ends of the beam, rather than the beam as a whole. You must enter settings for the left end and the right end of the beam separately.

Note 2: Wherever possible, it is recommended that you apply auto standard connections to the ends of beams. This instructs SDS/2 to design similar connections for similar beams in similar framing situations. You can also apply user defined connections and moment connections on the *Beam Edit* window.

Note 3: Certain beam settings pertain to the physical geometry of the beam. For example, "*Section size*," "*Web rotation*," "*End elevation*." To get a proper system connection on the end of a beam, be sure that these fields are set properly.

5. After you close the *Beam Edit* window, the member line (work line) of the beam whose settings you applied in step 4, and whose work points you located in step 3, is shown on screen in stick form. Do one of the following:

Alternative 1: Position the mouse pointer and middle-click (**Repeat**) to add a new beam just like the one you specified above from the point where the point location target is at.

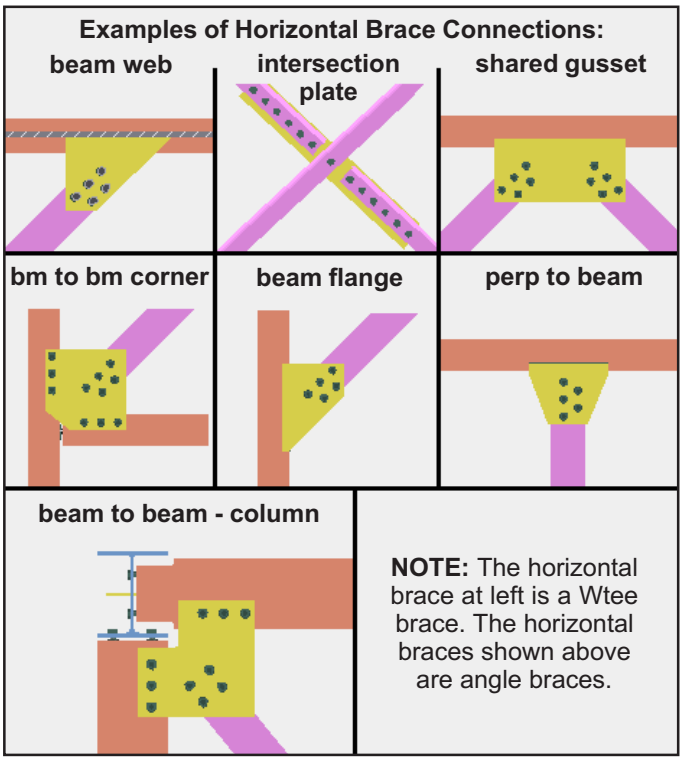
Alternative 2: Follow these instructions beginning with step 3 to add a beam with different settings than the one you just laid out.

Alternative 3: Right-click (**Return**) if you are done laying out beams.

Note: An unique member number [num] is assigned to a beam when it is added, and the beam can initially only be displayed in stick form. During *Process and Create Solids*, bolts, holes and end connections are designed and a member piecemark is assigned. After solids are created, you can display the beam in any of the three solid forms.

Adding Horizontal Braces

The examples below show the basic framing situations for which SDS/2 is able to design connections on horizontal braces. The type of gusset plate that SDS/2 designs depends on the framing situation. These instructions assume you are using a 3-button mouse.



1. Before starting the *Add Horizontal Brace* operation, open a view whose work plane is parallel to the flanges of the beams the brace frames to. For a non-sloping horizontal brace, this means a plan view. For a sloping beam, use *Navigate > Snap to Surface* to get a view in the plane of the beam flanges, then use *View > Relative Depth* if you want to lower the work plane. Lay out any construction lines needed for locating points.

2. Choose *Model > Member > Add > Horizontal Brace*.

3. *Locate* options become active along with **Locate-Repeat-Return** mouse bindings so that you can locate the work points of the brace. A horizontal brace work point should be located on the work line of a column (for a beam to beam – column juncture), **or** anywhere on the top/bottom flange of a beam (when the gusset fastens to the top/bottom flange), **or** below the top flange (when the gusset fastens to the beam web).

3a. Click on a *Locate* icon (e.g. *INCL*), position the point location target on the beam (or beam to beam – column juncture) you want to frame to, then left-click (**Locate**).

3b. The status line prompts, *"Locate second point:"* Position the point location target where you want the other end of the horizontal brace, then left-click (**Locate**). Please note the following before going on to step 4:

Note 1: When placing work points, look at the X-Y-Z display. For a non-sloping angle or tee horizontal brace, the Z coordinate tells you the elevation of the brace surface that fastens to the gusset. For a tube or pipe horizontal brace, the Z coordinate is the brace's neutral axis.

Note 2: Normally SDS/2 is not able to design a horizontal brace gusset plate on a brace with an angle to a beam of less than 20 degrees. However, you may be able to '*Force*' a connection on such a brace.

Note 3: SDS/2 cannot design a horizontal brace gusset plate on a brace with a slope of greater than 30 degrees. The brace must be in the same plane as the beam (for a roof that slopes 20 degrees, the brace must slope 20 degrees).

4. SDS/2 opens the *Horizontal Brace Edit* window for the horizontal brace whose work points you located in step 3.

4a. The default settings that appear on the *Horizontal Brace Edit* window are those of the last horizontal brace you added or edited (unless you exited and restarted *Modeling* between adding braces). You therefore only have to make changes to those settings which are different for this brace. If two or three braces frame together into a shared gusset plate, be sure to enter compatible material types for all of the braces. SDS/2 can generate system connections on horizontal braces with angle, W tee, S tee, pipe, tube, wide flange or S shape "*Section sizes*."

4b. "*Copy*" ( ), "*Paste*" ( ), "*Save*" ( ) and "*Load*" ( ) buttons let you quickly apply or save settings under particular sections on the *Horizontal Brace Edit* window. The set of these buttons at the top of the window applies to the entire window.

4c. To continue on to the next step after entering the desired settings, press the "*OK*" button on the bottom of the *Horizontal Brace Edit* window.

5. The horizontal brace whose settings you applied in step 4, and whose work points you located in step 3, is now shown on screen. Do one (1) of the following:

Alternative 1: Position the mouse pointer and middle-click (**Repeat**) to add a new horizontal brace just like the one you specified above from the point where the point location target is at.

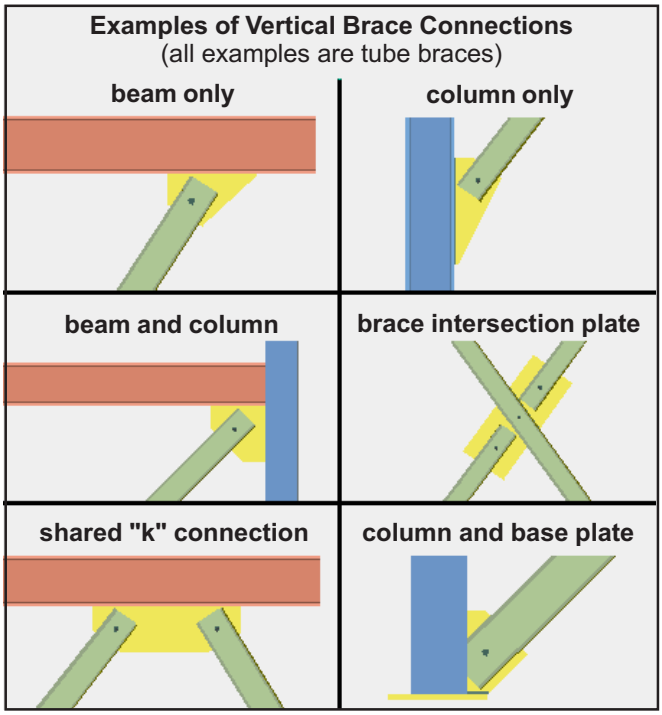
Alternative 2: Follow these instructions from step 3 to add a horizontal brace with different settings.

Alternative 3: Right-click (**Return**) if you are done adding braces.

Note: An unique member number [num] is assigned to the horizontal brace as it is added, and the brace can initially only be displayed in stick form. During *Process and Create Solids*, bolts, holes and end connections are designed and a member piecemark is assigned. After solids are created, you can display the brace in any of the three solid forms.

Adding Vertical Braces

The following illustration shows the basic framing situations for which SDS/2 is able to design connections on vertical braces. The type of gusset plate that is designed depends on the framing situation. The examples below are all tube vertical braces that have a single erection bolt per end.



1. Start the *Add Vertical Brace* operation with grid lines or construction lines already laid out. Vertical braces should be added in an elevation view.

2. Choose *Model* > *Member* > *Add* > *Vertical Brace*.

3. *Locate* options become active along with **Locate-Repeat-Return** mouse bindings so that you can place the work points of the brace. The work line drawn between the two work points is along the neutral axis of a wide flange, S shape, welded plate W, pipe or tube vertical brace. For a W tee or S tee vertical brace, the work line is along the top flange center line (the top flange is vertical). For a single angle vertical brace, the work line is optionally along the gage line of the angle or aligns with the neutral axis. For a channel vertical brace, the work line is at the half-depth of the heel of the channel (the channel web is vertical).

3a. Click a *Locate* icon (e.g. *INCL*), place your mouse pointer so that the point location target snaps to the center of the column or is on the beam you want the vertical brace to frame to, then left-click (**Locate**).

3b. Reposition the point location target where you want the work point for the opposite end of the brace, then left-click (**Locate**).

Note 1: SDS/2 supports automatic connections on vertical braces in X, K and W configurations. Three point bracing can be designed if the center brace is perpendicular to the supporting member.

Note 2: Work points for vertical brace-to-column connections must be at the work line (center) of the column. This is not true for vertical brace-to-beam connections.

Note 3: SDS/2 is not able to design a vertical brace gusset plate on a vertical brace with an angle to a beam or column of less than 20 degrees.

4. SDS/2 opens the *Vertical Brace Edit* window for the vertical brace whose work points you located in step 3.

4a. The default settings on the *Vertical Brace Edit* window are those of the last vertical brace you added or edited (unless you exited and restarted *Modeling* between adding braces). You therefore only have to make changes to those settings which are different for this vertical brace. If two or three braces share a gusset plate, be sure to enter compatible material types for the braces. Also, the braces should be similar in size. In order to get a connection on the end of a vertical brace, the "*Section size*" must be L, C, W, S, welded plate W, S shape, tube, pipe, W tee or S tee material. Welded plate wide flange braces must have equal flanges. For a wide flange (or S shape) vertical brace, the "*Section size*" must be between W6 and W30 (S6 and S30). For wide flange braces sharing a gusset, both braces must have the same "*Web orientation*."

4b. "*Copy*" ( ), "*Paste*" ( ), "*Save*" ( ) and "*Load*" ( ) buttons let you quickly apply or save settings under particular sections on the *Vertical Brace Edit* window. The set of these buttons at the top of the window applies to the entire window. The set of these buttons under the "*Left end settings*" or "*Right end settings*" are for connections. You can even copy and paste settings to opposite ends on this same window.

4c. After entering the settings that you want, press the "*OK*" button.

5. The vertical brace whose settings you applied in step 4, and whose work points you located in step 3, is shown in stick form on screen. Do one (1) of the following:

Alternative 1: Move the mouse pointer and middle-click (**Repeat**) to add a new vertical brace just like the one you specified above from wherever the point location target is positioned.

Alternative 2: Follow these instructions beginning with step 3 to add a vertical brace whose settings or orientation is different than the one you just added.

Alternative 3: Right-click (**Return**) when you're done adding vertical braces.

Note: An unique member number [num] is assigned to the brace as it is created, and the brace can initially be displayed only in stick form. During *Process and Create Solids*, bolts, holes and end connections are designed and a member piecemark is assigned. After solids are created, you can display the brace in any of the three solid forms.

Adding Miscellaneous Members

As with other member types, miscellaneous members are assigned member piecemarks. Work point layout for miscellaneous members depends on the material type of the miscellaneous member (material type is selected in step 2). SDS/2 does not create connections for miscellaneous members – users need to create the connections. Unlike other members, you do not have to *Process and Create Solids* after adding miscellaneous members. To edit the settings of a miscellaneous member's main material, select the member then right-click and choose the material on the shortcut menu.

1. Start the *Add Miscellaneous Member* operation with construction lines laid out.

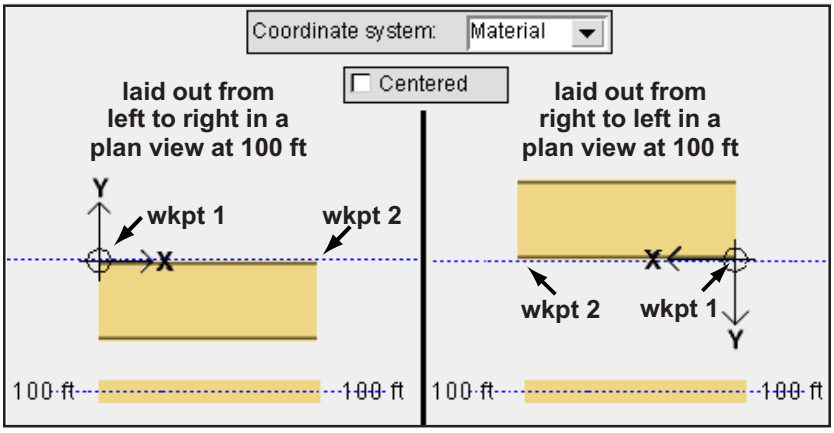
2. Choose *Model* > *Member* > *Add* > *Miscellaneous* > *xxx*. Where xxx = rolled section, rectangular plate, round plate, bent plate, rolled plate, flat plate layout, bent plate layout, round bar, square bar, flat bar, grating, grating tread, decking, assembly, shear stud or etc**.**

3. **Locate-Pan-Return** mouse bindings become active so that you can place the work points of the miscellaneous member.

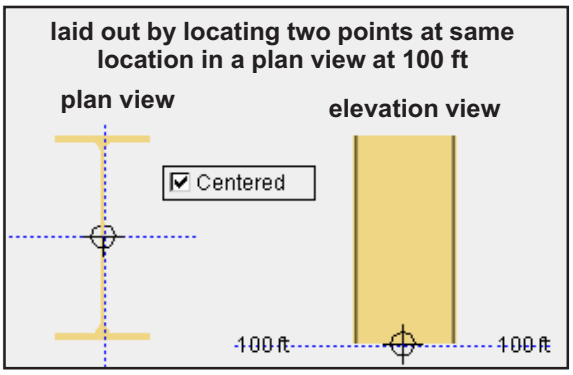
3a. Click a *Locate* icon (e.g. *INCL*) and place the mouse pointer so the point location target snaps to where you want the first work point of the miscellaneous member, then left-click (**Locate**).

3b. Position the point location target where you want the miscellaneous member's second work point, then left-click (**Locate**). For miscellaneous member types other than '*Flat Plate Layout*' or '*Bent Plate Layout,*' go to step 4. For '*Flat Plate Layout*' or '*Bent Plate Layout*,' continue to locate points then middle-click (**Done**) when you are ready to go to step 4.

Note: For miscellaneous members placed with two points, the first point defines the material's left end (which may or may not be the member's left end), and the second point sets the default length and rotation of the member.



Also note: Locating the two work points at the same location inputs the material as a cross section in a plan view (as illustrated below).



4. SDS/2 opens the edit window for the material you selected in step 2.

4a. Change the material's settings as needed. For a rolled section (W, S, L, C, WT, etc.), be sure to enter the "*Section size*" that you want.

4b. Under the heading *"Miscellaneous Member Settings*," specify the "*Member sequence*" and "*Member description*" that you want. Please note that you can double-click on the member main material at a later time to change these settings. To revise other settings on this window, you can select the member then choose the material on the shortcut menu.

4c. After you have entered the desired settings for the miscellaneous member, press the "*OK*" button at the bottom of the window. Go to step 5.

5. The *Rotate Material* window opens, and the miscellaneous member is generated on screen. A material origin reference point symbol (cross hairs within a circle) identifies the pivot point on the material around which subsequent rotation of the material can optionally take place. Note the on-screen orientation of the material with respect to the 3D model. Do one (1) of the following:

Alternative 1: If the material does not need to be rotated, press the "*OK*" button and go to step 6.

Alternative 2: Rotate the material around one or more axes (one axis at a time), then press the "*OK*" button. Go to step 6.

Alternative 3: Press the "*Cancel*" button to undo the last two steps of this *Add Miscellaneous Member* operation. Go back to step 3.

6. You have now added a miscellaneous member. The *Material Type Selection* window opens. Do one (1) of the following:

Alternative 1: Locate points for another miscellaneous member (see step 3).

Alternative 2: Press "*Cancel*" if you are done adding miscellaneous members.

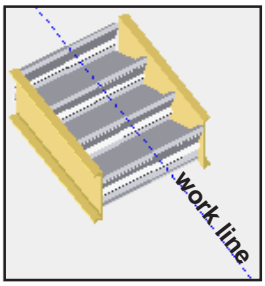
Adding Stairs

Before beginning, draw a sketch showing how many steps you want on your stair and the rise and run of each step. This sketch will help you to determine where you want to position the work points for your stair and what specifications you want to enter on the *Stair Edit* window. Also, define any bent plate or bolted grating stair tread configurations that you want to apply in *Options > Fabricator Options > Stair Tread Definition Schedule*.

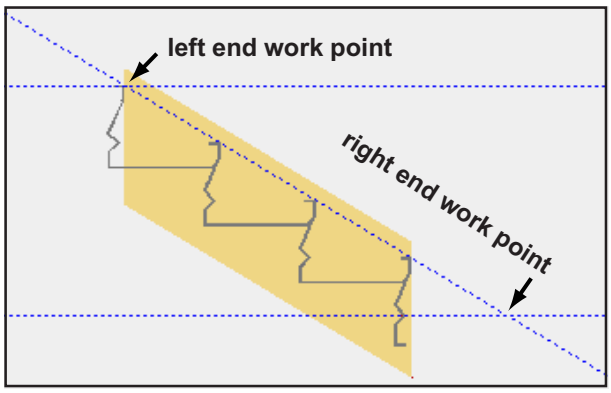
1. Choose *Model > Member > Add > Stair* while in an elevation view with grid lines or construction lines already laid out.

2. **Locate-Pan-Return** mouse bindings become active so that you can place two work points to define the work line of the stair. This work line is drawn along the tops of the risers of the stair (the nosing line). The width of the stair tread is centered along this same work line.

2a. Select an appropriate *Locate* option, position the mouse pointer so the point location target snaps to where you want the first work point of the stair, then left-click (**Locate**).



2b. The status line prompts, *"Locate second point:"* Reposition your mouse pointer so that the point location target snaps to where you want the opposite end of the stair work line, then left-click (**Locate**).



3. The *Stair Edit* window opens.

3a. "*General Settings*" and "*General Stringer Settings*" and "*General Tread Settings*" should be filled out first. Under "*General Tread Settings*," be sure to select the stair tread (1 through 8) that you want from the "*Tread schedule*" menu.

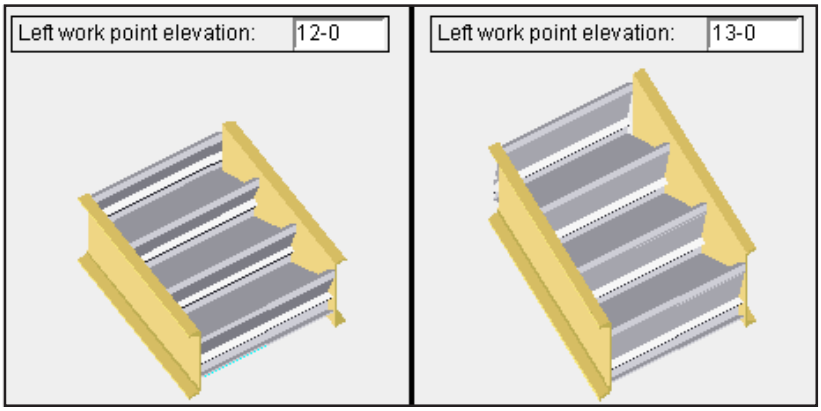
3b. For each side of the stair, there is a near side stringer and far side stringer, and these too must be filled out separately. To get to the settings for the near side stringer, press the "*NS Stringer*" button. The "*FS Stringer*" button gets you the settings for the far side stringer.

3c. When you have entered the desired settings, press the "*OK*" button.

4. The stair is generated on screen in solids form and is automatically assigned a piecemark. As is the case for miscellaneous members, there is no need to *Process and Create Solids* after you add a stair.

A time-saving tip:

If you find when adding a stair that the work points of the stair are not positioned precisely as you want them, you can double-click the near-side or far-side stringer to open the *Stair Edit* window so that you can change the elevation of one or both work points.



The above illustration shows the same stair before and after the elevation of its left end work point has been changed. Note that the number of stairs (risers) does not change, but height of the risers is automatically adjusted.

Step 4: Process and Create Solids

After you are done constructing a 3D Model, choose *Process* > *Process and Create Solids* to cause SDS/2 to automatically design system connections, assign piecemarks to members and submaterials, and generate solids, thus enabling members to be displayed in any of the three solid forms. Before solids are created, a member's member number [num] is used to identify that member on screen (in *Modeling*); after *Create Solids*, a member's piecemark identifies that member on screen. The member number, however, is not replaced in SDS/2. It will continue to be assigned to the member as long as that member exists. Only if a member has been erased can its member number be assigned to a different member.

What happens during Process and Create Solids:

During *Process and Create Solids*, each member in the 3D model undergoes the phases of *Process* and/or *Create Solids* that are required for it. The first phases of the operation are referred to as *Process*; the last phases are called *Create Solids*.

Node matching is the phase of *Process* that checks the nodes of intersecting members to get the framing situation. Members always go through node matching when they first undergo *Process and Create Solids*, but node matching does not necessarily take place each time they undergo *Process and Create Solids*.

Calculating lengths uses the results of node matching to calculate the geometry of member main material. These calculations are based on the work points located in *Modeling* during member layout and also on any "*Setbacks*" applied to the member edit window. They are also based on cross referencing the user-entered "*Section size*" with section size data contained in the local material file. Member lengths are considered in the calculation of member end reactions, which in turn set the required strength of connections.

Designing connections is the phase of *Process* that looks at member edit windows and defines end connections according to the settings on those windows. SDS/2 looks at "*Auto Standard Connections*" as defined in *Job Options* (if '*Auto standard*" is specified on the member edit window) or "*User Defined Connections*" as defined in *Job Options* (if a user defined connection is specified for the member), and so on . . . For a connection marked '*System*' on the member edit window, connection design adjusts the strength of the connection based on the end reactions (loads) set on that same member edit window. When '*AUTO*' is set for a load on a member edit window, connection design looks to *Design Criteria* settings in *Job Options* to calculate the load. User defined connections go through connection design once, and different framing situations cause the same user defined connection to be designed in different ways. Other '*System*' connections go through connection design as many times as necessary to design a connection that stands up to loading conditions. If, by adjusting material thicknesses and dimensions and increasing the bolt size where necessary, connection design still cannot design a connection that stands up to the end reaction, the connection fails. The design checks that the connection undergoes are referenced in the *Design Calculations Report*.

Framing situations is the last phase of *Process*. It checks beam connections that frame together, on opposite sides of the same beam or column web. SDS/2 does this checking based on data fields and node matching (at this point no graphics the user can see have yet been created). If connections designed in previous phases of *Process* exhibit interference problem, SDS/2 sends the connection back through connection design, which will fail the connection if it can't find a design that works. Beam-to-beam and beam-to-column framing situations will be checked. The program does not, however, check braces. Consequently, it is important that the user review the 3D model after *Process and Create Solids* to double check what SDS/2 has designed.

(At this point *Create Solids* begins.)

Creating 3D material is the first phase of *Create Solids*. It creates 3D material, thus allowing the affected members to be displayed in any of the three solid forms. Solids are created for each member's main material and its connection materials based on information from connection design. The program also creates member views based on connection design. When the member is detailed, these views are drawn.

Matching holes generates holes in the main material of members so that they exactly match the hole patterns on connections that fasten to those members. This phase ensures that holes are properly aligned when the bolts go through them. **Tip:** If you have holes in user-added materials that are face-to-face with beam, column or brace main material, SDS/2 automatically copies those holes to the member main material and inserts bolts through the matching holes. The program does not do this for miscellaneous members. For miscellaneous members, you need to *Match Holes* and *Add Bolts*.

Generating bolts inserts bolts through holes that match. Bolts are inserted through holes that were automatically matched (in the previous step) as well as through holes interactively matched using *Model > Hole > Match*. Material thicknesses derived from the local material file along with the "*Maximum bolt stick-thru*" set in *Bolt Design Criteria* under *Job Options* are used to calculate the bolt lengths.

Checking member marks checks the submaterials of members to ensure that each member with the same mark is made up of the same submaterials. Other criteria used to combine or break apart piecemarks is also evaluated. This is sometimes referred to as "piecemark hashing."

Cleaning up submaterial evaluates the counts of submaterials. If the box is checked for "*Show submaterial quantity on details*" in *Member and Material Piecemarking,* SDS/2 automatically marks for detailing any previously-detailed materials whose quantities have changed.

Assigning piecemarks is the phase of *Create Solids* that ensures that the system member piecemark assigned to each unique member is unique and that members that are exactly the same receive the same mark. Members that have not yet received a piecemark are assigned a member piecemark at this time. This phase only applies to system piecemarks, not user piecemarks; it is the user's responsibility to ensure that members assigned user piecemarks are physically equivalent.

When SDS/2 automatically marks members for Process:

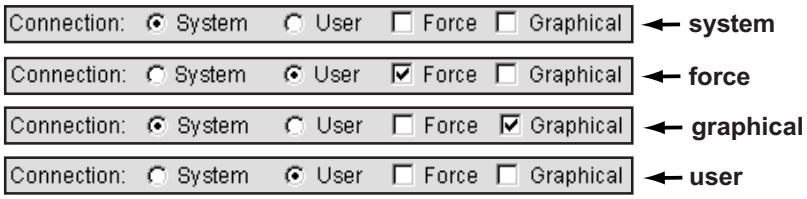
- Members are automatically marked for all phases of *Process and Create Solids* as you *Add* them to the model.
- Members that have undergone *Process Selected Member* are automatically marked for *Create Solids*. To create solids for those members, either *Create Solids for Selected Members* or *Process and Create Solids*.
- Members that have undergone *Design* only (that is, members which have been redesigned using the "*Re-Design Connection*" button found on member edit windows) are marked for the '*Framing situations*' phase of *Processing*.
- Members that have been altered using *Edit Member* are automatically marked for *Process and Create Solids*.
- If you *Process Selected Members*, it may happen that members framing into members acted on during the operation are marked for *Process*. If this happens, you should *Process and Create Solids* to bring those newly marked members up to date.

Tip 1: To tell which members in a view have been marked for *Process and Create Solids*, choose *Model* > *Status* and set a display color for "*Needs to be processed*."

Tip 2: If SDS/2 has not automatically marked a member for *Process and Create Solids*, you can mark it yourself using *Model* > *Member* > *Mark for Processing*. Do this, for example, to apply *Job Options* or *Fabricator Options* to specific members.

Prioritization in connection design:

During *Process and Create Solids*, SDS/2 uses information from *Job Options* and *Fabricator Options*, from member work points laid out in *Modeling*, from member edit windows as well as built-in routines based on the "*Connection design method*" in order to design connections and generate materials. Users have considerable control over how connection design prioritizes information used during *Process and Create Solids*.



You can override a failed connection by generating a forced connection. This gives you the connection that connection design would have created if it had not failed the connection. Care should be taken doing this, as you may get results that are physically impossible or ill advised from an engineering standpoint.

Connection design does not alter '*Graphical*' connections during *Process and Create Solids*. Three methods are available for clearing the graphical flag so that a system connection can be designed: **Method 1:** Choose *Change > Graphically altered to System Connections* and select the member(s) you want. **Method 2:** Press the "*Re-Design Connection*" button on a member's edit window. **Method 3:** Uncheck the box for "*Graphical*" on the member's edit window.

Members that have a "*Model complete date*" set are not affected by any phase of *Process and Create Solids*, including connection design.

Connection design may adjust the design of a '*System*' connection in order to make it stand up to loading conditions or fit particular framing situations. For example, SDS/2 may increase bolt diameter or material thickness or cut materials to fit around the materials that they frame to. **Tip:** Automatic *Search* options are available for *Bolt Diameters Changed by System* and *Connections Changed by System* to help you quickly find members whose connections SDS/2 has in some way changed.

User connections and user defined connections are designed as the user specifies (disregarding conflicting *Job Options* or *Fabricator Options*) but do adjust to framing situation changes such as the change in a member's "*Section size*." These types of connections go through connection design only once. User connections may be defined on a member edit window after *Process and Create Solids* has taken place. User defined connections are defined in *Job Options* and applied on member edit windows.

Connection design looks at connection specifications ("Conn Specs") on the *Beam Edit*, *Column Edit*, *Vertical Brace Edit* or *Horizontal Brace Edit* window when designing an "*Input connection type*" other than '*Auto standard*' or '*User defined*.' Where '*Automatic*' is selected for a connection specification, SDS/2 looks to *Job Options* or *Fabricator Options* for the setting it needs.

Assigning of piecemarks: SDS/2 automatically assigns system piecemarks to members during *Process and Create Solids* (or as members are revised) unless user piecemarks have been assigned to those members. SDS/2 **does not** combine or break apart user piecemarks.

Example: In *Job Options*, you specify the default bolt diameter for non moment bolts. On the *Beam Edit* window, you check the box for '*AUTO*' for "*NM bolt diameter*," thus causing the *Job Options* value to be the minimum bolt diameter that connection design attempts to use for its first attempt to design the "*Input connection type*." If, on the other hand, you enter a "*NM bolt diameter*" on the *Beam Edit* window, connection design first tries to use that size. If during *Process and Create Solids* connection design calculates that the connection will fail if it uses a bolt diameter of the size specified, connection design automatically increases the bolt diameter as needed to make the connection work.

Tip: For a list of the formulas that SDS/2 uses during connection design in order to design and test a connection, choose *Reports > Design Calculations*, then check the box for "*Cover Sheet*" to print out a copy of the *Design Calculations Cover Sheet*.

Things you should do before Process and Create Solids:

- It is crucial that you set certain *Job Options* and *Fabricator Options* before *Process and Create Solids* since changing these options after *Process and Create Solids* may necessitate your having to *Mark for Processing* those members to which you want your newly changed options to apply.

- If there are members that are already erected on the site for which you are constructing a 3D model, you can designate these members as existing members and include them in the 3D model. Reports and details are not generated for existing members. To designate a member as an existing member, open its edit window, then press the "*Status*" button and check the box for "*Existing member*."

- Outputting a *Check Plot* and a *Check Report* before you *Process and Create Solids* can help you review member specifications to make certain that they are set the way you want them to be set.

Things you can do after Process and Create Solids:

- Generate member details and submaterial details ("*Detail Members*" or "*Detail Submaterial*" on the *SDS/2 Main Menu*).

- Print an *Advance Bill of Material* (choose *Reports > ABM – Generate New File*, then choose *Reports > ABM - Print Current Report*).

- Print a *Design Calculations Report* (choose *Reports > Design Calculations*, then select the members whose design calculations you want included in the report).

- You can also print various other reports that list members and material or are organized by piecemark. Please note, however, that some reports are based on member bills of material, and therefore cannot be generated until after you have detailed members.

- The downloading of CNC files is also made possible by *Process and Create Solids*. Although it is not required, you may also want to create details before generating CNC downloads. The "*CNC*" option is found on the *SDS/2 Main Menu*.

- Use revise & review buttons (which are found on member edit windows) to review detailed information about connections. To change these settings, you must first switch the "*Connection*" from '*System*' to '*User*.'

- Conduct searches (*Edit > Search*) for members whose connections have specific characteristics (e.g. failed connections or connections that SDS/2 has changed). Please note that in order to conduct searches you do not necessarily have to first create solids. Completion of the "connection design" phase of *Process* is all that is required.

- Find the calculated values for items on beam, column, vertical brace or horizontal brace edit windows that are marked '*AUTO*' (e.g. "*Shear load*," "*Minus dimension*" & "*Material setback*").

- Use *Model > Status Display* (in *Modeling*) to display members with connection design failures in different colors.

- View structural members in any of the three solid forms (for example, choose *View > Change All to Solid Opaque*) in order to visually inspect framing conditions and assess the validity of connection design. Members must be displayed in one of the solid forms in order for their associated materials to be shown in the model.

- Add material and fasten it to a member using *Modeling* operations such as *Model > Material > Add* or *Model > Hole > Add* or *Model > Bolt > Add*.

- Use *Navigate > Snap to Surface* to get to a view whose work plane is on the surface of the material that you click on. Do this in order to check connections or add material that is face-to-face with the surface or to add holes to the surface.

- Use *Model > Member > Isolate Member* to create preset member views and user member views that you want to appear on the member's detail.

- Use *Model > Material > Find Material* to isolate members that include a particular material. Usually you would do this in order to inspect the member/material or make modifications.

- Do a clash report (*Reports > Clash Report*) in order to find materials that are too close together (under a specified tolerance).

- Use *Save Assembly* (*Model > Save Assembly*) and *Load Assembly* (*Model > Load Assembly*) to copy a connection from one member and add it to, for instance, members with plain ends.

- Make changes on a single beam, column, vertical brace or horizontal brace edit window and assign the changes to all members with the same member piecemark.

Step 5: Reviewing the 3D Model

An important part of developing a Job in SDS/2 is double-checking the model to confirm that SDS/2 has designed connections to your liking. The framing situation checking that SDS/2 performs during *Process and Create Solids* is designed to handle most cases of beam-to-beam and beam-to-column connections and prevent material interferences for these connections while at the same time ensuring that the connections are designed according to AISC practices. Framing checking is limited for vertical and horizontal braces since the possible combinations are so numerous. Consequently, there are always going to be situations where the user must exercise his/her judgment in how to handle multiple interacting connections. That is why reviewing settings and visually inspecting the 3D model is so important.

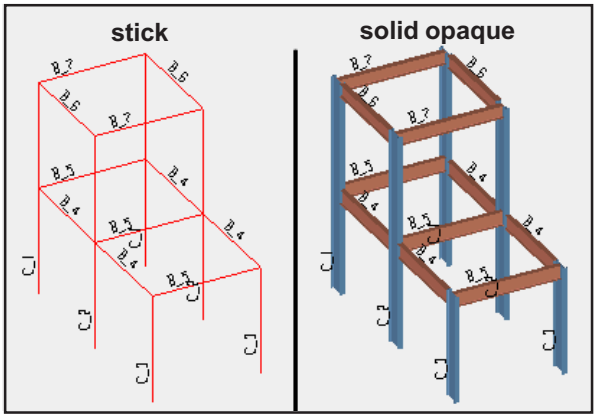
Two ways of reviewing the 3D model

Visual inspection: One way to review how SDS/2 has designed connections is to enter *Modeling* to view the 3D model in a solid form. Before 3D computer modeling became available, you would have had to actually physically build the structure in order to gain the kind of perspective on your detailing work that you are able to gain in SDS/2. Visually examining the 3D model is an excellent way to catch glaring errors as well as to see subtleties of design that would otherwise be difficult to visualize.

Specification review: Much information about the 3D model can be obtained from various edit windows. For example, double-click on a member (beam, column or brace) to open its edit window and review that member's connection settings. You can also open individual member edit windows by performing searches (*Edit* > *Search*) for members with, for instance, "failed connections" or "indeterminate ends." The most detailed of connection settings are reviewed using revise & review buttons.

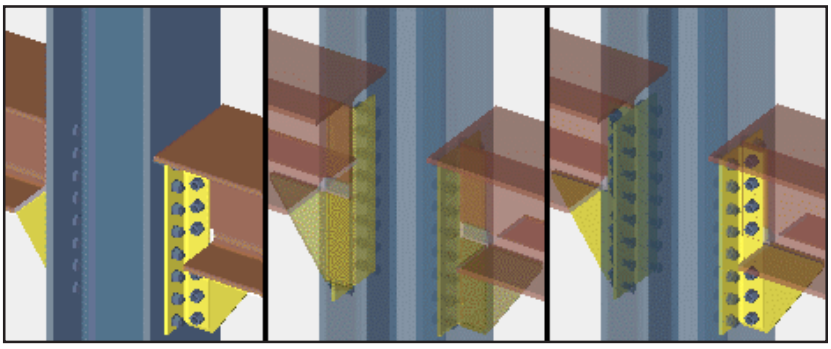
Tips for visually examining the 3D model

Reviewing the 3D model is easiest in an isometric view, as this type of view allows you to see more surfaces than you would be able to see in a plan view or elevation view. Shown below is an isometric view of a model displayed in stick form and solid opaque form:



Changing between stick and various solid forms can be done using options on the *View* menu in *Modeling*.

Any of the three solid forms show connections. You can see through the main material of members when the members are displayed in transparent or transparent main form.



solid opaque (opaque main material & connection)

solid transparent (transparent main material & connection)

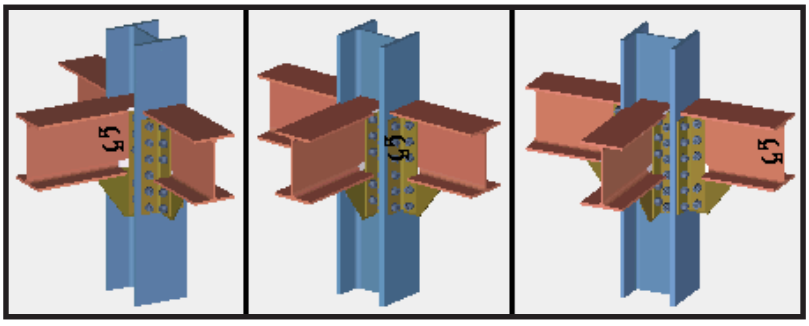
solid trans main (transparent main material, opaque connection)

To switch from view to view while you are in *Modeling*, use *File > Open View.*

To zoom in and zoom out of views, use your mouse wheel. If you don't have a mouse wheel, other zoom options are available on the *Navigate* menu.

To scroll across the screen, use the scroll bars around the *Modeling* drawing area, or use *Pan*.

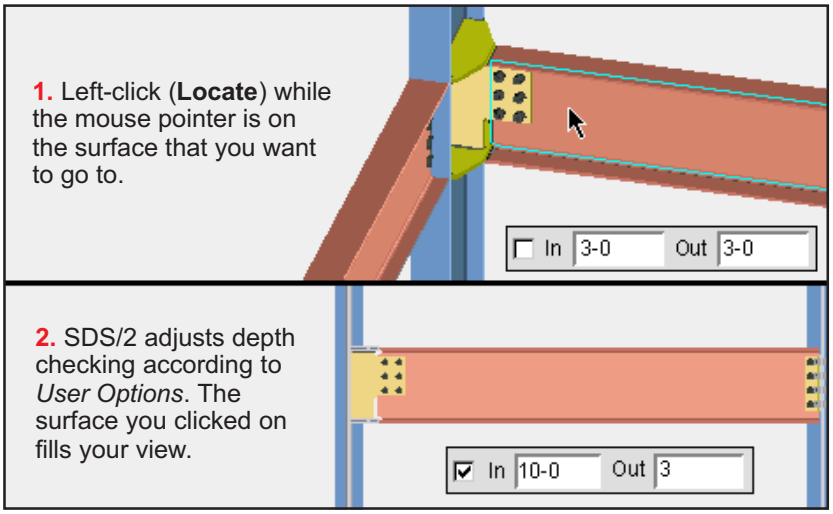
To rotate around a member, hold down the mouse button for **Rotate** (middle mouse button). The mouse pointer changes its appearance ( ). Drag the mouse pointer in any direction (horizontally or vertically or diagonally). In this example, the mouse pointer is dragged horizontally, thus causing the view to rotate around the column.



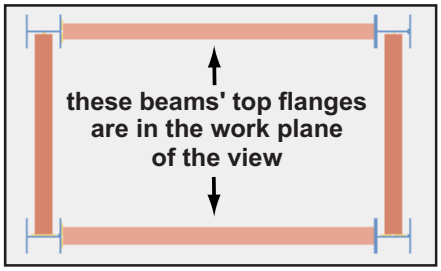
To undo view changes, you can use *View > Undo* or *File > Revert*.

To save view changes as permanent erection views, you can use *File > Save View As*. You'll get best results saving view transformations made using *View > Isometric* or *View > Plan* or *View > Section* or *Navigate > Rotate View*, *Navigate > Snap to Surface*, *Navigate > Snap to Farside*, or *Navigate > Snap to Adjacent*.

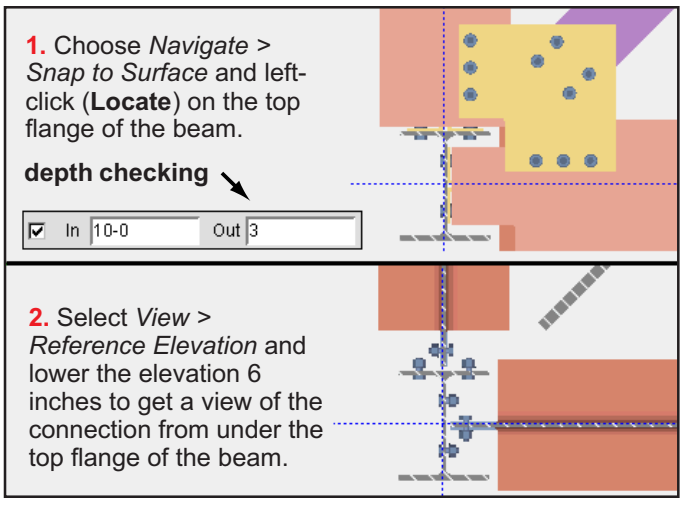
Surface tools can bring you to a particular surface that can be seen in your current view (as shown below), or to a far-side or adjacent surface not visible in your current view.



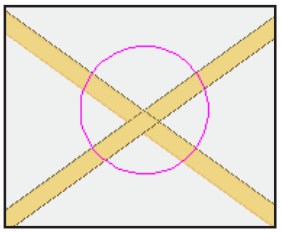
When you are on a surface, surfaces that are in the work plane of a view are displayed in a lighter color.



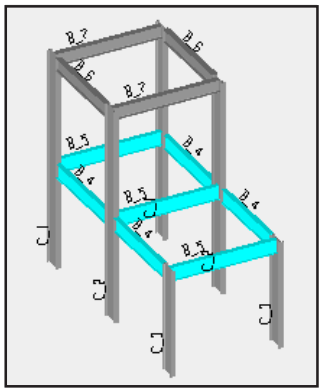
An excellent way to check connections is to *Navigate* > *Snap to Surface*, left-click (**Locate**) on the top flange of the beam whose connection you want to look at, *Pan* over to above the connection, then lower the elevation so that your perspective is from underneath the beam's top flange.



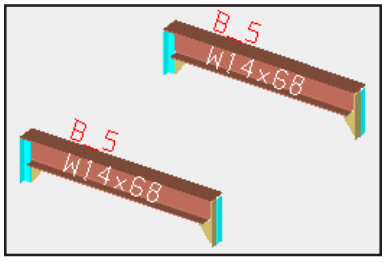
Doing a Clash Report (*Reports* > *Clash Report*) identifies materials that are as close as or closer together than a specific tolerance that you specify. The area where the two materials "clash" is circled by the program as shown below:



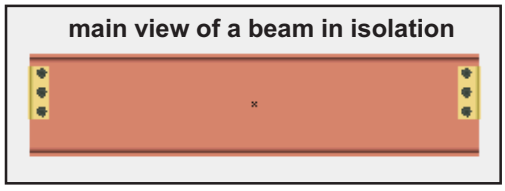
***Status* can help you find items** such as members with failed connections. Choose *Model* > *Status* to set status display options. In the example below, *Status* was used to display W16x31 sections in a different color (cyan) than the other members:



Find Material lets you easily locate material by its submaterial piecemark. Simply choose *Model* > *Material* > *Find Material*. All members containing the material whose submaterial piecemark you select are isolated from other members in your current view. The submaterial specified are displayed in the color cyan. In the example below, the specified submaterial is an angle:



Isolating a member lets you view a member separately from other members in the model. Choose *Model* > *Member* > *Isolate Member*. Available views of the isolated member correspond to views shown on the member's detail. If you create additional views, those views will also be shown on the member detail.



Searches to review member edit windows

After *Process and Create Solids*, you should make sure that SDS/2 has designed all system connections the way you want them to be designed. Toward this end, *SDS/2* provides a number of searches. These searches may be done in *Modeling* or the *Drawing Editor,* by choosing *Process* > *Search*. Some of these searches are listed below:

Failed Connections is a search for members for which the program was unable to design a connection that stands up to the specified or calculated load. On the beam, column, vertical brace or horizontal brace edit window for that member, you will find a connection failure message such as that shown below. Beam connection failure messages, column connection failure messages, horizontal brace connection failure messages and vertical brace connection failure messages can give you clues about steps you can take to generate a connection that does not fail.

Connections Below Minimum Setup is a search for beams on which the number of bolt rows are less than the minimum number of bolt rows that are specified under *Job Options* in the *Structural Members Schedule of Minimums* for a beam with that particular nominal depth. The program also looks for welds that are less than the "*Minimum weld size for this job*" in *Job Options*.

Bolt Diameters Changed by System is a search for members with connections whose bolt diameters have been increased by SDS/2 in order to design a connection that would stand up to the specified or calculated loading conditions.

Indeterminate Ends is a search for members with ends that do not frame into anything (plain ends). When you go to the member edit window (*Beam Edit* window or *Column Edit* window or *Horizontal Brace Edit* window or *Vertical Brace Edit* window or etc.) for a particular member that has been found in this search, you will find that the "*System designed connection*" for at least one end of the member is a '*Plain end*.'

Tip: Connection design can be quickly reviewed on member edit windows by clicking on individual revise & review buttons. To change a revise & review settings, mark the connection as '*User*,' click on the revise & review button and make your change, press the "*Re-Design Connection*" button, then press the revise & review button again to see the results of the change you have made.

Step 6: Modifying/Revising Connections

Once you have identified members that have failed or are not designed to your precise specifications, you can create new connections or modify existing connections using one of the following methods:

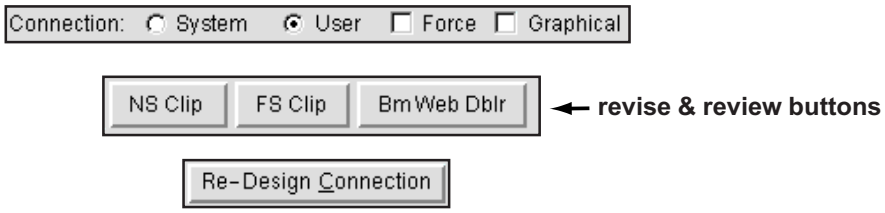
Change the "*Input connection type*" that was originally entered on the beam, column, vertical brace or horizontal brace edit window.

This automatically marks the member for *Processing*. The newly selected system connection will be designed the next time you *Process and Create Solids*.

Change Job Options or Fabricator Options that govern the design of connections.

You should then *Model* > *Member* > *Mark for Processing* the members you want to be affected by the setup changes you made. The next time you *Process* > *Process and Create Solids*, SDS/2 will redesign the connections on all those members you marked according to the revised choices you made in setup.

Create user connections to more precisely define parameters such as the number of rows of bolts, etc., thus instructing the program to override *Job Options* or *Fabricator Options*. **On the member edit window: 1.** Change the connection to '*User*.' **2.** Press a revise & review button and change the setting you want. **3.** Press the "*Re-Design Connection*" button or close the window and *Process and Create Solids*.



Create user defined connections:

A user defined connection is basically a '*User*' connection that you set up once and apply on different members. See page 29 for more information.

Create a forced connection:

If SDS/2 has failed a connection during *Process and Create Solids* because the connection "as designed" does not comply with AISC guidelines or stand up the loads placed on it, the "*Force*" button on the member's edit window (followed by *Process and Create Solids*) lets you force SDS/2 to design the connection anyway. This, of course, should be done with caution since the forced connection had most likely failed for a good reason.

Create connections using options like *Add Material*, *Add Holes*, and *Add Bolts* to add material to system connections or to create a connection from scratch.

The disadvantage of connections created from user-added materials is that they **do not** undergo the checking against AISC guidelines that system-generated connections undergo during *Process and Create Solids*. Creating connections in this way should be done as a last resort. It is a lot more work for you to create a connection than to have SDS/2 do it for you.

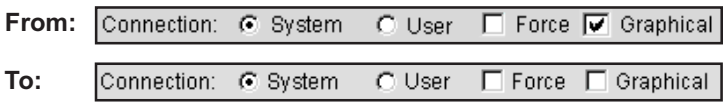
Tip: A *Status Display* option is available for tracking "*User created material*."

Use Save/Load Assembly instead of options like *Add Material* and *Add Holes*. You can save connections using *Model > Save Assembly*, then "*Load*" them onto other members using *Model > Load Assembly*. If you want a connection that you have created to be used in a number of different places in the model, this is a useful way to apply the connection.

Use Python scripts (parametrics) that automatically add materials, holes, bolts and welds. These scripts can be automatically created in SDS/2's *Parametric Modeling* program. To run a Python script in *Modeling*, choose *Model > Parametric > Run*.

Create graphical connections by modifying system-generated connection materials or holes. Graphical connections are not changed during *Process and Create Solids*.

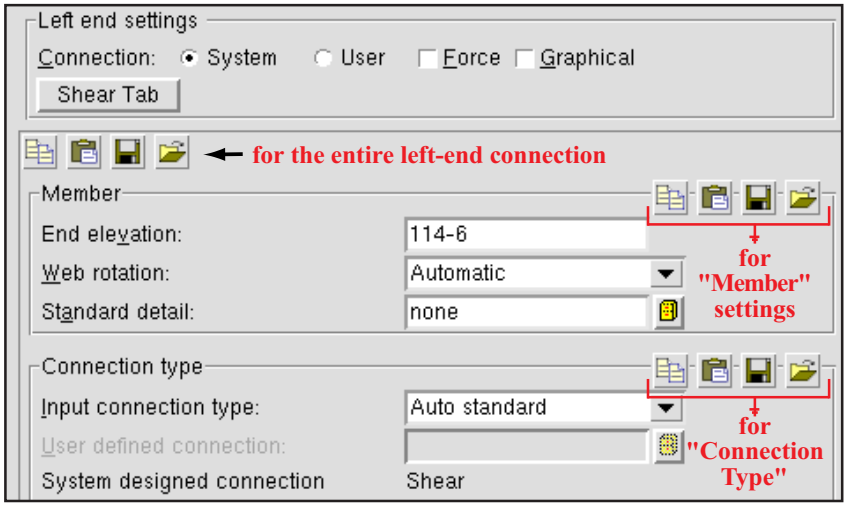
Replace a graphical connection with a system connection by unchecking the "*Graphical*" check box for that connection on the member's edit window



During *Process and Create Solids*, all system-generated connection materials are regenerated, which means that any graphical changes to those materials are lost.

Replace a graphical connection with a system connection by unchecking the "*Graphical*" check box for that connection on the member's edit window.

Replace connection settings or entire connections using "*Copy*" ( ), "*Paste*" ( ), "*Save*" ( ) and "*Load*" ( ) buttons.



- You'll find buttons like these at the top of a member edit window, above the left-end and right-end settings, and embedded in the border of individual sections on the window. They are located above the settings that they apply to.

- You can "*Copy*" and "*Paste*" (or "*Save*" and "*Load*") only same sections on same-type windows. You **cannot**, for example, "*Copy*" sections from a beam to a column.

- You can "*Copy*" or "*Load*" equivalent left sections to right sections on the same window or to different windows. For example, you could "*Copy*" the "*Connection Type*" settings under "*Left end settings*" shown above to the same section under the "*Right end settings*."

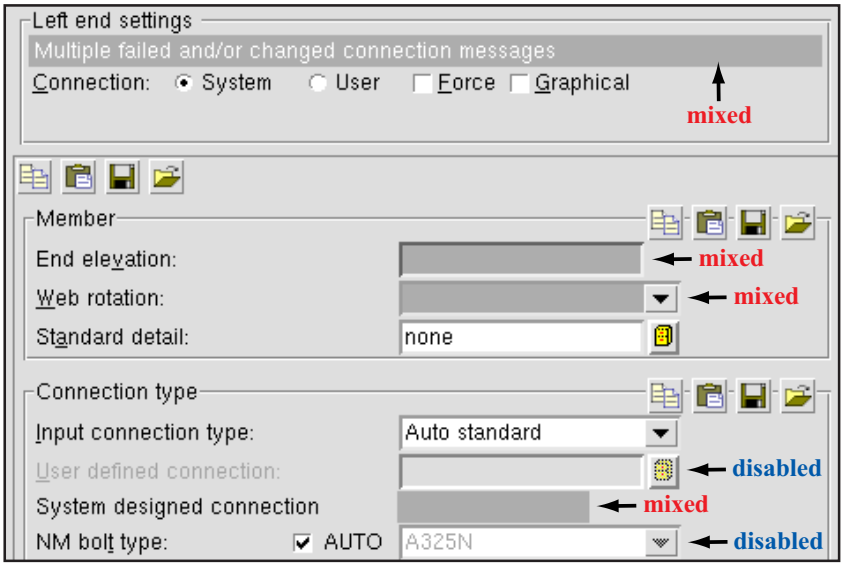
- To copy a connection, use "*Copy*" ( ) for the entire left or right end. All left- or right-end settings are copied except "*End elevation*." You can "*Paste*" ( ) to the opposite end of the same member or another member of the same type.

- "*Save*" ( ) places a file (which you name) in a subfolder of the form folder in your current version of SDS/2. The exact subfolder depends on the member type and the settings that the button controls. "*Load*" ( ) automatically opens that same subfolder.

- Since the form folder is located in your current version of SDS/2, you can "*Load*" files that have been saved in one Job into other Jobs. Also, you can "*Load*" files that have been saved by other users on your network.

- "*Paste*" and "*Load*" replace mixed entries to a single field with a single entry. "*Copy*" and "*Save*" ignore fields with mixed entries, treating them as if they have no entry or do not exist.

Use multi-member edit to review and change the connection settings (or other settings) on members of the same type. Fields on an edit window are grayed out in different ways to indicate that the field is **disabled** or has **mixed entries**.



- When a field is **disabled**, you **cannot** make any changes to it. However, you can usually enable a disabled field by making a different selection to another field on the same window. For example, on the *Beam Edit* window (shown above), you could enable "*User defined connection*" by selecting '*User defined*' as the "*Input connection type*."

- When a check box or entry field or selection field has **mixed entries**, you **can** change it to a single entry. The entry will be applied to all of the items being edited, and the contents of the field will be normal in appearance (no longer gray).

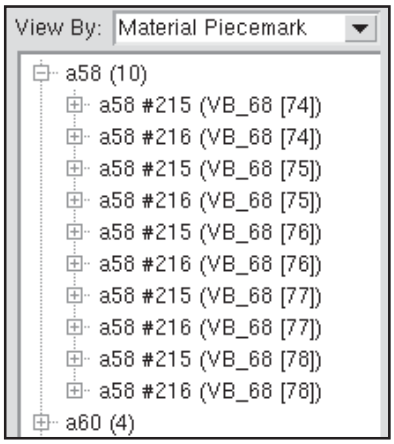
- A field is normal in appearance if its setting is the same for all of the members being edited. If you change that setting, it is changed for all members being edited.

- **A method for editing multiple members: 1)** Set the selection filter for a particular type of member (e.g. '*Beams*'). **2)** Draw an area box to select beams. **3)** Right-click then choose "*Edit*" on the shortcut menu.

- **Be careful when doing a multi-member edit** that you do not unintentionally break apart piecemarks. *Model > Member > Edit by Piecemark* is one tool you can use to ensure that you do not break apart members with the same piecemark.

- **An alternative to doing a multi-member edit** is to edit a single member among many members with the same piecemark. After you press "*OK*" on the member edit window, you will be given the option to apply your changes to all members with the same mark. You **do not** get such an option when you edit more than one member simultaneously.

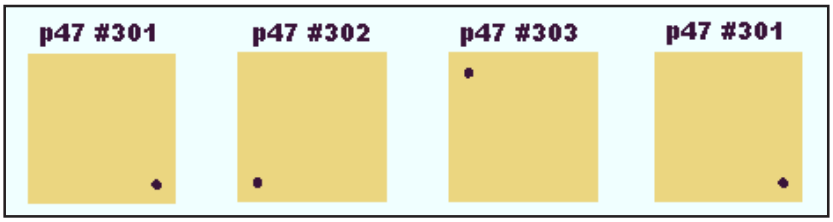
Editing materials is something you may want to do on non-system connections that have been manually or parametrically added. You may also want to edit system-generated material as a last resort, in order to get a desired connection. When editing materials, especially if you multi-edit or use "Change all," you should be aware of the significance of the submaterial piecemark index number.



Submaterial piecemark index numbers identify which materials with the same submaterial mark have the same settings on their edit windows. In this screen shot of the model tree, the **a58** materials with the index number **#215** have '*In*' set as their "*Toe direction*." The submaterials with the index number **#216** have '*Out*' set as their "*Toe direction*."

Basic principle for index number assignment: Some settings that are available on a material's edit window can shift or rotate that material in the model. For example, a rectangular plate's "*Thickness reference point*" can be changed from '*NS*' to '*FS*', or a channel's "*Toe direction*" can be switched from '*In*' to '*Out*.' These settings do not cause that material to be assigned a different submaterial mark. They do, however, affect the index number that is assigned to a material. Different left/right end settings also result in materials with the same piecemark being assigned different index numbers. Materials which have the same index number have the same material edit window settings.

Cuts and holes may also generate different submaterial mark index numbers. In the following example, the placement of holes results in different index numbers on three of the four rectangular plates. The hole in each **P47 #301** is on the right, bottom end of the plate. On the **P47 #302**, the hole is on the left, bottom end. To superimpose **P47 #302** on **P47 #301**, you could flip it, or you could rotate it 90 degrees.

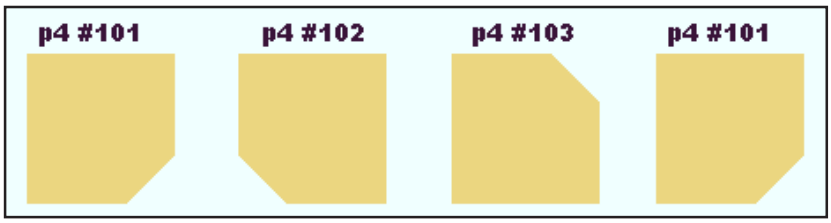


Materials with cut layouts, copes or clips or hole patterns that can be superimposed on one another are assigned the same submaterial mark. This is true even if the holes or cuts are on different ends (top or bottom; left or right) of the materials.

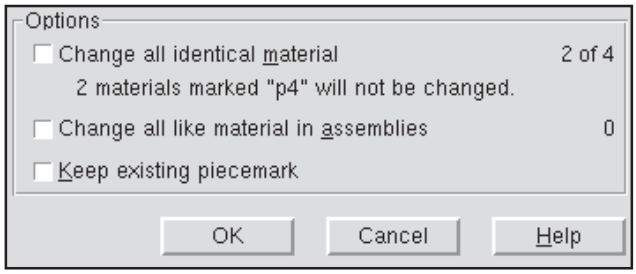
To superimpose materials, you may have to flip them and/or rotate them. If you have to rotate and/or flip one material to superimpose the hole pattern or cut layout or edit-window-specified cope or clip on another material, the two materials will have different index numbers.

Materials with the same submaterial mark and hole patterns or copes, clips or cut layouts will also have the same index numbers if those hole patterns or cuts can be superimposed on one another without your having to rotate or flip the material.

Following is an example of four plates with the same submaterial mark. Some of the plates have different index numbers because the corner clips on them were entered using equivalent settings at different left/right and/or top/bottom locations on the *Rectangular Plate Material* window.



If you were to edit one of the two p4 #101 plates illustrated above and, for example, change its steel grade, you would get the "Change all" options shown below. The "*Change all identical material*" option reads 2 of 4 because there are only two #101 plates.



The "*Change all identical material*" option, which you get when you edit a single material, will only apply changes to materials with the same index number. This is a good thing, not a liability, since it prevents materials from shifting in the model, or cuts from being translated to the opposite end (left/right or top/bottom) of a material.

If you multi-edit materials with the same submaterial mark but different index numbers, certain fields may have mixed entries (see page 75) on the edit window. If you change the mixed entries to a single entry, some of the edited materials may shift to a new location in the model, or cuts may move to the opposite end of the material.

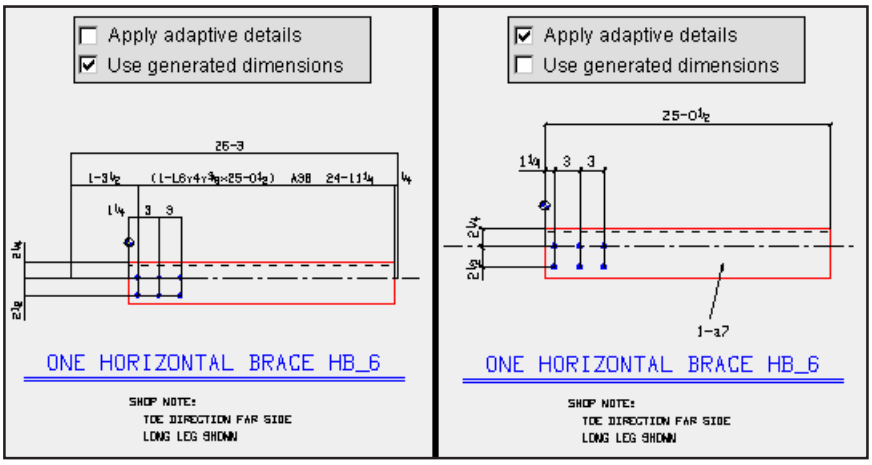
You can find submaterial mark index numbers on the model tree, when selecting submaterials on the shortcut menu, or in the balloon description that appears when you hover a submaterial with your mouse pointer.

Step 7a: Member Detailing with Adaptive Details

At this point you may want to copy adaptive details from other Jobs for use in your current Job. You can do this using the *Utility* function "*Copy Job Items*." If you have not yet created any adaptive details, then you will need to do step 7b (create member details) before this step. Adaptive details are created from member details. They are applied when you *Detail Members* and check the box for "*Apply adaptive details*."

What is an adaptive detail?

An adaptive detail is a special drawing created by the user that will cause dimensions and other annotations to be added to or deleted from a member detail when you *Detail Members*. SDS/2 applies an adaptive detail only to member details with the same member type (beam, column, etc.), the same material type (channel, angle, etc.), the same view (main view, left end, etc.), and the same "*Material usage definition*" (always the same if none has not been applied).



The above illustration shows two details of a horizontal brace that was broken apart in *Modeling* (using "*Break Member Apart*") so that its gusset plate and main material were detailed separately. The detail on the left (without an adaptive detail) dimensions the brace from its work points. The detail on the right (with an adaptive detail) dimensions the brace from the ends of the material.

How to create, modify & apply adaptive details:

1. While in *Drawing Editor*:

1a. *File* > *Open* a system-generated member detail.

2. Now that the selected member detail is your current drawing:

2a. Choose *File* > *Create Adaptive Detail*.

2b. Select the materials you want to include in the adaptive detail.

2c (optional). Select the dimensions that you want to delete.

2d. Press the Enter key (or right-click (**Menu**) and choose "*OK*" on the shortcut menu) when the items that you want included in the adaptive detail have been selected.

2e. A preview of the adaptive detail is shown on screen. In the *Save Adaptive Detail* window, give the adaptive detail a name then press "*OK*."

3. To review and modify the adaptive detail you created:

3a. *File* > *Open* the adaptive detail that you named in step 2e.

3b (optional). *Objects* > *Dimensions* > *Add* dimensions. The "*Adaptive detailing repeat type*" and special labels can be applied on the *Dimension Edit* window.

3c (if you did 3b). *File* > *Save* your changes to the adaptive detail.

4. To apply the adaptive detail to a member detail:

4a. Choose *Process* > *Detail Members*.

4b. On the member selection dialog, select at least one member of the same type as the member whose detail you created the adaptive detail from in step 2. The member must also have material that is the same type as the material you selected for inclusion in the adaptive detail. Press "*OK*" to continue.

On the *Annotations and Dimensioning* window: **4c.** Check the box for "*Apply adaptive details*" **4d (optional).** Uncheck the boxes for "*System-generated dimensions*" and "*System-generated annotations*" if you want the detail to strictly conform to the adaptive detail. To have SDS/2 draw at least some dimensions and annotations, check these boxes. **4e.** Press "*OK*" to close the *Annotations and Dimensioning* window.

4f. On the selection dialog that opens, select the adaptive details that you want to be applied to the member details that you selected in step 4b, then press "*OK*."

Note: If you select particular adaptive details in step 4f, that does not necessarily mean those details will be applied to all of the members you selected in step 4b. SDS/2 automatically sorts which adaptive details to apply to which member details based on the member type, material type and other categories.

5. SDS/2 generates member details for all of the selected members. The adaptive details you selected in step 4f are applied, where appropriate, to those member details as they are generated.

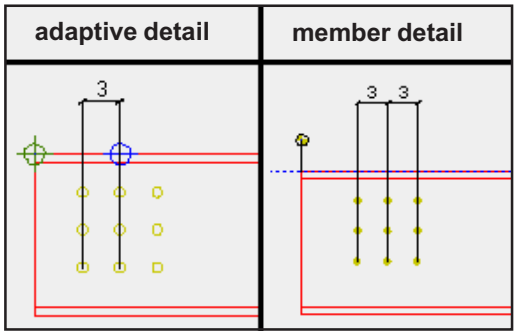
5a. *File* > *Open* the details of the members selected in step 4b and review the results.

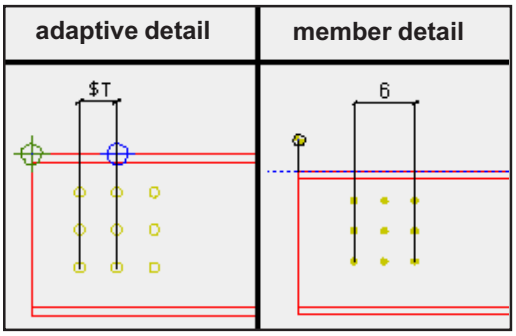
Tip: An adaptive detail's dimensions and annotations are placed on a single drawing layer that is named after the adaptive detail.

To delete an adaptive detail: Use the *Utility* function *Delete Job Items*.

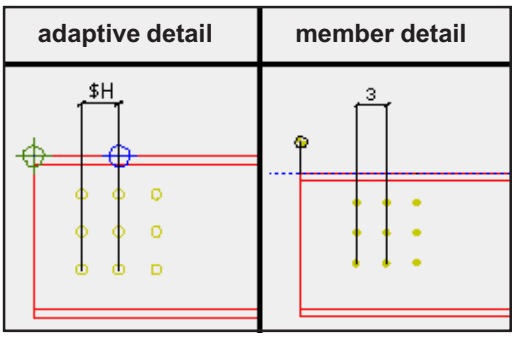
Special dimension labels for adaptive details:

With no special dimension label, a single dimension in the adaptive detail applies to all columns of holes in the hole group.





$T or $N expands a dimension to the first and last columns or rows of a hole group.



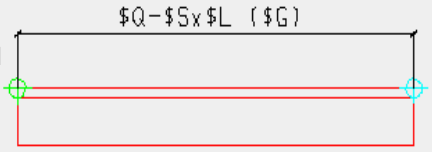
$H holds the dimension to keep it from applying to other columns of holes in the group.

The text for the dimension between the two outside shear studs in this example of an adaptive detail is "$N@$D=$T."

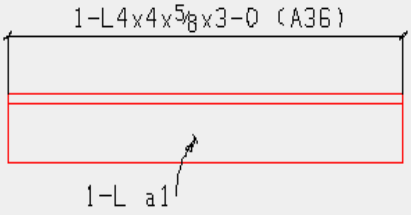
This is translated to "5@2-0=10-0" in the member detail.

You can use these special dimension labels for repeated hole groups as well as repeated materials.

an adaptive detail



part of a member detail that the adaptive detail has been applied to

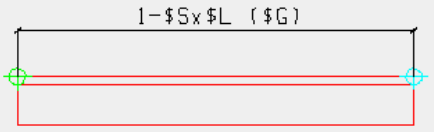


Special Dimension Label	Meaning	After Detailing
$N spa @ $D = $T	number of spaces @ dimension of each space = total dimension	5 spa @ 2-0 = 10-0
$N	number of spaces	5
$D	dimension of each space	2-0
$T	total dimension	10-0
$H	"holds" a dimension	see example above

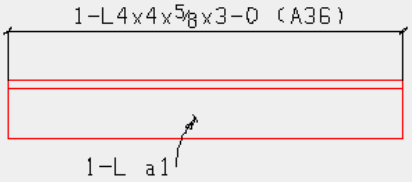
Special dimension labels or labels for adaptive details

The main dimension on the adaptive detail incorporates the special dimension label "1-SxL ($G)." This label is translated to "1-L4x4x5/8x3-0 (A36)" in the member detail. The dimension end points must go to the same material for this to work. You can also apply these as regular labels with pointers.

an adaptive detail



part of a member detail that the adaptive detail has been applied to



Dimension Label or Label	Meaning	After Detailing
$Q-$Sx$L ($G)	quantity-material section size x material length (material grade)	1-L4x4x5/8x3-0 (A36)
$Q	material quantity	1
$S	material section size	L4x4x5/8
$L	material length	3-0
$G	material grade	A36
$P	material piecemark	a1

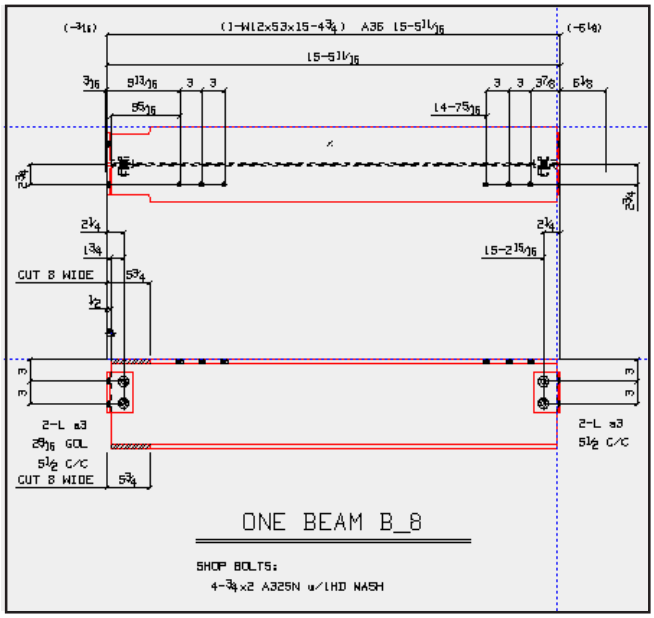
Tips for adaptive detailing:

- It's generally good practice to limit the number of materials you select when you *File > Create Adaptive Detail*. The fewer materials in an adaptive detail, the more member details that adaptive detail will likely apply to.
- Look at your mouse binding reporter or the status line when using *Add Dimension* in an adaptive detail. These will tell you the type of point you are dimensioning to.
- You can dimension to cardinal points, vertex points, member and material work points and setbacks, hole group reference points and member framing points. To *Add Dimension* to these points, use the *Locate* option *Exact Point* (EXPT).
- Use EXPT to *Add Dimension* to vertex points instead of cardinal points if you want dimensions on your adaptive detail to be restricted to a lesser number of member details – that is, to member details with particular copes.
- You can enter any combination of $D, $N, $T in the primary and secondary dimension text. **Example:** For the primary dimension text (upper) you could enter "$N@$D=" while entering "$T" to the secondary dimension text (lower).
- You can use *Utility Functions > Copy Job Items* from the *SDS/2 Main Menu* to copy adaptive details from one Job to another.

Step 7b: Creating and Modifying Member Details

At this point you have designed, reviewed and revised a complete 3D model, and it is time to generate shop drawings. Fortunately for you, SDS/2 can automatically detail complete and accurate shop drawings of members without your ever having to manually draw a line. It's all done automatically, and very fast.

A single member detail is a drawing representing all members in your current Job with the same major piecemark. The example below is a member detail for all beams with the piecemark B_9. In this case, only one beam in the 3D model has that piecemark.



Creating member details:

- On the *Main Menu* click "*Detail Members*" (or choose *Process* > *Detail Members* in *Modeling* or the *Drawing Editor*). SDS/2 automatically generates details of each member that you select.
- Details of members that are not in the 3D model can be user created in the *Drawing Editor.* Choose *File* > *Open*, select '*Details*' (Details) then press "*New ...*"
- Details can be copied into your current Job from another Job using *Utility Functions* > *Copy Job Items* > *Details* (from the *SDS/2 Main Menu*).
- Please note that you cannot regenerate a member detail (using *Detail Members*), or modify it in the *Drawing Editor* if the *Detail Complete* flag for that detail has been set. You can set this flag when you *File* > *Exit* (or *File* > *Open*) after having made a change to a *Drawing Editor* drawing.
- Also, SDS/2 cannot generate details for joists since joists can never be represented in solids form in the model. Beams, columns, braces, etc. must have undergone *Process and Create Solids* at least once before they can be auto detailed.

How system-generated member details (piecemarks) are named:

- A member detail is identified by the piecemark of the member(s) the drawing depicts.
- When the member first undergoes *Process and Create Solids* (or is first created in the case of a stair or miscellaneous member), SDS/2 assigns members the "*System Piecemark Prefix*" listed in *Material Descriptions* that identifies the type of the member (e.g. B_ for a beam).

Changing detail file names (member piecemarks):

- SDS/2 provides three different tools you can use to change all references to members and their details throughout your current Job. Even the piecemarks of details on sheets are changed. These tools are: *Objects > Sheet Items > Detail Sheet Autoloading* (*Drawing Editor*); *File > Change Marks* (*Drawing Editor*); *Utilities > Rename Job Items* (from the *SDS/2 Main Menu*). Piecemark changes also apply to current member bills of material and current erection view details.

An unique characteristic of SDS/2 member details:

- Each system-generated member detail has complete bill of material information which can be updated using *Objects > Bill of Material > Edit Bill* in the *Drawing Editor*. This information is automatically compiled into the bill of material on a sheet as member details are placed onto that sheet.

	Quantity Unit	Quantity Total	Description	Piece Mark	Length	Weight Unit	Weight Total
1		1	BEAM	B_65		307	307
2	1	1	W10x22		12-4	270	270
3	4	4	L4x3x3/8		5	4	16
4	1	1	FL3/8x8		2-0	20	20
5	4	4	3/4 Dia A325N		2	1	1

SDS/2 automatically marks members for detailing:

- Members that have been marked for detailing are automatically selected on the selection dialog for *Process > Detail Members*. In other words, SDS/2 keeps track of which members need detailing so that you don't have to keep track yourself.
- When solids are generated for a new member, that member is marked for detailing. This is true even if the new member receives the same member piecemark as other members – this lets the quantity on the detail be changed during *Detail Members*. Members are also marked for detailing if they are changed in some way, or if one member is deleted while other members with that same piecemark remain.
- You can mark members for detailing yourself by using *Model > Member > Mark for Detailing*. You might want to do this, for example, if you have made some changes to *Fabricator Options* and you want those changes applied to specific members that are already detailed.

Automatic detailing of members:

- SDS/2 automatically generates different views of members as required to present necessary fabrication information.
- If you have created views in member isolation (*Model* > *Member* > *Isolate*), these are automatically incorporated into the detail.
- Dimensioning of members is done automatically according to choices made to *Options* > *Fabricator Options* > *Dimensioning Criteria*.
- Bevel symbols and weld symbols are generated according to choices made to *Options* > *Fabricator Options* > *Detailing Symbol Options*.
- Labels are sized according to settings under *Options* > *Fabricator Options* > *Drawing Cosmetics*.
- *Model* > *Hole* > *Set Reference Point* in *Modeling* lets you set the point/direction from which SDS/2 dimensions a group of 3D holes.
- *Model* > *Material* > *Set Reference Point* in *Modeling* lets you change, if necessary, the dimensioning reference point of a material.
- Each member detail is identified by a member piecemark.

Reviewing and editing member details:

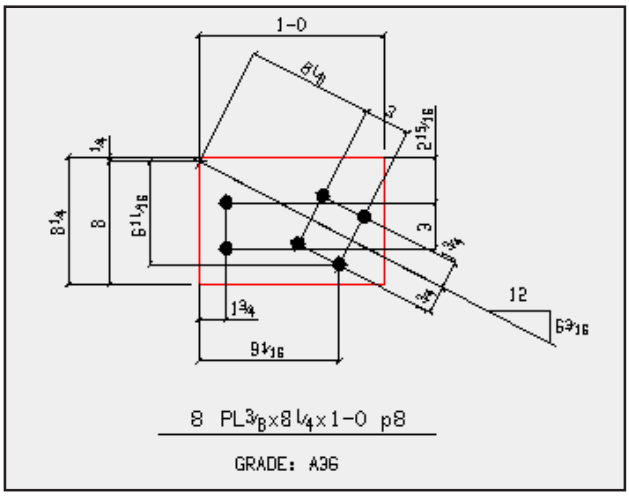
- To start the *Drawing Editor*, click "*Drawing Editor*" on the *SDS/2 Main Menu*, then select the drawing that you want to view.
- Use *File* > *Open* or *File* > *Next* or *File* > *Previous* after you are done reviewing one detail and want to look at another. SDS/2 prompts you to save changes to a drawing if you have made changes.
- While viewing a drawing, you can add new drawing entities (objects). For instance, you can add weld symbols, circles, pointers, labels, etc. On a member detail, this should be done in an *Unshortened* view.
- You can also add job standard details or global standard details to drawings, or create new job standard details from drawings. Standard details are usually simple drawings that you use repeatedly on different drawings or on sheets.
- If you have used the *Drawing Editor* to add graphic objects to a member detail and now want SDS/2 to regenerate that drawing, choose *Process* > *Detail Members* then select "*Save drawing annotations*" to keep any user-added changes you have made.
- Be sure to add graphic objects to member details in an *Unshortened* view. If you fail to do this, then the *Detail Members* option to "*Save drawing annotations*" may not work properly. Also, tools that measure distances (*Ruler*, *BSCL*, *Dimension Add*) may not always measure those distances properly in a *Shortened* view.

Removing member details from a Job:

- To remove user-created member details, choose *Utility Functions > Delete Job Items* from the *SDS/2 Main Menu*.
- If a member is deleted after having been detailed, using the *Release Deleted Members* utility removes that member's detail along with the member. The member detail is also removed from its sheet, if it is on a sheet.

Step 7c: Creating and Modifying Submaterial Details

A submaterial detail is a drawing of a single piece of material that may be used many times in the SDS/2 model, on many different members. Submaterial details can only be created by SDS/2. They cannot be created by the user. The submaterial detail shown below is a drawing of a plate.



How submaterial details are created:

- Choose *Process > Detail Submaterials* (or choose *Detail Submaterial* on the *SDS/2 Main Menu*) to have SDS/2 create submaterial details. You can do this any time after *Process and Create Solids* has taken place.
- Submaterial details can be modified in the *Drawing Editor*, but new submaterial files can only be created automatically by SDS/2. You cannot create them yourself. However, you can save copies of them as standard details.

How submaterial details are named:

- The name of a submaterial is its submaterial mark. A single submaterial mark is assigned to all submaterial pieces that have the same dimensions, holes, steel grade, end cuts, etc.

- During *Process and Create Solids*, or when solids are generated after a material is added or edited, like submaterials are assigned their submaterial mark according to choices made on the *Submaterial Piecemarking Prefixes* list found on the *Member and Material Piecemarking Options* window in *Fabricator Options*.

- Submaterials can optionally be "*Broken apart by sequence*" so that submaterials that are otherwise exactly alike receive different piecemarks if they are in different sequences. SDS/2 even gives you the option to "*Include the sequence in the submaterial's name*." These setup options are found under *Options > Fabricator Options > Member and Material Piecemarking Options*.

Changing submaterial detail file names (material piecemarks):

- Two different tools can be used to change the file names (material piecemarks) of submaterials along with all references to those files throughout your current Job. These tools are *File > Change Marks* (*Drawing Editor*) and *Utility Functions > Rename Job Items* (from the *Main Menu*). They change the piecemarks of submaterials placed on gather sheets along with the submaterial piecemarks in *Modeling* and on currently generated member details and member bills of material and on subsequently generated reports.

Automatic detailing of submaterials:

- Submaterials are automatically detailed using *Process > Detail Submaterial* in *Modeling* or the *Drawing Editor* (or click "*Detail Submaterials*" on the *SDS/2 Main Menu*).

- Like member details, submaterial details are generated according to *Fabricator Options* such as *Dimensioning Criteria* or *Detailing Symbol Options* or *Member and Material Piecemarking Options*.

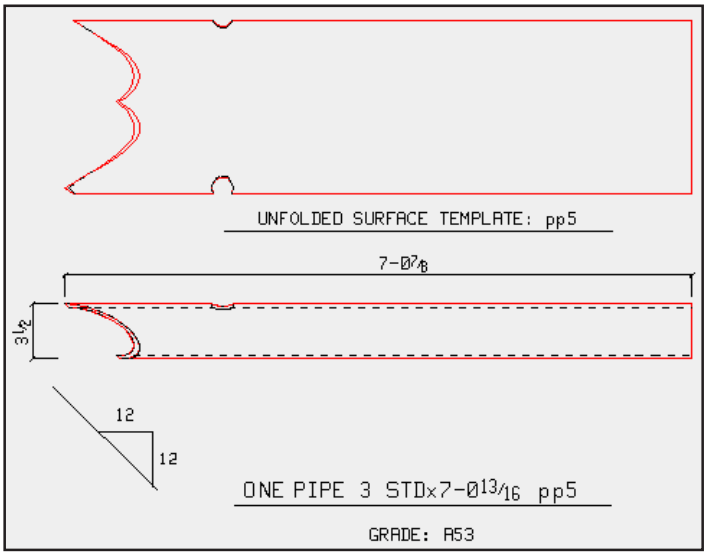
- *Model > Hole > Set Reference Point* in *Modeling* lets you set the point/direction from which SDS/2 dimensions a group of 3D holes on a particular piece of material.

- *Model > Material > Set Reference Point* in *Modeling* lets you change, if necessary, the dimensioning reference point of a material.

- Submaterial details must be placed onto gather sheets before they can be plotted. To output a report on which submaterials have been placed on which sheets, choose *Reports > Sheet List, Select by Sheet*.

Creating a rolled-out template:

- If you want a rolled-out template of a cut material in the submaterial detail, cut the material using one of the *Model* > *Material* > *Fit* options in *Modeling*. For pipe you get an interior and exterior cut surface. Non-fit cutting operations do not generate a rolled-out material template. Below is an example of a rolled-out template:



Reviewing and editing submaterial details:

- To start up the *Drawing Editor* so that you can review and edit submaterial details, click "*Drawing Editor*" on the *SDS/2 Main Menu*. By default, the selection dialog that opens shows you a list of member details. Select '*Submaterial*' (Submaterial) to make the selection dialog list submaterials, then double-click on the drawing that you want to view.

- Once you have reviewed one submaterial detail, choose *File* > *Open* or *File* > *Next* or *File* > *Previous* to review another.

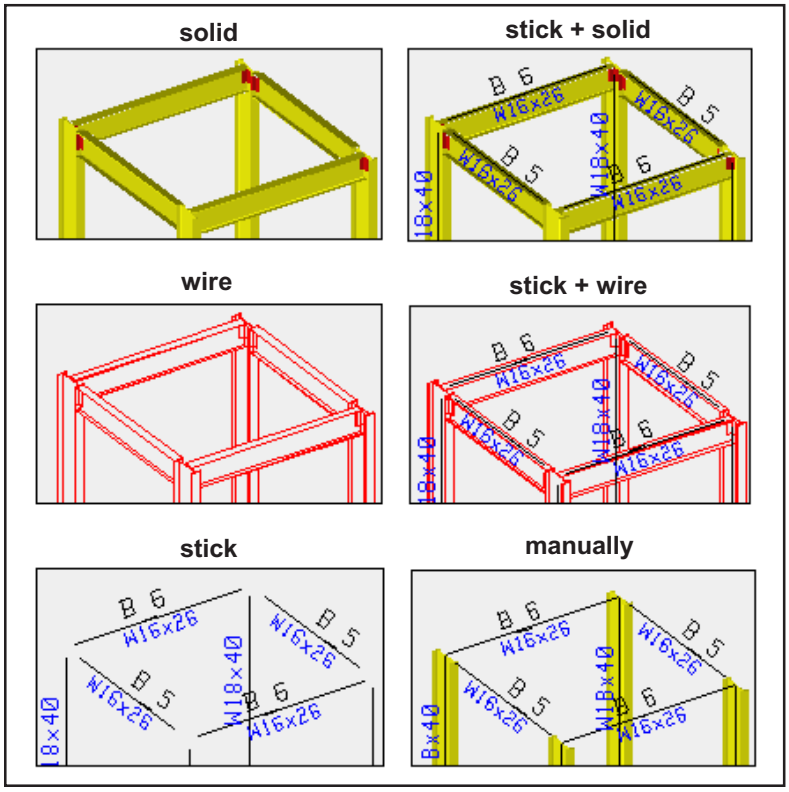
- If you add new objects (pointers or labels or etc.) or move or change objects on a submaterial detail, SDS/2 gives you the option to save your changes when you *File* > *Open*. Also, you can optionally set a "*Detail complete date*" to prevent the submaterial detail from being changed.

- If you set the "*Detail complete date*" for a submaterial detail (or for that matter, any other type of drawing), you are notified of such the next time you *File* > *Open* that drawing.

- There is no bill of material information on a submaterial detail. The drawing itself shows the material type and (if the appropriate box is checked in *Member and Material Piecemarking Options*) the material quantity.

Step 7d: Creating and Modifying Erection Plans

Erection plans are drawings of individual erection views that you have created in *Modeling*. Erection views can only be created by SDS/2. They cannot be drawn by the user. As shown in the illustration below, members in erection views can be displayed in solid, stick + solid, wire, stick + wire, stick, or combinations of forms (set manually).



Creating erection plans:

- The creation of erection plans begins in *Modeling*, when you create isometric views, plan views or elevation views. Click "*Detail Erection Views*" on the *SDS/2 Main Menu* (or choose *Process* > *Detail Erection Views* while in the *Drawing Editor* or *Modeling*) to detail whichever plan views, isometric views and elevation views you select.

- You can also cut a *Section View* on an erection view in the *Drawing Editor*. This creates a new erection view in *Modeling*, details that erection view, and adds that erection view as a sheet item to your current erection view.

- Only one 2D erection view can be created per 3D erection view. Each time an erection view is detailed, the previous detail (if one exists) is replaced. However, changes to the positions of piecemarks and section sizes can be retained.

- Members in an erection view can be detailed in stick, solid, or wire frame form.

- A variety of hide/show options are available for detailing erection views. If you don't, for example, want section sizes for cross sections, you can set them to be hidden on the detail. This can save you the trouble of having to hide or show them manually.

How erection plans are named:

- Erection plans have the same name as the erection view they are a drawing of.
- You give an erection view a name when you create it in *Modeling* using *View > New*.
- You can also create a new erection view and give it a name by using *View > Save View As* after having performed an operation in your current view that changes the view's location with respect to the 3D model.

Changing erection view file names:

- You can change the name of an erection view by choosing *Utility Functions > Rename Job Items* from the *SDS/2 Main Menu*. This utility changes all references to that erection view throughout your current Job. For example, its name is changed on any sheets onto which the erection plan has been placed and on the corresponding grid line in *Modeling*.

Scaling erection views:

- When an erection view is detailed for the first time, its scale is the "*Drawing scale*" entered on the *Display Options* window in *Modeling* (*View > Display Options*).
- Once an erection plan has been created, you can change its "*Drawing scale*" on the *Drawing Data* window in the *Drawing Editor* (*File > Drawing Data*). This remains the scale of the erection view if you detail it again.
- You can also use *Objects > Sheet Items > Edit* to change an erection view's scale on a sheet. Doing this **does not** affect the scale on the *Drawing Data* window.
- The default sizes of piecemarks and section sizes is set in *Drawing Cosmetics*.

Viewing the erection views:

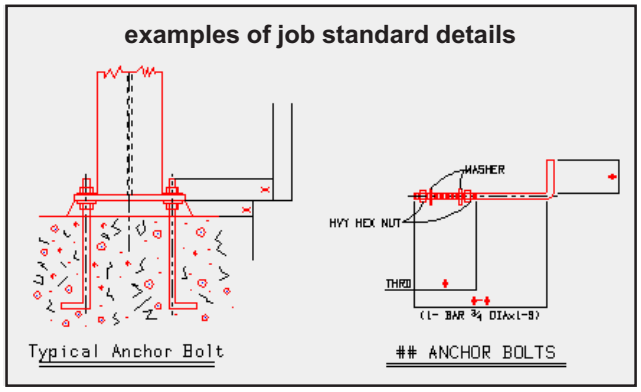
- After an erection view has been detailed, you can *File > Open* it and view it in the *Drawing Editor*.
- If the erection view you open in the *Drawing Editor* is an isometric view that is not shown from the angle you want, you can rotate the view in *Modeling*, then redetail it.
- If you make changes to an erection plan and then decide to redetail it, any graphic enhancements made to the current detail may optionally be retained in the new detail.

Modifying the erection plan in the Drawing Editor:

- When you are sure that an erection plan is detailed the way you want it to be, the *Drawing Editor* can be used to improve its appearance.
- You can add objects such as pointers, labels, etc. to erection plans by choosing *Objects* > ... > *Add* while in the *Drawing Editor*.
- To move section sizes and piecemarks, drag them while in *Select Items* mode.
- To change the visibility, size, etc. of piecemarks or section sizes or elevation or camber notations on the erection plan, double-click on the item while in *Select Items* mode, then make the desired change on the *Erection View Cleanup* window.
- To edit multiple piecemarks or section sizes or etc., first select them, then right-click and choose "*Edit*" on the shortcut menu.
- You can change the scale of an erection plan on the *Drawing Data* window (opened using *File* > *Drawing Data*). But you may not find this to be necessary since you can also change the scale of any instance of that erection plan as it is placed onto a sheet (or other drawing) using *Add Sheet Item*.
- Choose *Edit* > *Save Standard Detail* while in the *Drawing Editor* to save a portion of an erection plan as a job standard detail. This is one way to create an inset that shows a close-up view of a particular portion of a drawing. You can later add that inset to the erection plan or to its erection sheet using *File* > *Add Standard Detail*. Or, instead of creating a standard detail, you can *Objects* > *Sheet Items* > *Add* to place a second copy of the erection view, then re-scale it and adjust its viewport (that is, mask off or crop away the portions you don't want to see).
- Any job standard detail that you can add using *Add Standard Detail* can also be added using *Add Sheet Item*. A job standard detail that is added as a sheet item updates automatically whenever the original job standard detail is updated. A job standard detail added using *Add Standard Detail* is a copy of the original drawing and is embedded in the erection plan, which means that it **will not** be updated on the erection plan if its original standard detail file is altered. Global standard details cannot be added as sheet items.
- You **cannot** use *Save As* to save copies of an erection plan under different erection view file names. You also cannot use the "*New ...*" button to create an entirely new erection view. For all other drawing types, with the exception of submaterials, you can use *Save As* to make copies, and you can use "*New ..*" to create an entirely new drawing.

Step 8a: Creating and Applying Job Standard Details

To copy part of one drawing into a different drawing, you can select the graphic, right-click and choose "*Copy*." Then, on the different drawing, right-click and choose "*Paste*." Or you can save part of the first drawing as a job standard detail and later place it using *File > Add Standard Detail*. The big advantage of job standard details is that they are permanent files, as opposed to clipboard files, and thus can be placed at any time you are in the same Job in the *Drawing Editor*, even if you go back to that same Job many months or many years later.



Creating job standard details:

- To create a job standard detail from another drawing, *File > Open* that other drawing, choose *Edit > Save Standard Detail*, select the graphics you want copied and locate a reference point, then enter a file name.
- To create a job standard details from scratch, choose *File > Open*, select '*Job standard details*' (Job standard details), then press "*New ...*" and enter a file name.
- To copy job standard details from other Jobs into your current SDS/2 version, select *Utility Functions > Copy Job Items* from the *SDS/2 Main Menu*.
- The *Drawing Conversion* program imports .dxf , .dxb, .dwg, .dgn graphics files into SDS/2 as job standard details.

Placing job standard details:

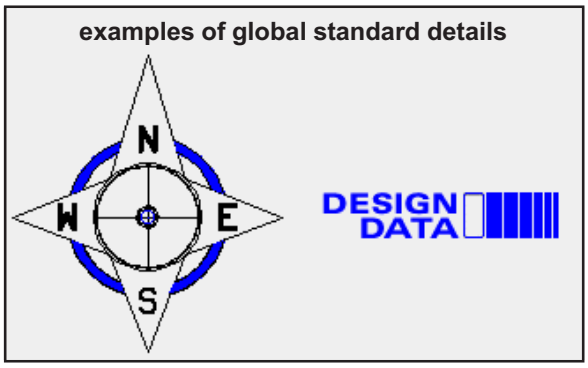
- Job standard details may be added to drawings or sheets using *File > Add Standard Detail*, or *Objects > Sheet Items > Add*. *Add Standard Detail* places an embedded copy of the original drawing. *Add Sheet Item* places a linked graphic, which updates automatically whenever the original job standard detail is updated.
- You can apply a standard detail to the end of a member in *Modeling* so it is applied to the member's detail during auto detailing.

Removing/renaming job standard details:

- To remove a job standard detail from any Job, choose *Utility Functions > Delete Job Items* from the *SDS/2 Main Menu*. To rename a job standard detail, choose *Utility Functions > Rename Job Items* from the *SDS/2 Main Menu*.

Step 8b: Creating and Applying Global Standard Details

Global standard details are the same as job standard details, except that they are stored in your current version of SDS/2 rather than in a particular Job. This means that the same global standards can be used in any Job within that same version of SDS/2. A single global standard detail can be placed in many different drawings and many times within the same drawing. This characteristic of global standards makes them ideal for adding special symbols or annotations to multiple drawings.



Both global and job standard details have reference points:

- To verify and/or relocate the standard detail's reference point, choose *File > Verify Reference Point* while accessing that standard detail in the *Drawing Editor*.
- The reference point of a job/global standard detail is the insertion point that *File > Add Standard Detail* uses when placing a standard detail.

Creating global standard details:

- To create new global standard details in the *Drawing Editor*, choose *File > Open*, select the radio button for "*Global standards*" (Global standards), then press the "*New ...*" button and enter a file name.
- To create a new global standard detail from an existing global standard detail, *File > Open* the existing global standard detail, then *File > Save As*.
- To create global standard details from existing job standard details, on the *SDS/2 Main Menu* choose *Utility Functions > Copy Job Standards to Global Standards*.

Placing global standard details:

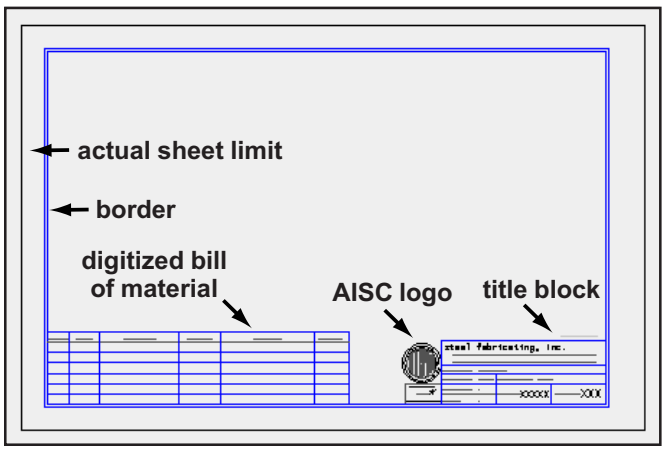
- A global standard detail can be placed by using *File > Add Standard Detail* or by applying it to the end of a member in *Modeling*. You **cannot** place global standards using *Add Sheet Item*.

Removing/renaming global standard details:

- To remove global standard details from SDS/2, use the *Delete Job Items* utility. To rename global standard details, use the *Rename Job Items* utility.

Step 9: Setting Up Sheet Outlines

Sheet outlines are set up in the *Drawing Editor* to be used as templates for sheets. Many sheets can be based on the same sheet outline, thus saving you the effort of having to repeatedly place the same graphics on different sheets. This helps to ensure that your details are presented in a consistent manner. Different sheet outlines should be used for detail sheets, gather sheets and erection sheets. Shown below is an example of a sheet outline:



The fastest way to add a sheet outline:

- To copy sheet outlines from one Job to another, choose *Utility Functions* > *Copy Job Items* > *Sheet Outlines* from the *SDS/2 Main Menu*.

Another fast way to create a sheet outline:

- After you have added standard details to an existing sheet outline (in the *Drawing Editor*), you can quickly create duplicates of the sheet outline using *File* > *Save As*. You can then modify these duplicates. For example, you can add a bill of material to a sheet outline that does not have one.

Creating a sheet outline using "New":

1. While in the *Drawing Editor*, choose *File* > *Open*.

2. Select the radio button for "*Sheet outlines*" (Sheet outlines) then press the "*New ...*" button. In the dialog that opens, type in the sheet outline name and press "*OK*."

3. Select a "*Paper size*," then press the "*OK*" button at the bottom of the dialog box.

4. The sheet outline appears on screen, and you can place a bill of material on it (if it is to be used for a detail sheet) or place other items onto it.

5. To make your changes permanent, *File* > *Save* the sheet outline.

Create different sheet outlines for different sheet types:

- Different sheet outlines should be used for detail sheets, gather sheets and erection sheets.
- On detail sheets, but not erection sheets or gather sheets, you will probably want to place a bill of material (*Objects > Bill of Material > Place Bill*).
- For all types of sheets you may want to include a title block and perhaps a border and a company logo. If you have these items saved as standard details, you can add them using *File > Add Standard Detail*.

Tips for naming sheet outlines:

- You should create sheet outlines for detail sheets with bills of material of different lengths (e.g. of 40, 50 & 60 lines). You can name the sheet outlines accordingly.
- For example, call a 24x36 sheet outline with a 50-line digitized bill D24x36x50, but call a 24x36 sheet outline with a 60-line bill of material D24x36x60. A 24x26 sheet outline without a bill of material (to be used for erection sheets) might be named E24x36. The same sheet outline for a gather sheet might be called G24x36.
- Sheet outlines can be renamed using the *Rename Job Items* utility.

The scale of a sheet outline:

- The scale of a sheet outline is 1:1. In other words, if you are using imperial dimensioning, its scale is 12. If you are using metric dimensioning, its scale is 10. Detail sheets, gather sheets and erection sheets also have a scale of 1:1.
- A standard detail that is specifically for placement on sheet outlines (for example, a logo), will be easiest to work with if it is drawn at a scale of 1:1. This tip applies regardless of whether the standard detail is added using *Add Standard Detail* or *Add Sheet Item*.

Placing a bill on a sheet outline for a detail sheet:

- A bill of material may be placed onto a sheet outline for a detail sheet using *Objects > Bill of Material > Place Bill*. Standard practice is to do this only for detail sheets.
- You may place up to three bills of material onto a sheet if they are needed.
- If you don't want a bill of material on your detail sheet, you can generate a *Bill of Material Report* instead.
- Please note that the digitized bill of material is represented on the computer screen as a series of lines. The bill information will be automatically compiled into this bill in the order in which details are placed on sheets (unless you change this order using *Objects > Sheet Items > Edit Bill Order*).

Placing special labels on a sheet outline:

- Special labels are character strings that can be entered as labels. When the program sees the character string, it makes the appropriate substitution. Labels are added using *Objects > Labels > Add*.

- **Do not** try to embed a special label. The six characters of a special label must stand alone. Embedded strings such as "Plot time is $TIME" are not substituted. The actual size of the substituted label is the size you specify when you add the label.

- The current time or date or source information are plotted on a sheet if you place a label with one of the following character strings on the sheet outline:

Character String	Plot Format	Example	Explanation
$TIME1	hh:mm:ss	14:12:05	24 hour time
$TIME2	hh:mm:ss	2:12:05	12 hour time
$DATE1	dd mmm yyyy	16 Jan 2004	day month year
$DATE2	mmm dd yyyy	Jan 16 2004	month day year
$JOB	alpha-numeric	jobname	current Job
$FAB	alpha-numeric	fabname	current Fab
$USER	alpha-numeric	Joe	login name
$HOST	alpha-numeric	station_1	work station plotted from
$REV	alpha-numeric	3	current revision

- Each detail sheet is given an unique name as it is created using *Objects > Sheet Items > Detail Sheet Autoloading*. If you type in "$NAME" to the title block on your sheet outline (using *Label Add*), SDS/2 automatically replaces $NAME with the name of the detail sheet on each detail sheet it creates.

- A "total weight line" is a special label that you can add using *Objects > Bill of Material > Place Total Weight*.

- Other special labels are ${value} (for symbols) and the various adaptive detail special labels. For more about special labels, search for "special label" in Help's index page.

Tips for placing "other items" onto a sheet outline:

- Examples of these "other items" are a title block, a border, a north arrow, disclaimers, notes, logos, revision charts.

- If these items are stored as standard details, you can place them onto sheet outlines in the *Drawing Editor* using *File > Add Standard Detail* or, for job standards only, *Objects > Sheet Items > Add*. Standard details placed using *Add Standard Detail* become embedded components of the sheet outline to which they are added. *Add Sheet Items*, on the other hand, places job standard details as linked graphics (sheet items), which are updated on the sheet outlines – and also on any sheet that uses that outline – whenever the original job standard detail is updated.

Using sheet outlines for preprinted sheets:

- If you are plotting on preprinted sheets which include a preprinted bill of material, you can create a representation of the preprinted bill of material on your sheet outline using sheet lines (*Objects > Bill of Material > Place Bill via Plotter*). Sheet lines are not plotted, but are shown on screen only.

- Other graphic elements that appear on preprinted sheets (for instance, title blocks or borders) can be traced onto a sheet outline by using *Objects > Sheet Lines > Add*. Sheet lines created in this manner let you know where preprinted areas are, so you can avoid placing details or other items in those areas.

Please note:

- If you modify a sheet outline after it has been used for a detail sheet, your changes **are not** automatically updated on the detail sheet. Only newly created detail sheets based on that sheet outline will show the changes you made to the outline.

- If you make changes to *Bill of Material Layout* in *Fabricator Options* after you have placed a bill on a sheet outline, you need to erase the old bill of material and then place the bill of material on the sheet outline again (*Objects > Bill of Material > Place Bill*).

- To erase a bill of material, choose *Objects > Bill of Material > Place Bill*, select the appropriate bill, then enter zero (0) to "*Lines in bill:_*." Then delete the physical representation of the bill (select the lines, then press the Delete key).

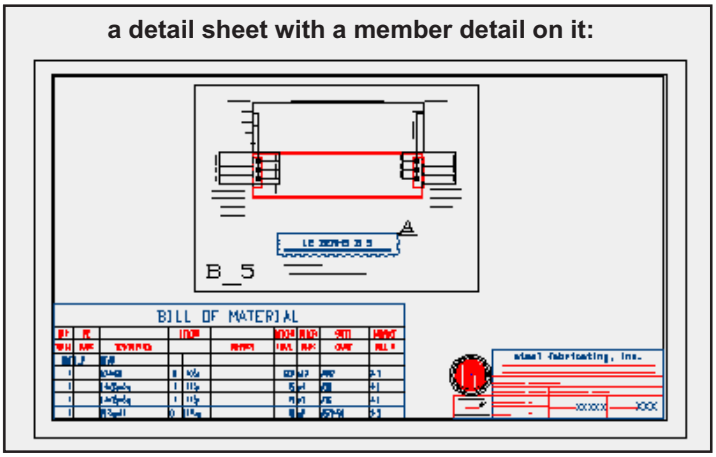
- You can use *Objects > Bill of Material > Edit Bill* to enter bill data on a sheet outline. The data is placed at the top of the digitized bill on the sheet outline and also appears on the top of sheets created using that sheet outline.

- You can delete sheet outlines using the *Delete Job Items* utility. Deleting a sheet outline **does not** affect the appearance or functionality of any detail sheets, gather sheets or erection sheets that were created using the deleted sheet outline. However, it does prevent that sheet outline from being used in your current Job for the creation of additional detail sheets, gather sheets or erection sheets.

Step 10a: Placing Details onto Detail Sheets

Detail sheets are used to place member details on, so that they can be plotted. You can also print drawings directly, using *File* > *Print*, without first placing them onto sheets. Following is a detail sheet with one member detail on it. Another detail sheet may have several details placed on it, and its bill of material may therefore be much larger than the bill of material shown on this sheet.

a detail sheet with a member detail on it:



The fastest way of creating a detail sheet:

- The fastest way to create a detail sheet is to choose *Objects* > *Sheet Items* > *Detail Sheet Autoloading* while in the *Drawing Editor* (or click "*Detail Sheet Autoloading*" on the *SDS/2 Main Menu*). Not only does this create the detail sheet, it also automatically places details onto the sheet, and it can be configured to, additionally, automatically change the piecemarks of those details.

Another fast way of creating a detail sheet:

- If you are accessing a detail sheet onto which you have already placed details, you can *File* > *Save Reuse* to exit and save your current sheet and create a new detail sheet based on it. The member details **are not** copied to the new detail sheet file you create in this manner.

Creating a detail sheet using "New":

1. In *Drawing Editor*, choose *File* > *Open*, select the "*Detail sheets*" radio button (Detail sheets), then press the "*New ...*" button.

2. Type in the "*Drawing name*" that you want to give the sheet, then press "*OK*."

3. Double-click on the sheet outline you want. If you want a bill of material on the sheet, be sure to select a sheet outline that has a bill with the appropriate number of lines.

4. Your new detail sheet appears on screen. See the next section for information on how to place details on your new sheet.

Manually placing details onto sheets:

- Before manually placing member details onto sheets, you may wish to run a *Sheet Loading Report* in order to sort SDS/2-generated details by categories that you can configure using *Sheet Loading Report Criteria* in *Fabricator Options*. The report serves as a guide for grouping similar details together on the same sheet.
- Manual placement of details on sheets is done in the *Drawing Editor* using *Objects > Sheet Items > Add*.

How SDS/2 compiles bill information:

- Bill data from member details is complied into the bill in the order in which details are placed onto the sheet.
- SDS/2 users can use *Objects > Bill of Material > Edit Bill* to enter bill data to the sheet, if they so choose. Data added in this way is placed at the top of the digitized bill on the sheet.
- You can change which detail is listed first, second or etc. in a bill of material by using *Objects > Sheet Items > Edit Bill Order*.
- If more lines exist in the compiled bill of material than were allocated when the bill was digitized, the extra lines are plotted below the bill.
- Material information for different members is separated in the bill of material by five lines if there is room. If there isn't enough room, then SDS/2 separates material information for members by as few as two lines.
- If more than one bill of material exists on the sheet you are placing details on, the bill of material information is compiled into Bill 1 first, then Bill 2, etc.
- The "*Bill items character height*," "*Bill items width/height ratio*," and other characteristics of the text used for the data that is compiled into the bill of material is set up in *Drawing Cosmetics*.

Keeping track of detail placement:

- SDS/2 automatically tracks which member details have been placed onto sheets. You can use *Model > Status* to graphically display in a color of your choosing those members in *Modeling* whose details have (or have not) been placed onto sheets.
- While viewing a detail sheet in the *Drawing Editor*, you can identify what details you have placed on that sheet by their piecemarks or their appearance.
- Member details are placed onto detail sheets so that they can be plotted. To output a report that tells you which members have been placed on which sheets or have not yet been placed, choose *Reports > Sheet List, Select by Detail*.

After placing details onto detail sheets:

- *File > Change Marks* can be used in the *Drawing Editor* to change the piecemarks of members whose details have been placed on sheets.
- *Utilities > Rename Job Items* (from the *SDS/2 Main Menu*) can also be used to change the piecemarks of members and their details.
- If you change member piecemarks in either of these ways, the piecemarks are changed globally throughout your current Job (in both *Modeling* and the *Drawing Editor*). The new piecemark is used for all references to that piece in subsequently generated reports as well as in currently generated member details and currently generated erection views.

Please also note:

- You can change the names of system piecemarks or user piecemarks automatically as details are loaded using *Detail Sheet Autoloading*.
- You can place a detail on more than one sheet using *Objects > Sheet Items > Add*. You can also place the same detail on the same sheet as many times as you like. Submaterials, erection views and job standard details can also be added as sheet items, along with any number of member details, to a detail sheet.
- If you manually alter a member detail – or any other sheet item – that has been placed on a sheet, that sheet item is automatically updated on the sheet.
- If you delete the original drawing file that a sheet item which is placed on a sheet is linked to – for example, using the *Release Deleted Members* utility to remove a member whose quantity has gone to zero – that sheet item is removed from the sheet.
- You can delete detail sheets using *Utility Functions > Delete Job Items* from the *SDS/2 Main Menu*. Deleting details sheets does not erase the member details placed on the sheets. It does, however, remove the "placed on sheet flag" from any member details that were placed on the detail sheet.
- SDS/2 automatically marks for plotting any sheet that has never been plotted or which has been altered since it was last plotted or which has a detail placed on it which has been altered since the sheet was last plotted.
- You can track the "*Plotted*" status of individual members in *Modeling* using *Model > Status Display* to color-code members that are on sheets which have been plotted.

Step 10b: Placing Submaterials onto Gather Sheets

Gather sheets are used to place submaterial details on. Submaterial details are typically placed onto gather sheets before they are plotted. You can also plot drawings directly, using *File* > *Print*, without first placing them onto sheets. Unlike detail sheets, gather sheets do not have the capability of compiling the bill of material information of the details added to them. The sheet outline for a gather sheet typically does not include a bill of material.

The fastest way of creating a gather sheet:

- The quickest way to place submaterials onto gather sheets is to use *Objects* > *Sheet Items* > *Gather Sheet Autoloading*. Or click "*Gather Sheet Autoloading*" if you are on the *SDS/2 Main Menu*.

- Not only does *Gather Sheet Autoloading* create one or more new sheets for you, it also places submaterial details onto the sheets it creates.

Another fast way of creating a gather sheet:

- If in the *Drawing Editor* you are accessing a gather sheet onto which you have already placed submaterial details, use *File* > *Save Reuse* to exit and save your current sheet and create a new gather sheet based on the same sheet outline. The submaterial details saved on the original gather sheet **are not** copied to the new gather sheet that is created from the original.

Creating a gather sheet using "New":

1. While in any *Drawing Editor* drawing or sheet, choose *File* > *Open*, select the radio button for "*Gather sheets*" (), then press the "*New ...*" button.

2. Type in the "*Drawing name*" that you want to give the sheet, then press "*OK*."

3. Double-click the sheet outline you want to serve as a template for the sheet. You should use a sheet outline that doesn't have a bill of material.

4. Your new gather sheet is now your current drawing. See the next section for information on how to place submaterial details onto the sheet.

Manually placing submaterial details onto gather sheets:

- The *Submaterial Piecemark List* is a report which itemizes submaterials associated with particular details and lists the section size, steel grade and length of material required for a single submaterial. This report can help you determine which submaterial details you want to place on which gather sheets, and is especially useful if you plan to send the report to the shop along with the gather sheets.

- To manually place details on sheets in the *Drawing Editor*, use *Objects* > *Sheet Items* > *Add*.

After placing submaterial details onto sheets:

- You can use *File* > *Change Marks* in the *Drawing Editor* to change submaterial marks.
- Gather sheets as well as submaterial marks can be renamed using *Utility Functions* > *Rename Job Items* (from the *SDS/2 Main Menu*).
- If you change marks in either of these ways, the submaterial mark is changed globally throughout your current Job. The new submaterial mark is used for all references to that piece of material in subsequently generated reports, in currently generated member details and member bills of material, as well as in the 3D model and in currently generated submaterial details.

Please also note:

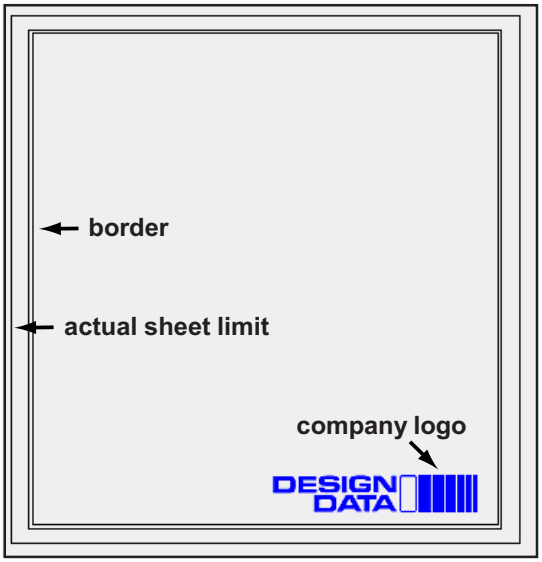
- You can place a submaterial onto more than one gather sheet using *Add Sheet Item*. You can also place the same submaterial onto the same gather sheet as many times as you like. Member details, erection views and job standard details can also be added, along with submaterials, to a gather sheet.
- If you manually alter a submaterial detail – or any other sheet item – that has been placed onto a gather sheet, that sheet item is automatically updated on the sheet.
- If the quantity of a submaterial changes in the model (and the box for "*Show submaterial quantity*" is checked in *Member and Material Piecemarking Options*), SDS/2 automatically marks that submaterial for detailing. SDS/2 also marks submaterials for detailing if, for example, you change the material and retain the same piecemark. To tell which submaterials are marked for detailing, choose *Process* > *Detail Submaterial* – those materials that are automatically selected on the selection dialog are the materials that are marked for detailing.
- You can delete gather sheets using *Utility Functions* > *Delete Job Items* (from the *SDS/2 Main Menu*). Deleting gather sheets does not erase the submaterial details placed on them. It does, however, remove the "placed on sheet flag" from any submaterial details placed on the gather sheet.

Step 10c: Erection Views on Erection Sheets

Erection sheets are used to place erection plans on. Erection plans are typically placed onto erection sheets before they are plotted. You can also print drawings directly, using *File > Print*, without first placing them onto sheets.

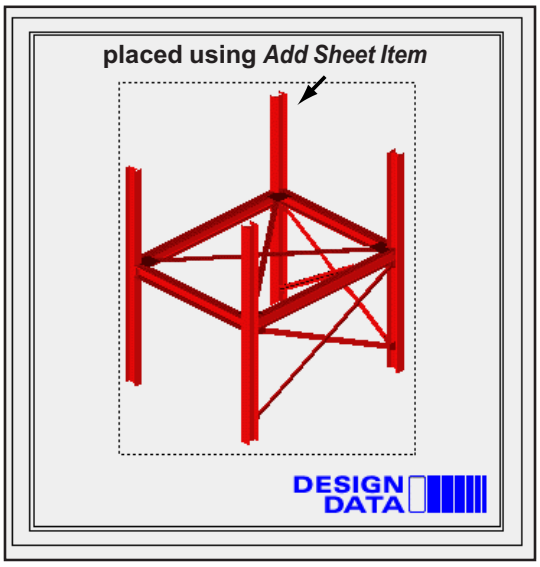
Developing an erection sheet outline:

You should develop an unique sheet outline for use as a template for your erection sheets. You may want logos and a border on your erection sheet outline, but not a bill of material.

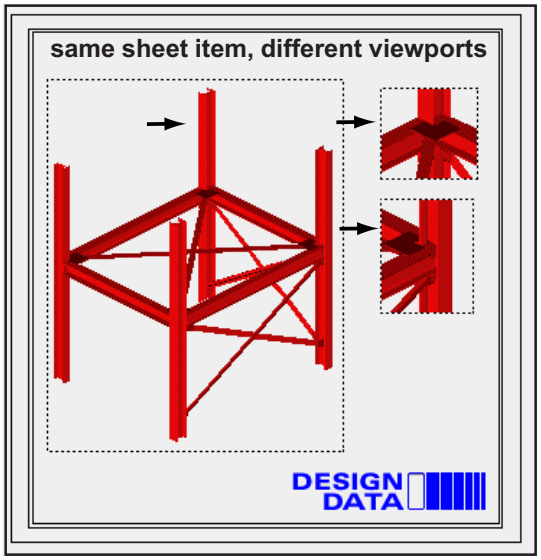


Add Sheet Item to add an erection view:

Erection views, like member and submaterial details, can be placed onto sheets using *Objects > Sheet Items > Add* in the *Drawing Editor*. The illustration below shows an erection view that has been placed in this way.

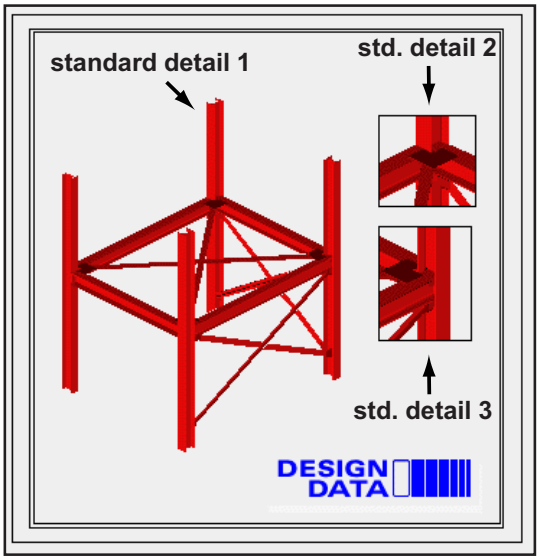


The big advantage of placing an actual erection view instead of a standard detail that depicts an erection view is that any changes made to the erection view (even piecemark changes in the 3D model) are automatically updated on the sheet. More than one erection view can be placed as a sheet item, and each sheet item can have a different "*Viewport*" and a different "*Scale*" as shown in the example below.



Adding an erection view as a job standard detail:

To add erection views to erection sheets as job standard details, create the job standard detail using *Edit > Save Standard Detail* on an erection view (in the *Drawing Editor*), and then place it on the erection sheet using *File > Add Standard Detail*. The main advantage of placing an erection view as a standard detail is that you can easily use drawing tools to edit the drawing on the erection sheet. Standard details become embedded components of the sheets onto which they are placed, and therefore they **are not** automatically updated on those sheets when their original drawing file is changed.



Step 11a: Plotting Sheets in Linux

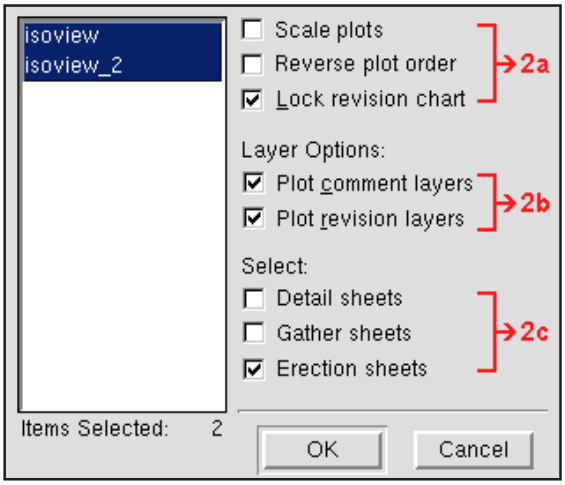
Refer to the context-sensitive Help manual in SDS/2. The procedure for plotting under Linux is similar to plotting under Windows, but not exactly the same.

Step 11b: Plotting Sheets (Windows Operating Systems)

1. Use any one (1) of the following methods to begin the *Plot Sheets* operation:

Method 1: On the *SDS/2 Main Menu*, click "*Plotting/Print*."

Methods 2, 3 & 4: In *Modeling* or the *Drawing Editor*, choose *Interface* > *Plotting* or use a keyboard shortcut or click the *Plot Sheets* icon.



2. A selection dialog opens. The default settings for "*Scale plots*," "*Reverse plot order*," "*Lock sheet revision chart*," "*Plot comment layers*" and "*Plot revision layers*" come from the last time **you** plotted. It does not matter if another workstation on your network plotted in the meantime – these settings are remembered from the last time **you** plotted.

2a **(optional).** Check the box for "*Scale plots*" if you want SDS/2 to automatically adjust the plot size (up or down) so that it fits onto the actual sheet. Check the box for "*Reverse plot order*" if you want the sheets to be plotted opposite to their order in the selection list. Check the box for "*Lock revision chart*" if you want SDS/2 to increment the sheet revision of selected detail sheets the next time any details that are on those sheets are changed during *Detail Members*.

2b **(optional).** Check the boxes for "*Plot comment layers*" and/or "*Plot revision layers*" to plot drawing layers of those types. Sheets themselves typically have only a single drawing layer. These options affect the drawings on those sheets, which may have several drawing layers, including revision and comment layers.

2c **(optional).** Press the "*Hide ...*" button (not shown in the example above) if you want to restrict the sheets that you select to particular sizes.

2d. Check the boxes for "*Detail sheets*" and/or "*Gather sheets*" and/or "*Erection sheets*" to display the type(s) of sheets you want to choose from, then select the sheets that you want to plot, then press the "*OK*" button.

3. If you deselected sheets that SDS/2 automatically selected in step 2, SDS/2 opens a yes-no warning dialog with the message, "*Sheets automatically selected for plotting have been deselected. Would you like to retain automatic selections for next time?*"

Alternative 1: Press "*Yes*" to cause the sheets you deselected in step 2 to be automatically selected (highlighted) the next time you plot a sheet.

Alternative 2: Press "*No*" to permanently clear the plot flags.

4. The Windows *Print* dialog opens.

4a. To "*Select printer*," select the name of the printer or plotter you are outputting to.

4b. To "*Number of copies*" enter the quantity of each sheet to be plotted.

Alternative 1: Press the "*Preferences*" button. Go to step 5.

Alternative 2: Skip step 5 and go to step 6.

5. The *Printing Preferences* dialog opens for the printer you selected. The information on this window may be different for different printers.

5a. To "*Orientation*" select either '*Landscape*' (long side horizontal) or '*Portrait*' (long side vertical).

5b. Make any additional changes you want to the *Printing Preferences* window.

5c. Press the "*OK*" button on the bottom of the window.

6. The *Print* dialog (which first opened in step 4) becomes active again.

6a (optional). Check the box for "*Print to file*" if you want to output the sheet(s) to a file instead of the plotter. The files are given a .plt extension.

6b. Press the "*Print*" button.

7. One (1) of the following happens:

Possibility 1: The sheets you selected are output to the designated plotter.

Possibility 2: If "*Print to file*" was checked in step 6, the *Save As* dialog opens so you can select the folder you want to place the file in. By default, the files are sent to the "*Plot to file directory*" set in *User Options*.

Note 1: Even if the boxes are checked for "*Plot comment layers*" and "*Plot revision layers*," hidden drawing layers **are not** plotted. You can hide or "*Show*" drawing layers using *Objects* > *Layers* > *Edit All* in the *Drawing Editor*.

Note 2: On the selection dialog discussed in step 2, SDS/2 automatically selects for plotting (that is, highlights) any sheet that has never been plotted, any sheet that has been altered, and any sheet that has a drawing (sheet item) on it which has been altered since that sheet was last plotted.

Index

F

G

H

I

J

K

L

M

T

V