Requirement Traceability Matrix

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ID	Requirement	Implemented By	Tested By
R1	The system must allow variable numbers of passengers, floors, and elevators.	SimulationController, ElevatorController, Passenger, Floor	Unit tests for variable setup in SimulationControllerTest
R2	Simulation time must start at 0 and progress until all events are handled.	SimulationController (processNextEvent(), timer)	Integration test verifying time progression in SimulationTest
R3	Simulation starts with a “Start” button and proceeds one time step at a time.	SimulationController (start(), pause(), resume(), stop())	GUI test: Button click triggers start(), step-by-step validation
R4	The elevator location and state (idle, moving, etc.) must be displayed in the GUI.	Elevator (currentFloor, state), MainWindow updates	GUI test: Elevator moves floor-by-floor, state changes correctly
R5	Elevator movement must be step-by-step, not teleporting between floors.	ElevatorController, Elevator, Floor	Unit test: Verify elevator moves sequentially
R6	Passengers must be able to press floor buttons in the elevator.	PassengerAction (floorButtonPress signal)	Unit test: Trigger floorButtonPress and verify elevator response

R7	Passengers must be able to press floor call buttons on a floor.	PassengerAction (directionButtonPress) → ElevatorController (handleFloorButton)	Unit test: Verify floor button requests queue up in ElevatorControllerTest
R8	Elevator doors must open for a fixed time (10 seconds) before closing.	Elevator (openDoors(), closeDoors())	Unit test: Verify doors stay open for 10s
R9	Passengers can override default door timing using "open" and "close" buttons.	PassengerAction (openButtonPress, closeButtonPress) → Elevator	Unit test: Verify doors stay open/close prematurely when buttons are pressed
R10	An elevator must ring a bell when it arrives at a floor.	Elevator (bellRing() signal)	Unit test: Check bellRing() emits when reaching a floor
R11	Each elevator must have a sensor to detect when it arrives at a floor.	Elevator (checkArrival())	Unit test: Verify elevator stops at correct floor
R12	Elevator control system should service requests efficiently.	ElevatorController (Request handling logic)	Performance test: Verify requests are handled with minimal delay
R13	Elevator displays and audio must show floor number and warnings.	Elevator (updateDisplay(), playWarningAudio())	GUI test: Verify UI updates and audio playback
R14	Passengers must be able to request help via a "help" button.	PassengerAction (helpButtonPress signal)	Unit test: Verify help signal triggers appropriate system response

R15	The system must log passenger actions and system responses.	SimulationController, MainWindow	Integration test: Verify expected logs for a simulation run
R16	Administrator can pause, continue, and stop the simulation.	SimulationController (pause(), resume(), stop())	GUI test: Verify button interactions trigger the correct actions
R17	Administrator must be able to configure safety events.	SafetyEvent, SimulationController	Unit test: Ensure safety events trigger correctly at expected time steps