WoodWorks® Software

Sizer | Shearwalls | Connections

Getting Started with WoodWorks®
Shearwalls

For US and Canadian Versions

Canadian Wood Council

American Wood Council

Developed by

Acronym Software Inc.

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As always, the engineer is ultimately responsible for his or her design.

Refer to Read Me for further information.

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1   Welcome to WoodWorks® *Shearwalls*

With WoodWorks® *Shearwalls*, you can perform complete shearwall design and lateral load analysis.

- Design shearwalls for multi-storey "regular" and some "irregular" (as defined by code) shaped buildings
- Determine hold-down and drag-strut forces and display them graphically
- Design shearwalls with or without hold-downs
- Generate an elevation view to show loads and forces on each shearwall
- Assign loads to shearlines following a flexible or rigid diaphragm analysis
- Import CAD .wmf files to establish the building footprint
- Model wood structures up to six stories
- Specify openings in shearwalls such as windows and doors
- Model roof shapes, including hips, valleys, gables, and overhangs

Wind Load Generation

- Generate wind pressure and resulting diaphragm loads
- Input specific site information
- Manually input lateral loads or modify wind loads that were automatically generated
- Report shearwall material designs for all wind load cases
- Check the capacity of wall sheathing and nailing to resist wind suction (components and cladding loads)

Seismic Load Generation

- Generate seismic loads
- Input site-specific seismic information
- Manually input lateral loads or modify seismic loads that were automatically generated
- Report shearwall material designs for all seismic load cases

1.1 Scope

The purpose of this 'Getting Started' guide is to help the beginner quickly and efficiently learn how to use *Shearwalls* and the *Database Editor*. This guide also makes reference to online step-by-step tutorials (interactive audio/video and instructional text formats) that demonstrate how to use the software. Both interactive and instructional tutorials can be accessed via the **Help** menu within the software or directly through the website. Detailed technical and engineering information is available within the online help files, which can be accessed from within the software by pressing F1 or via the **Help** menu. Further information can also be obtained from the Frequently Asked Questions (FAQ) section of the website.

This document applies to both the Canadian and US versions of the WoodWorks® software.

1.2 Technical Support

For information and keyword searches related to engineering assumptions, features, functionality, and version histories, please consult the online help. The online help can be accessed from within the software by pressing F1 or via the **Help** menu on the top toolbar.

The WoodWorks® software website contains additional information which includes product news, frequently asked questions, maintenance releases, and updates for registered software owners.

www.woodworks-software.com

If you have installation or software performance issues, please contact WoodWorks® Support via one of the options listed below.

Email: support@woodworks-software.com

Phone: 1-800-844-1275 ext. 2

1 Welcome to WoodWorks® Shearwalls

2   About *Shearwalls*

Getting started…

Shearwalls is an engineering design tool for lateral wind and seismic load generation, distribution and design of light frame wood shearwalls for buildings.

The **Getting started…** button provides instructions on the main steps required to design a structure using *Shearwalls*. In addition, refer to the video tutorials that offer an overview of the software, accessible here.

2.1   Navigating the User Interface

Figure 1:   *Shearwalls Toolbar*

The user can navigate the functionalities by accessing the top toolbar buttons and drop-down menus. If a button is greyed out, it is necessary to complete a previous step before the greyed-out button becomes accessible. Hover the mouse cursor over the toolbar button in order to determine the functionality.

For further information on a specific input within the program, use the context sensitive help found by selecting the **?** symbol at the top right of and then clicking on the area for which help is needed.

2.2   Status Bar

The status bar at the bottom of the screen displays information and descriptions, menu items, and data fields. Consult the status bar if you are uncertain as to how to proceed.
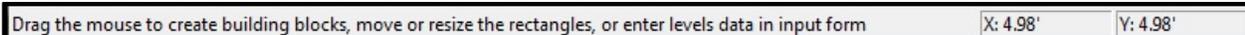

Drag the mouse to create building blocks, move or resize the rectangles, or enter levels data in input form   X: 4.98'   Y: 4.98'

Figure 2:   *Shearwalls Status Bar*

3   Design Settings

3.1   General

Shearwalls includes a comprehensive *Settings* dialog box that is accessible by selecting the ***Settings…*** drop-down menu. It allows the user to control graphical interface options, to specify design settings, and to filter the information that is presented in the Plan, Elevation and Results views.

For further information on the settings, refer to the online help, which can be accessed by pressing F1 or via the drop-down ***Help*** menu on the top toolbar. In addition, refer to the video tutorials, accessible here.

4   Navigating Viewing Options

When construction a model, *Shearwalls* is divided into two viewing options that are visible in large windows and several data input views that appear in a smaller window. The three viewing options are *Plan View* and *Elevation View*. The data input window for each tab on the top toolbar is known as the *Form View,* which is visible only when the *Plan View* is active.

Elevation View shows a drawing in elevation of the shearwall or shearline that has been selected in *Plan View*. *Elevation View* displays the dimensions of building elements, openings, applied shear forces, dead and uplift loads, and output data such as shear resistance, hold-down forces, dragstrut forces, nailing patterns required, and sheathing thickness.

The *Form View* contains a specific input form related to the data for building elements and loads. Each form contains data fields that are specific to a button on the main toolbar; *Importing CAD Drawing*, *Structure*, *Walls*, *Openings*, *Roof Blocks*, *Building Site*, *Generate Loads*, and *Loads and Forces*.
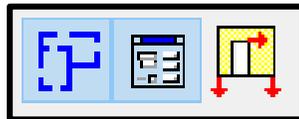

Figure 3:   *Plan View, Form View and Elevation View buttons*

5 Getting Started – Step-by-Step

5.1 Step 1: CAD Import (Optional)

It is possible to import CAD drawings as a bitmap (.bmp), Windows metafiles (.wmf or .emf) or PDF using the **Import CAD Drawing** button on the top toolbar. These are file formats that can typically be exported from CAD programs such as AutoCAD®. The Form View will display a form called **CAD Import Wizard**, which contains instructions for importing CAD drawings

The imported CAD drawing is displayed in **Plan View** for the user to trace over and construct the model. It is possible to import up to six levels of CAD drawings, although users typically only import the first level CAD drawing as a starting point for the *Shearwalls* model. It is possible to view or hide the imported CAD drawing at any time by pressing the **Import CAD Drawing** button.
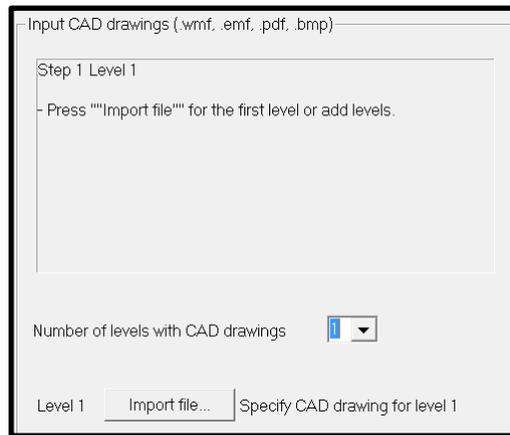

Figure 4: *Importing CAD Drawing*

5.2 Step 2 & 3: Structure Blocks and Levels

The user should define sections of a structure that have different number of levels or different roof shapes using alternate structure blocks, e.g., a two-storey house with a one-storey attached garage.

To create a structure block, click and hold the mouse button, then drag and release. All structure blocks must intersect or abut with one another. Once drawn, a structure block can be deleted, re-sized or moved using the mouse or using the **Structure Input** window. The user should also input the number of levels, wall heights, floor/ceiling depth, and diaphragm elevations for each block within the **Structure Input** window.

For further information, refer to the video tutorials, accessible [here](#).

Figure 5:   *Structure Input Form View*

5.3   Step 4: Create Walls

Once blocks have been created, and the number of levels (storeys) for each block has been specified, it is now necessary to create the exterior walls of the structure. By selecting the **Walls** button, the exterior walls will automatically be inserted at the edges of the structure blocks.

The user can then create the plan view wall layout that will later be extended upwards to all levels. Interior walls can also be drawn by clicking and holding, then dragging and releasing the mouse. The geometry (location and length) of each wall segment can be manipulated by selecting a wall segment and modifying the inputs in the **Wall and Shearline Input** window.

It is possible to subdivide walls by clicking and holding the mouse within a wall, dragging the mouse to the end of the wall segment and then releasing. Adjacent wall segments can be merged by holding the **ctrl** key and then clicking and highlighting two walls segments, then selecting **Merge** from the **Edit** drop-down menu on the top toolbar. Walls can also be shifted, vertically or horizontally, by holding the **shift** key, hovering the cursor over the wall segment to be shifted (arrows will appear), and then clicking holding, dragging and releasing the wall segment in its new location. Walls can be deleted by selecting a wall with a mouse click and then pressing the **delete** button on the keyboard.
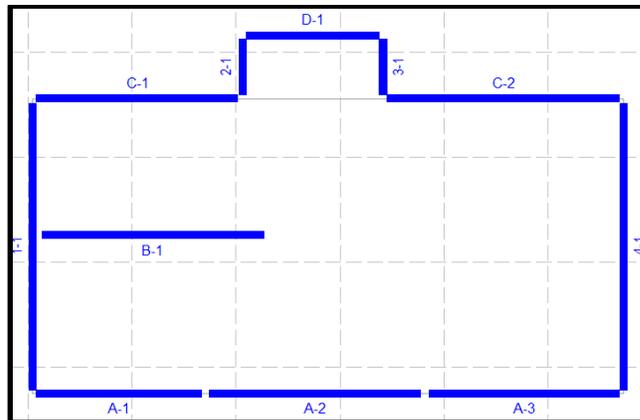
Figure 6:   *Sample wall layout*

5.4   Step 5: Edit Walls

After selecting the **Walls** button in the top toolbar, the **Wall and Shearline Input** form will become visible. These inputs allow the user to specify information for individual walls and groups of walls, such as the wall location and material properties (e.g., sheathing, framing and hold-downs). If the user leaves certain wall properties as **(unknown)**, *Shearwalls* will determine these undefined properties during the design process.

It is possible to select and highlight an individual wall segment by clicking on it; these specific wall properties will now appear in the **Input Form**. Multiple walls can be selected by holding the **ctrl** key and then clicking on several walls; this allows the user to modify the properties of multiple walls at once. To select all the walls on a single level, right click and choose **Select All**; walls can then be deselected by holding the **ctrl** key and clicking on individual walls.

Users can create their own **Standard wall** by selecting the **Edit standard walls…** button or users can modify the existing standard walls that are prepopulated within the software and accessible via the **Standard wall** drop-down menu within the **Input Form**.

For further technical information related to the properties within the **Wall and Shearline Input** or the **Edit standard walls…** function, refer to the online help, which can be accessed by pressing F1 or via the drop-down **Help** menu on the top toolbar.

Figure 7: *Wall and Shearline Input Form (Canada)*

Figure 8: *Wall and Shearline Input Form (US)*

5.5   Step 6: Create Openings

The user can create openings in walls by selecting the **Openings** button from the top toolbar. The **Opening Input** form allows for the specification of the opening dimensions and hold-downs installed on each side of the opening.

The user must select an individual wall segment and then it is possible to insert an opening by either clicking, holding, dragging and releasing the cursor along the wall line or using the **Opening Input** form to **Add** a *(new opening)*. The location, dimensions and hold-down properties of existing openings can also be modified or deleted in the **Opening Input** form.

Figure 9:   *Opening Input Form*

5.6   Step 7: Extend Walls Upwards

After the user has finalized the information for the first level within the **Structure Input**, **Walls** and **Openings**, it is possible to extend these inputs to the levels above using the **Extend Walls Upward** button on the top toolbar. Once the user activates the **Extend Walls Upwards** button, all properties of the exterior walls defined for the first level will be copied to all levels above for all blocks up to the maximum number of levels specified for each block.
It is still possible to modify the wall properties on any level after the **Extend Walls Upwards** action has been completed. The user should now scan through all the levels in the *Shearwalls* model, using the **Current level** arrows located on the top toolbar, add walls and make any modifications to the properties of the walls on upper levels using the inputs located on the **Walls** and **Openings** buttons.

5.7   Step 8: Creating Roofs

The user can specify the roof shape(s) and geometry of each structure block by selecting the **Roof Blocks** button from the top toolbar. When an individual roof block is selected, the **Roof Input** form is used to modify the specific properties of individual roof blocks, including the location, construction type, slope, elevation and overhangs.

A roof block is created and defined for each structure block. It is also possible to create additional roof blocks by clicking, holding, dragging and releasing the cursor within plan view; this allows users to create more complicate roof shapes and geometries, such as dormers.

Figure 10: *Roof Input Form*

5.8   Step 9: Load Generation Site Information

The user can select the **Building Site** button to obtain information that pertains to inputs related to enclosure, exposure, occupancy, irregularities, as well as climatologic, topographic, seismologic and soil characteristics of the site. The inputs within the **Load Generation Site Information** form are used for the automatic generation of wind and seismic loads.

5   **Getting Started – Step-by-Step**

For further technical background and engineering design information related to the inputs found within the *Load Generation Site Information* form, refer to the online help, which can be accessed by pressing F1 or via the drop-down *Help* menu on the top toolbar. In addition, refer to the video tutorials, accessible [here](#).

Figure 11:　*Load Generation Site Information (US)*

Figure 12: *Load Generation Site Information (Canada)*

5.9   Step 10: Generate Loads

The user can automatically generate wind and seismic loads using the ***Generate Loads*** button, located on the top toolbar. Wind or seismic loads can be generated simultaneously or separately. It is possible to generate loads for the entire building, over a range of building levels or on a single level. The user can also generate wind loads for all directions or for a single direction only.

Once the loads are generated, the wind and seismic loads will be displayed on each level in plan view and on each shearline in elevation view. It is possible to view the different types of generated loads using the drop-down menu accessible via the ***Show*** button on the top toolbar.

For further information related to the inputs found within the ***Generate Loads*** window, refer to the online help, which can be accessed by pressing F1 or via the drop-down ***Help*** menu on the top toolbar. In addition, refer to the video tutorials, accessible here.

Figure 13: *Generate Loads Form View Inputs*

5.10 Step 11: Add or Edit Loads

The user has the ability to manually add or edit the automatically generated loads using the **Loads and Forces** button on the top toolbar. It is possible to add a variety of load types (seismic, wind shear, components and cladding, uplift, dead loads and building masses) and distribution profiles (point, line and area loads) to the structure within the **Load Input** window. *Shearwalls* has the flexibility to add loads to one or several levels at once, to individual walls or entire building faces. In order to add loads, the user must click on the **Add...** button within the **Load Input** window.

For further information related to the load types that can be added through the **Load Input** window, refer to the online help, which can be accessed by pressing F1 or via the drop-down **Help** menu on the top toolbar.
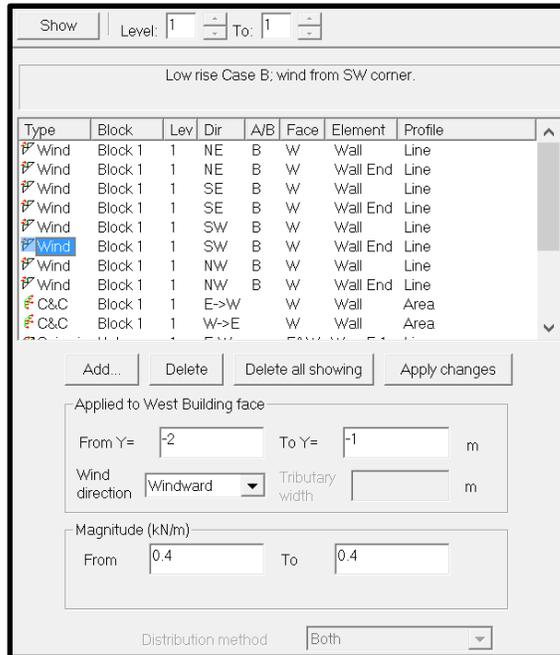
Figure 14:   *Load Input Window*

Figure 15:   *Inputs to Add a New Load*

5.11 Step 12: Generating Design Results

After the user has constructed the model, it is possible to then click the **Run Design** button, located on the top toolbar. The *Shearwalls* software will distribute all the applied loads to all the shear resisting elements in the structure, using flexible and rigid diaphragm assumptions, and design all the shearwalls to resist the applied forces.

For further information on the flexible and rigid diaphragm load distribution processes, refer to the online help, which can be accessed by pressing F1 or via the drop-down **Help** menu on the top toolbar. In addition, refer to the video tutorials, accessible here.

After the software has completed the load distribution and shearwall design checks, it is possible for the user to view the distributed loads within each shearwall segment using the **Plan View** and **Elevation View** tabs on the top toolbar. The user can navigate through the types of loads (wind, seismic) and distribution assumptions (flexible and rigid diaphragm) using the **Show** button on the top toolbar. For further information on the information within **Plan View** and **Elevation View**, refer to the legends that appear on the lower half of the window. Any shearwalls that fail a design check are highlighted in red in **Plan View**.

Figure 16: *Plan View, Elevation View and Show Menu Tabs*

5.12 Step 14: Design Results

After clicking the **Run Design** button and immediately following the completion of the applied load distribution and shearwall design checks, the **Design Results** are displayed. This is an extensive list of information related to the input and outputs from the *Shearwalls* model. It is possible for the user to navigate and select relevant sections of the **Design Results** report by using the **Go To Table** button, located on the top toolbar.

5.12.1   Detailed Calculations

After the loads are generated, distributed and the shearwall elements are designed, *Shearwalls* creates detailed calculation records for the generation of seismic and wind loads, torsional analysis and individual shearwall and shearline design (Canada only), accessible via the *Seismic Load Generation Details*, *Wind Load Generation Details*, *Torsional Analysis Details*, and *Detailed Shearwall Design* buttons on the top toolbar.

For further information and explanation of design results, refer to the video tutorials, accessible here.

5.13 Accept Design

The user can click the ***Accept Design*** button on the top toolbar in order to populate any inputs within the ***Walls*** view, that were previously specified as ***(unknown)***, with the shearwall materials that were automatically selected during the design process. The user can then iteratively adjust the materials and rerun the design process.

6   Shearwalls Tutorials

6.1   Video Tutorials

Introduction to Shearwalls	(US) & (Canada; English and French)
Shearwalls US 2019 Overview	(US)
How Quickly a Structure can be Designed	(US) & (Canada; English and French)
Changing Units and Adjusting Snap Increments	(Canada; English and French)
Importing a CAD File	(US) & (Canada; English)
Creating and Moving Walls	(US) & (Canada; English)
Load Generation Site Information	(Canada; English and French)
Envelope Design Approach; Flexible and Rigid Diaphragm	(US) & (Canada; English and French)
Flexible Diaphragm	(US) & (Canada; English and French)
Rigid Diaphragm	(US) & (Canada; English and French)
Torsional Analysis	(US) & (Canada; English)
Capacity and Deflection-Based Load Distribution	(US) & (Canada; English and French)
Deflection Calculations using 3-term and 4-term Equations	(US) & (Canada; English and French)
Example Deflection Calculations	(US) & (Canada; English and French)
Project information and Structural Data	(US) & (Canada; English and French)
Design summary and Loads	(US) & (Canada; English and French)
Shear Results	(US) & (Canada; English and French)
Hold-downs and Collectors/Drag Struts	(US) & (Canada; English and French)
Deflection and Storey drift	(US) & (Canada; English and French)
Components and Cladding Loads	(US) & (Canada; English and French)
Seismic Information and Seismic Irregularities	(Canada; English and French)
Single Shearwall Design Example	(US) & (Canada; English and French)

6.2   Worked Examples – Step-by-Step

All worked examples are available for download at the following links; Canada and US.

7 *Database Editor*

The *Database Editor* is a simple application that allows you to create new material databases, view existing databases, and customize the material database list for local availability. It is possible to modify or create new materials databases for beams, columns, joists and studs consisting of solid sawn lumber, glulam and engineered wood products. Sheathing materials and fasteners are not incorporated in the *Database Editor*.

7.1 Editing Buttons

7.1.1 Add

Click on the **Add** button in the top toolbar to add new species, grades or sections to a **Custom** database file. The **Add** button is only available for **Custom** database files.

7.1.2 Delete

Click on the **Delete** button in the toolbar to delete existing species, grades or sections in a Custom database file. The **Delete** button is only available for Custom database files.

7.1.3 Edit

Click on the **Edit** button in the toolbar to edit the species, grade or section properties of a Custom database file. The **Edit** button is only available for Custom database files.

7.1.4 Use

Click on the **Use** button in the toolbar to allow a selected species, grade, or section of a material database to be used by *Shearwalls* during the design process. A check mark will appear beside the species, grade or section to indicate that it can be used by *Shearwalls*. The **Use** button applies to both **Standard** and **Custom** databases.

7.1.5   Ignore

Click on the **Ignore** button in the toolbar to prevent *Connections* from using a selected species, grade or section during the design process. An 'X' will appear beside the species, grade or section to indicate that it cannot be used by *Connections*. The **Ignore** button applies to both **Standard** and **Custom** databases.

7.2   Material Databases

Material databases are described as either being a **Standard** database or a **Custom** database. The properties of the **Standard** databases can be viewed, but not edited. **Custom** database files can be viewed, edited and created.
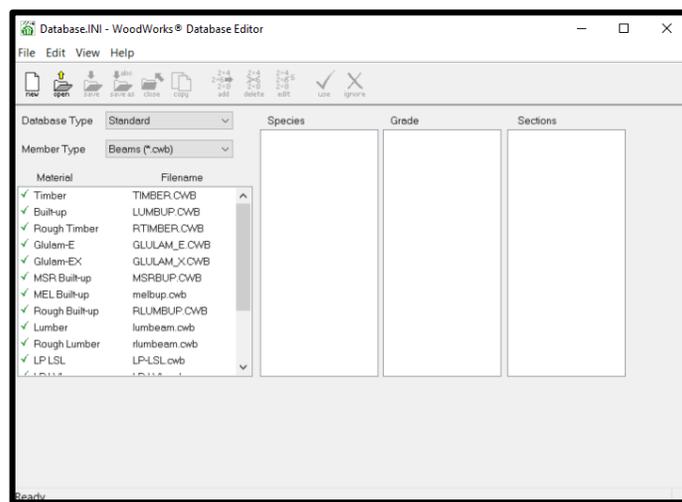

Figure 17:   *Switch between Standard and Custom Database*

The **Database Type** drop-down list allows the user to switch between the **Standard** and **Custom** databases.

7.2.1   Standard Material Databases

Standard material databases include sawn timber and glulam members whose strength properties are based on those published in the applicable design standards. The **Standard** databases are based on values published in the National Design Specification (NDS) for Wood Construction for the US and based on the CSA O86 'Engineering design in wood' for Canada.

7.2.2   Custom Material Databases

Custom material databases include I-joists, Parallel Strand Lumber (PSL), Laminated Veneer Lumber (LVL), and Laminated Strand Lumber (LSL) as a default. The strength properties included in these databases are based on proprietary listings. The **Custom** databases included as defaults or created by the user should only be used for preliminary sizing of members. Contact the engineered wood product manufacturers directly for an accurate and complete design of proprietary wood products.

7.3   Viewing Standard Databases

The *Database Editor* allows the user to view the material, species, grade and section properties of the **Standard** databases. To view the **Standard** databases, first open the **Material** and **Filename** by using the **Open** button or by double clicking on the file name.
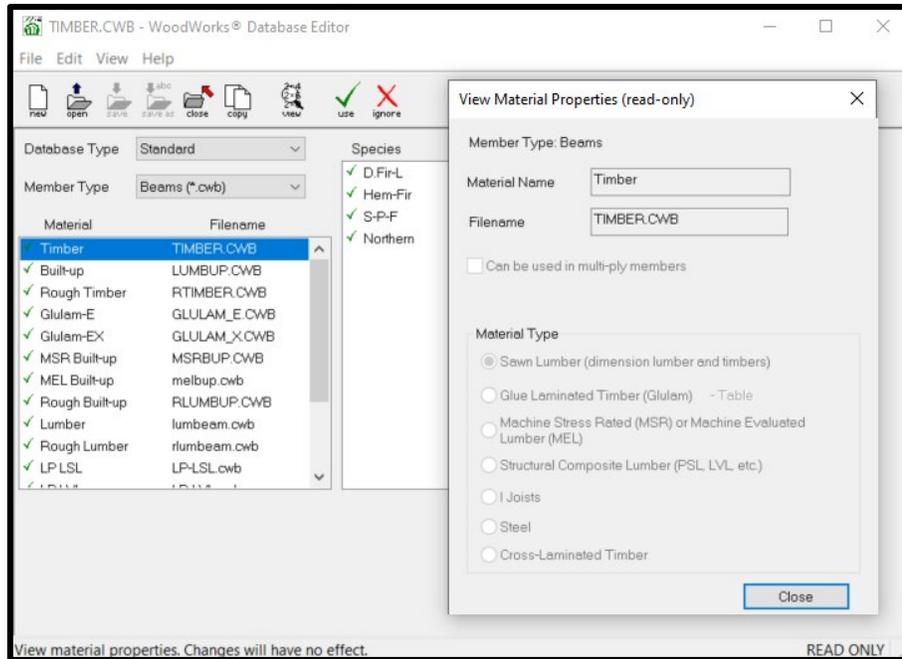

Figure 18:   *View Standard Material Properties*

It is now necessary to select the material property to view. This is done by highlighting the material, species, grade or section and then clicking on the **View** button from the toolbar. Depending on the information that was selected, one of the four following dialog boxes will open:

- **Material Properties** dialog
- **Species Properties** dialog
- **Grade Properties** dialog
- **Section Properties** dialog

Figure 19:   *Species Properties Dialog*

7.4 Creating Custom Databases

The *Database Editor* allows you to create custom material databases for beams, joist, columns, and walls. You can specify material type, species, grade, dimension, and strength properties.

7.4.1 New Material

Click the **New** button on the toolbar menu. The **New Material** dialog window opens and prompts the user to enter a **Material Name**, specify the type of material, define whether this is a multi-ply member, and select a **Material Type**.

Figure 20: *New Material Window*

7.4.2 Species Properties

When the user clicks on the **Add First Species** button in the **New Material** window, it is now possible to enter a new species name and weight.

Alternatively, it is also possible for the user to use the **Edit** button after highlighting the name listed under the **Species** heading in the *Database Editor* window.

Figure 21: *Species Properties Window*

7.4.3 Grade Properties

When the user clicks on the **Add First Grade** button in the **Species Properties** window, it is now possible to enter the strength and stiffness properties of the new material.

Alternatively, it is also possible for the user to use the **Edit** button after highlighting the name listed under the **Grade** heading in the *Database Editor* window.
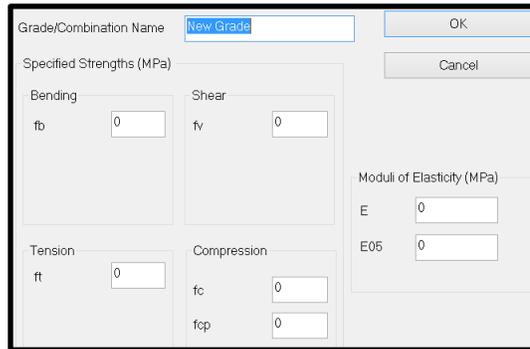

Figure 22: *Grade Properties Window*

7.4.4 Section Properties

It is possible for the user to use the **Edit** button after highlighting the name listed under the **Section** heading in the *Database Editor* window.
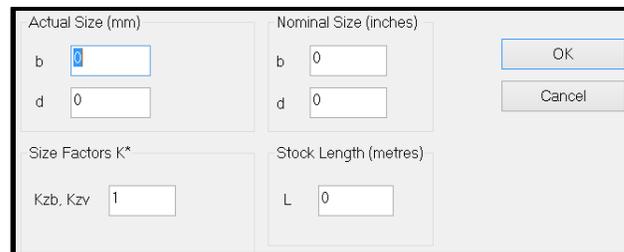

Figure 23: *Section Properties Window*