

CHAPTER THREE: METHODOLOGY

3.1 Design Considerations

The door was designed to be:

- 1800 mm height × 1200 mm width (600 mm per panel)
- Reinforced with internal stiffeners
- Hinged on a mild steel frame with bolt locks

3.2 Material Selection

- Mild steel sheet (1.5 mm thick)
- Hollow square pipe (25 mm × 25 mm for frame)
- Hinges, lockset, angle bars
- Welding rods (E6013)
- The materials selected for the fabrication of the door were based on availability, cost, strength, and durability:
- Mild Steel Sheets (16-gauge): Used for the door panels due to their ease of welding and sufficient strength.
- Mild Steel Angle Bars (30mm x 30mm): Used for the door frame and panel reinforcement.
- Steel Hinges (Heavy-duty, 3"): For door mounting and operation.
- Metal Handles and Lockset: For functional entry and security.
- Electrodes (E6013): Used for Shielded Metal Arc Welding (SMAW).
- Red Oxide Primer and Enamel Paint: For corrosion resistance and final finishing.

3.2 Tools and Equipment Used

- Measuring Tape and Try Square – For accurate marking and squaring edges.
- Hack Saw/Angle Grinder – For cutting steel to size.
- Welding Machine (AC Arc Welder) – For joining metal parts using SMAW.

- Clamps – To hold workpieces in position during welding.
- Bench Vise – For holding components during grinding or shaping.
- Grinding Machine – For surface smoothing and weld clean-up.
- Paint Brush/Spray Gun – For applying finishing coats.

3.3 Design and Construction Process

3.4 Step 1: Design Drafting

- A manual sketch and basic CAD drawing were prepared to outline the dimensions and structural layout of the door (1980 mm x 900 mm).
- Step 2: Cutting of Materials
- Angle bars and mild steel sheets were marked and cut using an angle grinder according to the specified dimensions for the frame and panels
- Step 3: Frame Assembly
- The cut angle bars were tack-welded to form the outer frame. Diagonal measurements were checked to ensure squareness before final welding.

Step 4: Panel Fabrication

- Two mild steel sheets were cut and fitted within the frame to create twin panels. Vertical and horizontal stiffeners were added using flat bars for reinforcement.

Step 5: Welding

- All components were permanently welded, ensuring continuous welds for strength and minimizing weak joints.

Step 6: Grinding and Finishing

- Welds were ground smooth, and all surfaces cleaned to remove slag, rust, or dirt before painting.

Step 7: Priming and Painting

- A coat of red oxide primer was applied, followed by two coats of oil-based enamel paint for aesthetics and corrosion protection.

3.5 Assembly Techniques Hinges were attached using arc welding and aligned to ensure smooth swing action.

3.6 Finishing Processes

4.0 Personal Protective Equipment (PPE) like gloves, welding helmets, and boots were worn throughout.

5.0 Fire extinguishers were kept nearby due to flammable materials.

6.0 Welding was done in a well-ventilated area to prevent gas inhalation.