**Electromagnet Crane**

**Bill of Materials**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number | Part | Length | Width | Thickness | notes |
| 1 | Bottom | 6.2 cm (battery) | 4 cm | 1 cm | Rectangular: Slightly longer than the battery |
| 2 | Back | 14 cm | 4 cm | 1 cm | Rectangular |
| 3 | Front  | 6.5cm | 4 cm | 1 cm | (Notched for boom) |
| 4 | Top | 4.5 cm  | 4.5 | 1 cm | Notched for switch and lever. Back terminal strip must be in place before glueing this on. |
| 5 | Boom | 20 cm | 1.5 | 1 cm | Hole drilled in end for pivot nail (Mobile Joint). Position in place after front terminal is screwed on. |
| 6 | Sides (Plywood) | 14 cm | 8.2 cm | 0.4 cm | Glue on only after boom and lever are nailed in place. |
| 7 | Back terminal/switch | 18 cm | 1.5 cm | Sheet Metal | Screw hole punched 7cm up from the bottom. Fastened before top is glued in place. |
| 8 | Front Terminal | 9 c | 1.5 cm | Sheet Metal | Hole is punch 1 cm from the bottom. Position before boom is in place. |



**Day One:**

1. Lab Tour/Safety

Preparation: Magnets, Meter, Batter

 Scrap to practice cutting

 1 cm x 4 cm strips

 Name Tags

1. Shoes and Safety Glasses
2. Fool around/run/throwing
3. Distractions and distracting
4. Fire/lockdown
5. Magnets, Electromagnets
6. Are magnets magic
7. What materials will a magnet attract
8. Usefulness of a magnet that can turn on and off (Jointer feather board turns on and off- can be repositioned
9. Electro Magnet
10. Electricity FLOWS negative to positive. Wire is a conductor to allow the flow. Resistance and voltage
11. Cutting Wood
12. Vise safety
13. Margin of Safety, stay put, avoid crowding
14. Carry and pass tools
15. Pull saw hand position, how to hold…hand margin of safety
16. Make Back/Bottom/Front- Glue together
17. Gluing and clamping

-Check that battery is shorter by a bit than the bottom

-Mr. Bain will cut the notch in the front

-you need more than 2 hands-glue is slippery

-setting a clamp

-how much glue

-three important times when gluing

1. Clean-up-Tidy work area

**Day Two: Prepare:** Metal strips 1.5 cm wide. Punch, files, Sheet metal screws, nut driver

1. Sheet Metal-Sharp
2. Punch-Watch Pinch Points
3. Electric Drill-Speed, Direction, Bits, Chuck
4. Cut Boom and lever
5. Drill Boom and Lever
6. Make and Screw in terminals
7. Glue on Top-Wait 20 minutes

**Day Three: Prep:** Arrange for grade 8s to help drill press 8:45 – 9:45 and 10:15 – 11:15

Plywood sides cut to size. Cut base pieces 15 cm x 10 cm x 2 cm. Drill, wire and sandpaper

1. Cut sides to shape

Insert boom and lever before you put on the sides. Glue on the sides and let the glue set.

1. Making the Base

Drill holes for wheels

Drill hole in center for pivot screw

Squeeze on wheels with a clamp

1. Make the Electromagnet

**Day Four**

1. Electricity-Electrical Connections

**Day Five**

1. Make the Lever Work
2. Attach Base