

## INTRODUCTION:

- To predict the behavior of masonry walls when they are under a lot of strain, you must first test force on smaller structures called masonry prisms.
- As we test the masonry prisms, we are mainly interested in where the concrete structure fails and the strength of masonry [figure 2.] and steel [figure 1.] so we can input this information into an excel sheet.
- The excel sheet will tell us what to expect once we test full scale walls, and how much moment the structure will be able to handle, and how much the structure will bend before it fails.

Purpose: Creating a tool that allows us to predict the behavior of full scale masonry walls.

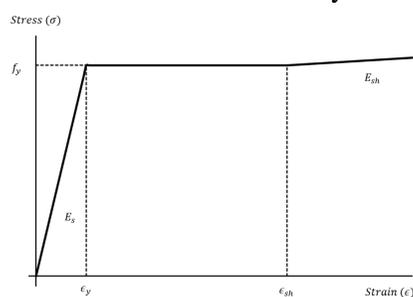


Figure 1. Graph of the behavior of steel

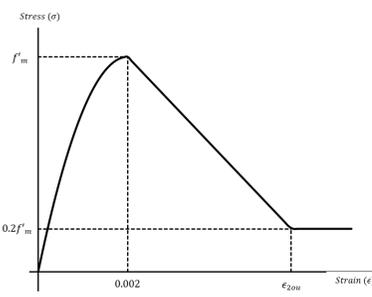


Figure 2. Graph of the behavior of masonry

## METHOD:

- We began by creating an excel sheet to ultimately help us predict the behavior of masonry wall
- Using fibre analysis, we were able to measure the total force and total moment a structure experiences when faced with various compressive strains. [figure 3.]
- To figure out the total moment of the structure, you must first find the neutral axis in which the structure has balanced forces.

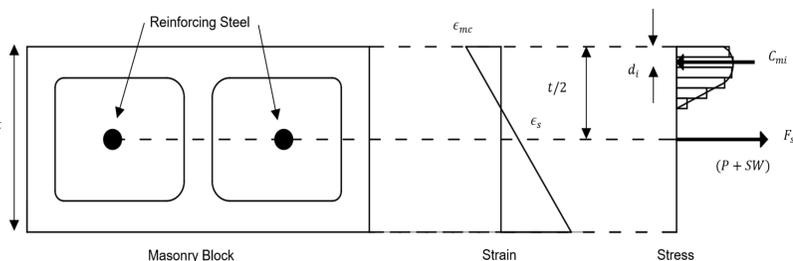


Figure 3. Cross section fibre analysis of masonry, detailing a strain graph.

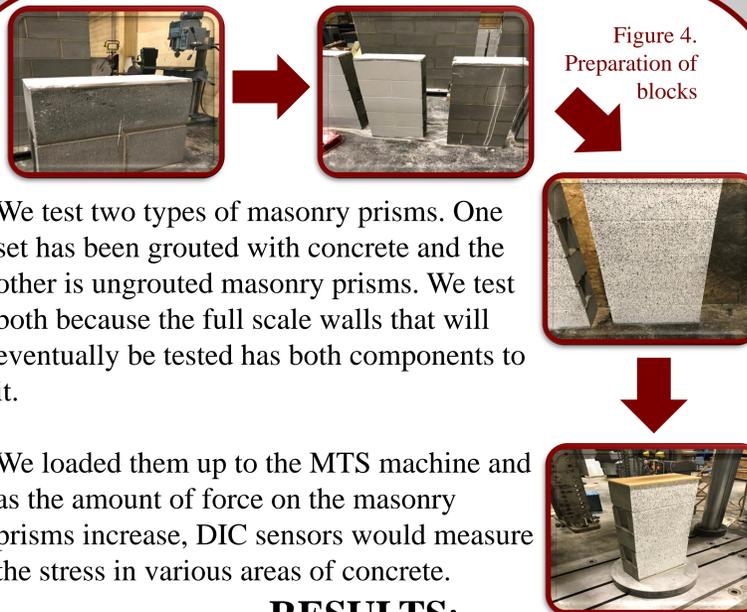


Figure 4. Preparation of blocks

- We test two types of masonry prisms. One set has been grouted with concrete and the other is ungrouted masonry prisms. We test both because the full scale walls that will eventually be tested has both components to it.
- We loaded them up to the MTS machine and as the amount of force on the masonry prisms increase, DIC sensors would measure the stress in various areas of concrete.

## RESULTS:



Figure 5. Grouted masonry prism cracked after experiencing intense lateral loads



Figure 6. UngROUTED masonry wall cracked completely in half

- The ungrouted specimens experienced cracking throughout their sides [figure 6.]. The grouted specimens cracked along their sides and experienced some cracking within the inner layer of concrete. [figure 5.]
- The grouted prisms ended up being able to handle more stress than the ungrouted prisms. This is unusual, because in previous testing it was observed that ungrouted masonry can usually handle stress better.

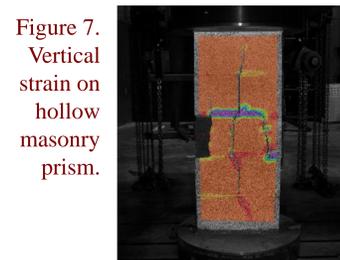


Figure 7. Vertical strain on hollow masonry prism.

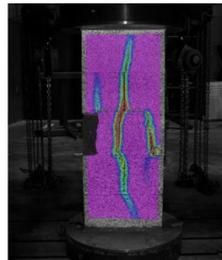


Figure 8. Horizontal strain on hollow masonry prism.



Specimen	Peak Axial Load (kN)	Peak Stress (MPa)
1	424.24	15.71
2*	397.99	14.74
3	494.61	18.32
4	513.90	19.03
5	468.19	17.34
Average		17.03

Figure 9. graph detailing how ungrouted masonry prisms move when experiencing different strength axial loads and chart detailing the maximum load and stress each specimen could handle before they finally failed.

Specimen	Peak Axial Load (kN)	Peak Stress (MPa)
1	1525.80	20.59
2	1271.09	17.15
3	1615.04	21.80
4	1593.84	21.51
5	1653.32	22.31
Average		20.67

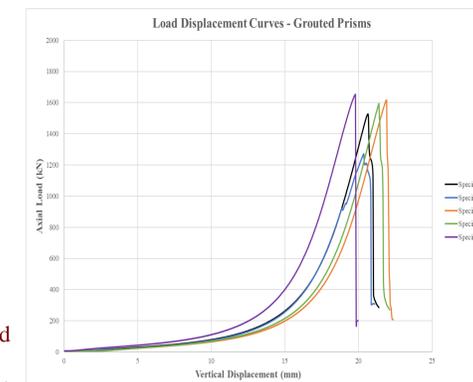


Figure 10. graph detailing how grouted masonry prisms move when experiencing different strength axial loads and chart detailing the maximum load and stress each specimen could handle before they finally failed.

## GOING FORWARD:

- Our next steps will be to test lateral loads on full scale masonry walls using the MTS machine.
- The next step in our experimentation can be applied to real life masonry codes that people all over the world use as guidelines when creating walls for buildings. Our tests will take into account that masonry is anchored into the ground to make the application of masonry more cost effective but just as safe.

## ACKNOWLEDGEMENT:

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