IE 4466: Senior Design
El Paso Electric

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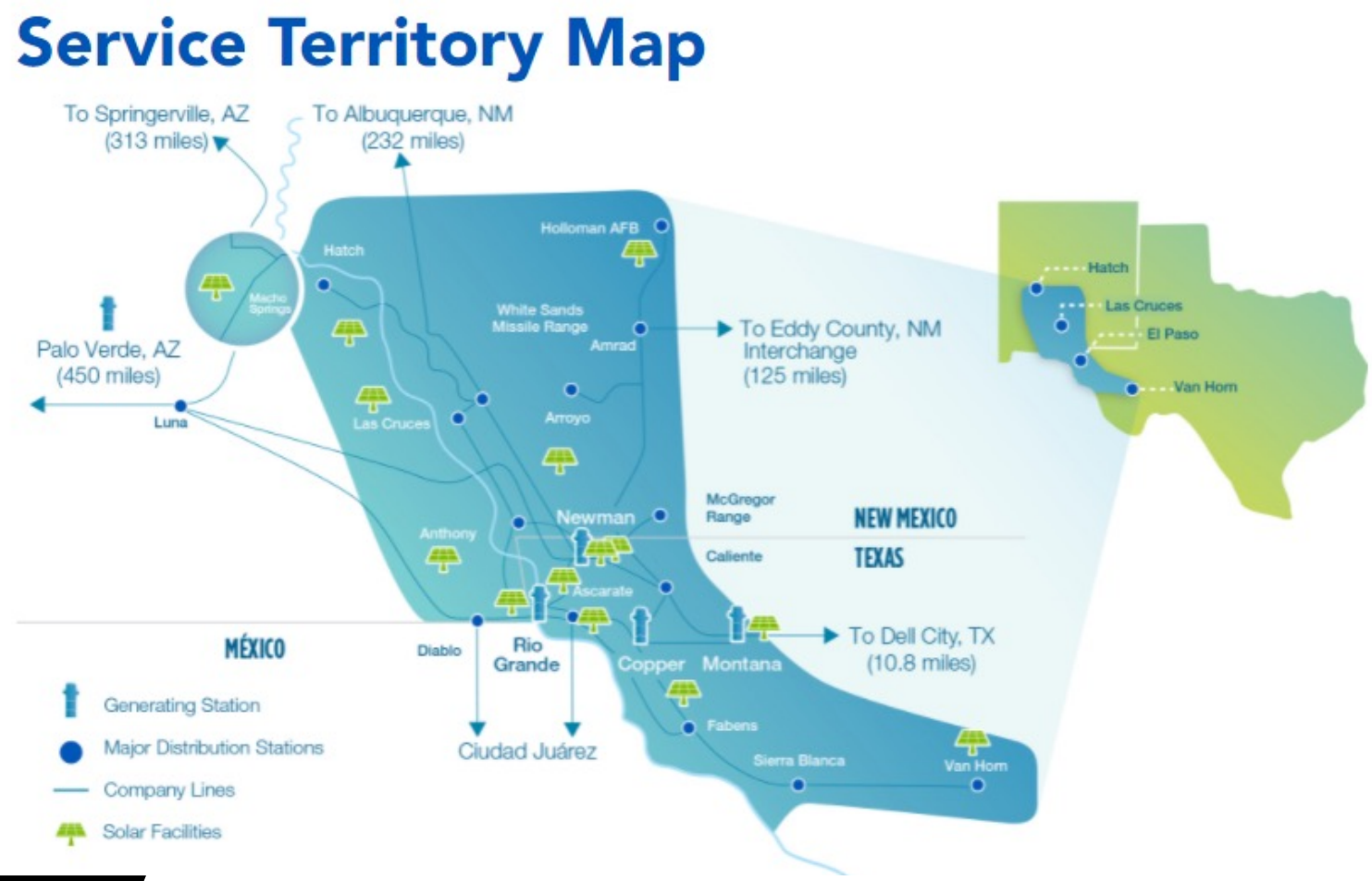
El Paso Electric Background

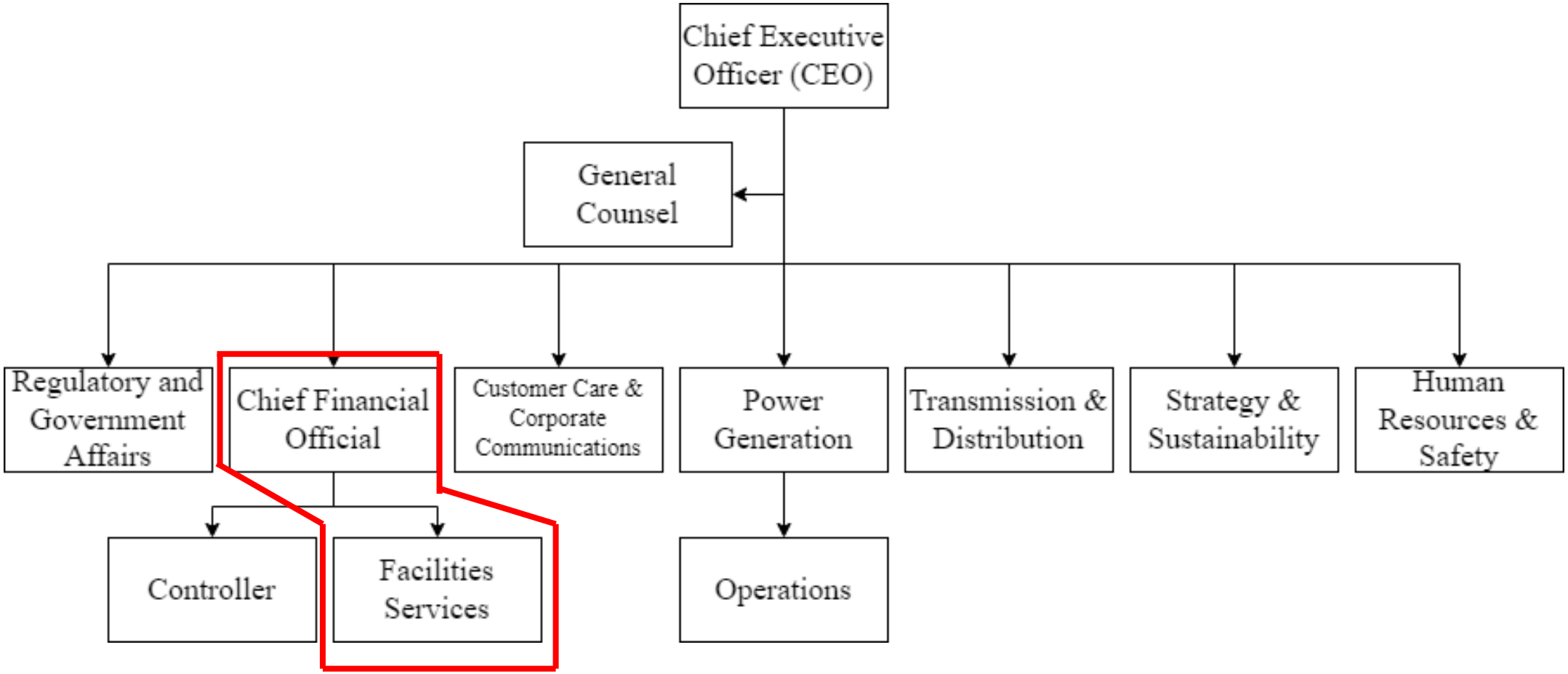
- Has served the *El Paso del Norte* area since 1901
- Generation, transmission and distribution of electricity from west Texas (Van Horn), to southern New Mexico (Hatch)
- Approximately, 20 buildings and more than 200 substations.



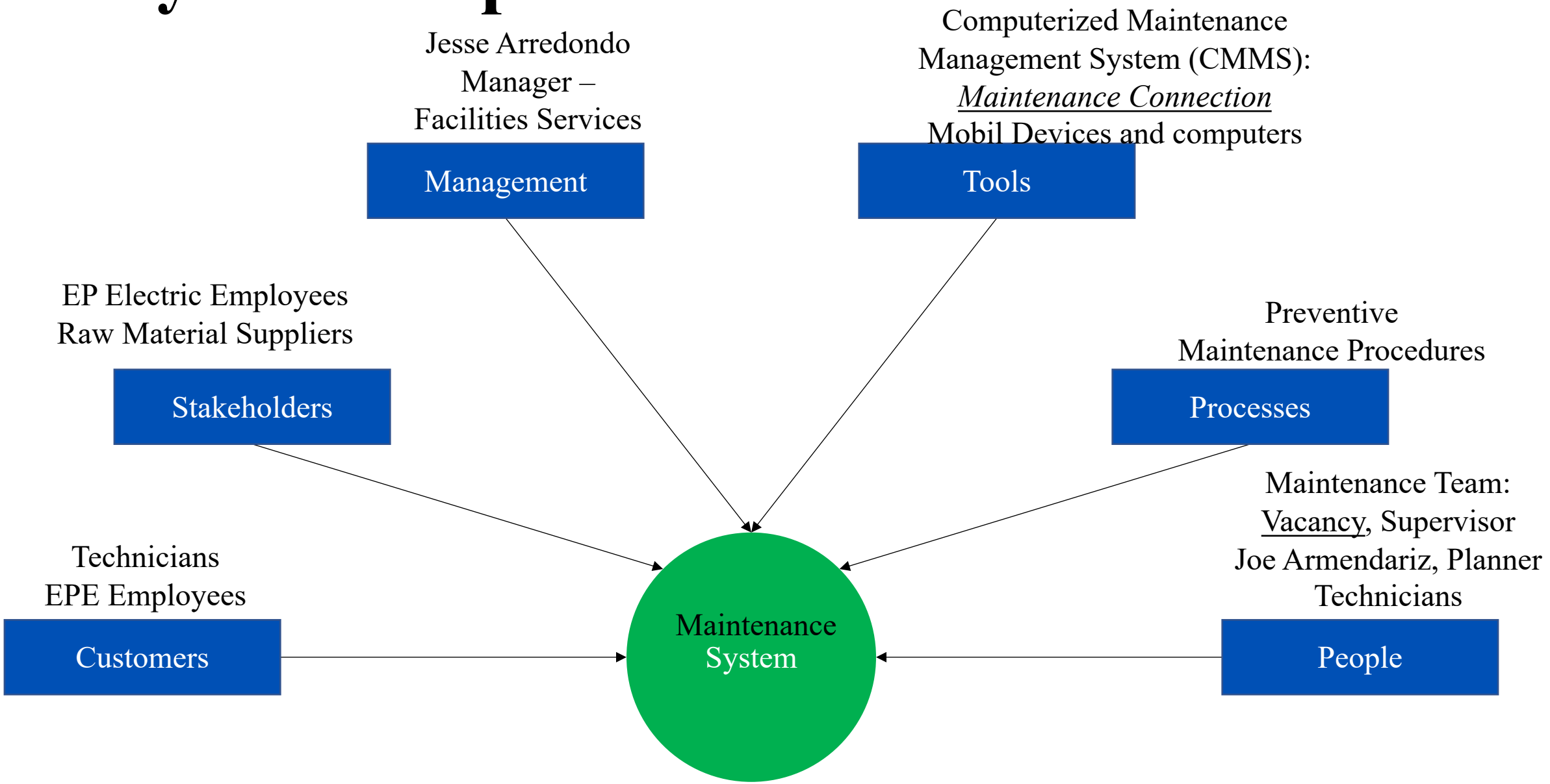
The Electric Company®

El Paso Electric

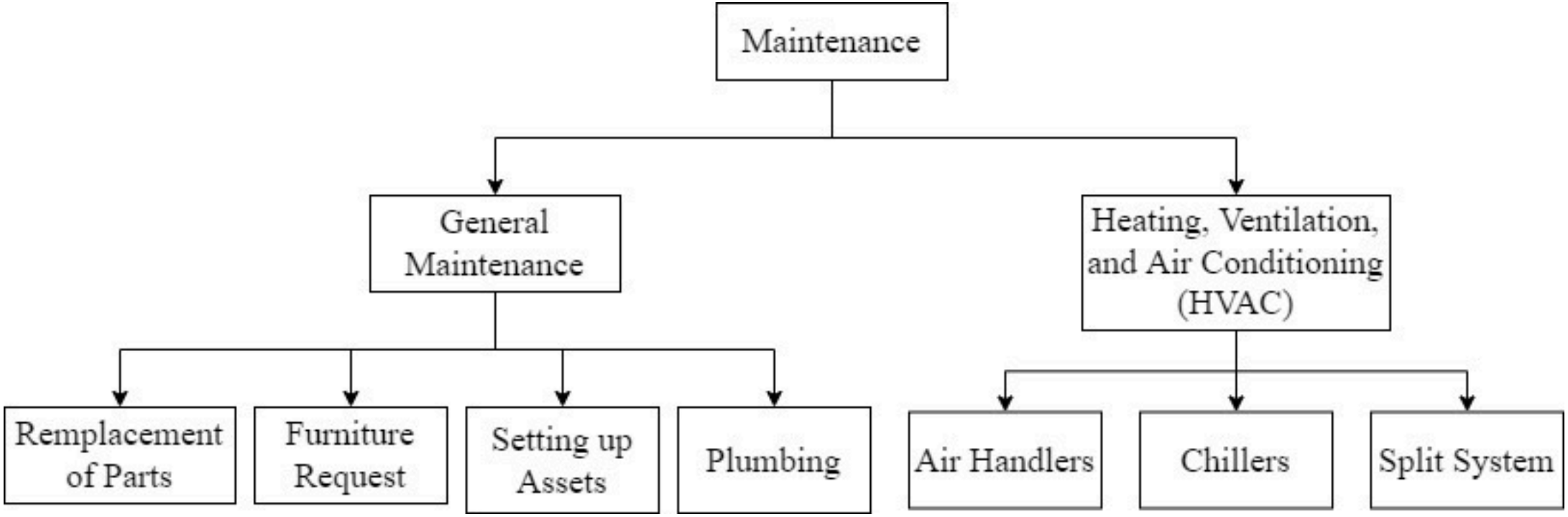
Organization Chart



Sub-System Scope - Maintenance

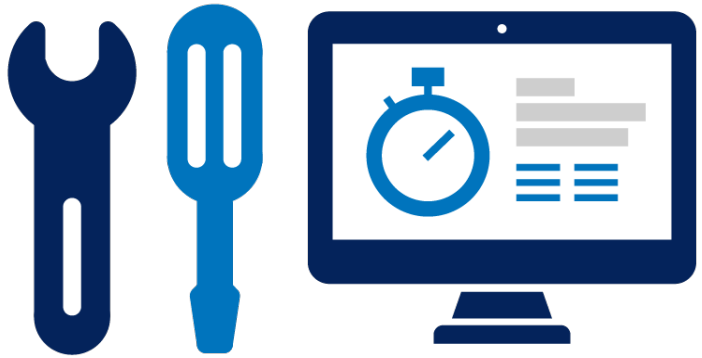


System Analysis



Computerized Maintenance Management System (CMMS) **Software**

- Centralizes maintenance information and facilitates the processes of maintenance operations.
- Helps optimize the utilization and availability of physical equipment (assets)
- Resource and labor management
- Asset registry/history
- Work order management
- Scheduling
- Materials and inventory management



Technician Day

- **The technician:**
  - Meets with the facilities team at Hawkins in the morning (online or in-person) to review daily schedule, safety issues, and general business.
  - Receives the call of the Facility Services Planner to check the PM Work Order
  - Goes to the asset location and performs daily PM tasks
  - Opens the CMMS Application on his mobile device to check the maintenance steps
  - Closes any electrical or water supply to the asset Lock Out Tag Out (LOTO)]
  - Checks each step covered on the app until all the steps are completed.

Project Requirements

The Preventive Maintenance (PM) Manuals shall

- contain as step 0 the need to close any electric or water supply connected to the asset before the maintenance starts(LOTO) if required.
- contain at most ten steps, excluding the step 0 and final step. In case that the procedure requires multiple steps, depending on the Planner perspective, this requirement can be disregarded.
- contain as final step that the technician cleans up the workspace once the maintenance is performed before the technician leaves.
- shall be examined and approved by either the Support Services Supervisor or the Facility Services Planner

PM List

ASSET	BRAND	MODEL
HVAC Units:		
Package/RTU	Trane	TCH060F4RGA06D001
Split (Condenser, Evaporator Coil, & Furnace)	Trane	4TWR4030G1000AA
Mini Split (Condenser & Air Handler)	Daikin	FTXB18AXVJU RXB18AXVJU
Wall Pack	Bard	W48A2-A15
Liebert Units (Fan Coil & Condensing Unit)	Liebert	MCL110E8ADG759
Window Units	Sea Breeze	WH425ZRC
PTAC	Friedrich	PDE12K3SG-A
Elevators		
Otis		
Geda		
Wheel Chair Lifts		
Fire Protection (certifications/testing):		
Fire Hydrants		
Fire Pumps	FAIRBANKS/PENTAIR	6"1824BF
Exit Signs/Emergency Lights		
Clean Agent Fire Suppression	Ecaro	Ecaro-25

		Number of Assets
	Priority 1	46
	Priority 2	6
	Priority 3	23
	Total	75

	Draft
	Approved

PM Samples

Wall Pack

Source of Maintenance Manuals

Sources Samples

STANDARD MAINTENANCE PROCEDURES

⚠ WARNING

Electrical shock hazard.

Disconnect all power supplies before servicing.

Failure to do so could result in electric shock or death.

⚠ CAUTION

Cut hazard.

Wear gloves to avoid contact with sharp edges.

Failure to do so could result in personal injury.

1. Disable system from LC controller (see Advanced Programming section).
2. Turn off AC breakers at wall-mount units.
3. Check inlet sides of condenser and evaporator coils for obstructions/debris—clean if necessary using a quality manufactured coil cleaning product specific for the evaporator or condenser coil.
   - Condenser coil: Remove the fan shroud/ motor/motor bracket as an assembly from the condenser section. This will give clear access to the inlet side of the coil for cleaning. Follow the coil cleaner manufacturer's directions for necessary safety gear and precautions, as well
4. Manually spin fan and blower motors to ensure they turn freely. All motors are permanently lubricated, so no oil is necessary.
5. Inspect free cooling damper actuator and linkage.
6. Install new air filter; check for additional filter grilles internal to the structure.
7. Inspect the control panel of the system.
   - Look for insect or rodent activity and remove any nesting materials.
   - Manually push contactor closed, observe for movement—contactor points should have minimal discoloration, no spalling or other signs of arcing. Replace if doubtful.
   - Check field and factory wiring for tightness and look for signs of overheating (discoloration of terminals or wire insulation).
8. Ensure that supply and return registers are not obstructed, and more importantly, are not recycling the air to one another. Adjust supply louvers if necessary to direct discharge air away from any direct route to the return grille.
9. Re-assemble wall-mount unit, turn breakers back on.
10. Enable system from LC controller (see Advanced Programming section).
11. Repeat steps for additional wall-mount units.

WARNING
Supplement the maintenance plan with details regarding maintenance / servicing / operating materials / replacement / repair of component parts contained in the instructions provided by the suppliers.

Abbreviations used in the maintenance schedule
W = Week / M = Moth / Y = Year

● = Visual inspection ■ = Check ▲ = Replace	W	1M	3M	6M	1Y	3Y	5Y
Electrical components							
Check the travelling cable, mains supply cable and control lines for damage.		●					
Abrasion protection for cables			●				
Lighting / emergency lighting			■				
Function check of the control locations Car control / return control / landings			■				
Move car to every level Stop in front of the landing (tolerance +- $^{13}/_{16}$" / 2 cm)				■			
Control devices, limit switches and sensors				●			
Test overload setting					■		
Protective earth testing in accordance with EN 60204, Part 1					■[1]		
Insulation testing in accordance with EN 60204, Part 1					■[1]		
Switch boxes							
Switch box filter pads	●						
Soiling, moisture, scorched areas			●				
*EMERGENCY accumulator					■	▲	
Mechanical components							
Check the gear rack and drive pinion for lubrication and wear	●		■				
Track rollers, car and drive unit		■					
Car from below		●					
Cable carriage Rollers / deformation / cracks / freedom of movement / wear		■					
Ladder in the car		●					
Lubrication device		●					
Lubricate safety gear pinion / countershaft assembly			■				

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Purge Test Cocks:
Open test cocks # 4,3,2,1
Close test cocks # 1,2,3,4

Close Valves on Gauge and Connect Hoses:
Install Fittings in test cocks using Teflon Tape
Connect High Hose to # 2 test cock. Connect Low Hose to # 3 test cock.
Open # 3 test cock, Open Low Bleed Valve.
Open # 2 test cock, Open High Bleed Valve.
Close # 2 Shut Off Valve. **Close High Bleed Valve. Close Low Bleed Valve.**
Observe the gauge reading as **Apparent Reading, (AR)**

Test # 1: Differential Pressure Relief Valve:
Test Requirement: Has to keep the Zone at Least 2 psi Less than Supply
Open High Control, (High Control Remains On Throughout the Test)
Place Hand Under Relief Valve. **Open Low Control.**
Pointer Stops and Water is Dripping, Read the Gauge
Close the Low Control, (Remains Closed)
Record as the Relief Valve Opening Point, (RVOP) Must 2 psi or more.

Test # 2: Check # 2 Check Valve for Tightness Against Backpressure:
Test Requirement: Must Hold Tight Against Backpressure
Open Bypass Valve on Gauge to purge Air from Hose. Close Bypass Valve.
Connect Bypass hose to # 4 test cock and open #4 test cock.
Normalize the Zone, (Open Low Bleed, Peg the Gauge, Close Low Bleed)
Perform the Test, **(Open Bypass Valve. Bypass Valve Remains Open)**
Evaluate Gauge Reading, (Gauge Reading must be above the RVOP)
If above the RVOP and the Relief Valve is not leaking: Record : **Closed Tight.**
If the gauge falls to the RVOP, **Normalize the Zone: (DO NOT CLOSE BYPASS)**
If Gauge Holds **Above RVOP** and Does Not Leak: **Closed Tight, PASS.**
If Reading **Falls to RVOP** and Leaks: **Leaked, FAIL.** Record **NO TEST** for #1 CK.

Test # 3: # 1 Check Valve: (Can only be performed if #2 Check Valve Passed
Test Requirement: Must Be Above the RVOP and in No Case Less Than 5 ps
Open Low Bleed. Peg the Gauge. **Close Low Bleed. Read the Gauge** Evaluate Gauge Reading. Record the Reading.
Remove Equipment. Complete and File Test Repair Form.

www.hactexas.com www.SteveFain.com

PM Sample

Furnace **PM Frequency: Semiannual**

Checkpoints:

1. Block out Power supply (LOTO).
2. Clean all dirt, lint, and grease from the combustion air opening (UDAP) and venter assembly.
3. Clean all dirt, lint, and grease from the fan blade, fan guard, and motor.
4. Check the heat exchanger both internally and externally.
5. Check the burner for scale, dust, or lint accumulation. Clean if needed.
6. Check the vent or vent/combustion air system for soundness. Clean openings.
7. Check any gas leaks.
8. Check for Carbon Monoxide.
9. Replace Filter if needed.
10. Check the wiring for any damaged wire. Replace damaged wiring.
11. Clean up work area
    11.1 Comments and Feedback.
    11.2 Close Workorder.

Maintenance Checklist Updated: 2/10/2022

Asset:	Furnace				System:	HVAC Units					
Model:	Udap 40050000				Brand	Reznor					
Serial Number:					Installation Date:						
Location:											
Maintenance Period:		Weekly		Fortnightly		Monthly		2 Monthly		3 Monthly	
		4 Monthly	X	6 Monthly		Annually		Another period (specify):			

Material Required

Tools Required	Quantity	Tool Location

Preventive Maintenance	YES	NO
Block out electricity.		
Clean all dirt, lint, and grease from the combustion air opening (UDAP) and venter assembly.		
Clean all dirt, lint, and grease from the fan blade, fan guard, and motor.		
Check the heat exchanger both internally and externally.		
Check the burner for scale, dust, or lint accumulation. Clean if needed.		
Check the vent or vent/combustion air system for soundness. Clean openings.		
Replace any parts that do not appear sound.		
Check the wiring for any damaged wire. Replace damaged wiring.		
Clean up the work area		

Prepared by:	
Prepared on:	
URL:	

Progress

- Established contact with a Management team representative and his Maintenance team
- **Eleven** visits to the Hawkins Facility to perform update or kickoff sessions
- Documentation of 66 Preventive Maintenance Manuals
- 62 Preventive Maintenance Manual Approved

What did we learn?

- The documentation of Preventive Maintenance Manuals on the Facilities Engineering field
- Understanding the resilience and commitment value to support a small but meaningful subsystem (PM manuals) to reach success on the whole system (Maintenance Connection, CMMS System)
- Understanding of the importance of keeping historical data for decision making