

4 Connections Tutorial 4 – Design Collectors or Drag Strut (Canadian)

4.1 Software Version and Standard

This tutorial was completed using WoodWorks® Canada 2020, and CSA O86-19.

4.2 Introduction

This tutorial will demonstrate how the results from a WoodWorks® Shearwalls model can be interpreted to complete a connection design of a collector or drag strut. Good engineering judgement should be used when designing collectors or drag struts within shearlines. The forces used in this model come from the shearwalls model which is created by going through [Shearwalls Tutorial 6](#).

Click [here](#) to download a copy of the Connections file (.des) created from going through this tutorial.

4.3 Drag Strut Force from Shearwalls Model

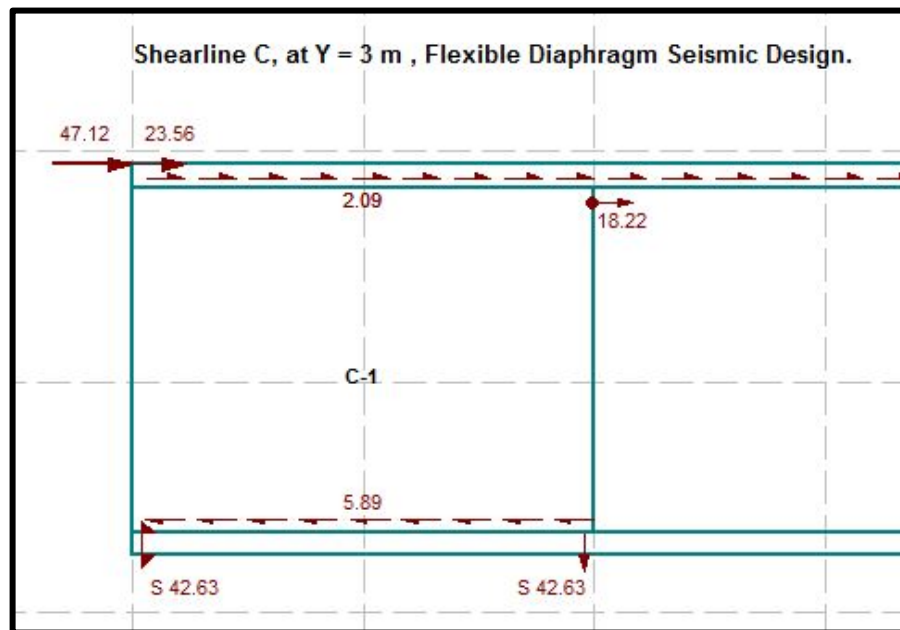


Figure 1: *Connections Tutorial 4 – Designing Collector along Shearline C Level 1*

Upon reviewing the forces in the elevation view, it can be observed that the worst-case loading scenario is when seismic loads are distributed by a Flexible diaphragm. The two portions of shearline C (C-1 and C-2) need to be connected by a collector that can resist an **18.22 kN** tension force. To resist the **18.22 kN** tension force, it will be necessary to specify a steel strap that can drag the 18.22 kN between the two shearline segments. Based on the model created in concept mode, it has been determined that the joists in the diaphragm above the shearwalls run parallel to the shearline. It will be necessary to create a continuous row of beams or blocking between segments C-1 and C-2 of the shearline. The steel strap will be nailed from the top plate of wall C-1 and be continuously nailed to blocking or beams on the underside of the diaphragm until it reached the top plate of Wall C-2. For more information on designing drag struts, please refer to [Thor Matteson's Wood-Framed shear wall construction](#).

4.4 Steel to wood Lap Splice Connection Design

4.4.1 Connection Type

1. Click the **New** button on the toolbar.
2. Select the connection type **Lapped Shear, wood-to-steel, Splice, one wood, one steel**.
3. Select **Nails**.

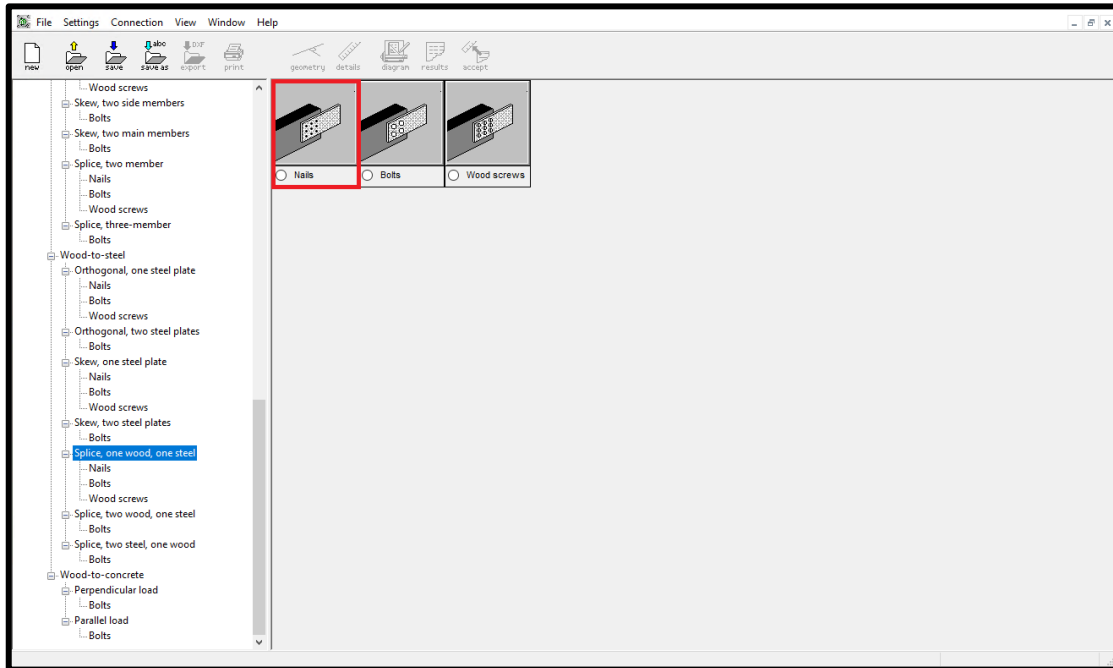


Figure 2: Connections Tutorial 4 – Selecting Nail Splice Connection

4.4.2 Main Member

1. Specify **Material** to **Lumber joist**.
2. Specify **Species** as **S-P-F**.
3. Specify **Grade** as **No.1/No.2**.
4. Specify **Thickness** as **38 (mm)**.
5. Specify **Width** as **140 (mm)**.

The image shows a software interface for defining the main member details of a connection. The 'Main' tab is active. The 'Name' field is set to 'Main'. The 'Material' is 'Lumber joist', 'Species' is 'S-P-F', and 'Grade' is 'No.1/No.2'. The 'Thickness' is '38 mm' and the 'Width' is '140 mm'. The 'Ply' field is empty. The 'End Type' is 'Overlap' and the 'Overlap' distance is '0 mm'. On the right side, the 'Moisture Content' section has 'In-Service' set to 'Dry' and 'Fabrication' set to 'Dry'. The 'Treatment' section has 'Fire treatment factor' set to '[not active]' and the 'Preservative-treated incised' checkbox is unchecked. The 'Factored Loads (kN)' section has two sets of 'Force' (0) and 'Duration' (empty) fields. A 'Run Design' button is located at the bottom center.

Figure 3: Connections Tutorial 4 – Main Member Details

4.4.3 Side Member

1. Specify **Width** as **127 (mm)**.
2. Specify **Thickness** as **1.519 (16 ga) (mm)**.
3. Specify **End Type** as **Overlap**.
4. Specify a **Force** of **18.22 (kN)**.

The screenshot shows a software interface with a 'Main' and 'Side' tab. The 'Side' tab is active, displaying various input fields for side member details. The 'Name' field is set to 'Side Plate'. The 'Width' field is set to '127' mm. The 'Thickness' field is set to '1.519 (16 ga)' mm. The 'End Type' is set to 'Overlap'. The 'Overlap' field is set to '0' mm. The 'Moisture Content' section has 'In-Service' and 'Fabrication' both set to 'Dry'. The 'Treatment' section has 'Fire treatment factor' set to '[not active]' and a checkbox for 'Preservative-treated incised' which is unchecked. The 'Factored Loads (kN)' section has 'Force' set to '18.22' and 'Duration' set to 'Standard'. A 'Run Design' button is located at the bottom left of the form.

Field	Value	Unit
Name	Side Plate	
Material		
Species		
Grade		
Width	127	mm
Thickness	1.519 (16 ga)	mm
Ply		
End Type	Overlap	
Overlap	0	mm
In-Service Moisture Content	Dry	
Fabrication Moisture Content	Dry	
Fire treatment factor	[not active]	
Preservative-treated incised	<input type="checkbox"/>	
Force (Factored Loads)	18.22	kN
Duration (Factored Loads)	Standard	

Figure 4: Connections Tutorial 4 – Side Member Details

4.4.4 Nail Details

1. Specify a **Nail Type** as **Common**.
2. Specify a **Nail Length** of **44 mm (1-3/4")**.
3. Leave all other Parameters as **(unknown)**.
4. Click **Run** Design.

Nail Type	Common	<input type="checkbox"/> Allow Clinching
Nail Length	44 mm (1-3/4")	10 mm
Number of Rows	(unknown)	Max. Protrusion
Nails Per Row	(unknown)	<input type="checkbox"/> Add Staggered Nails Between Rows
Spacing Within Rows	(unknown)	mm
Spacing Between Rows	(unknown)	mm

Figure 5: *Connections Tutorial 4 – Nail Details*

4.4.5 Review and Accept Design Results

Once a load has been input, *Connections* will automatically complete the design, and a drawing of the connection will automatically generate on the **Details** screen. At this point, it is possible to review the **Diagram**, **Results** and **Accept** the design. Both the **Diagram** and **Results** can quickly be printed using the **Print** icon.

Click [here](#) to download a PDF of the design results.

Click [here](#) to download a PDF of the diagram.

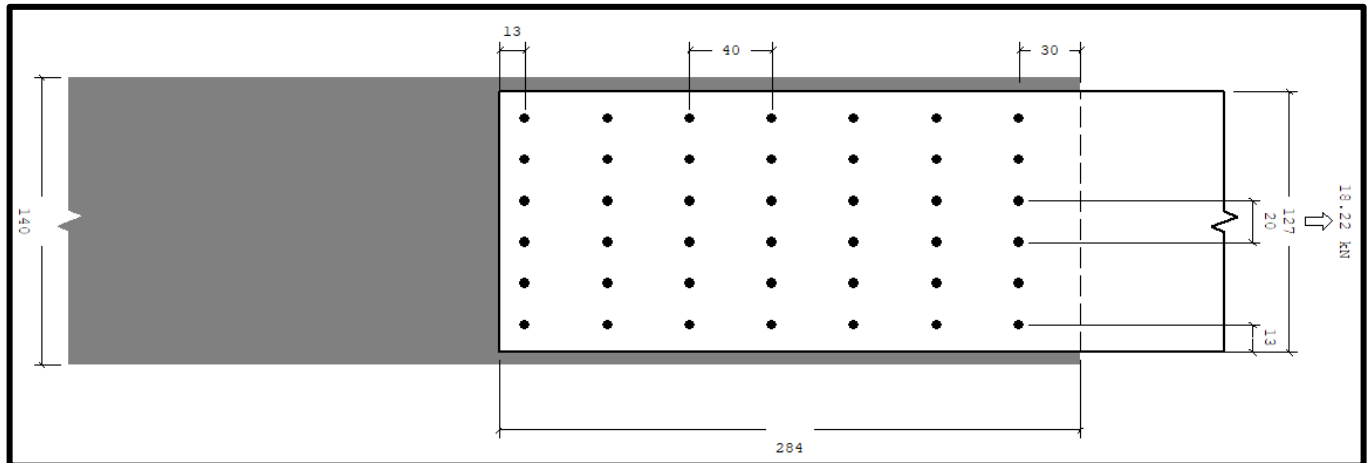


Figure 6: *Connections Tutorial 4 – Nail Splice Connection Detail*