Lockbox Requirements Summary Document

# 1. Lockbox Components Overview

• Lockbox Shell: Main structure housing all internal components. Includes slots for rods and wiring channels.

• Door Panel: Removable door, supports keypad and lock bar. Hinges on one side.

• Top Panel: Lid of the lockbox. Removable for access.

• Hinge Rods: Cylindrical rods securing the door to shell.

• Lock Bar: Slides horizontally to secure or release door.

• Servo Motor: Drives the locking bar when correct input is detected.

• Mount: Holds servo motor securely to wall of the lockbox.

# 2. Electrical Integration Overview

## A. Binary Tree LED/Button System

- Install 31 tactile pushbuttons in a pyramid layout on a panel (6" × 6").

- Mount 31 corresponding LEDs above each button. Use 220Ω resistors in series.

- Connect all buttons and LEDs to 3 MCP23017 GPIO expanders via I2C.

- Use pull-up resistors (~10kΩ) for each button input line.

- Debounce buttons in software or with capacitors (~0.1µF).

- Run wires through small printed holes from the external button panel to inside the lockbox.

## B. Keypad Input

- Use a 3x3 matrix keypad (1–9). Mount flush into the door panel.

- Wires should route into the interior through pre-drilled holes or pass-throughs.

- Each button connects to GPIO or additional MCP23017 pins.

- PIN code is stored and compared in software after tree sequence success.

## C. Servo Motor and Lock Bar Control

- Mount the servo to its printed mount and secure against the lockbox wall using screws.

- The servo arm connects to the lock bar. Rotation causes horizontal slide.

- Ensure free movement within the lock bar tunnel. Test manually before wiring.

- Power the servo separately with 5V, ideally not from Pi’s internal rail.

## D. Power & Raspberry Pi Setup

- Raspberry Pi 4 recommended. Mount internally or externally based on space.

- Use a 5V 3A power supply to ensure stable operation.

- Connect SDA (GPIO2) and SCL (GPIO3) for I2C control to MCP23017 expanders.

- Use common GND for Pi, LEDs, keypad, and servo.

- Optional UPS HAT or battery backup for secure boot and uptime.

## E. Wiring Management

- Use color-coded jumper wires for clarity.

- Use cable ties, adhesive clips, or glue paths to manage interior wiring.

- Reserve openings in shell for routing external wires or extensions as needed.