Cooling Tower Fill Media Inspection and Scale Removal Procedure

1.0 Maintenance Objective & Frequency

The objective of this procedure is to inspect the cooling tower fill media for scale buildup, biological fouling, and physical damage, and to perform chemical or mechanical scale removal as required. This ensures optimal heat transfer efficiency, reduces fan and pump energy consumption, and extends the service life of the fill media. This PM is to be performed quarterly (every 3 months) or more frequently if water quality analysis indicates high hardness or scaling potential.

2.0 Lockout/Tagout (LOTO) & Safety

- Electrical Isolation: Lock out and tag out the cooling tower fan motor(s) and circulating pump motor(s) at the respective disconnect switches.
- Chemical Safety: Wear appropriate PPE as specified in Section 3.0 when handling cleaning chemicals. Ensure adequate ventilation.
- Confined Space: If entry into the tower basin or plenum is required, follow confined space entry procedures per site policy.
- Fall Protection: Use fall arrest equipment when working on elevated tower decks or access platforms.

3.0 Required Tools, Parts & Lubricants

- Personal Protective Equipment (PPE): Safety glasses, chemical-resistant gloves, rubber boots, full-face shield, and Tyvek suit if handling chemicals.
- Inspection Tools: Flashlight, inspection mirror, borescope (optional for tight spaces), digital camera for documentation.
- Cleaning Chemicals: Scale remover (e.g., sulfamic acid or citric acid based, per water chemistry), neutralizer (sodium bicarbonate), and biocide (if biological fouling present).
- Mechanical Cleaning Tools: Low-pressure sprayer (max 1000 psi), soft-bristle brush, plastic scraper, wet/dry vacuum.
- Water Quality Test Kit: Hardness test strips or digital meter, pH meter, conductivity meter.
- Miscellaneous: 5-gallon bucket, clean rags, marking tape, lockout/tagout kit, and a logbook or tablet for recording data.

4.0 Step-by-Step Maintenance Procedure

1. Perform LOTO on the cooling tower fan and circulating pump motors. Verify zero energy state by attempting to start the fan and pump from the control panel.
2. Visually inspect the exterior of the cooling tower for any obvious leaks, structural damage, or debris accumulation. Document findings.
3. Remove access panels or doors to expose the fill media. Use caution as the interior may be slippery and contain residual water.
4. Inspect the fill media for scale buildup, biological growth (algae, slime), and physical damage (cracks, sagging, missing sections). Use the flashlight and mirror to view all areas. Take photos for record.

5. Assess the severity of scale: light (thin, powdery), moderate (visible crust, but fill passages still open), or heavy (blocked passages, significant loss of open area). Record the percentage of fill area affected.

6. If scale is light to moderate, apply a diluted scale remover (per manufacturer's instructions) using the low-pressure sprayer. Allow dwell time as specified (typically 10-15 minutes). Do not let the chemical dry on the fill.

7. For heavy scale or stubborn deposits, use a soft-bristle brush or plastic scraper to gently dislodge the scale after chemical application. Avoid damaging the fill material. Rinse thoroughly with clean water using the low-pressure sprayer.

8. If biological fouling is present, apply a suitable biocide per manufacturer's instructions. Allow contact time, then rinse with clean water.

9. After cleaning, neutralize any residual acid by spraying a sodium bicarbonate solution (1 lb per 5 gallons water) over the fill. Test the rinse water pH to ensure it is between 6.5 and 8.0 before returning to service.

10. Inspect the fill media again after cleaning to confirm all visible scale and fouling have been removed. Check for any damage that may have been uncovered. Replace any severely damaged fill sections if necessary.

11. Clean the basin and sump of any debris or sludge that may have accumulated. Remove and clean the strainers.

12. Replace all access panels and secure them. Remove LOTO tags and locks. Restore power to the fan and pump.

5.0 Verification & Return to Service

1. Start the cooling tower fan and circulating pump. Verify that the fan rotates freely and the pump operates without unusual noise or vibration.

2. Check the water flow distribution over the fill media. Ensure even coverage and no dry spots or channeling.

3. Measure the temperature drop across the tower (supply vs. return water) and compare to baseline. A return to baseline indicates successful cleaning.

4. Test the basin water for pH, hardness, and conductivity. Adjust chemical treatment as needed to prevent future scaling.

5. Document all inspection findings, cleaning actions, and water quality readings in the maintenance log or CMMS (ServiceGrid). Sign off on the PM work order.