5 Shearwalls Tutorial 5 – Matching Published Design example (U.S.)

The following Tutorial goes through how to recreate the shearline from SDPWS Commentary C4.3.3.4.1. The tutorial will go over commentary example for capacity based distribution (C4.3.3.4.1-2), although the distribution method along shearlines can be modified to deflection based distribution to recreate example C4.3.3.4.1-1.

Note that it is not possible to 100% recreate the calculations demonstrated in the SDPWS commentary example problem for two main reasons.

1. Shearwalls does not use the same load level for calculating shear resistance and calculating deflection as is done in the SDPWS commentary examples. Shearwalls software utilizes ASD level forces when checking the shear capacity of a shearline, but when calculating deflection, the load level is brought back to strength level loads as per ASCE 7-10.
2. When using deflection based distribution, Shearwalls software iterates the load going between segments along a shearline until deflections are equalized, while the SDPWS commentary example C4.3.3.4.1-1 determines how much the segment SW2 will deflect based on the deflection of SW1 when it is loaded to capacity.

Click [here](#) to download the shearwalls file (.wsw) which will be created by going through this tutorial.

5.1 Define Settings

1. Click on the **Settings, Design Tab**.
2. Under **Rigidity for shear force distribution based on...** select **Shearwall capacity (wood panels and fiberboard only)**.

![Shearwalls Tutorial 5 – Design Settings](image)

Figure 1: Shearwalls Tutorial 5 – Design Settings
5.2 Plan View Settings

1. Click on the **Settings, Plan View Tab**.
2. Modify **Mouse clicks recorded at** to **2 in snap increment**.
3. Click **OK**.

![Image of Settings window showing plan view settings](image)

**Figure 2**: Shearwalls Tutorial 5 – Plan View settings

5.3 Structure Blocks & Levels

1. Click on the **Structure** button.
2. Create a **Structure Block**, and adjust its dimensions so that the **X and Y locations** are both set to **0 (ft)**, set the **X extent** equal to **15 (ft)**, and the **Y extent** equal to **15 (ft)**.
3. Set the **Wall height** of **Level 1** to **8 (ft)**.
4. Set the **Floor/Ceiling depth** of **0 (ft)** between each level.
5. Adjust the **Foundation elevation** equal to **0 (ft)**.
6. Under **Diaphragm flexibility**, uncheck the **rigid analysis** checkbox.

Note: The Y extent is irrelevant for this problem as manual loads will be generated for the shearline along the Southern end of the model.
Figure 3: Shearwalls Tutorial 5 – Creating Structure Block
5.4 Create Openings for Levels 1 and 2

1. Click on **Walls** View.
2. Click on **Openings** View.
3. Toggle Shearline **A-1**.
4. Add an opening that is **offset from edge** by **8 (ft)**, with a **width** of **4.67 (ft)**.

Note the height and offset from bottom of the opening are irrelevant since segmented shearwalls will be specified, which do not account for the areas above and below wall openings when completing shear analysis.

![Image of Shearwalls Tutorial 5 – Adding Openings in Shearline A](image)

**Figure 4:** Shearwalls Tutorial 5 – Adding Openings in Shearline A

5.5 Creating Standard Walls

As default, all of the walls on level 1 should be specified as **exterior segmented**, which consists of wood structural panels on the exterior and gypsum wallboard on the interior. These details need to be modified to match the SDPWS commentary example.

5.5.1 Modifying Wall A-1 on Level 1

1. Click on **Walls**.
2. Click on **ctr+a**, to toggled all the walls on the storey.
3. Specify the Type as **segmented**.

4. Specify the following parameters for the **Exterior Side**:
   a) Material is **Structural Sheathing**.
   b) Thickness is **15/32 in**.
   c) Orientation is **Horizontal**.
   d) Click on the **OSB** box.
   e) Click on **Blocking** box.
   f) Fasteners type as **Common wire nails**
   g) Fasteners Sizer of **8d**.
   h) Fastener Edge Spacing as **6 (in)**.
   i) Fastener Interior Spacing as **12 (in)**.
   j) Framing material as **Lumber**.
   k) Framing Species as **D.Fir-L**.
   l) Framing Grade as **No.2**.
   m) Framing Thickness b as **2 in nom**.
   n) Framing Width d as **4 in nom**.
   o) Framing Stud Spacing as **16 in**.
   p) End studs at left is **2**.
   q) End Studs at Right is **2**.
   r) Specify Hold-down **HDUS-SDS2.5** for the **Left** and **Right Ends** of the wall

5. Specify the following parameters for the **Interior Side**:
   a) Material as **None**.
5.6 Roof Block

1. Navigate to **Roof Input View**.
2. Specify the **Construction** as **Flat roof**.
5.7 Applying Manual Loads

Skip the Building Site and Generate Loads buttons, as loads will be manually applied for this tutorial.

1. Click on the Loads and Forces button.

2. Set the current Level to 1.
   a) Click on wall A-1, Click Add...
   b) Click on Add as a factored force directly (parallel) to the shearline.
   c) Select Type of load as Seismic Shear
   d) Select Profile type as Point Load
   e) Modify Levels to From 1 To 1.
   f) Modify Location to Apply to... Shearline A
   g) Specify a Magnitude of 2400 lbs.
   h) Set Distribution method as Both.
   i) Click OK.
5.8 Run Design and Compare Design Results to Wood Design Manual

1. Click on Run Design.
2. In the Results View, click on Go To Table, Seismic Design, Flexible Diaphragm Design, Shear Results.
3. Compare Seismic Shear results to those shown in SDPWS 2015 Example C4.3.3.4.1-2.
4. Click here to download a pdf of the design results.
5.9 Additional Practice

1. Go to the Design Settings tab
2. Under *Rigidity for shear force distribution based on...* select *Deflection of wall segments or perforated walls.*
3. Press OK.
4. Click on Run Design.
5. Compare seismic shear results to those shown in SDPWS 2015 Example C4.3.4.1-1 (Take note of the differences as per explanation at the beginning of the tutorial).