PART II – PRIMARY SYSTEMS INFORMATION

7. ELEVATORS

1. Operation

c. Normal Operating Instruction:

(1) Normal Operation: The elevator power system is fed from a disconnect switch located in the elevator machine room. Power-on sequencing, safety interlock operation, and basic elevator operation are all fully automatic. The elevator should not be shutdown by using the disconnect switch except by an elevator serviceman or in an emergency situation.

The elevator has an automatic "re-leveling circuit" which must be energized to be in working order.

(2) Selective-Collective Operation: For basic selective-collective operation, the elevator answers and remembers calls placed at the car-operating panel and at the hall stations. There are two hall call buttons at intermediate landings (up and down). When the elevator is traveling upward to answer calls (up car) it answers car calls and up hall calls in the order they are reached regardless of the order in which the car were placed. When all calls above the car have been answered, the elevator will reverse directions and travel downward (down car) to answer the calls and down hall call which have been placed below the car. An up car will bypass down hall calls and a down car will bypass up hall calls. When all calls below a down car have been answered, the elevator will reverse directions again to answer calls above the car.

(3) Operating Sequence: When a hall call button or a car call button is momentarily pressed, the elevator registers and remembers the call, travels to the indicated destination, opens the door and cancels the call then the door closes.

Before the door is fully closed, it may be reopened by:

-Pressing to correct hall call button for the car's direction of travel.

-Pressing the car call button for the car's direction of travel.

-Pressing the car call button for the landing the car is at.
-Pressing the DOOR OPEN button.
-Contacting the door safety edge.

Once the door is fully open it will recluse immediately. When the door has closed, the elevator proceeds to answer any remaining calls; then parks with the door closed.

(4) Safety Device: Activation for any of the safety devices or interlocks will immediately stop the car until the "safe" condition is restored. When it is again safe, normal operation resumes automatically and all registered calls are remembered.

The car will be stopped if:
-The emergency stop button is pulled.
-The car door is forced open.
-Any hall door interlock is malfunctioning.

(5) Access and Inspection Option: Elevator maintenance people only should enter the elevator shaft to inspect and service hoist way equipment by using the access and inspect key switches and the car top controlled.

(6) Access: Ride or call the elevator to the top or bottom landing, and hold the door open. Turn the ACCESS key switch on the car operating panel to the "on" position to remove power from the door operator and call answering circuits; the elevator is now out of service with the door open. Turn the ACCESS key switch in the entrance doorjamb to the right or left to move up or down within safe limits set by limit switches in the hoist way. The car moves away from the entrance, it will allow the hall door to close. Hold it open if the hall door is allowed to close, you will be locked out, (If you are inside the hoist way, you cannot be locked in).

(7) Inspect: After the car has been moved from the top landing, it may be run up and down the shaft at leveling speed from the car top controlled. Close the INSPECT switch on the controller and then press the UP or DOWN buttons. The car and hall doors must be closed before the car can move. (The UP and DOWN buttons will signal the car door to close).

(8) Restoring Normal Service: Restore normal service by leveling the car to the top or bottom landing with the hall ACCESS key switch (the INSPECT switch must be in the NORM POSITION); manually open the car door, and then return the ACCESS key switch in the car to its normal position.

(9) Independent Service Option: Independent service is selected on the key switch in the car-operating panel (COP); an elevator on independent service bypasses all hall calls and answers only calls placed at the COP by the attendant. When the car stops at a landing, it parks with the door open to allow loading or unloading. To close the door, continuously press the car call button for the next destination until the door has fully closed; releasing the button prematurely will reopen the door. To restore normal service, simply return the key switch to the RUN position.

(10) Pump Motor and Pump Operation Instruction: The pump motor is a three-phase induction motor. The rotation speed of this type of motor depends upon the line frequency and is nearly 3440 RPM, for all loads. The inter-meshing screw type pump produces a smooth flow of oil, which is nearly constant for a fired pump speed, regardless of output pressure. The pump is protected from over pressure by a relief valve in the hydraulic valve assembly. The motor is protected for overheating by an overload heater relay which drops power to the motor starter contractors.

(11) Unit Valve Operating Sequence: The Unit Valve is a series of solenoid-controlled valve: pressure relief valve, manual lowering valve and two check valves combined in one assembly and utilized to direct the flow of oil to and from the car jack the solenoid-controlled valves functionally provide for valves, but physically consist for two piston (UP and DOWN) valves, with two solenoid-actuated hydraulic control circuits to each valve. When an up call is registered and the pump starts, the up solenoid (U) and the up stop solenoid (US), are simultaneously energized, the pump output flows temporarily through the up valve and back to the tank, before directing the flow to the jack, for a smooth start.

(12) Selective-Collective Operation:

(A) Car at Rest-Solenoid Coils De-energized: The car at rest is held by a hydraulic fluid

system locked in place by a check valve, down valve, solenoid pilot valve and a manual lowering valve.

(B) Up Direction: When an up call is registered and the pump starts, the up solenoid (U) and the up stop solenoid (US) are simultaneously energized, closing ball checks 1 and 2, the pump output flows through the up valve and back to the reservoir.

Hydraulic fluid from the pump travels through the up control fluid strainer to the by-pass sizing adjustment, then to the control side of the up piston. The control side of the up pistons larger in area than the area of the up piston Exposed to the pressure; therefore, the up piston begins to move rapidly forward, retracting the opening in the up valve, raising the pump pressure. When the pump pressure reaches a point slightly below the pressure on the Ram side of the check, the fluid coming through the by-pass sizing Adjustment is shut off. Then fluid from the up acceleration adjustment (UA), which also comes from the control fluid strainer, causes a continuing Movement of the up valve.

Fluid begins from the up control fluid strainer through a ball check to the down piston holding it firmly in position. This allows the guide and has the down checks assembly to act independently as a check valve. As the pump pressure increases above that on ram side of the check valve, the check valve is opened, allow fluid to flow to the ram cylinder, causing movement of the ram in the up direction. The elevator the Accelerates to full speed as the up piston closes the valve.

Upon reaching a predetermined distance below the floor to which the car is traveling (6 inches for each 25 feet per minute of car speed), the up solenoid (U) is de-energized, allowing fluid from the control side of the

up piston to flow through the up transition adjustment (UT), then to the up leveling speed regulator the orifice of which is held open by mechanical linkage attached to the check valve. The control fluid then returns to the reservoir and the up piston moves toward the open position. As the up piston moves, opening the up valve, hydraulic fluid begins flowing to the reservoir, reducing the pump pressure. As the pump pressure is reduced, the check valve begins closing, also, partially closing the orifice in the up leveling speed regulator linked mechanically to the check valve.

When the flow through the orifice in the up leveling speed regulator (LS) equals in quantity, the flow through the maximum up acceleration orifice (UA) and the up leveling adjustment (UL) the car will be in leveling speed. Upon reaching a point slightly before the floor (usually 3/8 of an inch to ¼ of an inch), the up stop solenoid (US) is de-energized. This allows fluid to flow through the up stop adjustment (US), causing the up piston to fully open, permitting the total pump output to flow to the reservoir, causing the car to stop. After the car comes to a complete stop, the pump motor is then electrically timed out and stops. If during up movement, the car has been overloaded or hits an obstruction, the fluid on the control side of the u piston is evacuated to the reservoir through the relief valve, causing the up piston to cycle open and by-pass the entire pump output.

(13) Down Direction: When a down call Is registered, the down leveling solenoid (DL and the down valve solenoid (D) are simultaneously energized, allowing fluid from the control side of the down piston and fluid from control adjustments, (Down Stop DS and Down Transition DT) to flow through the down acceleration adjustment (DA) and back to the reservoir. This reduces the pressure on the control side of the down piston. The pressure acting on the area of the down piston exposed to the ram pressure

then causes the down piston to open the down valve. The down valve will remain in the open piston as long as the flow of the control fluid passing through the down acceleration adjustment (DA) exceeds the flow through the down transition (DT) and the down stop adjustment (DS) the maximum door speed is controlled by a mechanical stop limit the down piston travel (Adjustment D).

Upon reaching a predetermined distance above the floor to which the car is traveling (6 inches for each 25 feet per minute of car speed) the down solenoid (D) is de-energized, the fluid input to the control side of the down piston from the ram continues, as the control side of the piston is larger in area than the area to ram pressure.

This causes the down piston to start closing. A control rod follows the movement of the piston, uncovering control porting and allowing fluid to flow through the down level adjustment (DL), which when equal in quantity to the flow through the down level adjustment (DT), stops the motion of the piston, placing the down valve in the leveling position. The rate of movement of the down piston from the open position to leveling position is controlled by the down transition adjustment (DT), upon reaching a point slightly before floor level, the down leveling solenoid (DL) is de-energized, causing the fluid coming through the down transition (DT) and the down stop (DS) adjusters to be diverted to the control side of the down piston, moving the down piston to the fully closed position of the down valve.

The final closing rate of the down valve is controlled by the down stop adjustment (DS). Opening the down stop adjustment (DS) will cause the car to sop more firmly, as control fluid is sent to the control side of the down piston at a more rapid rate.

IN NO CASE SHOULD THE SLOWDOWN DISTANCE EXCEED THE 6 INCHES FOR EACH 25 FEET PER MINUTE CAR SPEED. THIS RULE APPLIES TO BOTH UP AND DOWN ADJUSTMENT SEQUENCE.