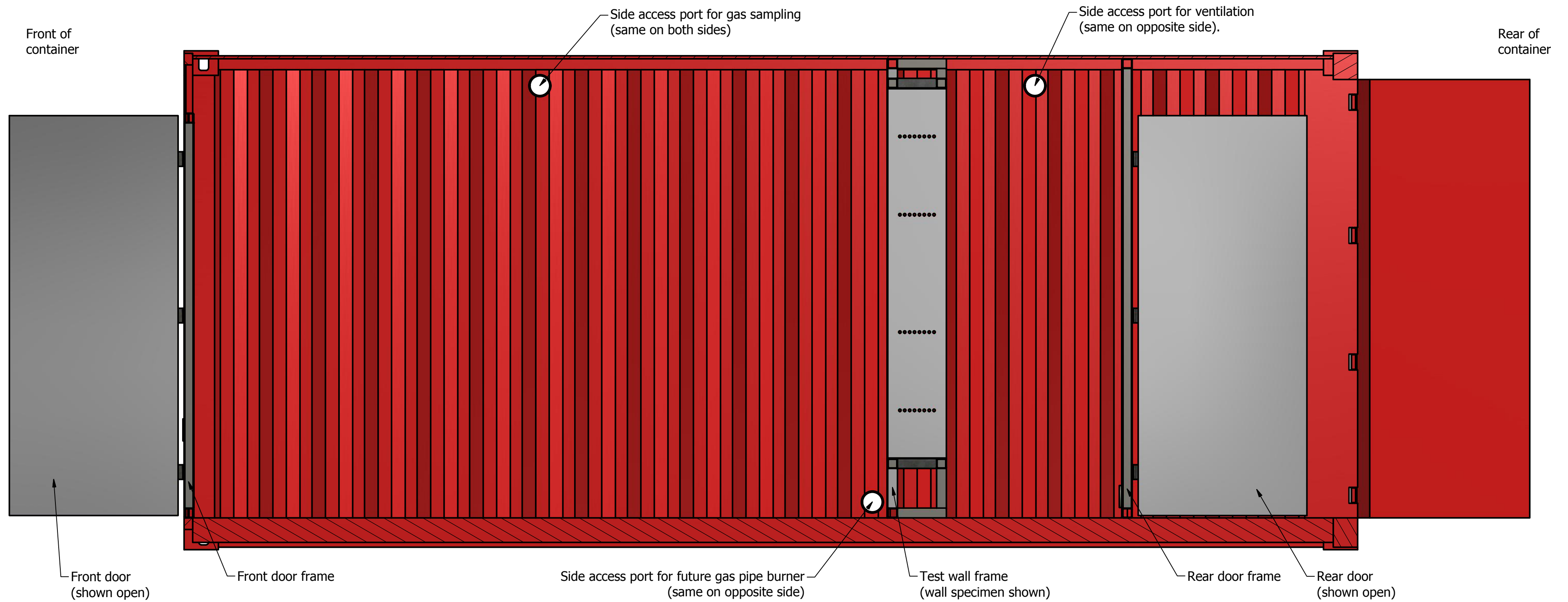


Model Overview
SCALE: 1/16

**UW Intermediate-Scale Fire
Endurance Test Apparatus**

AUTHOR: Matt DiDomizio
COMPANY: University of Waterloo
REVISION: 03
DATE: August 17, 2015

SHEET SIZE: C
SHEET NUMBER: 1 OF 6
DRAWING SCALE: As indicated (all dimensions in inches unless
otherwise stated).



Section Along Container Length

SCALE: 1/16

Notes

The fire endurance test apparatus is a 20 ft shipping container (nominal exterior dimensions of 19'10.5" long, 8'0" wide, and 8'6" tall) modified with several steel frame inserts. The modifications are summarized below:

1. A rectangular section shall be cut out of the front wall of the container to accommodate a steel door and its frame. The front door frame shall be constructed of 2" square tube (steel) with an opening that measures 31.5" wide by 78.75" tall (the same dimensions as the door in a ISO 9705 room). Refer to "Front Door Frame" for details.
2. A frame with an opening measuring 75.5" wide by 75.5" tall shall be installed 142" back from the inside front face of the container. The purpose of this frame is to mount a wall test specimen (73.5" wide by 73.5" tall) during a fire endurance test (the interior of the frame shall be lined with 1" ceramic fibre insulation on all 4 sides). With the test wall frame in this position, the dimensions of the room shall be 142" long, 92.5" wide, and 93.9" tall (the dimensions of an ISO 9705 room measure 142" long, 94.5" wide, and 94.5" tall). Refer to "Test Wall Frame" for details.
3. A frame shall be installed in the rear section of the container 3 ft from the back side of the test wall frame. The purpose of this rear door frame is to separate the back side of the test wall (hot environment) from the area where instrumentation and computer equipment will be located (cool environment). The rear door frame will include a door to allow access to the back side of the test wall frame pre/post test, as well as circular access ports for the routing of cables near floor level. The dimension of the door on the rear wall frame is not critical, but is shown in these drawings as equal to the front door. Refer to "Rear Door Frame" for details.
4. A total of 8 access ports (2 on the front side, and 3 each on the left and right sides) shall be installed by cutting 4.5" holes into the container and welding in place 4.5" OD steel pipes (wall thickness 0.237").
5. Exact details of front and rear doors (hinges and locking mechanism) shall be left to the discretion of the supplier. It is recommended that doors be reinforced with angle bar to prevent warping in the event of direct fire exposure.

Note that dimensions marked with a "*" symbol indicate critical dimensions for the design.

Note that tolerances and welds are not included in this design revision.

Additional Notes

In addition to the steel container modifications itemized before, the following modifications will be performed by UW:

1. The floor of the container shall be built-up using 2 layers of 2" fire bricks (to be even or slightly raised above the bottom of the front door frame).
2. Batwing doors shall be constructed and installed on the inside of the front door frame for the purpose of controlling ventilation during a fire test.
3. Thermocouples within the fire room shall be routed under the floor and up the sides of the container, tucked into the corrugations of the steel, and insulated and fire protected as necessary.
4. All instrumentation to the wall specimen shall be located on the back side of the test wall frame, with data transmission cables routed into the rear instrumentation room through access ports in the rear door frame.
5. The test wall frame will be exposed to significant heat loads during a test, and as such, warping or weakening of welds is a concern. To this end, it is suggested that the exposed face of the test wall frame be covered with a sacrificial layer of drywall or cement board for each test. This material may be loosely fitted in place using brackets (future modifications).

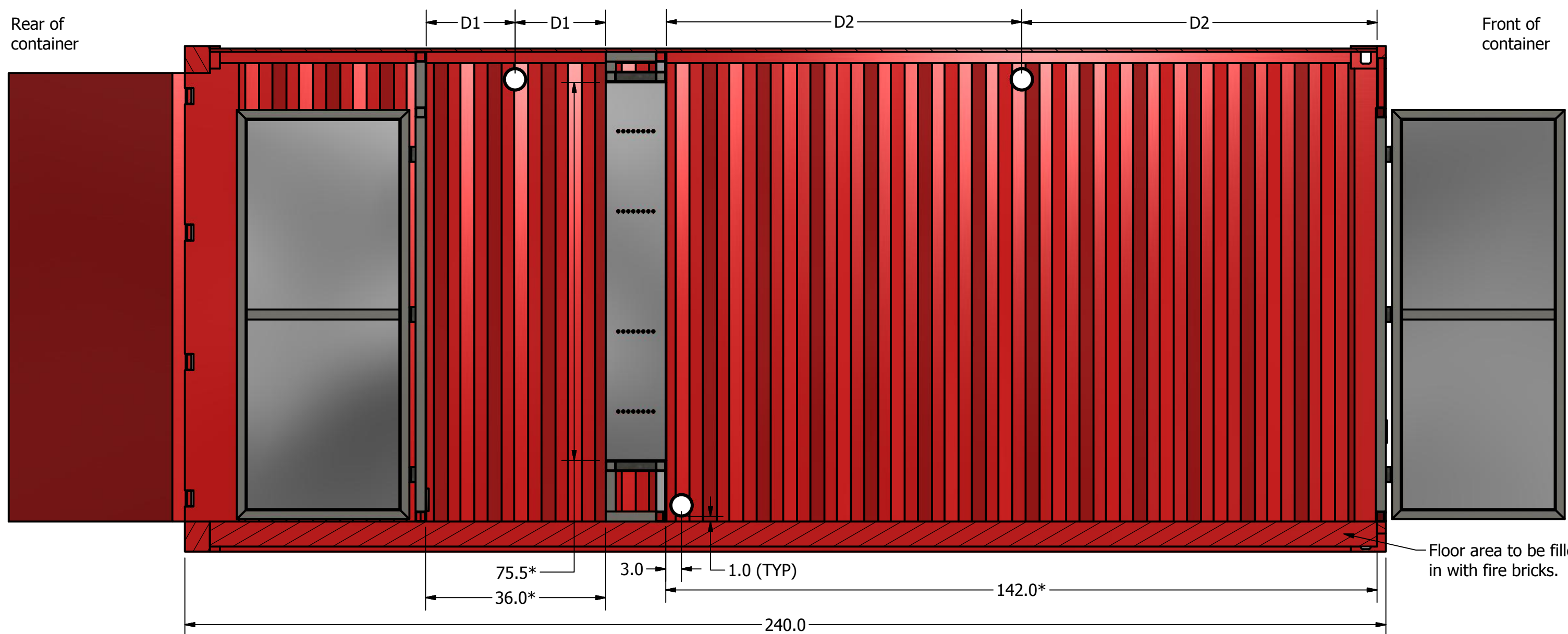
UW Intermediate-Scale Fire Endurance Test Apparatus

AUTHOR: Matt DiDomizio
 COMPANY: University of Waterloo
 REVISION: 03
 DATE: August 17, 2015

SHEET SIZE: C
 SHEET NUMBER: 2 OF 6
 DRAWING SCALE: As indicated (all dimensions in inches unless otherwise stated).

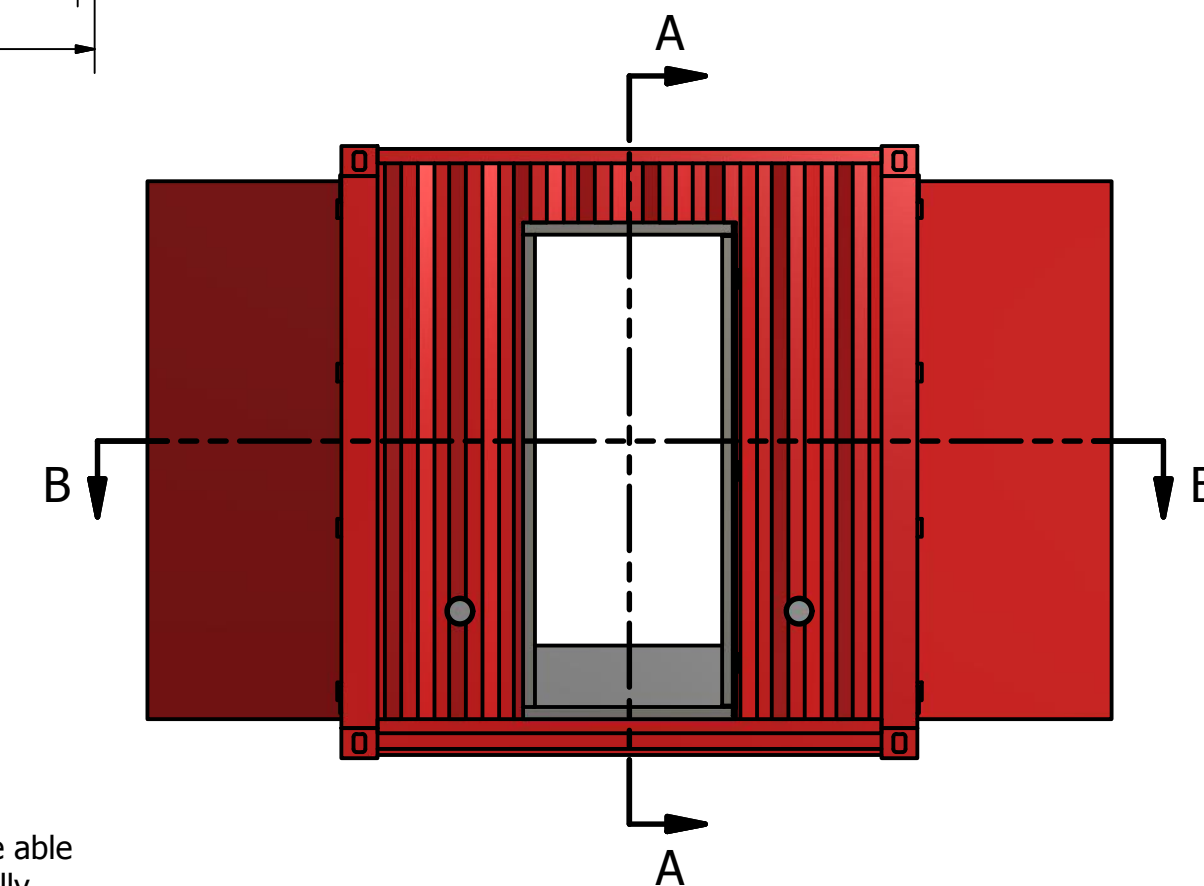
Rear of container

Front of container



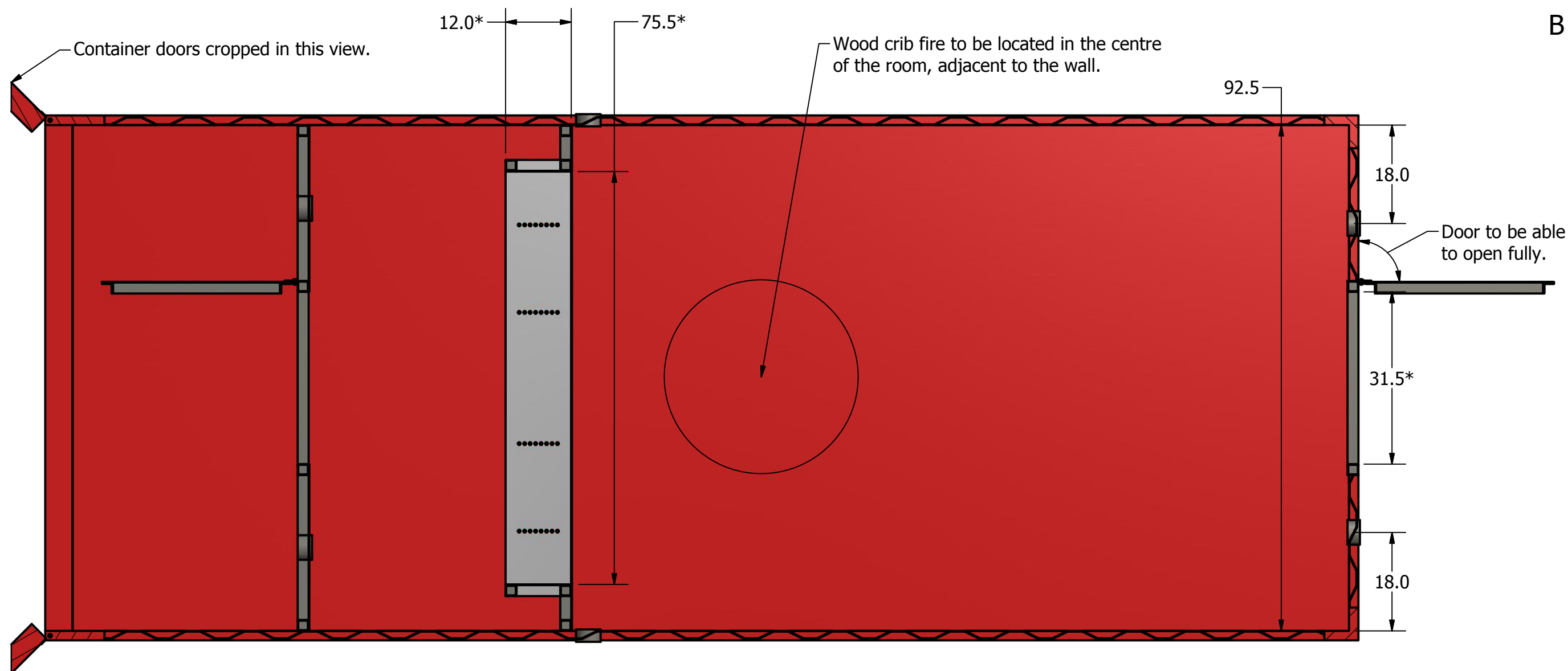
Section Along Container Length (A-A)

SCALE: 1/20



Front of Container

SCALE: 1/32



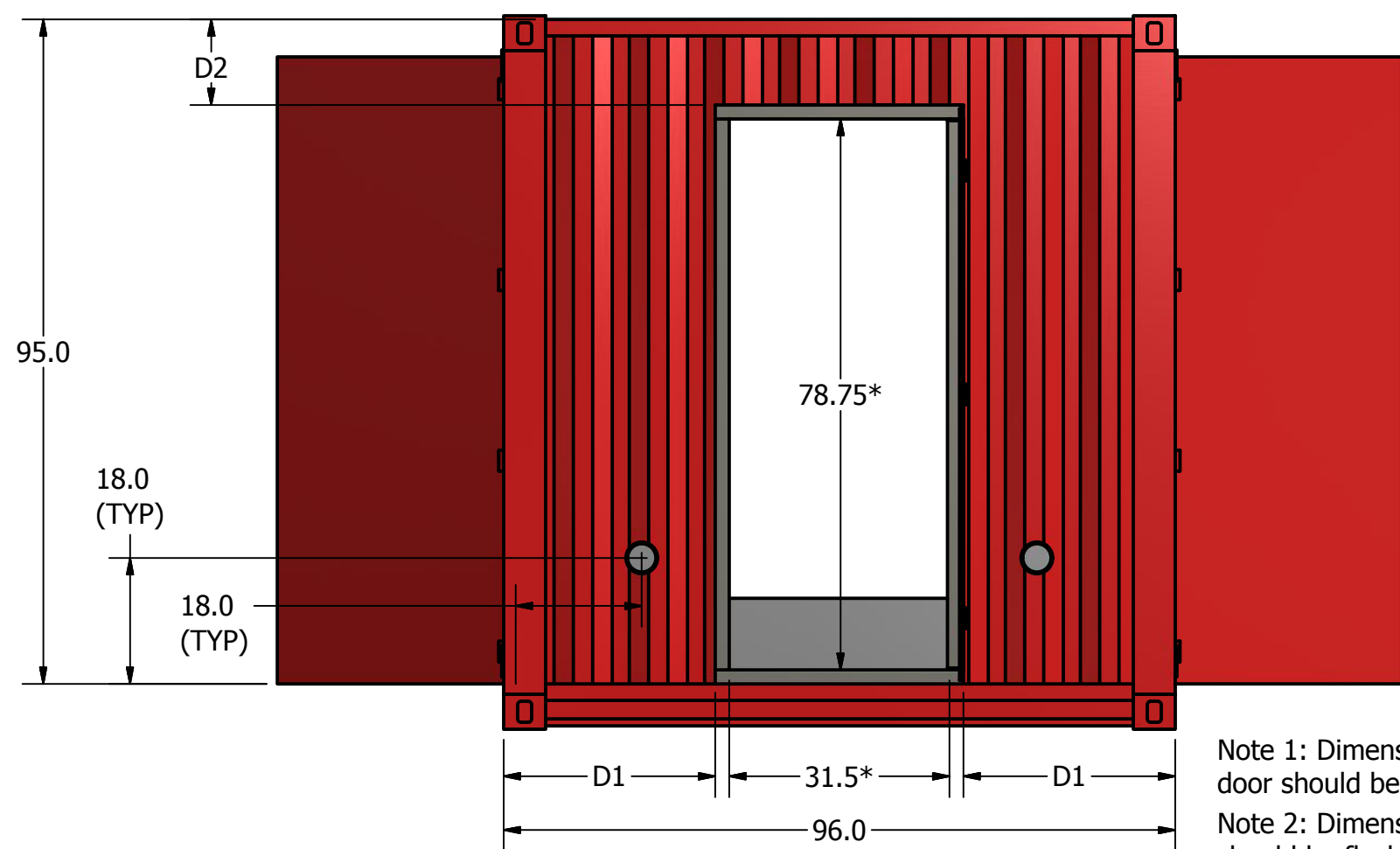
Section Along Container Length (B-B)

SCALE: 1/20

**UW Intermediate-Scale Fire
Endurance Test Apparatus**

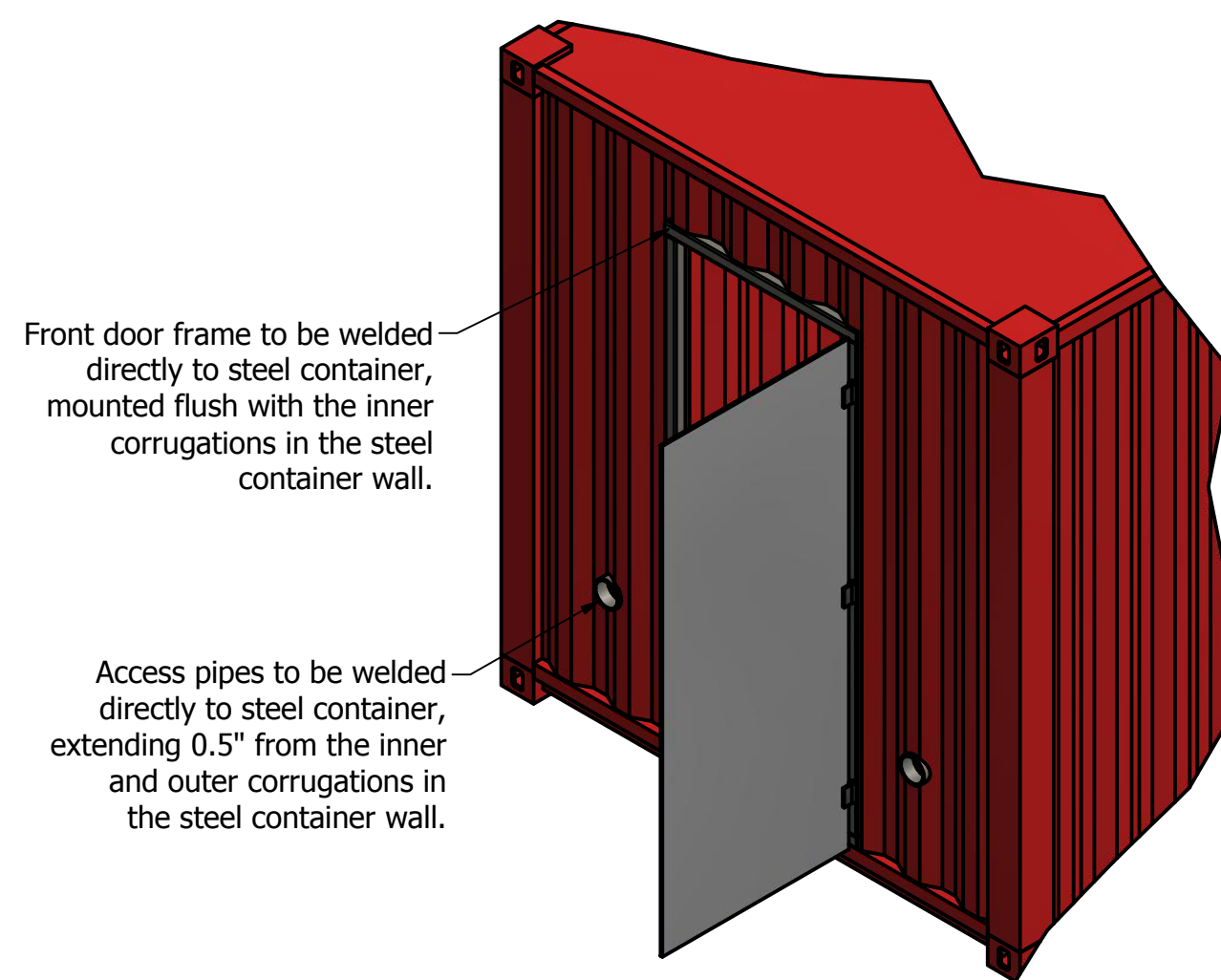
AUTHOR: Matt DiDomizio
 COMPANY: University of Waterloo
 REVISION: 03
 DATE: August 17, 2015

SHEET SIZE: C
 SHEET NUMBER: 3 OF 6
 DRAWING SCALE: As indicated (all dimensions in inches unless otherwise stated).

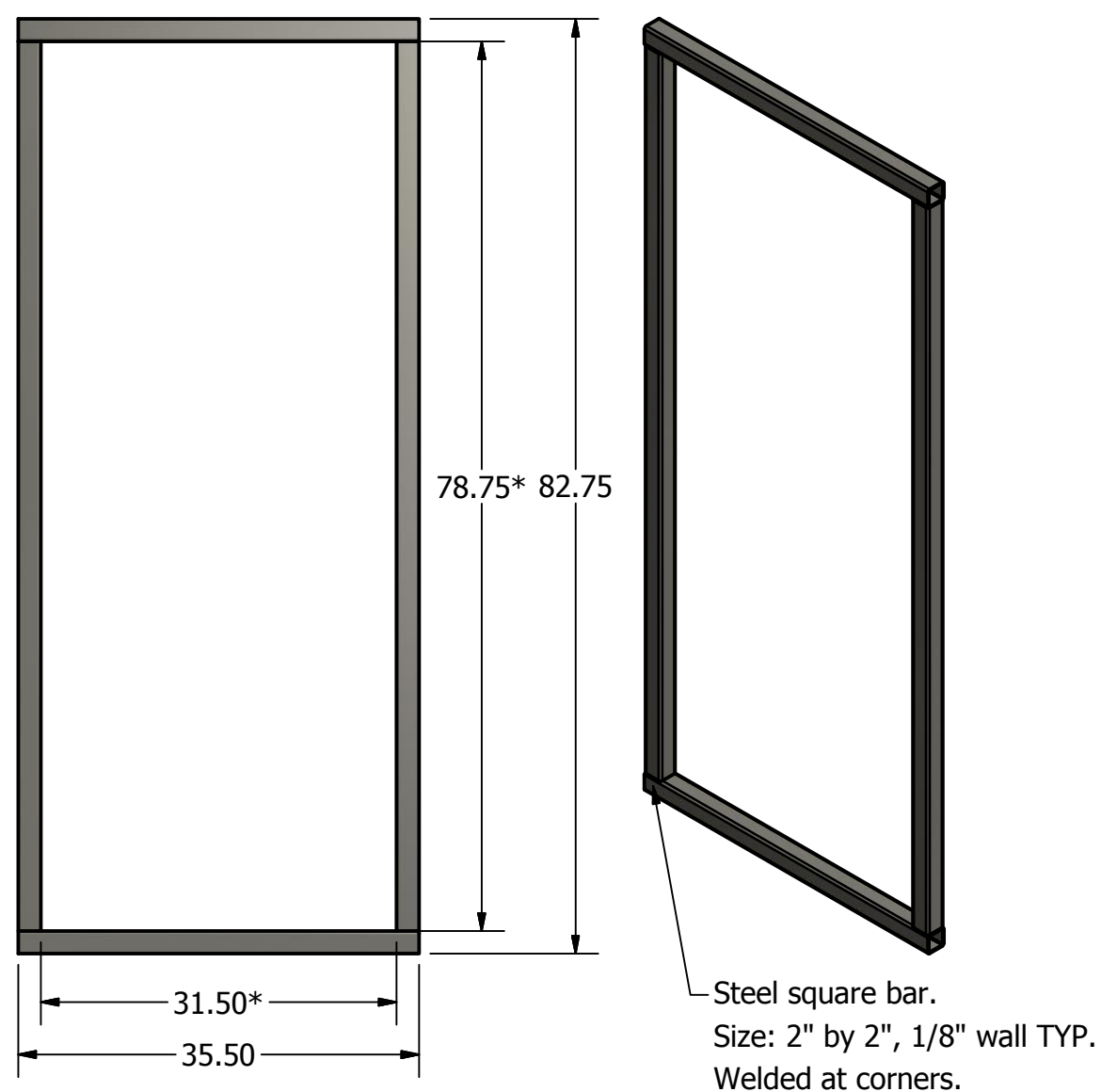


Front Door Frame
SCALE: 1/24

Note 1: Dimension D1 is not critical (the door should be centred on the front face).
Note 2: Dimension D2 is not critical (door should be flush with the bottom frame of the container, and have an opening size of 78.75" tall by 31.50" wide).

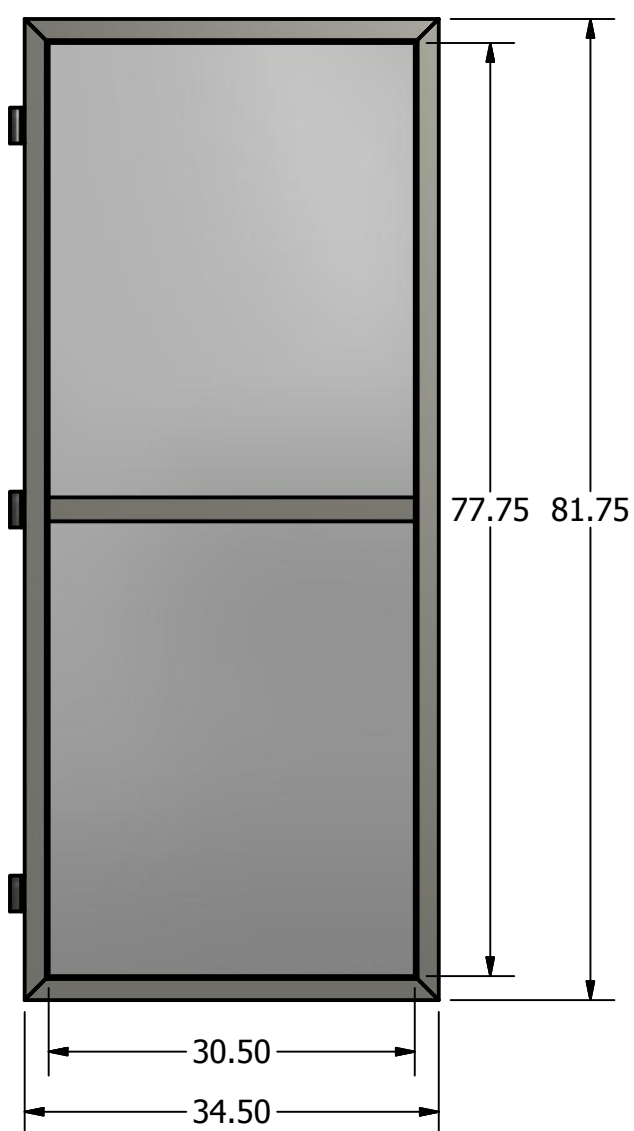


Front Door Frame (Detail 1)
SCALE: 1/24

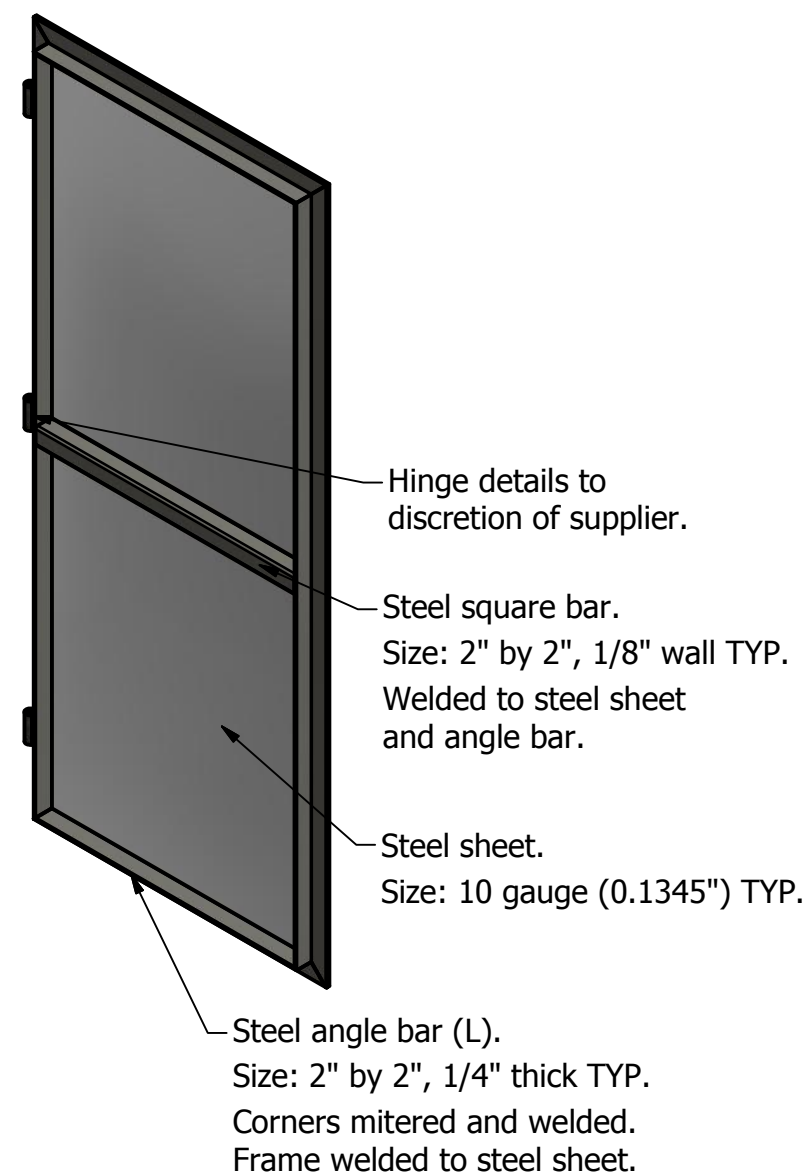


Front Door Frame (Detail 2)
SCALE: 1/16

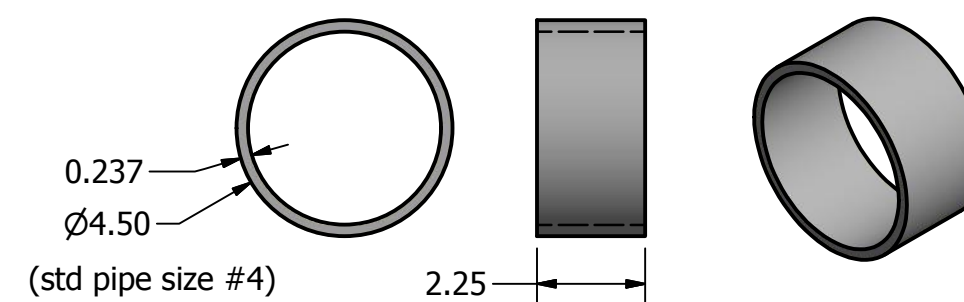
Steel square bar.
Size: 2" by 2", 1/8" wall TYP.
Welded at corners.



Front Door
SCALE: 1/16



Hinge details to discretion of supplier.
Steel square bar.
Size: 2" by 2", 1/8" wall TYP.
Welded to steel sheet and angle bar.
Steel sheet.
Size: 10 gauge (0.1345") TYP.
Steel angle bar (L).
Size: 2" by 2", 1/4" thick TYP.
Corners mitered and welded.
Frame welded to steel sheet.



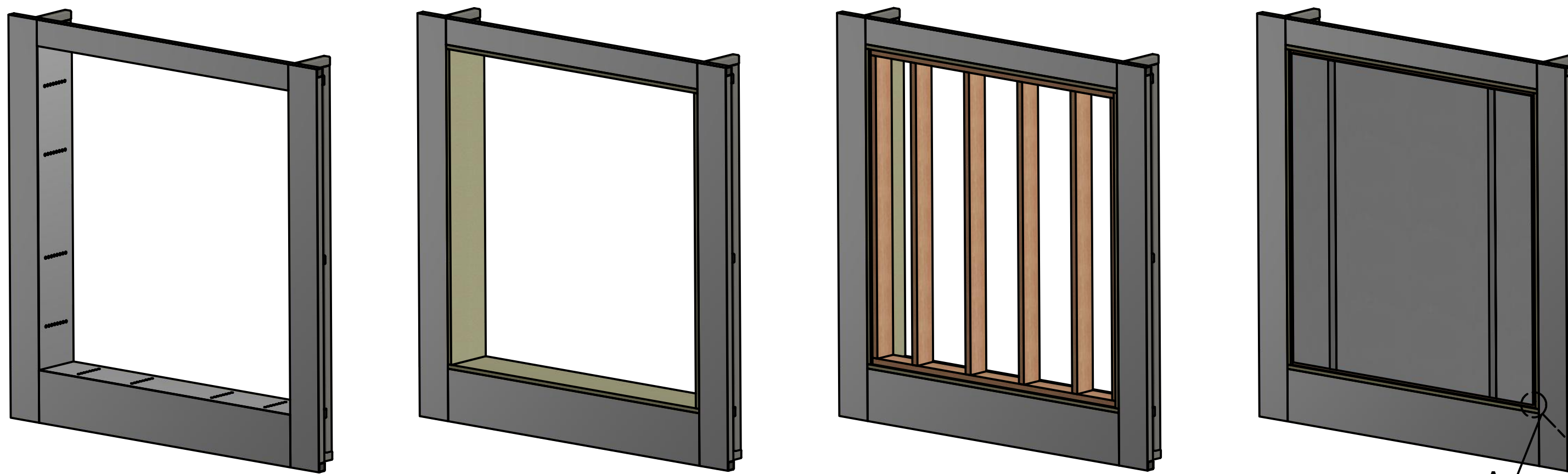
Access Pipes
SCALE: 1/4

Note 1: Pipe depth of 2.25" is TYP to extend 0.5" on both the inside and outside of container walls.
Note 2: Access pipes to be stuffed with ceramic fibre insulation when not in use.

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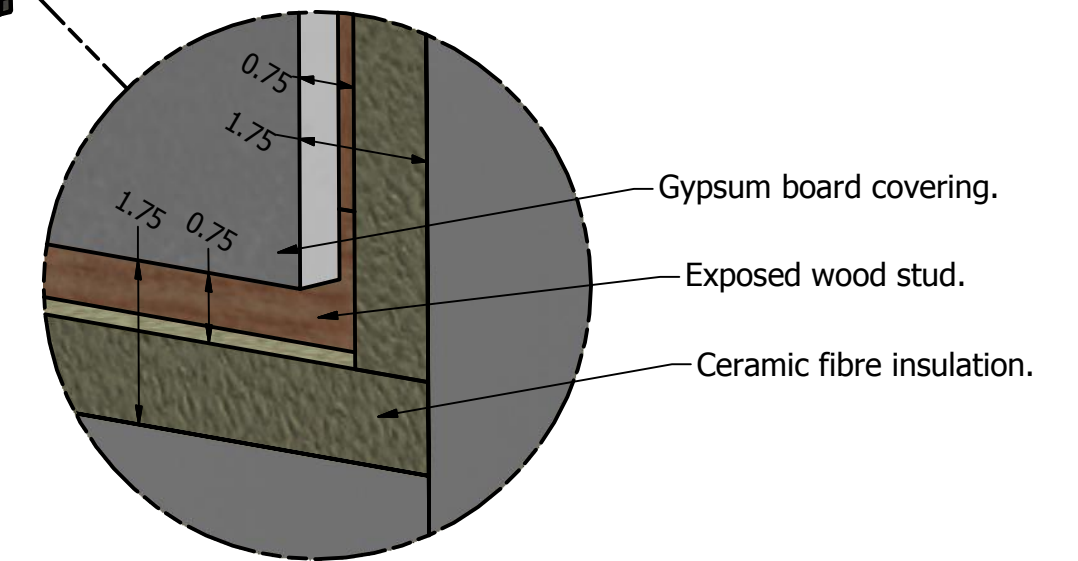
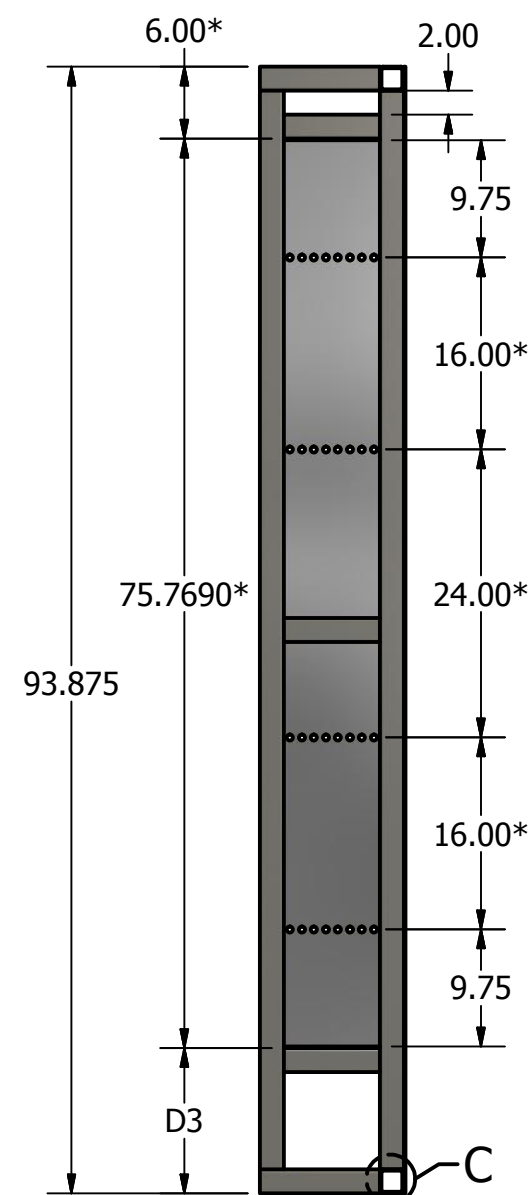
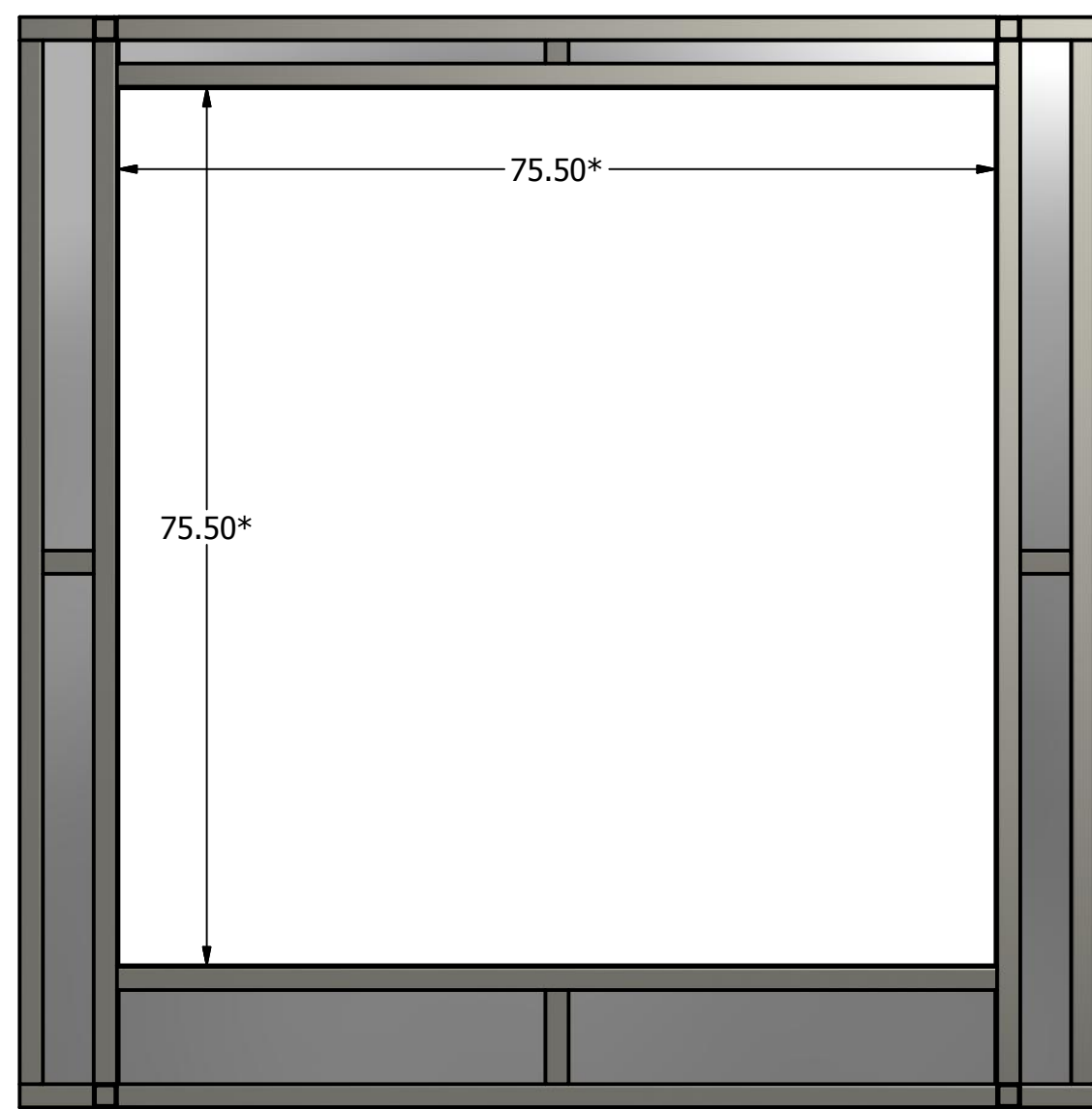
SHEET SIZE: C
SHEET NUMBER: 4 OF 6
DRAWING SCALE: As indicated (all dimensions in inches unless otherwise stated).



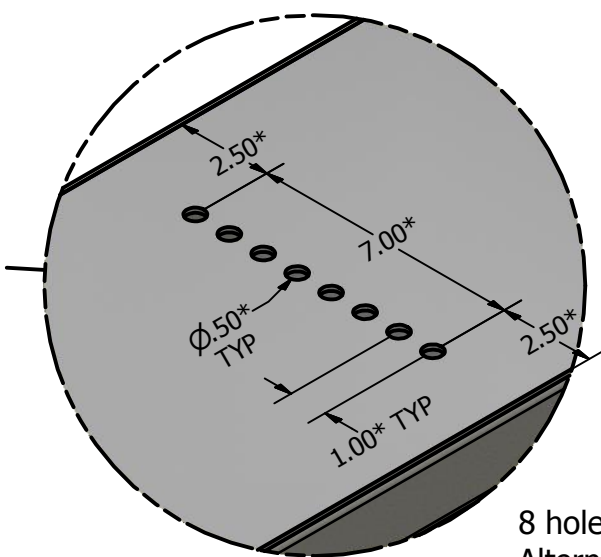
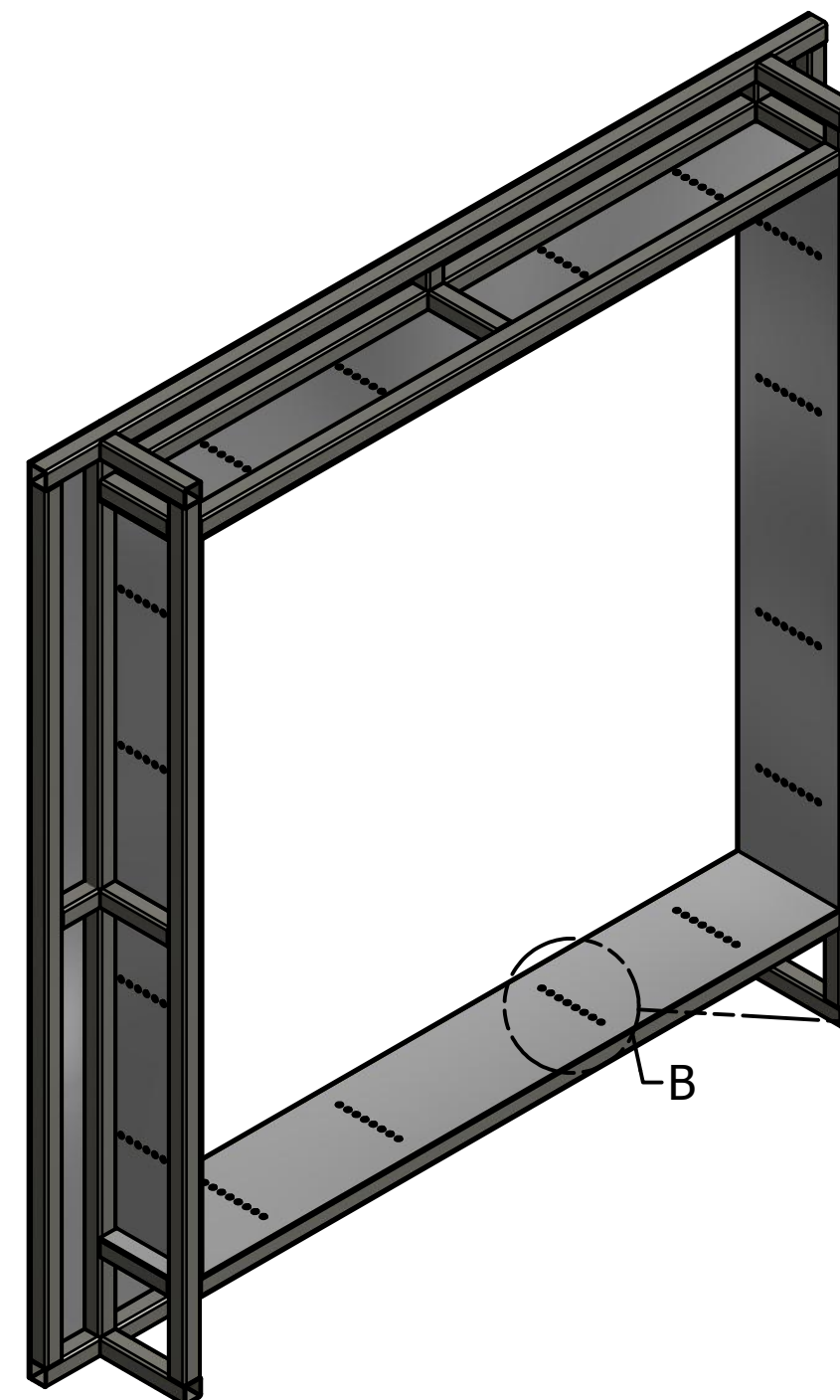
- From left to right:
1. The test wall frame with no test specimen mounted.
 2. The inside of the frame is lined with ceramic fibre insulation (1" thick) to reduce heat transfer from the steel frame to the test specimen.
 3. The wood stud frame of the test wall is constructed in-place once the test wall frame has been lined with insulation. Studs are attached to the inside of the steel frame with bolts.
 4. The covering material (gypsum board) is screwed to the wood stud frame such that it is flush with the steel sheet on the front the test wall frame. Any drywall seams are taped and sealed with drywall compound.
 5. (Not shown) The remainder of the test specimen is constructed in-place, from the back side of the test wall frame. This includes insulation, sheathing, etc.
 6. (Not shown) 1.75" wide strips of drywall are screwed into the wood stud frame around the edges of the wall (over both the edge of the stud as well as the exposed ceramic fibre insulation). Drywall compound is then applied liberally around the edges to minimize leakage gases through edges. See detail A below.

Test Wall Frame (Specimen Mounting)

SCALE: 1/24

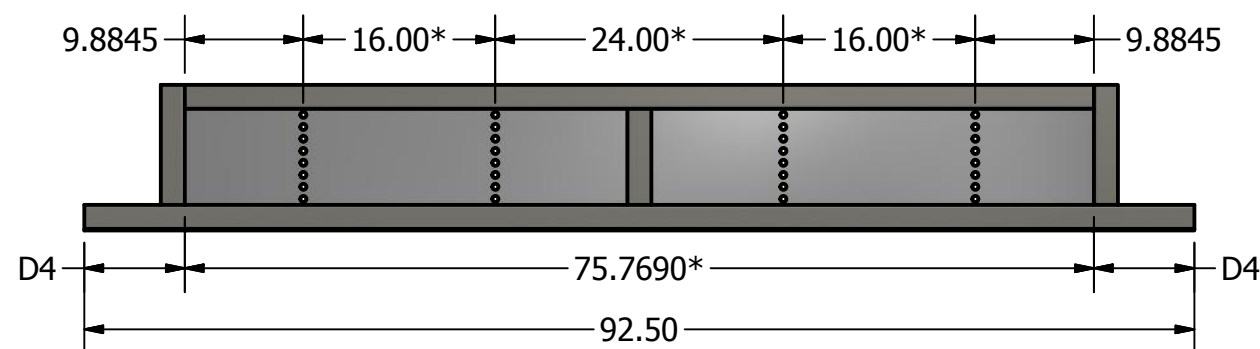


DETAIL A
SCALE: 1 / 2



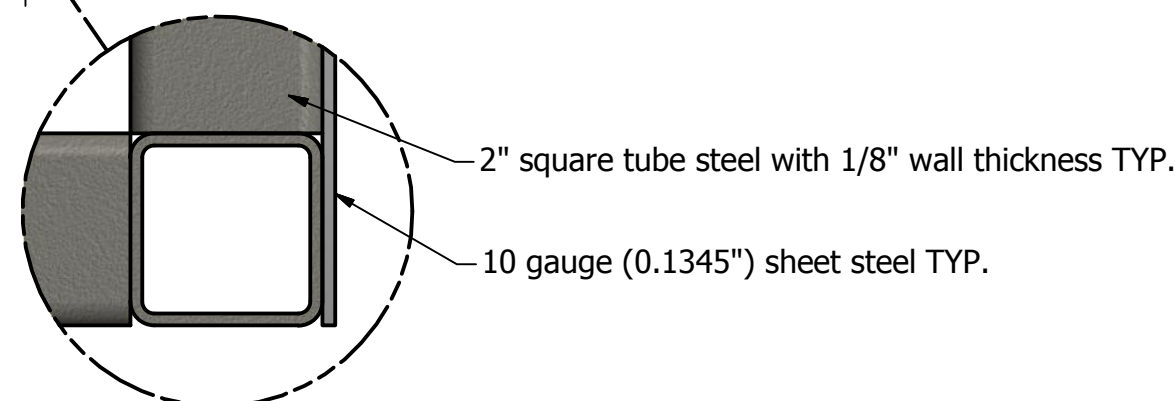
DETAIL B
SCALE: 1 / 4

8 holes, each with 0.5" diameter. Alternatively, this could be a slot with total length 7.5".



Test Wall Frame

SCALE: 1/16

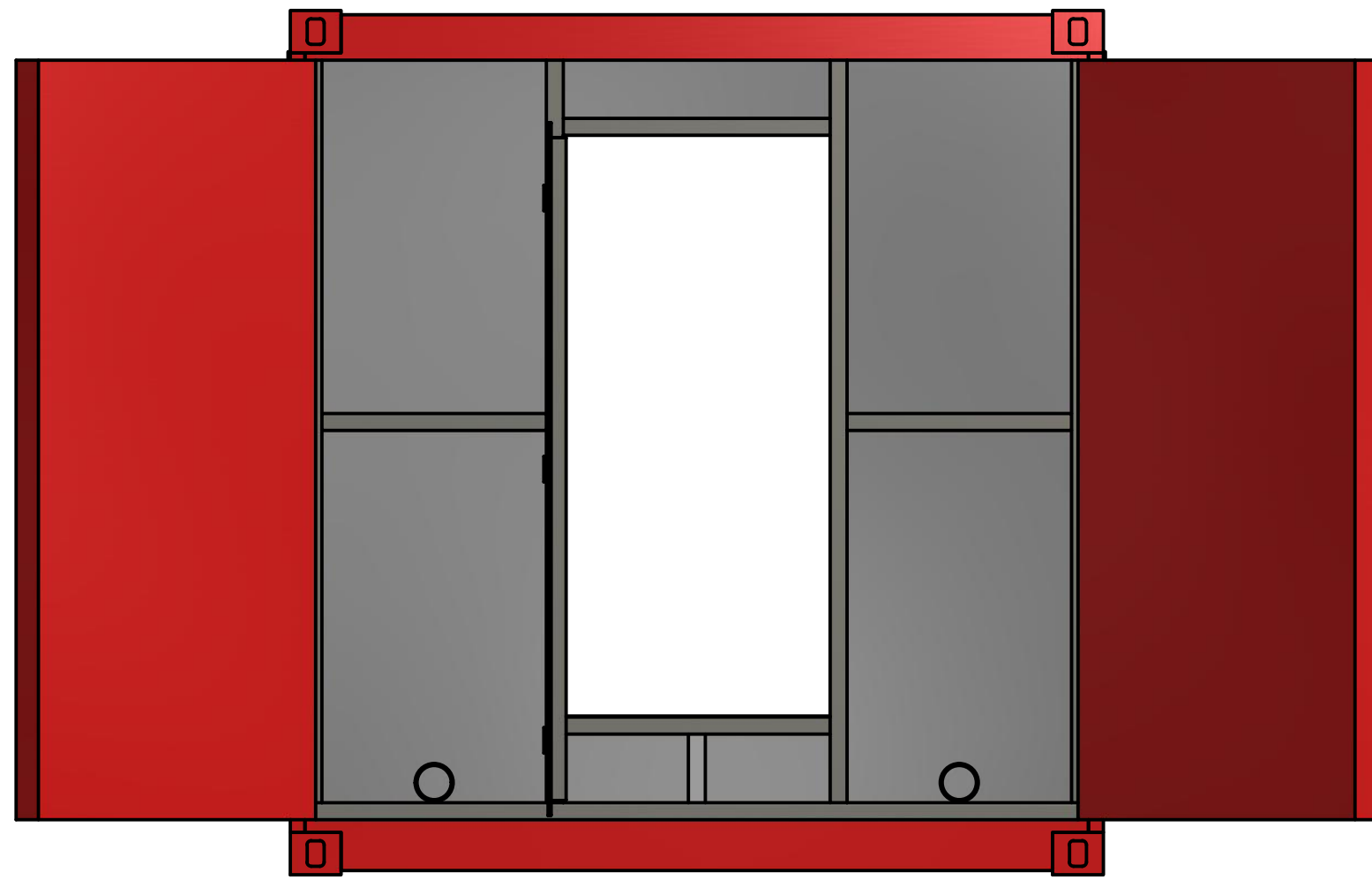


DETAIL C
SCALE: 1 / 2

UW Intermediate-Scale Fire Endurance Test Apparatus

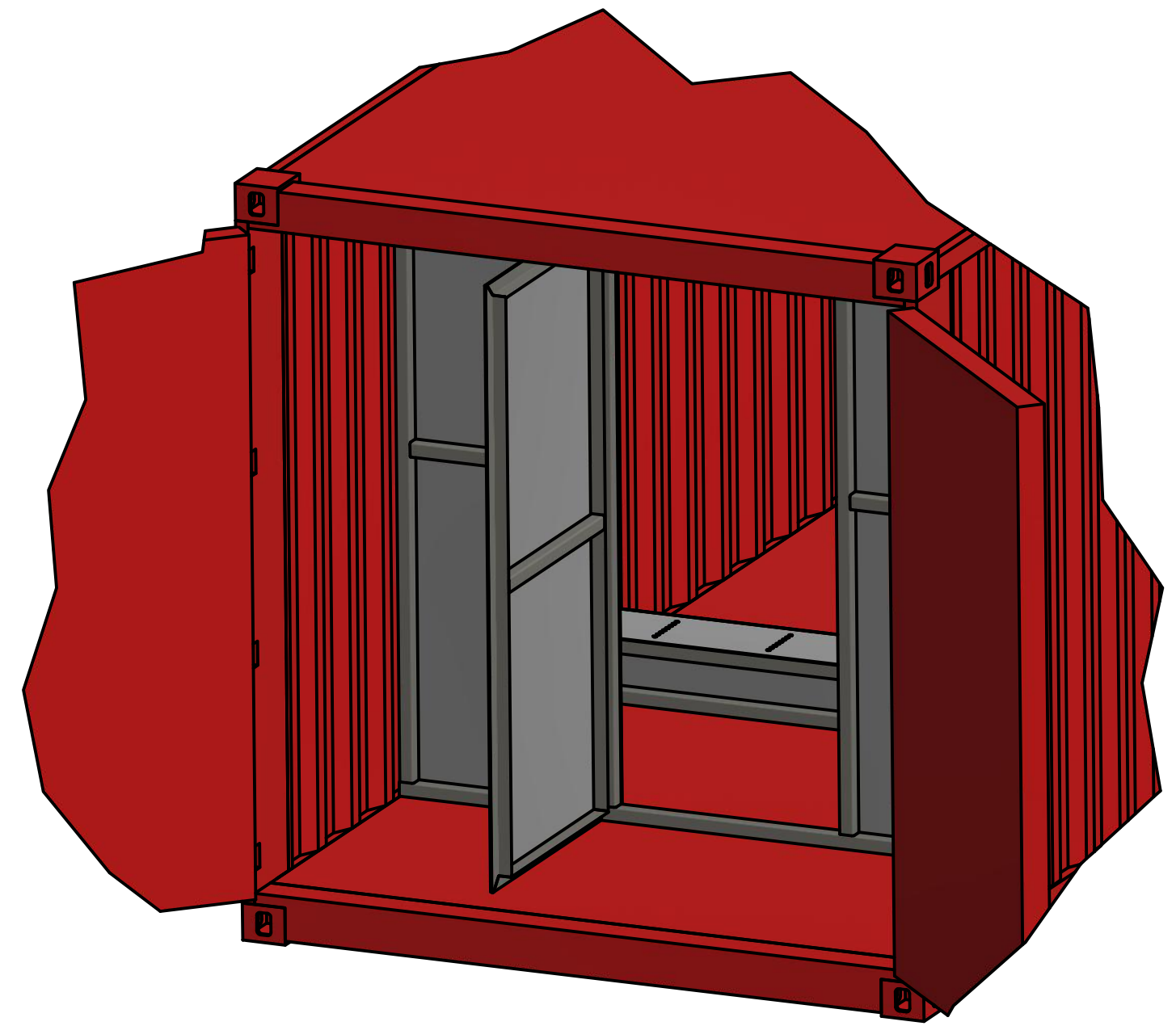
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SHEET SIZE: C
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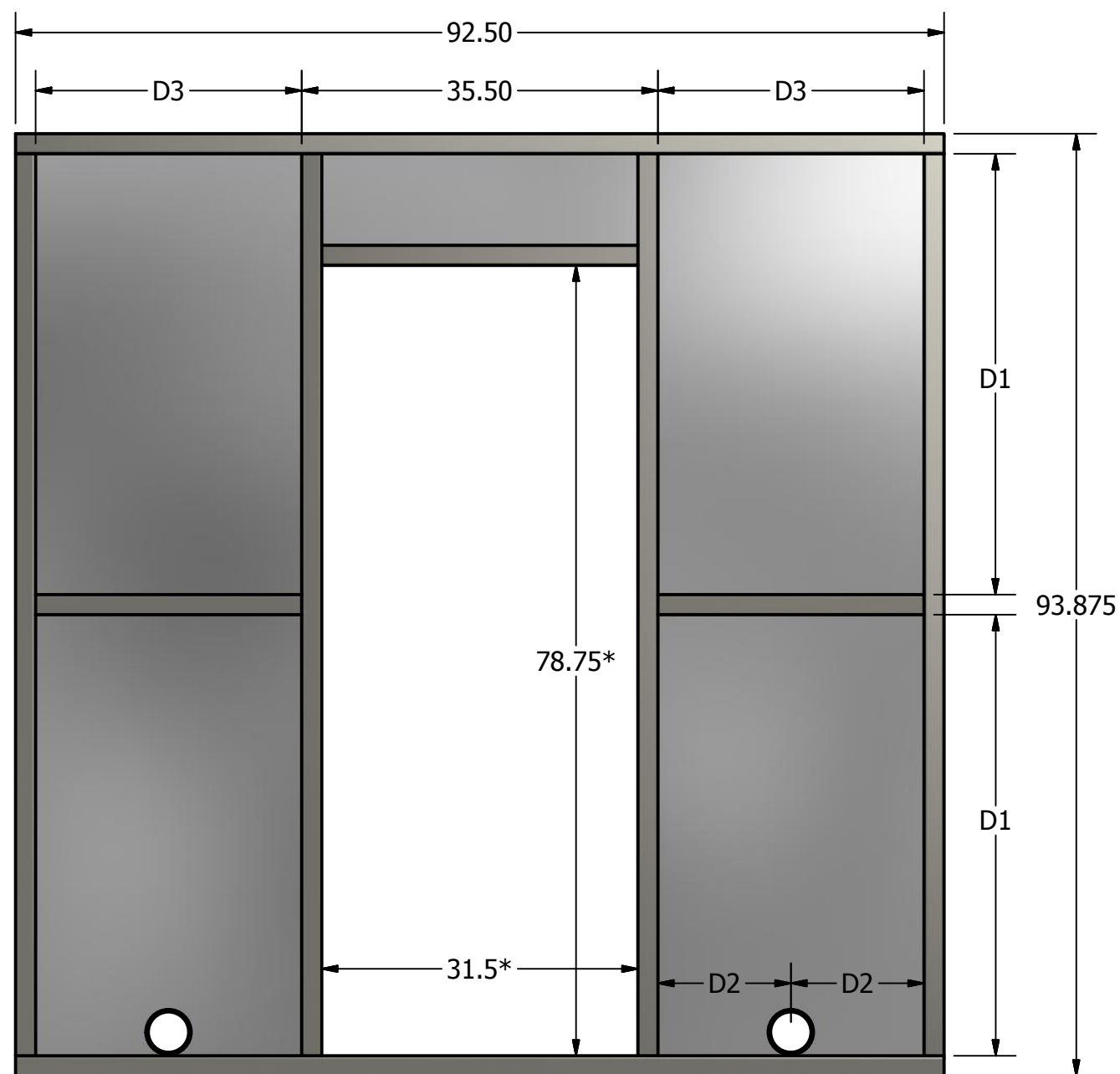
Rear Door Frame

SCALE: 1/20



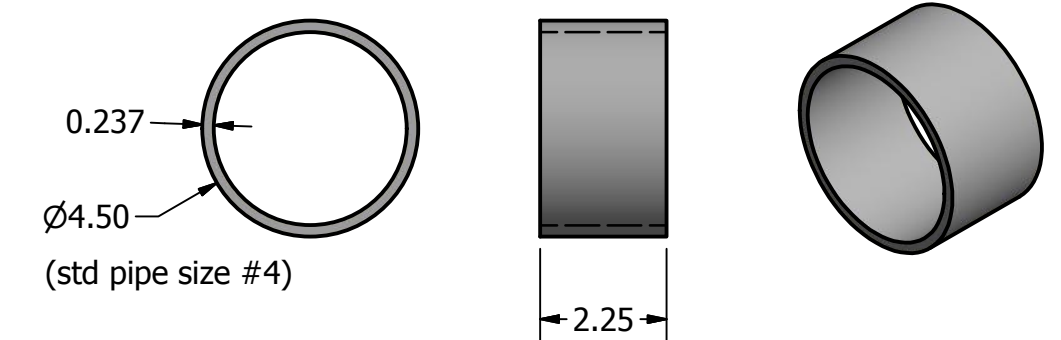
Rear Door Frame (Detail 1)

SCALE: 1/20



Rear Door Frame (Detail 2)

SCALE: 1/16



Access Pipes

SCALE: 1/4

Note 1: Pipe depth of 2.25" is TYP.

Note 2: Access pipes to be stuffed with fibre insulation when not in use.

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