Reconstructing Historical Building Volumes

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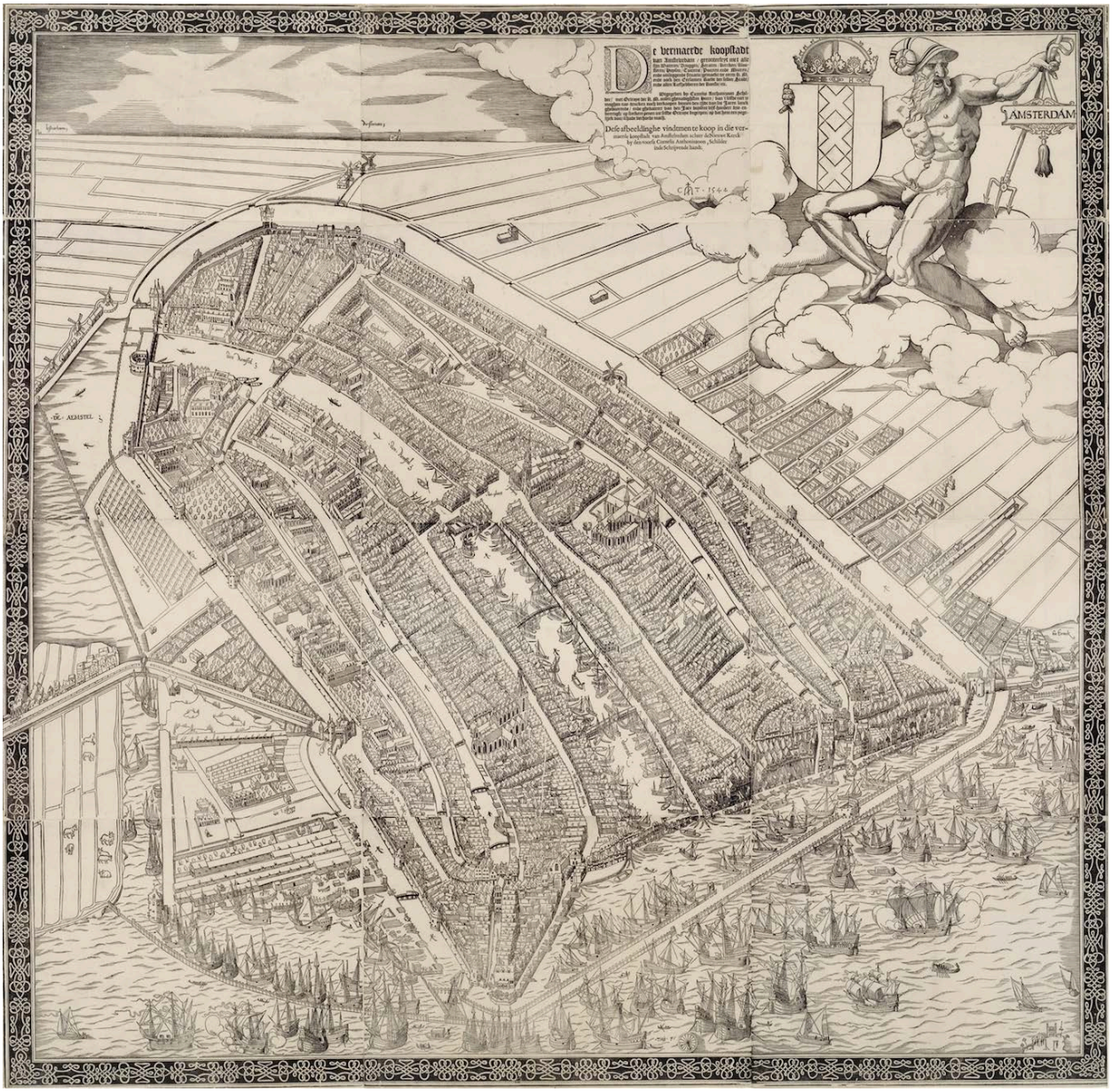
The goal of this assignment is to reconstruct the building volumes for the 16th-century Warmoesstraat based on the historical maps and existing measurements.

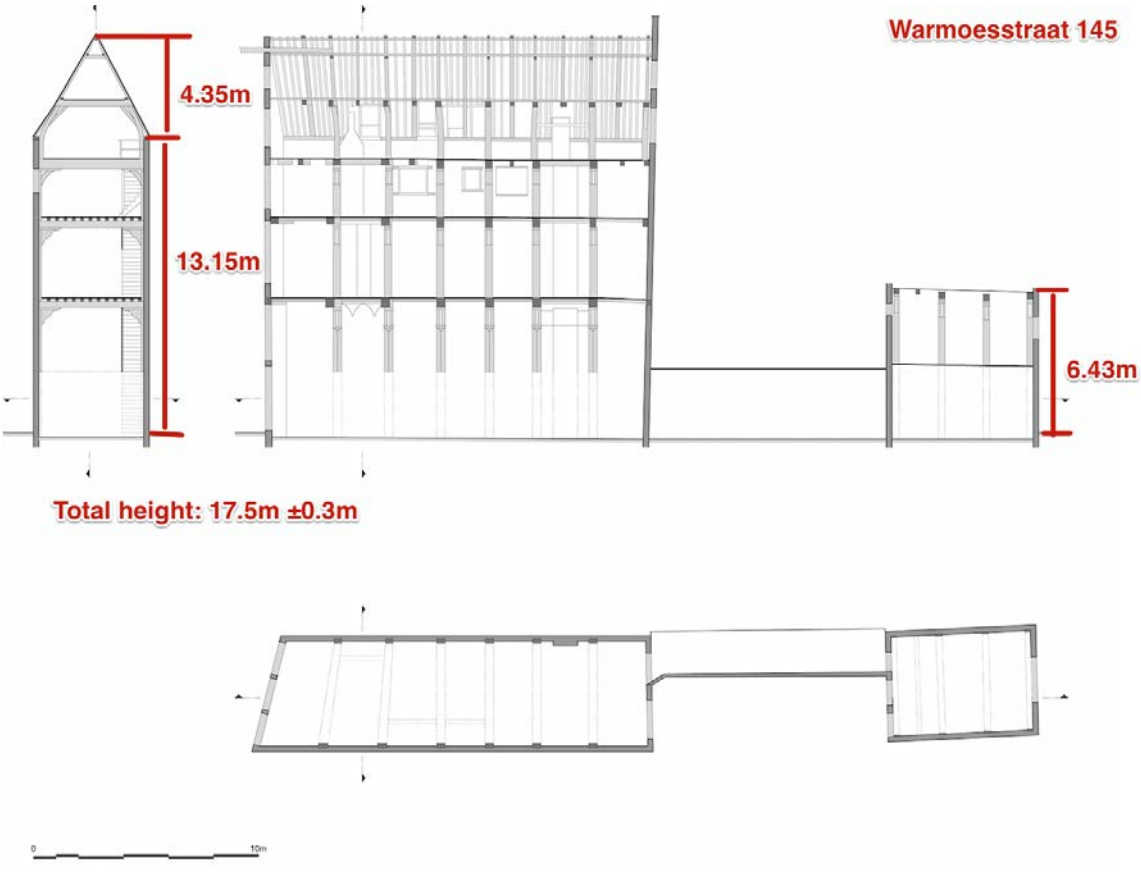
The geographical coordinates and the cadastre map you have used for the GIS assignments only provide us with information on a 2D surface. In order to visualize the 16th-century Warmoesstraat, we need to seek alternative sources about how the buildings stood in a physical space, rather than lying on the maps.

Fortunately, Cornelis Anthonisz's bird-eye map of Amsterdam, made in1544, is almost a 2.5D map, providing not only the layout of the city, but also the meticulous details of each individual building. Cornelis Anthonisz's masterpiece is a valuable source that identifies the relative height and size of each building compared to its surroundings. Although many of the original buildings are now lost, with the help of this map, we can use the information available for the surviving buildings to suggest the features of the now-lost ones.

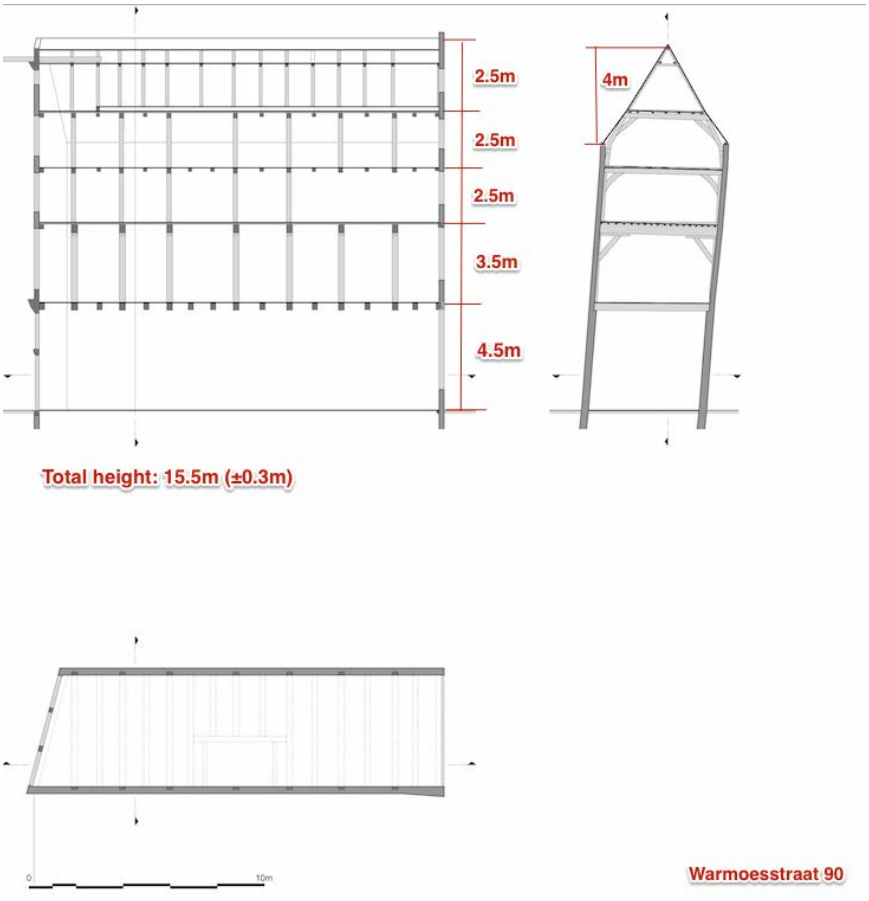


Besides this historical 2.5D map, the City of Amsterdam has made inventories of the surviving historical buildings in the city. As for Warmoesstraat, the drawings for two buildings are shown below:

Warmoesstraat 145:



Warmoesstraat 90:



Measured from the map above, Warmoesstraat 90 is approximately 15.5m (±0.3m) high and Warmoestraat 145 is approximately 17.5m (±0.3m) high (both measured from street level to the roof ridge).

If we compare the Warmoesstraat 145 with 90, the difference in height comes from the ground level. The other floors have pretty standard heights:

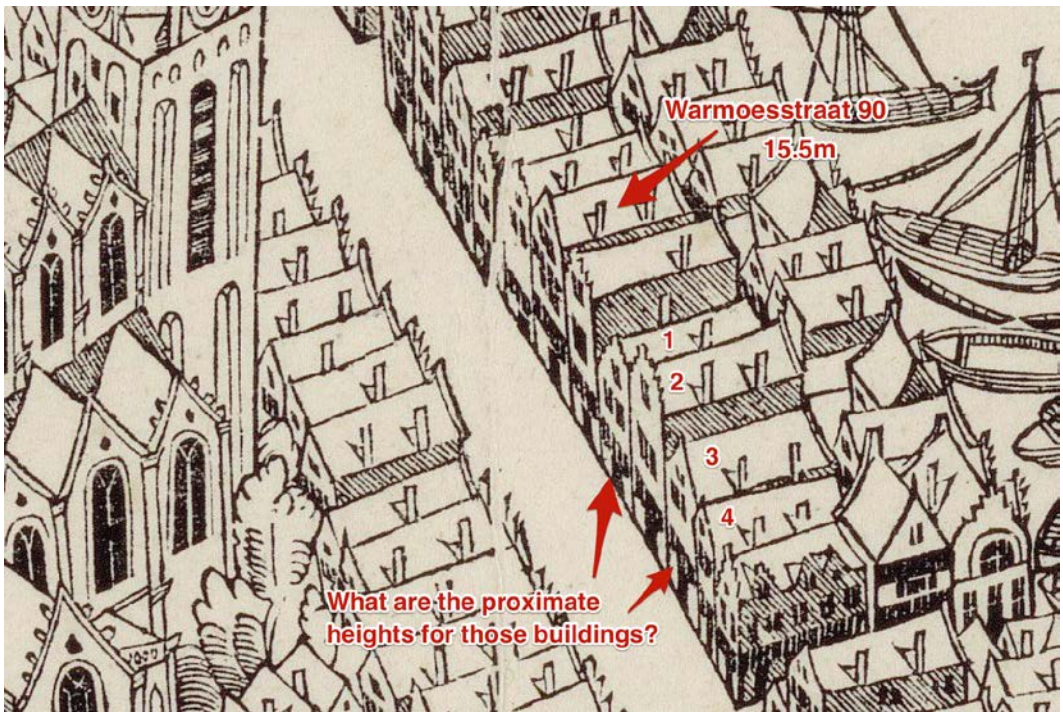
- Ground floor: 4.5 meters or 7.5 meters
- First floor: 3.5 meters
- Second floor: 2.5 meters
- Third floor: 2.5 meters (with 1.5 m as a part of the gable roof)
- Attic: 2.5 (±0.3m) meters (within the gable roof)

Warmoesstraat 145 seems to be a grand house, comparing to Warmoesstraat 90. These two buildings thus might serve as examples to suggest the height of large, luxurious houses as well as relatively large but less grand homes. Other examples are:

- Warmoesstraat 5: Ground floor: 4.64m, first floor: 3.40m
- Warmoesstraat 38: Ground floor: ca. 4.75m, first floor: ca. 3.50m, second floor and attic: 2.50m
- Warmoesstraat 40: Ground floor: ca. 4.00m, first floor, ca. 3.00m, second: ca. 2.50m
- Warmoesstraat 42: Ground floor: 5.50m, first floor: ca. 2.90m, second floor 2.50m, attic, 2.50m

[Question] Can you find some patterns in the heights?

Seen from the sections, Warmoesstraat 90 has four rows of windows. This fact can help us to locate the building on Cornelis Anthonisz.'s map:



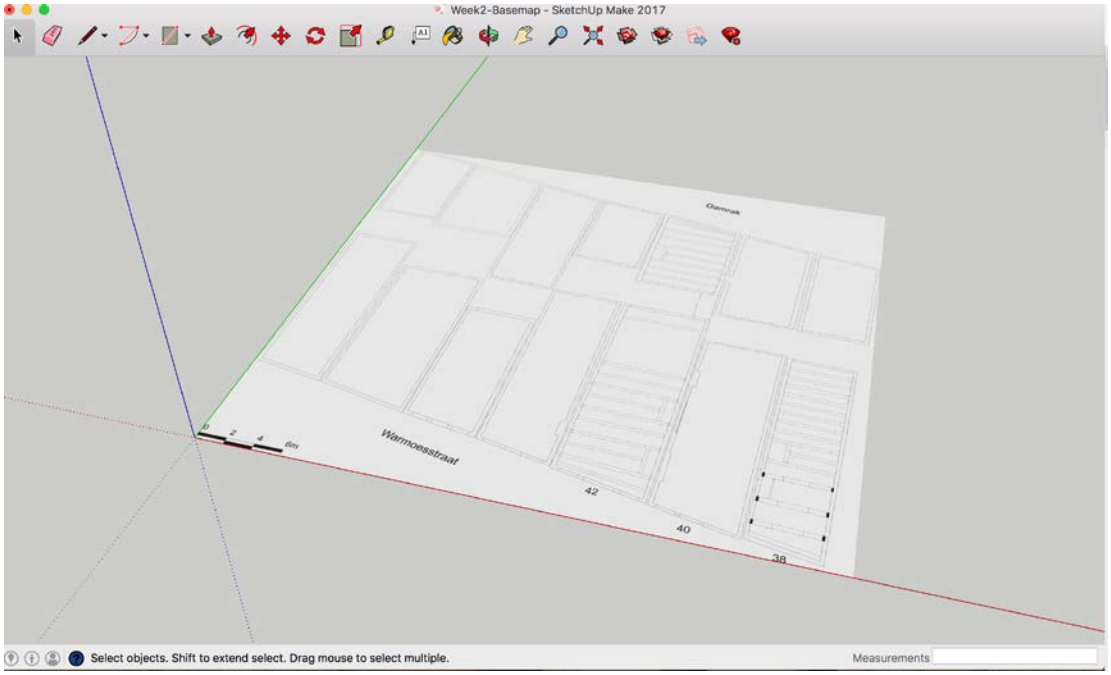
Compared to Warmoesstraat 90, the houses with number 1-4 in the map above seem to be much smaller and have fewer stories than Warmoesstraat 90.

- **House # 1** seems to have a ground floor slightly lower than Warmoesstraat 90, based on the standard floor height, presumably 4 meters high. It seems to have a standard first floor, probably also 3.5 meters high and an attic, 2.5 meters high. Therefore, # 1 might be ca. 10 meters high from street level to the roof ridge.

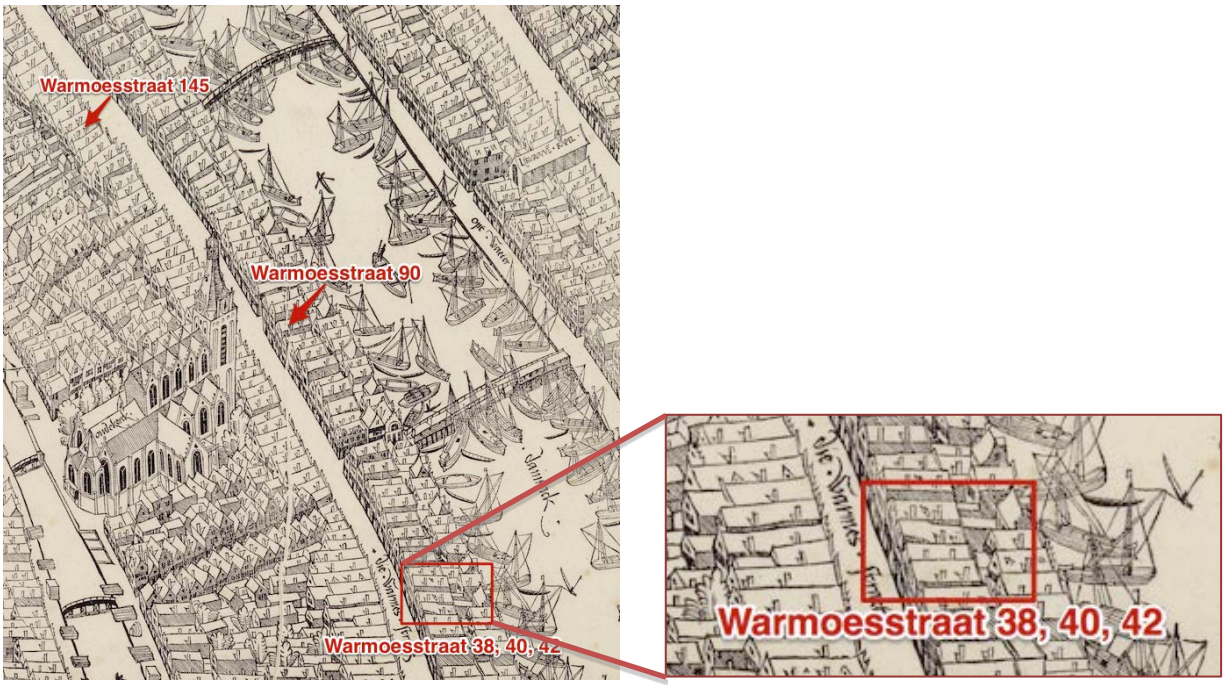
- **House #2** seems to be slightly higher than #1. Judging from the map above, it seems to have a higher attic – # 2 might be around 11 meters high.
- **House # 3 &4** look lower than #1 and #2. Presumably they have a 4-meter ground floor, 3.5-meter first floor and a 2.5-meter attic – probably 9 meters high.

These height estimations together with the relative height showing on the map can be used as a reference for other buildings along the Warmoesstraat.

If we use Warmoesstraat 90 and 145 to reconstruct some other houses along the street such as number 38, 40 and 42 of which we have the base map ready for you in SketchUp:



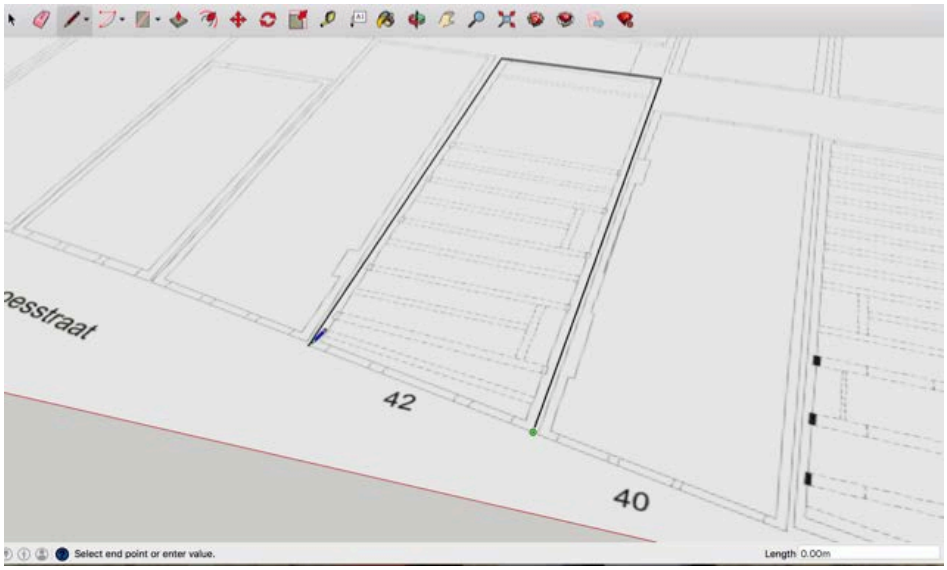
Here's how they look on Cornelis Anthonisz.'s map:



Judging from Cornelis Antonisz's map, the three houses look similar to House #1 in the previous example, therefore, assuming they are of a similar height of 10 meters.

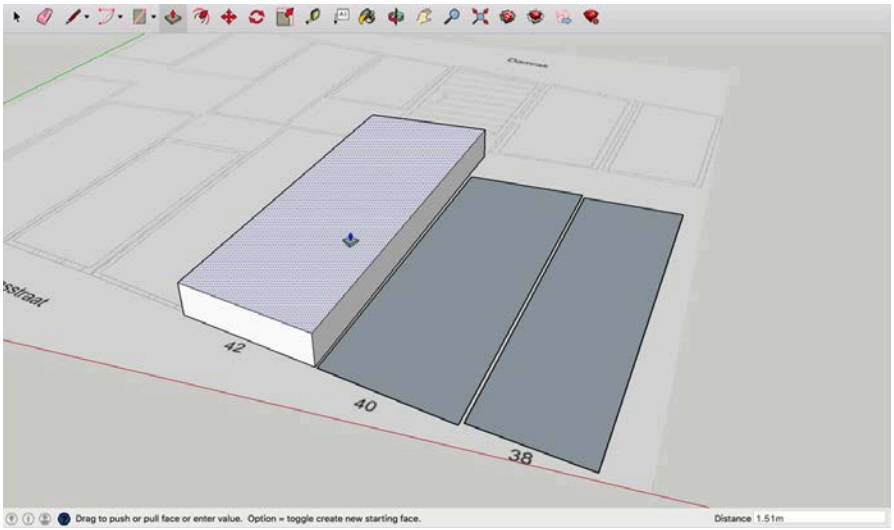
Creating the building volume of those buildings is a combination of drawing a surface using the **Line** tool ( ) and applying the **Push/Pull** tool ( ) to add a building volume of an appropriate height:

1. Select the **Line** tool ( ) and trace the boundaries of each building.



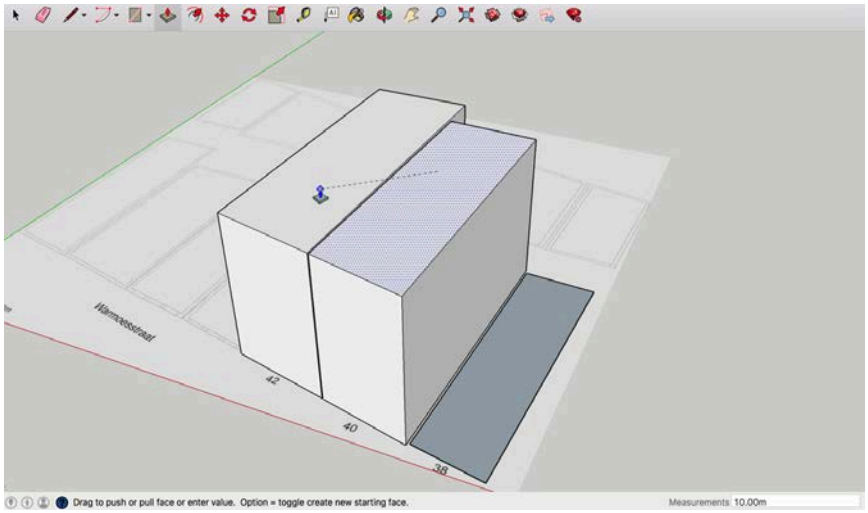
When you finish the tracing of one building by closing the lines, a surface will be automatically created which allows you to move to the next one. If no surface is created, please check 1) whether you have closed your shape, or 2) whether your lines are on the same axis.

2. Select the **Push/Pull** tool ( ). With the Push/Pull cursor, click the face that you want to expand. The selected face becomes shaded, as shown in the following figure.

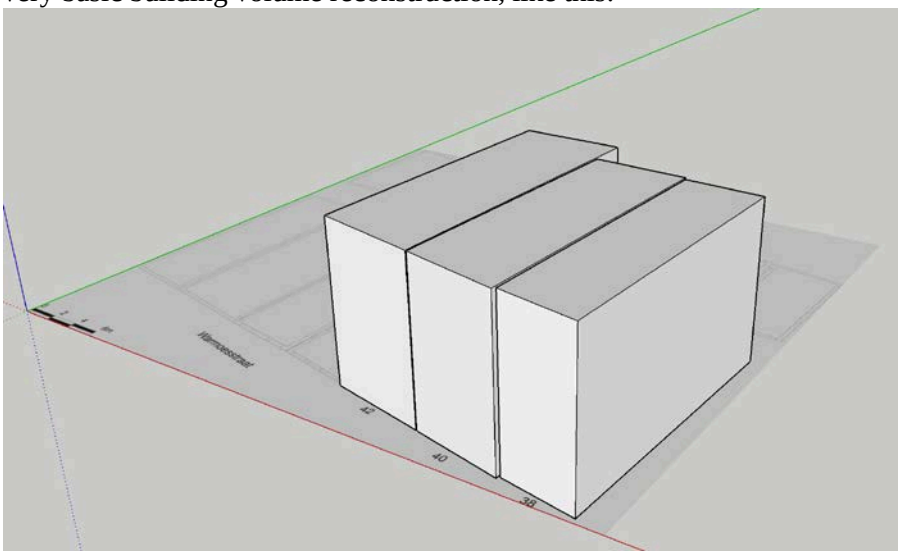


3. Move the cursor so that the selection expands. The Measurements box displays the height of the expanded face (also called an extrusion).
4. Click again to set the size of your extrusion when the extrusion reaches 10 meters. Or you can enter the height, which appears in the Measurements box as you type, 10 (you don't have to specify the unit since the template is using meter as the default unit) and then press **Enter**.
5. Repeat step 1-4 for all three buildings

[Tips] If you need to pull a face so that it's parallel with another face, let the SketchUp inference engine help. Before you pull the face, hover the Push/Pull cursor over the other face, and the inference engine tells you when the two faces are parallel, as shown in the following figure.



Here we have a very basic building volume reconstruction, like this:

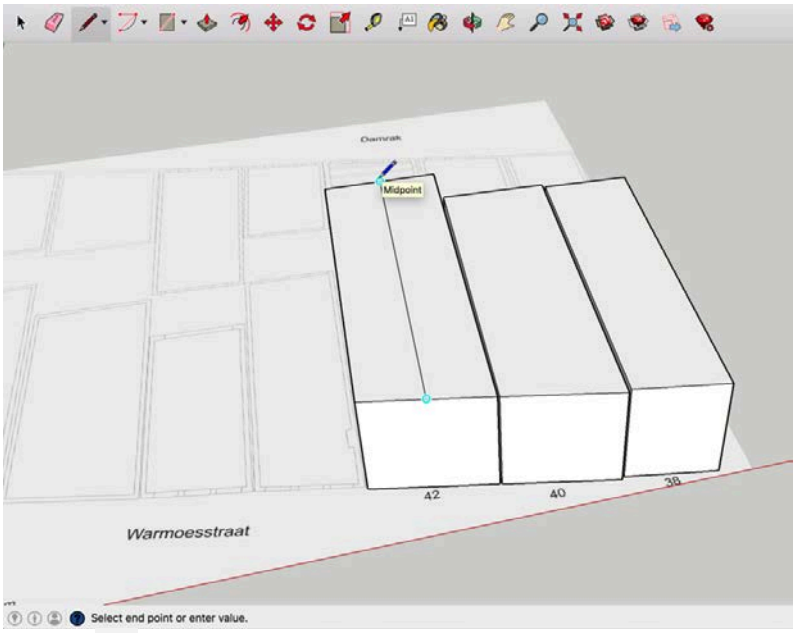


[Optional] If you want to make your reconstruction slightly more realistic by adding a gable roof, here is how you can do it. Start over again -

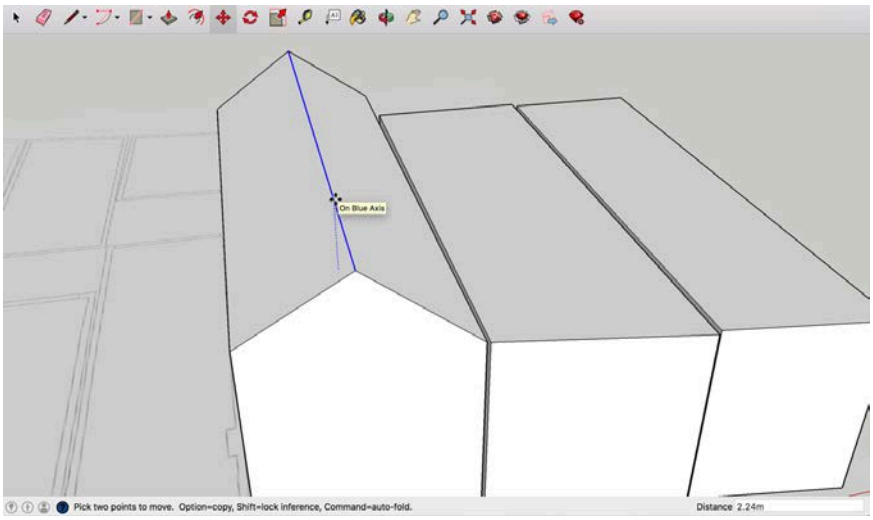
1. Trace your building block as you did before
2. Select **Push/Pull** tool ( ) and move the cursor

As we know from the drawings of Warmoesstraat 90 and 145, the height of the roof is around 4 meters. Therefore, the height of the building without roof will be 10- 4 = 6 meters high. Therefore:

3. Click again to set the size of your extrusion when the extrusion reaches **6** meters. Or enter **6** in the Measurement box and press **Enter**
4. Select the **Line** tool ( ) and draw a line from the midpoints of the top surface as the ridge of the roof.



5. Select the **Move** tool ( ) and click the **Move** tool cursor on the line you just drew
6. Move the cursor upwards along the Blue Axis



7. Click again when the extrusion reaches **4** meters, or enter 4 and press **Enter**.

Your building will look like this: