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Introduction:

- Modification of the furnace lid is to allow for magnesium to be placed in the furnace without opening the full lid and being able to remove the small amount of magnesium with the cauldron to then pour into the cast
- Like blacksmithing where a pot is removed from the furnace rather than the whole furnace be used to pour a mold, the goal is to be able to remove the pot of magnesium
- The reason why magnesium casting is so important is because it is an extremely light metal and very strong
- Magnesium has a very similar melting point to aluminum, but magnesium needs to be controlled by argon gas
- The melting temperature for aluminum is 660.3 Celsius while the melting temperature of magnesium is 650 degrees Celsius

Changes from original:

- The modification of the furnace is to add a hole with a diameter of 23cm on the lid along with an easier way to add to the furnace with a scissor-like cover
- This allows for an additional hatch that gives easier access to the heated interior and more control of the metal.

Original furnace internal lid

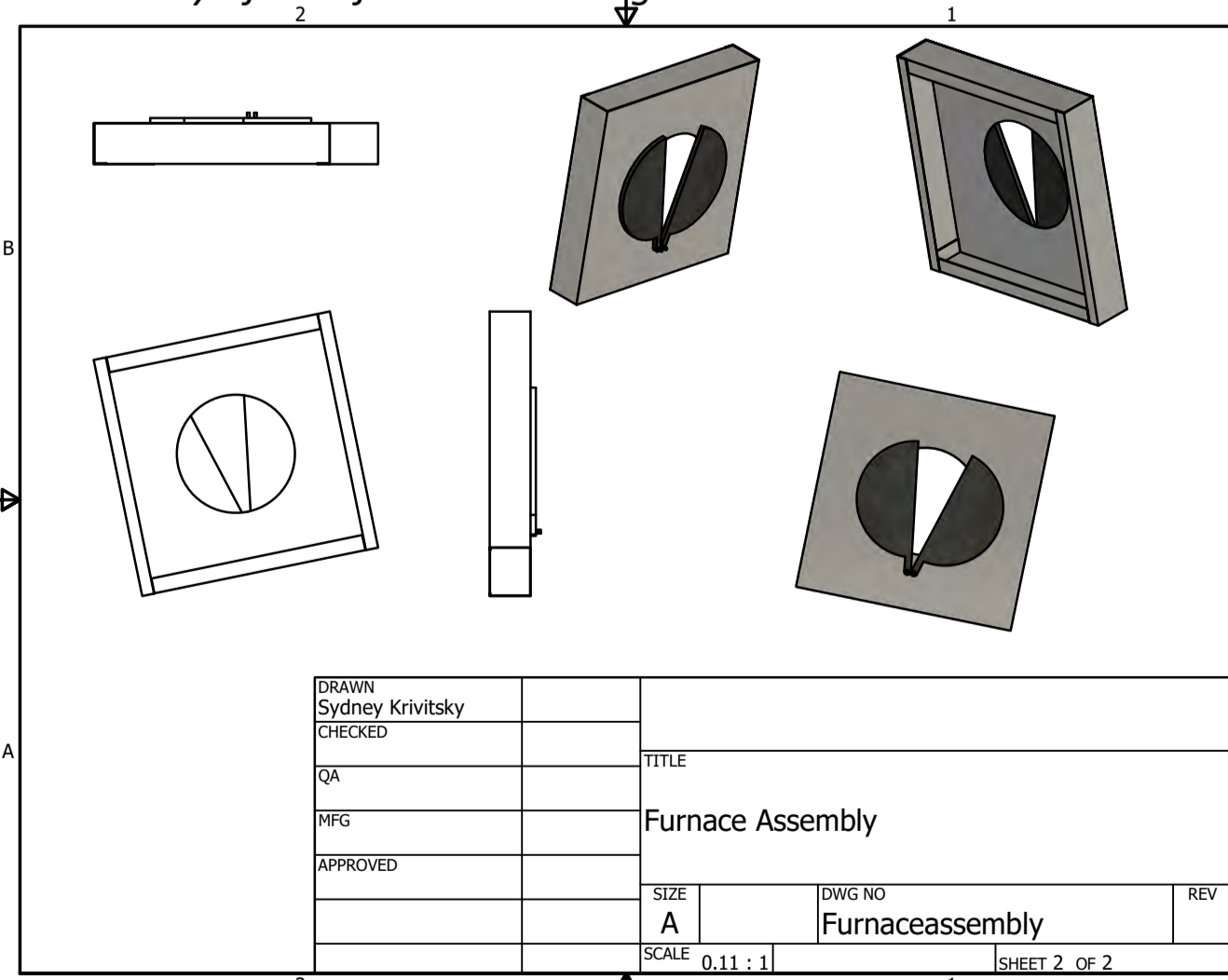


Original furnace and lid design compared to new design:

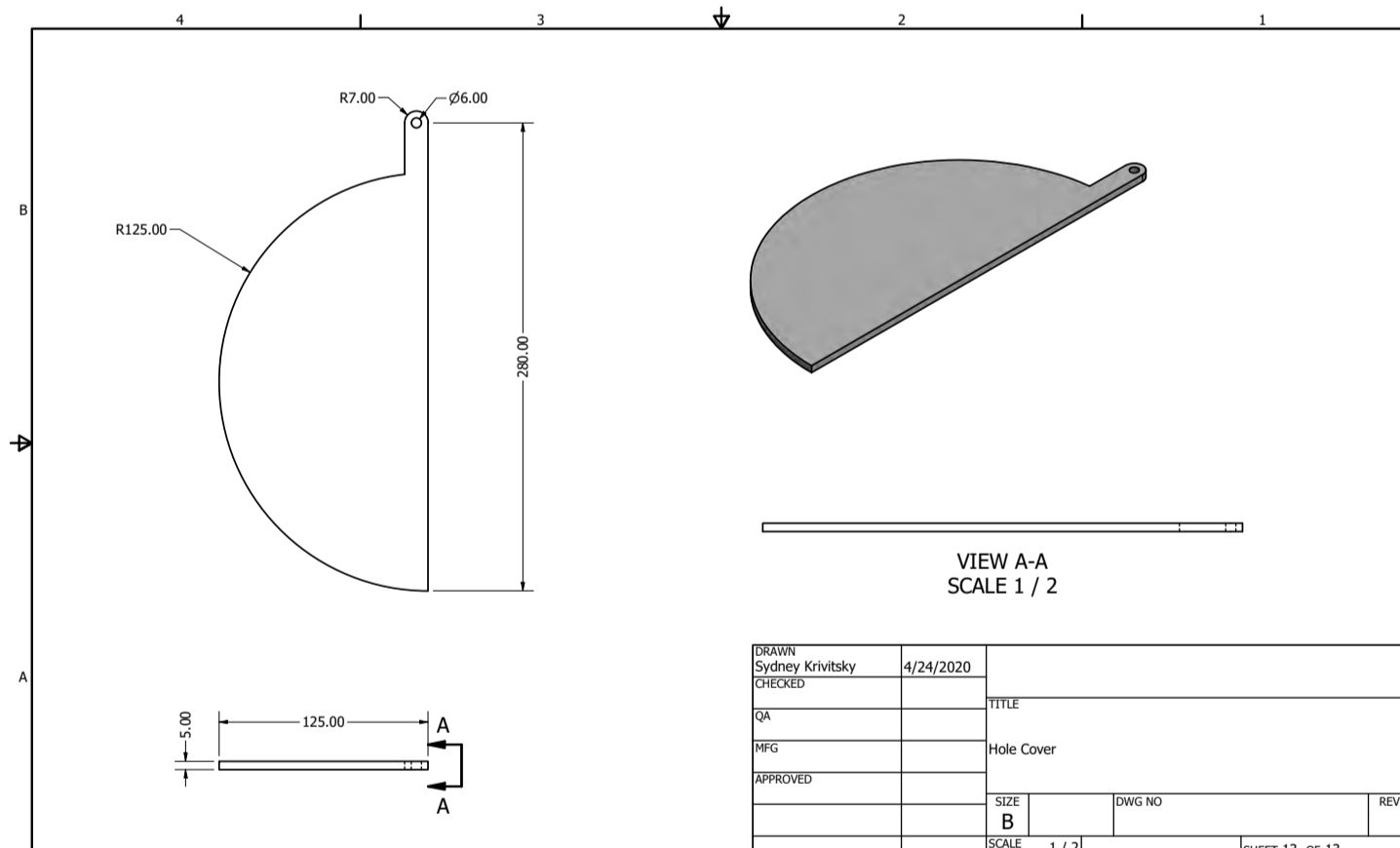


Capacity: 0,75 litres: 2 kg Al
Melting performance (100%): approx. 6 kg/h Al
Weight: 80 kg
Outside dimensions: 520 x 680 x 660 mm (WxDxH)

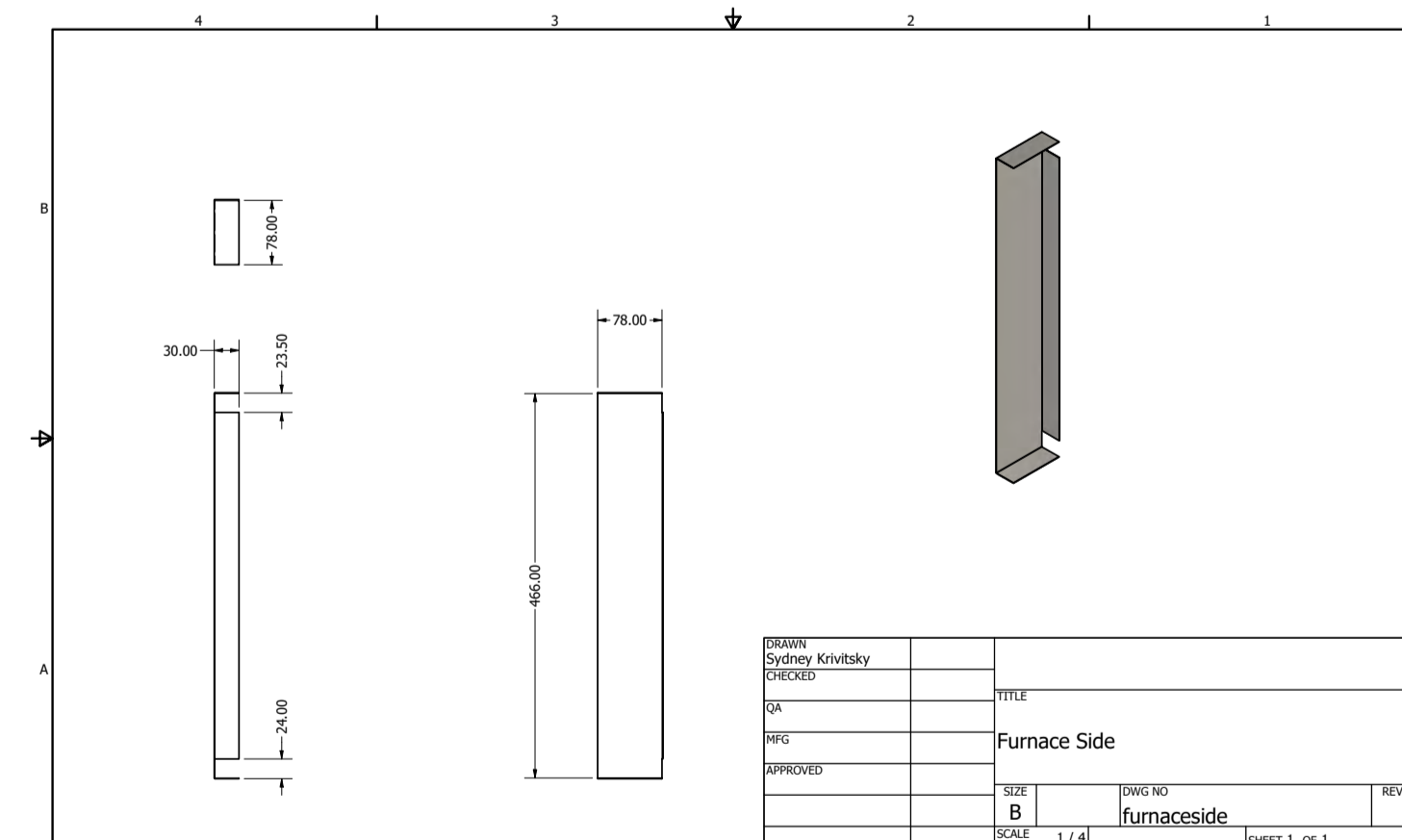
Assembly of new furnace lid design



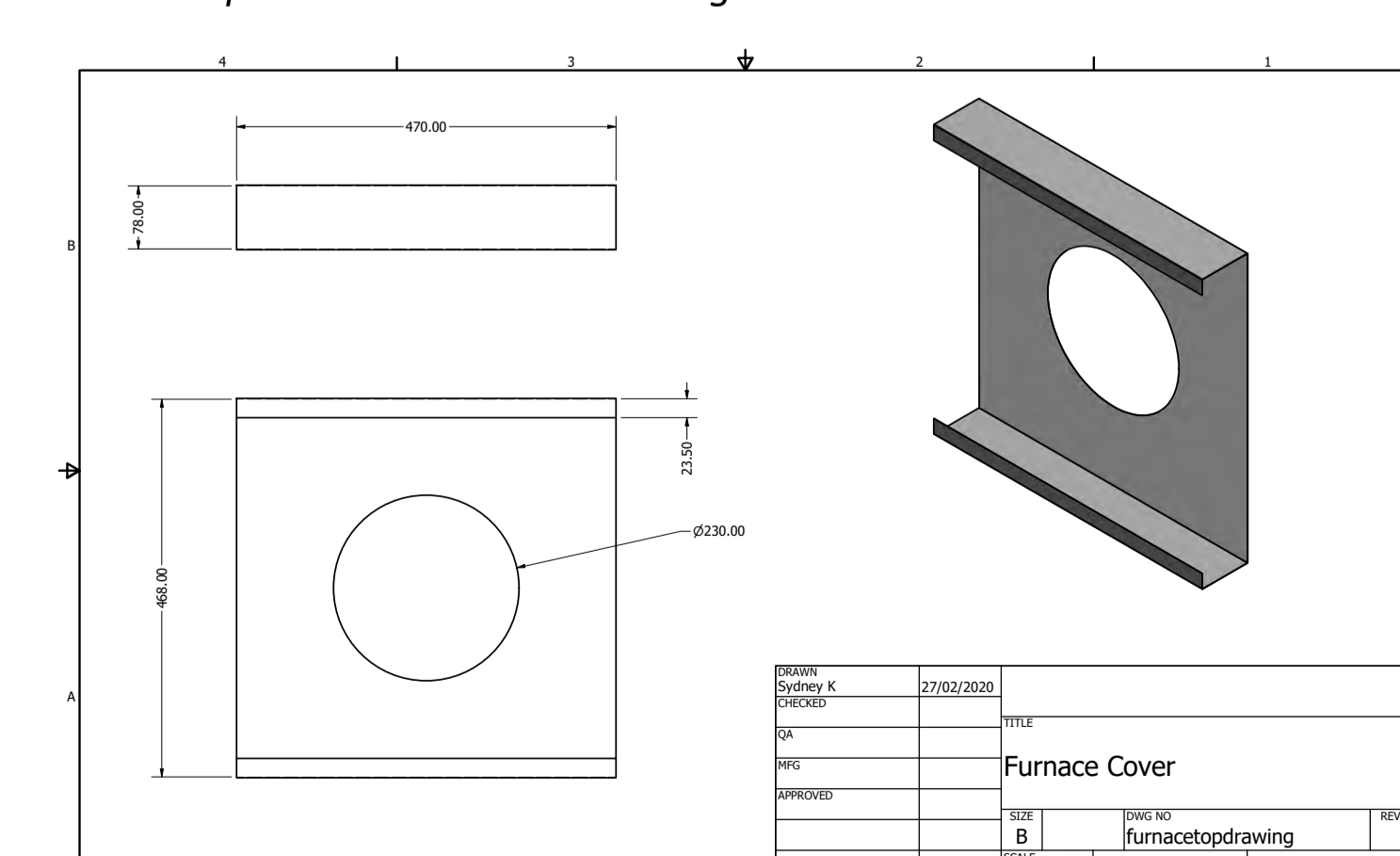
Furnace hole cover for new kid design



Furnace side cover



Furnace top cover with new hole design



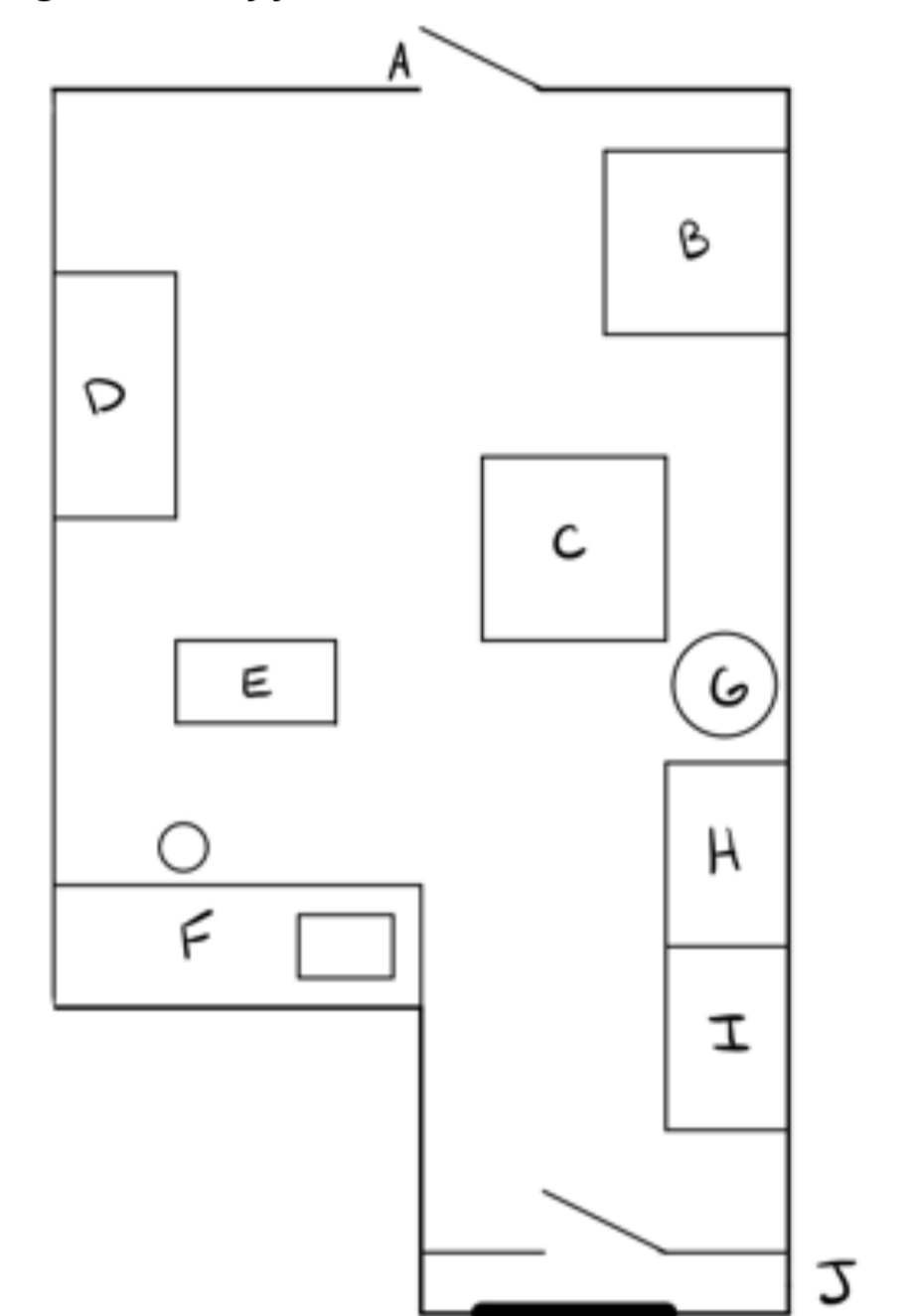
Modification of furnace:

- The below drawing includes the 23cm diameter hole on the lid while the original furnace lid did not have that. For future modification, the 23cm diameter hole within the drawing should be ignored.
- There are three steel metal parts to the lid of the furnace that are then combined with insulation to create the lid.
- There are two metals parts to the cover of the hole created they are symmetrical and only need one drawing of.
- There is the main cover where the 23cm diameter circle is cut out of and the two side covers that are identical, then the cover of the hole so there are only three CAD drawings needed to show the full dimensions of the lid.

Safety precautions:

- When using the furnace, a welding helmet must be worn as well as body protection such as waders and a jacket.
- Thermally protected gloves must always be worn along with closed toed shoes and bootie covers.
- All the safety equipment can be found in the first cabinet on the right as you walk into the lab which assures that you do not go near the furnace without the proper safety attire.
- Assure that those outside of the laboratory are aware that the furnace is on and to not be disturbed.
- There must be at least two others in the laboratory when the furnace is on to assure safety and assistance in case of an emergency.

Rough sketch of furnace lab



- A: Emergency exit, B: Furnace B (for larger metal amounts), C: Focused furnace, D: Supply closet (holds extra supplied such as metal, gloves, batteries, paper), E: Table with wheels, F: Sink and table with stool, G: Argon gas, H: Safety cabinet B (holds gloves, aprons, bootie covers), I: Safety cabinet A (Hold goggles, masks, and bodysuits), J: Double safety door (heat protected)

Procedure:

1. Assure all safety attire is in place such as clothing and air vent.
2. When the furnace is on, assure that those outside the lab are aware and do not disturb.
3. Prepare the mold where the metal will be poured into.
4. Once metal is melted, open the lid and prepare for turning the furnace.
5. Mold should be below the spout of the furnace.
6. The finished cast can be wheeled away, and the furnace must be returned to its original horizontal.
7. Excess metal will be removed once the furnace has cooled down to be saved for another mold.

Goal Comparison:

Images courtesy of anonymous German company



- Rather than manipulating the original lid, the goal was to make a new lid that would replace the original with the hole for the magnesium heating