Hot-Dip Galvanizing Process Checklist

Technical review sheet for fabricated steel, pipe supports, structural components, brackets, frames, hardware and other iron or steel items before, during and after hot-dip galvanizing.

This checklist is designed for engineering review, RFQ preparation and project handover. Final acceptance shall follow the purchase order, drawings, applicable standard, inspection and test plan (ITP), and project specification.

Key Technical References

Item	Reference Value / Basis	Why It Matters in the Checklist
Zinc bath chemistry	ASTM B6 zinc; commonly specified as at least 98% pure zinc for batch HDG.	Controls the zinc bath quality used to form the galvanized coating.
Typical zinc bath temperature	815-850°F (435-455°C) for batch hot-dip galvanizing.	Supports proper zinc wetting, alloy layer growth and drainage behavior.
Coating formation	Zinc reacts with iron to form metallurgically bonded zinc-iron intermetallic layers, normally with an outer zinc layer.	Explains why HDG is different from paint or simple deposited zinc coatings.
ISO 1461 scope	Hot dip galvanized coatings on fabricated iron and steel articles dipped in a zinc melt containing not more than 2% other metals.	Useful for international project specifications and non-US procurement.
Coating thickness measurement	Magnetic thickness gauge is the common non-destructive method; optical microscopy may be used as a destructive method for disputes.	Gives a measurable release basis instead of relying only on coating appearance.

Process Flow

1. Degreasing	2. Pickling	3. Fluxing	4. Drying	5. Zinc Immersion	6. Drainage	7. Cooling	8. Inspection
Remove oil, grease and organic contamination.	Remove rust and mill scale.	Prevent re-oxidation and improve zinc wetting.	Reduce moisture before immersion.	Form zinc-iron alloy layers in molten zinc.	Remove excess zinc and prevent unsafe pockets.	Stabilize the coating.	Measure thickness, appearance, bare spots and repairs.

Checklist Use

- Use the checklist before releasing drawings to the galvanizer.
- Do not substitute this checklist for ASTM, ISO, EN or project-specific acceptance requirements.
- Use it again before shipment to confirm coating inspection and repair records.
- For parts with closed sections, threaded areas, close tolerances or critical appearance requirements, review details before fabrication.

1. Pre-Fabrication Design Checklist

Hot-dip galvanizing is a total immersion process. The part must allow cleaning solution, flux, molten zinc and air to move safely through the component. Design review is especially important for hollow sections, pipe supports, frames, welded assemblies and parts with close dimensional tolerances.

Checkpoint	Review Requirement	Risk if Missed	Release Evidence
Venting and drainage	Closed or hollow sections must have vent and drain openings suitable for safe immersion and zinc drainage.	Trapped air, trapped acid, uncoated internal areas, zinc explosion risk, or excessive zinc buildup.	Marked-up drawing; galvanizer review; hole location confirmed before fabrication.
Overlaps and tight gaps	Avoid sealed crevices and narrow overlaps that can retain cleaning solution, flux or moisture.	Acid bleed-out, staining, delayed corrosion, poor coating continuity.	Fabrication detail review; weld map; gap/overlap comments in ITP.
Weld condition	Remove slag, spatter, anti-spatter compound and heavy soot before dispatch.	Bare spots, ash inclusion, rough coating, rejected appearance.	Visual weld cleaning record; pre-galvanizing inspection photos.
Threads and close tolerances	Allow for zinc coating buildup on threads, slots, hinges, sliding areas and precision holes.	Assembly difficulty, tapping/rework, thread fit failure.	Tolerance review; masking or chase/tap plan if allowed by specification.
Part size and lifting	Confirm kettle size, lifting points, orientation and progressive dipping requirements for large assemblies.	Incomplete dipping, distortion, handling marks, unsafe lifting.	Lifting plan; galvanizer capacity confirmation; orientation note.

2. Surface Preparation Checklist

Step	Acceptance Focus	Common Control Point
Degreasing / caustic cleaning	Oil, grease, dirt and organic contamination removed.	Heavy grease, paint markers and adhesive residues should not be sent to pickling without removal.
Pickling or abrasive cleaning	Rust, mill scale and oxides removed so zinc can contact bare iron.	High-silicon reactive steel and heavily scaled surfaces may need special review.
Rinsing	Chemical carry-over between tanks reduced.	Poor rinsing can contaminate later tanks and affect coating consistency.
Fluxing	Light oxides removed; steel protected against re-oxidation before zinc immersion.	Incorrect flux condition can reduce wetting and create uncoated areas.
Drying / preheating	Surface moisture reduced before immersion.	Moisture entering the kettle can create safety and coating-quality issues.

3. Galvanizing Operation Checklist

The galvanizing stage forms the zinc-iron alloy structure. Correct immersion, withdrawal, drainage and part orientation help control coating continuity, coating buildup and appearance.

Item	Control / Review Point	Typical Acceptance Meaning
Bath chemistry	Zinc bath specified to ASTM B6; batch HDG commonly uses at least 98% pure zinc.	Confirms zinc quality for coating formation.
Bath temperature	Typical operating range: 815-850°F (435-455°C).	Supports alloy growth and fluid zinc drainage.
Immersion orientation	Part lowered to allow air escape and zinc displacement, especially for tubular or pocketed shapes.	Reduces uncoated internal areas and trapped pressure risk.
Withdrawal and drainage	Withdraw slowly enough to allow zinc drainage; use vibration, centrifuging or wiping where applicable.	Controls runs, lumps, clogged holes and excessive buildup.
Cooling / quenching	Cooling method should not damage coating or trap moisture in stacked parts.	Reduces risk of handling stain, wet storage stain and premature cosmetic issues.

4. Final Inspection Checklist

Inspection Item	What to Check	Typical Evidence / Record
Coating thickness	Measure according to the applicable standard and product category; do not use one generic micron value for all articles.	Magnetic gauge readings, sampling locations, inspection report.
Appearance and continuity	Review for bare spots, uncoated areas, excessive roughness, ash, dross particles, heavy runs or zinc buildup.	Visual inspection sheet and photos of critical areas.
Adhesion	Check when required by standard or project specification; avoid destructive methods unless specified.	Adhesion record or standard-based statement.
Threaded / mating parts	Confirm bolt/nut fit, thread cleaning, blocked holes, slots and moving interfaces.	Fit-up check; thread gauge or assembly trial where applicable.
Repair areas	Damaged or uncoated areas repaired according to project requirement, often with ASTM A780 as a reference.	Repair method, repair material, repaired thickness or visual acceptance record.
Marking and traceability	Bundle tags, heat/lot traceability, galvanized lot and inspection documents kept together.	Marking photos, packing list, MTC linkage, inspection package.

5. Common HDG Process Issues and Control Actions

Observed Issue	Likely Cause	Control / Prevention
Bare spots or uncoated areas	Residual paint, oil, weld slag, oxide, poor fluxing, trapped air.	Improve pre-cleaning; remove weld residue; review venting and immersion orientation; repair if permitted.
Heavy zinc buildup or blocked holes	Poor drainage, incorrect orientation, small holes, complex geometry.	Add/resize drain holes; change dipping angle; clear holes after galvanizing if allowed.
Rough coating with ash or dross	Bath surface contamination, geometry trapping zinc, poor withdrawal drainage.	Skim bath surface; improve drainage; inspect critical mating areas before shipment.
Dull gray or matte appearance	Reactive steel chemistry, especially silicon/phosphorus effects, or normal weathering.	Do not reject by brightness alone; verify thickness, adhesion and standard requirements.
Wet storage stain / white rust	Fresh galvanized steel stored wet, tightly stacked, or poorly ventilated.	Store dry, separate surfaces, allow airflow, avoid long wet packaging during sea shipment.
Thread fit difficulty	Zinc buildup on threads or internal mating surfaces.	Specify oversized nuts, thread chasing or post-galvanizing fit check where applicable.
Local damage after cutting/welding	Fabrication or site modification after galvanizing.	Repair using specified method; ASTM A780 is commonly referenced for damaged HDG coating repair.

6. Storage, Packing and Shipment Checklist

Item	Checklist Point
Before packing	Confirm coating inspection, repair record, marking photos and product identification.
Stacking	Use separators or spacing to reduce trapped moisture and abrasion between newly galvanized surfaces.
Ventilation	Avoid sealing wet galvanized components in airtight packaging for long transport periods.
Sea shipment	Keep drainage paths open; prevent prolonged contact with seawater or aggressive chemicals.
Documentation	Include standard reference, inspection report, coating thickness record, repair record, packing list and traceability documents where required.

Quick Release Summary

Before Galvanizing	During Galvanizing	Before Shipment
Drawing reviewed for venting, drainage, overlaps, threads and kettle fit. Steel surface is free from paint, heavy oil, weld slag and closed-pocket risks.	Bath chemistry and temperature are controlled. Parts are immersed and withdrawn in a way that supports air escape, zinc drainage and coating formation.	Coating thickness, appearance, repair areas, marking, packing and traceability documents are checked before release.

References Used for Technical Values

- American Galvanizers Association (AGA), Hot-Dip Galvanizing Process: ASTM B6 zinc bath, 98% zinc, and 815-850°F (435-455°C) bath temperature.
- American Galvanizers Association (AGA), HDG coating thickness inspection: magnetic thickness gauge and optical microscopy methods.
- ISO 1461:2022 / ANSI listing: hot dip galvanized coatings on fabricated iron and steel articles dipped in a zinc melt containing not more than 2% other metals.
- ASTM A780/A780M: practice describing methods for repair of damaged and uncoated hot-dip galvanized coatings.

Note: Minimum coating thickness, sampling frequency and repair acceptance values should be taken from the current project specification and the purchased edition of the applicable standard. This checklist intentionally avoids replacing copyrighted standard tables.