Commercial Chiller Startup Sequence And Refrigerant Leak Check

1.0 Maintenance Objective & Frequency

The objective of this procedure is to safely start a commercial chiller after a scheduled shutdown or maintenance event, and to perform a thorough refrigerant leak check to prevent refrigerant loss, system inefficiency, and environmental non-compliance. This PM ensures the chiller operates within OEM-specified pressures, temperatures, and flow rates.

Frequency: Perform this procedure after any chiller shutdown exceeding 72 hours, after any refrigerant circuit repair, or as part of the annual chiller PM schedule.

2.0 Lockout/Tagout (LOTO) & Safety

- Electrical Isolation: Lock out and tag out the main disconnect switch for the chiller. Verify zero voltage with a calibrated multimeter.
- Pneumatic Isolation: Close and lock out the compressed air supply to the chiller's pneumatic controls (if applicable). Bleed residual air from the control panel.
- Hydraulic Isolation: Close the isolation valves on the chilled water supply and return lines. Lock out the chilled water pump starter.
- Refrigerant Safety: Wear appropriate PPE including safety glasses, chemical-resistant gloves, and a refrigerant-rated respirator. Ensure adequate ventilation in the chiller room.
- Mandatory PPE: Safety glasses, steel-toed boots, chemical-resistant gloves, hearing protection (if near operating compressors), and a refrigerant-rated respirator.

3.0 Required Tools, Parts & Lubricants

- Calibrated multimeter (Fluke 87V or equivalent)
- Refrigerant leak detector (electronic, heated diode type, calibrated to detect the specific refrigerant type)
- Refrigerant pressure gauge manifold set (with hoses rated for the refrigerant type)
- Thermometer (infrared or contact type, ±0.5°C accuracy)
- Adjustable wrench set (up to 1.5 inches)
- Allen key set (metric, 2mm to 10mm)
- Refrigerant recovery cylinder (if needed)
- Leak detection spray (e.g., soap solution or electronic leak detector fluid)
- Chiller OEM service manual
- Lockout/tagout kit (padlocks, hasps, tags)
- Personal protective equipment (PPE) as listed in section 2.0

4.0 Step-by-Step Maintenance Procedure

1. Perform a visual inspection of the chiller unit. Check for any signs of physical damage, loose wiring, oil leaks, or refrigerant stains on piping and components.

2. Verify that all isolation valves on the chilled water supply and return lines are fully open. Confirm that the chilled water pump is primed and ready to operate.

3. Check the refrigerant sight glass (if equipped) for liquid level and moisture indicator. A clear sight glass with no bubbles indicates proper charge. A yellow moisture indicator indicates moisture contamination.

4. Connect the refrigerant pressure gauge manifold set to the suction and discharge service ports. Ensure hoses are purged of air before connecting. Record static pressures (with chiller off) for both high and low sides.

5. Energize the chiller control panel by restoring power to the main disconnect. Wait for the control panel to boot up and check for any active alarms or fault codes. Clear any non-critical alarms per OEM instructions.

6. Set the chiller to manual startup mode (if available) or initiate the automatic startup sequence from the control panel. Monitor the compressor start sequence: ensure oil pump runs for 30 seconds before compressor engages.

7. Once the compressor is running, observe the suction and discharge pressures. Compare to OEM specifications for the current operating conditions (ambient temperature, chilled water setpoint). Typical suction pressure: 40-60 psig (R-134a), discharge pressure: 150-250 psig (R-134a). Adjust if necessary.

8. Check the refrigerant superheat and subcooling values using the pressure/temperature chart for the specific refrigerant. Superheat should be 8-12°F (4.5-6.7°C) at the compressor suction. Subcooling should be 10-15°F (5.6-8.3°C) at the condenser outlet. Record values.

9. Perform a refrigerant leak check using an electronic leak detector. Methodically scan all refrigerant piping joints, service valves, compressor seals, and condenser coils. Pay special attention to Schrader valve cores and flare fittings. If a leak is detected, mark the location and proceed to step 10.

10. If a leak is found, isolate the affected circuit (if multiple circuits), recover the refrigerant into a recovery cylinder, repair the leak (e.g., tighten fitting, replace valve core, braze joint), evacuate the circuit to 500 microns, and recharge with the correct refrigerant type and weight per OEM specifications.

11. If no leaks are detected, verify the chilled water temperature drop across the evaporator. With the chiller at steady state, measure the entering and leaving water temperatures. The temperature drop should be 8-12°F (4.5-6.7°C) at design flow. Record values.

12. Monitor the chiller for at least 15 minutes of stable operation. Check for any unusual vibrations, noises, or oil pressure fluctuations. Record all operating parameters (pressures, temperatures, superheat, subcooling, water temperatures) in the PM log.

5.0 Verification & Return to Service

1. Confirm that the chiller is operating within all OEM-specified parameters and that no alarms are active on the control panel.

2. Verify that the chilled water system is functioning correctly: check that the water pump is running, flow is established, and the building management system (BMS) is receiving correct temperature and status signals.

3. Remove all lockout/tagout devices from the chiller and associated equipment. Ensure all personnel are clear of the equipment before re-energizing.

4. Sign off on the PM work order in ServiceGrid, documenting all recorded parameters, any repairs performed, and the leak check results. Attach any relevant photos or data logs.

5. Inform the facility manager or production supervisor that the chiller is back in service and ready for normal operation.

Regulatory Disclaimer: This document is a generic maintenance template provided for educational and informational purposes only. It does not constitute professional engineering or reliability advice. The end-user assumes all liability for validating all step sequences, torque specs, and LOTO protocols against specific machinery OEM manuals before deployment to a live production floor.