

Zinc Phosphating QC Checklist & Lab SOP

Version: General Industrial Use

Type: Microcrystalline Zinc Phosphate

1. Surface Cleanliness Check

Test: Water Break Test

Standard: ASTM F22

Frequency: Before each phosphating run

Pass Criteria: No beading or water breaks

Action if Fail: Re-clean or degrease with alkaline cleaner

2. Phosphating Bath Control

Daily and weekly control of bath parameters ensures consistent coating quality.

Parameter	Method	Frequency	Ideal Range
Free Acid	Titration (mL NaOH)	Daily	1.0–2.0 points
Total Acid	Titration	Daily	8.0–10.0 points
FA/TA Ratio	Calculated	Daily	1:5 typical
Iron Content	Titration / Colorimetric	Weekly	< 1.5 g/L
pH	pH Meter	Daily	2.2–2.6
Temperature	Thermometer	Hourly	50–60°C
Sludge Level	Visual / Filter	Weekly	Minimal accumulation

3. Coating Weight Test

Standard: ASTM D2091 / ISO 3892

Frequency: Per batch or shift

Method:

1. Weigh clean dry panel (W1)
2. Strip phosphate in chromic/nitric acid
3. Rinse, dry, and weigh (W2)
4. Calculate:

$$\text{Coating Weight (g/m}^2\text{)} = ((W1 - W2) \times 10^4) / \text{Panel Area (cm}^2\text{)}$$

Pass Criteria: 1.5–3.5 g/m² (adjust per process)

4. Crystal Structure Check

Method: Optical Microscopy / SEM

Frequency: Weekly or per formulation change

Pass Criteria: Uniform fine crystals (50–500 nm)

Optional: Phase ID via XRD

5. Paint Adhesion Test

Standard: ASTM D3359 – Crosshatch Tape Test

Frequency: Every painted batch

Pass Criteria: 4B–5B (minimal or no paint removal)

Substrate: After topcoat or primer cure

Tape Type: Permacel or equivalent

6. Corrosion Resistance – Salt Spray

Standard: ASTM B117 / ISO 9227

Frequency: Monthly or per process validation

Test Time: 96–500 hrs depending on spec

Evaluation:

- No red rust in un-scribed area
- Minimal undercutting at scribe

7. Line Control – Daily Production Checks

- Check coating uniformity visually
- Measure coating weight for random parts
- Ensure no bare spots or powdery coating
- Record bath parameters in log sheet

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8. Optional: Hydrogen Embrittlement (for high-strength steels)

Standard: ASTM F519

Applicability: For parts >1000 MPa tensile strength

Frequency: Per new process or batch

Documentation

Use standardized log sheets for:

- Coating weight records
- Bath titration logs
- Visual inspection records
- Paint adhesion test results
- Salt spray chamber log