

# Alloy Verification, Coating Inspection & Dimensional Control for China-Origin Metal Products | Metal-Asia.pw

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**Author:** [Jacek Nowak](#) | Senior Metallurgical Inspector & Inbound Quality Lead, Metal-Asia.pw

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## Introduction: The Three Pillars of Metal Product Quality

Through 12 years of field inspection at Chinese steel mills, I have identified **three critical parameters** that determine whether an imported metal shipment meets contractual requirements:

1. **Alloy Conformance** — correct steel grade with specified chemical composition
2. **Coating Conformance** — thickness, adhesion, and composition of protective coatings (zinc, polymer)
3. **Dimensional Conformance** — thickness, width, straightness, flatness within tolerance bands

If any one of these parameters falls outside specification, your project schedule, budget, and safety profile are compromised. In this technical brief, I detail the inspection methodology for each of the three pillars, reference applicable standards, and present our service structure for global procurement operations.

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## Section 1. Metallurgical Analysis & Alloy Verification

### Definition and Scope

**Metallurgical analysis** is a comprehensive investigation to determine the degree to which a metal's properties conform to specified requirements. Analysis provides conclusive data on composition, manufacturing method, heat treatment history, and projected service behavior.

### Applications:

- Incoming quality control of imported [metal products](#)
- Dispute resolution with suppliers
- Failure analysis of damaged components and structures
- New supplier qualification and vendor onboarding
- [Customs verification for HS Code classification](#)

### Standard Metallurgical Testing Methods

#### Table 1. Core Alloy Verification & Metallurgical Tests

#	Test Method	Standard	Determined Parameters	Equipment	Cost
1	<b>Optical Emission Spectroscopy (OES)</b>	GOST 18895-97, GOST 54153-2010	Full chemical composition: C, Si, Mn, Cr, Ni, Mo, V, Ti, Al, Cu, Nb, W, etc.	Benchtop OES spectrometer	From \$30/sample
2	<b>Portable PMI (XRF/LIBS)</b>	API RP 578, ASTM E1476	Rapid field chemical analysis	XRF / LIBS analyzer	From \$2/test
3	<b>Tensile Testing</b>	GOST 1497-84, ASTM A370	Yield strength (Re), tensile strength (Rm), elongation (A%), reduction of area (Z%)	Universal testing machine	From \$15/sample
4	<b>Charpy Impact Testing</b>	GOST 9454-78, ASTM E23	Impact toughness KCU/KCV at +20°C, 0°C, -20°C, -40°C, -60°C	Pendulum impact tester	From \$20/sample
5	<b>Hardness Testing</b>	GOST 9012-59, ASTM E10/E18/E92	Brinell (HB), Rockwell (HRC/HRB), Vickers (HV)	Hardness tester	From \$5/test
6	<b>Microhardness Testing</b>	GOST 9450-76, ASTM E384	Hardness distribution across section; case depth	Microhardness tester	From \$10/impression
7	<b>Metallographic Analysis</b>	GOST 1763, ASTM E3/E45	Microstructure, grain size, phase composition, non-metallic inclusions	Metallurgical microscope	From \$25/polished section
8	<b>Corrosion Testing</b>	GOST 9.019, ASTM G48/A262	Corrosion resistance, corrosion rate, intergranular attack	Climate test chamber	From \$50/sample
9	<b>Fastener Strength Group Verification</b>	GOST R ISO 898-1, ASTM F606	Strength class of bolts, nuts, studs	Tensile machine + hardness tester	From \$10/item
10	<b>Ferrite Phase Determination</b>	DIN 32514, Schaeffler diagram	Ferrite content in austenitic and duplex stainless steels	Ferritometer / metallography	From \$15/sample

**Table 2. Extended Metallurgical Analysis (Failure Investigation & Disputes)**

Service	Standard	Deliverable
Failure cause analysis	RD 153-34.1-017-1	Expert opinion on failure root cause, recommendations
Residual life assessment	GOST 25.506-85	Safe continued service prognosis
Decarburization depth measurement	GOST 1763	Thickness of decarburized layer
Heat treatment quality assessment	GOST 5950, GOST 14959	Conformance to quenching/tempering parameters
Creep and stress-rupture testing	GOST 3248, ASTM E139	Characteristics for heat-resistant alloy qualification

## Section 2. Coating Inspection for Metal Products

### Coating Types and Control Criteria

[Galvanized and polymer-coated products](#) represent a significant share of China-origin shipments.

Coating quality directly determines corrosion resistance and service life — particularly critical for roofing, cladding, and structural applications in coastal and industrial environments.

Table 3. Coating Inspection Methods

#	Parameter	Method	Standard	Tolerance	Inspection Frequency
1	<b>Zinc coating thickness</b>	Magnetic gauge, XRF, eddy current	GOST 9.302-88, ASTM D7091, ISO 2808	±5% of nominal (Z100–Z275 class)	1 test per 2 m <sup>2</sup>
2	<b>Zinc coating mass (g/m<sup>2</sup>)</b>	Chemical stripping, gravimetric	GOST 14918, ASTM A90	±10% of nominal	1 sample per lot
3	<b>Zinc coating adhesion</b>	Impact test, bend test, tape test	GOST 15151, ASTM D3359	No delamination	Sampling
4	<b>Organic coating thickness (PVDF, PUR, PE)</b>	Ultrasonic gauge, magnetic	GOST R 52146, EN 13523-1	±2 μm	1 test per m <sup>2</sup>
5	<b>Coating pencil hardness</b>	Pencil hardness test	ASTM D3363	≥2H	Sampling
6	<b>Coating impact resistance</b>	Falling weight (Dub Impact)	ASTM D2794	≥20 kg·cm	Sampling

#	Parameter	Method	Standard	Tolerance	Inspection Frequency
7	<b>Accelerated weathering resistance</b>	UV exposure, salt spray	ASTM G154, ASTM B117	≥1,000 hours no corrosion	Qualification testing
8	<b>Oil/preservative coating thickness</b>	Gravimetric, magnetic gauge	Technical specification	+20% of nominal	Sampling
9	<b>Coating composition (XRF)</b>	X-ray fluorescence	ASTM E1476	Conformance to specification	100% at PMI inspection
10	<b>Coating gloss</b>	Gloss meter	ASTM D523	±10% of nominal	Sampling

Table 4. Zinc Coating Classes and Standards

Coating Class	Zinc Mass, g/m <sup>2</sup> (both sides)	Thickness, μm	Application	Typical Defects from Chinese Suppliers
Z60	60	~8	Interior, dry environments	Non-uniformity, bare spots
Z80	80	~11	Moderate climate	Downgraded to Z60–Z70
Z100	100	~14	General construction	Downgraded to Z80
Z120	120	~17	Aggressive atmosphere	Downgraded to Z100
Z180	180	~25	Marine/industrial	Rarely available from China
Z200	200	~28	Extreme conditions	Practically not supplied
Z275	275	~38	Roofing, facades, long life	<b>Fraud: actual Z180–Z200</b>

**Critical Finding:** Chinese suppliers frequently declare Z275 class while delivering material with actual zinc mass of Z180–Z200 — a \$40–60/MT cost saving for the supplier that translates into 10–15 years of reduced service life for the buyer's roofing or facade system.

## Section 3. Dimensional Control & Geometry Verification

### Why Geometry Is Business-Critical

Even with perfect chemistry and coating quality, **dimensional deviation** causes:

- Inability to perform automated welding and assembly
- Introduction of residual stresses in fabricated structures
- Non-conformance with design weight and load parameters

- Field fit-up problems and schedule delays at construction sites

Table 5. Controlled Dimensional Parameters

Parameter	Method	Standard	Typical Tolerance	Equipment
<b>Plate/coil thickness</b>	Ultrasonic / mechanical	GOST 19903, EN 10051	±0.1–0.3 mm (class-dependent)	UTM gauge, micrometer
<b>Plate/coil width</b>	Tape measure, laser	GOST 19903, EN 10051	+20/0 mm	Laser distance meter
<b>Plate flatness</b>	Straightedge, feeler, 3D scanning	EN 10029, ASTM A6	≤3 mm/m	Straightedge, indicator, optical scanner
<b>Section profile (cross-section)</b>	Template, 3D scanning	GOST 8240, GOST 8509, EN 10056	±1.0–2.0 mm	Coordinate measuring machine (CMM)
<b>Bar/pipe straightness</b>	Straightedge, sag measurement	GOST 7417, GOST 8732	≤1 mm/m	Surface table
<b>Pipe outside diameter</b>	Caliper, pi tape	GOST 8732, API 5L	±0.5–1.0%	Digital caliper
<b>Pipe wall thickness</b>	UTM	GOST 8732, EN 10208	±10% (STD), ±5% (XS)	UTM gauge
<b>Pipe ovality</b>	Two perpendicular diameter measurements	GOST 8732	≤1.5% of nominal	Digital caliper
<b>Bar/cut length</b>	Tape measure	GOST 2590, EN 10060	+50/0 mm	Tape, laser meter
<b>Structural section angle</b>	Angle gauge, template	GOST 8509, GOST 8239	±1.5°	Digital protractor
<b>Strip/channel twist</b>	Level, straightedge	EN 10034	≤2°/m	Level, angle gauge
<b>Thread parameters (tubing)</b>	Go/no-go gauge, thread micrometer	API 5B, GOST 6357	Per accuracy class	Thread gauges

### Advanced Automated Dimensional Inspection

For high-volume shipments, we deploy **laser scanning systems**:

- 2D/3D laser scanners with ±0.01 mm accuracy

- Real-time automated profile measurement
- CAD model comparison with automatic deviation detection
- Color deviation mapping (deviation map)
- Integration with marking system: each item receives unique ID with complete dimensional protocol

## Full Product Nomenclature with HS Codes

Table 6. Products Subject to Integrated Alloy + Coating + Dimensional Control

#	Product	HS Code	Alloy Control	Coating Control	Dimensional Control	Overall Risk
1	Hot-rolled carbon plate/coil	7208.39, 7208.90	Sampling PMI	—	Thickness, width, flatness	Medium
2	Cold-rolled plate/coil	7209	Sampling PMI	—	Thickness, width, flatness	Low
3	Galvanized coil 100 g/m <sup>2</sup>	7210, 7212	Sampling PMI	Zn thickness — 100%	Base thickness, width	High
4	Structural sections (angles, channels)	7216	Sampling PMI	—	Profile, geometry, length	Medium
5	Rebar A400/A500C / Gr.60/75	7214	Mech. testing + PMI	—	Diameter, length, mass per meter	High
6	Seamless OCTG pipes	7304.19, 7304.29	100% PMI	—	∅, wall thickness, ovality, length	Medium
7	Line pipe (LSAW/ERW)	7305.31	PMI + mech. testing	Anti-corrosion (if specified)	∅, thickness, straightness	Medium
8	Stainless sheet AISI 304/316L	7219, 7220	100% PMI	—	Thickness, width, flatness, roughness	High
9	Stainless bar & sections	7222	100% PMI	—	Profile, ∅, length	High
10	Special alloys & steels	7224, 7228	100% PMI + OES	—	Per customer drawings	High

#	Product	HS Code	Alloy Control	Coating Control	Dimensional Control	Overall Risk
11	Sheet piles (Larssen, U-type, Z-type)	7308	Sampling PMI	Anti-corrosion coating	Profile, length, straightness, interlock	Medium
12	<a href="#">C45 / S350GD structural steel for LGSF</a>	7228	PMI + hardness	Zinc coating (S350GD)	Profile, thickness, straightness	Medium
13	Tool steels	7228.50	PMI + metallography + hardness	—	Dimensions, straightness	Medium
14	Aluminum sheets & coils (5083, 6061)	7606, 7607	LIBS/XRF (Al, Mg, Si, Cu, Mn)	Anodizing, lacquer	Thickness, width, flatness	Medium

## Our Solution: Three-Pillar Integrated Inspection

We offer **three service tiers** calibrated to shipment scale and criticality:

Tier A. Express Inspection (1–2 days, \$300–600)

**For:** Shipments up to 50 MT, standard [black steel products](#)

Service	Coverage	Method
Visual inspection	100%	VT
PMI analysis	5% (min. 5 points)	XRF
Coating thickness (if applicable)	10%	Magnetic gauge
Dimensional: thickness, width, length	100%	Caliper, tape
Inspection report	—	Photo + table

Tier B. Standard Inspection (2–3 days, \$600–1,500)

**For:** 50–200 MT, [stainless steel](#), tubular products

Service	Coverage	Method
Visual inspection	100%	VT
PMI analysis	100% of marked items	XRF + LIBS
Coating thickness	100%	XRF / magnetic

Service	Coverage	Method
Full dimensional: thickness, width, length, flatness, straightness	100%	UTM, laser, straightedge
UT lamination check (plate, coil)	Sampling (10%)	UT
Level II inspection report	—	Protocol + conclusion

Tier C. Premium Inspection (3–5 days, \$1,500–5,000)

**For:** Critical lots, [special alloys](#), OG piping, defense/nuclear

Service	Coverage	Method
Visual inspection	100%	VT
PMI analysis	100% of all items	XRF + LIBS + benchtop OES
Mechanical testing (tensile, impact)	1 set per lot	Universal testing machine
Metallographic analysis	1 polished section per lot	Microscope
Coating thickness	100%	XRF
Full dimensional + 3D scanning	100%	Laser scanner
UT defectoscopy	Per program	UT
MT surface crack detection	Per program	MT
Liquid penetrant testing (welds)	100%	PT
Level III inspection report	—	Full protocol with recommendations

## Logistics & Global Coverage

We conduct inspection **at the manufacturer's warehouse in China** before shipment dispatch, enabling:

- Rejection of non-conforming material before freight cost commitment
- Elimination of return logistics (reverse freight China←→destination costs \$150+/MT)
- Guaranteed conforming material receipt at your warehouse

[Global shipping options](#) include sea freight (FCL/LCL), rail (China–Europe), and multimodal delivery to any destination worldwide. [Payment terms](#) include Letter of Credit, bank guarantee, and deferred payment for qualified clients.

## How to Book an Inspection

1. Send your specification to [zakaz@metal-asia.pw](mailto:zakaz@metal-asia.pw)

2. Indicate lot volume, required inspection tier, and timeline
3. Receive a formal quotation within 4 business hours
4. Execute the agreement — we work without advance payment; settlement upon report delivery

**WhatsApp for urgent inquiries: [+86 132 50100874](https://wa.me/8613250100874)**

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