Ask Dr. Galv

Q **One of my customers has asked me to galvanize his product according to ISO 1461. Is this specification different from ASTM A 123? And, if so, what are the differences?**

A International Standards Organization (ISO) 1461, titled "Hot Dip Galvanized Coatings on Fabricated Iron and Steel Articles – Specifications and Test Methods," is a general galvanizing specification. This specification is essentially equivalent to the American Society of Testing and Materials' (ASTM) A 123 and A 153. The ISO specification is 15 pages in length and includes five appendices. The appendices include information such as required information to be supplied by the purchaser to the galvanizer, safety and process requirements, coating properties, determination of coating thickness, and a bibliography of other referenced specifications.

TABLE 1

ISO 1461 vs. ASTM A 123/A 153 Coating Thickness Comparison		
ISO steel thickness	*ISO minimum average coating thickness*	*ASTM average minimum coating thickness*
≥ 6 mm (≈ 1/4")	3.3 mils (85 µm) local – steel 3.1 mils (80 µm) – castings 1.8 mils (45 µm) – castings (if centrifuged)	3.0 mils (76 µm) – pipe & tubing 3.1 mils (79 µm) – wire 3.3 mils (85 µm) – castings (ASTM A 153) 3.9 mils (99 µm) – structurals, strip & bar
< 6 mm (≈1/4") & ≥ 3 mm (≈ 1/8")	2.8 mils (70 µm) – steel & castings 1.8 mils (45 µm) – castings (if centrifuged)	2.4-2.6 mils (61-65 µm) – wire 3.0 mils (76 µm) – pipe & tubing 3.0-3.3 mils (76-85 µm) – structurals, strip & bar 3.3 mils (85 µm) – castings (ASTM A 153)
< 3 mm (≈ 1/8") & ≥ 1.5 mm (≈ 1/16")	2.8 mils (70 µm) - castings 2.2 mils (55 µm) – steel 1.4 mils (35 µm) – castings (if centrifuged)	1.8 mils (46 µm) – pipe & tubing 2.0 mils (51 µm) – wire 2.6 mils (65 µm) – structurals, strip & bar 3.3 mils (85 µm) – castings (ASTM A 153)
< 1.5 mm (≈1/16")	2.8 mils (70 µm) – castings 1.8 mils (45 µm) – steel 1.4 mils (35 µm) – castings (if centrifuged)	1.4 mils (36 µm) – wire 1.8 mils (46 µm) – pipe & tubing 1.8 mils (46 µm) – structurals, strip & bar 3.3 mils (85 µm) – castings (ASTM A 153)
ISO 1461 vs. ASTM A 153 Coating Thickness Comp. – Fasteners only		
ISO steel diameter	*ISO minimum average coating thickness*	*ASTM average minimum coating thickness*
≥ 20 mm (≈ 3/4")	1.8 mils (45 µm)	2.1 mils (54 µm)
< 20 mm (≈3/4") & ≥ 6 mm (≈ 1/4")	1.4 mils (35 µm) – w/ threads 1.8 mils – w/o threads	2.1 mils (54 µm) – over 3/8" dia. 1.7 mils (43 µm) – under 3/8" dia.
< 6 mm (≈1/4")	0.8 mils (20 µm) 1.8 mils (45 µm) – w/o threads over 3 mm dia. 1.4 mils (35 µm) – w/o threads under 3 mm dia.	1.7 mils (43 µm)

In comparing the two standards, ISO 1461 and ASTM A 123 and A 153, there are no major differences. However, small differences do occur. The easiest way to sum up the differences between the two specifications is by comparing the coating thickness requirements in a table. Tables 1 and 2 relate the two specifications and note any differences between the two.

As you can see from Table 1, the differences in minimum average coating thickness for most steel articles are small. In the specifications, the ISO minimum coating thickness requirements are summed up into one table, which do not mention coating grades and do not require the user to reference two tables as with ASTM A 123. Also, the ISO 1461 specification lists minimum local coating thickness to which any one measurement must meet. These are 0.4-0.6 mils (10-15 mðm) thinner than the minimum average coating thickness. In the ASTM specifications, only ASTM A 153 has such minimum local coating thickness' listed for castings and fasteners. Rolled, pressed and forged articles referred to in ASTM A 153 also have minimum local coating thickness; these articles are not specifically mentioned in the ISO specification.

Other differences between ISO 1461 and ASTM A 123 specifications are listed in Table 2.

TABLE 2

ISO 1461	ASTM A 123
Includes mention of Wet Storage – Not a Basis for Rejection	No wet storage stain mentioned
Excludes mention of ash as a basis for rejection when affecting intended use.	Ash not form of rejection
Doesn't distinguish steel into material categories (i.e. pipe, strip, and wire)	Does categorize material by pipe, strip, and wire
Bath Composition – 98.5% Zn minimum / 1.5% additives by weight	Bath Composition – 98% Zn by weight
No adhesion testing suggested except visual inspection.	Adhesion testing – stout knife testing suggested
Mean coating average value on 1 large article or on all the articles in the control sample. – 5 test readings per m² Area (1,000mm² min)	The average of three specimen coating thickness'
No coating thickness grade	Has coating grade
Designates coating thickness for castings	No castings designation
RENOVATION Uncovered areas by galvanizer shall not exceed 0.5%. Each area shall not exceed 10 cm. Min 12 mil (30 µm) more than that required by coating requirements.	RENOVATION Shall be 1 in (25 mm) or less in its narrowest dimension. < 1/2 of 1% of the surface area or 36 in² (900 m²) per ton of piece of weight, whichever is less 50% higher than table 1, no more than 4.0 mils.
REFERENCE AREA 1. SA > 2 m² (large articles) at least 3 ref areas on each article in the control sample. 2. 10,000 µm² (SA) on each article in the control sample, one (at least) reference area. 3. 1,000 mm² – 10,000 mm² (SA) requires one reference area. 4. < 1,000 mm², group enough articles to form at least 1,000mm² surface area for an individual reference area. Table 1	REFERENCE AREA 1. SA > 160 in² (100,000 mm²) (multi specimen) the average of the 3 specimen coating thickness grades comprising each test article is the average coating thickness for that test article. 2. SA < 160 in² (single specimen) average of all specimens coating thickness grades is the average coating thickness for the sample. 3. Threaded components, the thickness of coating shall be made on a portion of the article that does not include any threads.
TESTING METHODS Microscopic method Calculation Magnetic method	TESTING METHODS Magnetic method Stripping method Weighing before/after galvanizing Microscopy
RENOVATION METHODS: Shall be by zinc thermal spraying or by a suitable zinc rich paint. Use of zinc alloy stick is possible.	RENOVATION METHODS: Use methods described in A780. Thermal zinc spraying, zinc rich paints, and zinc alloy stick
DISPUTE: Mean mass of HDG coating per unit area using gravimetric method and nominal density of the coating (7.2 g/cm³)	DISPUTE: New sample taken randomly from the lot, which has twice the # of test articles. Magnetic thickness test the sample.

Most of the information covered in ISO 1461 specification can be found in either ASTM A 123 or A 153. Some of the things mentioned in the appendices, such as strain-age embrittlement, can be found in other ASTM galvanizing specifications (ASTM A 143). After comparing the two specifications, I found that they are very similar, with the ASTM specs typically requiring more coating thickness on most types and thickness' of steel. Therefore, if you can meet ASTM coating requirements, you most likely will meet the ISO 1461 specification, as well. Contact John Krzywicki at the AGA for more details on the ISO 1461 specification.