



HDG STEELS – HOT DIP GALVANIZED STEEL PRODUCTS

26 APRIL 2019

HOT DIP GALVANISED STEELS (HDG)

Zinc has long proven itself as the ideal corrosion protection for steel. Hot-dip galvanized steel combines the exceptional properties of zinc as an oxidation inhibitor and high-quality surface appearance; with mechanical properties provided by the base metal characteristics for respective steel grades suitable for the applicable end-use.

The life-expectancy of the zinc coated steel product is directly proportional to the thickness of the zinc-coating layer and the climate condition in which the steel is used.

Applicable areas of end-use includes structural use such as air ducts, pipe insulation, roof drainage, roof sheeting, ceiling elements, door frames, building construction, and commercial use for various industries such as manufacturing of house hold appliances, panels, drums, consumer electronics, shelving etc.

1. Product Data

| | |
|-----------------------|----------------------------------------------------------------------------------------------------|
| Material: | Mild Steel Grades |
| | Maximum coil weight: 25.0 MT {gauges < 0.30mm (0.0118”), maximum weight of 16 MT will be supplied} |
| Specific Coil Weight: | 18 kg/mm |
| Maximum Coil OD: | 1880 mm |
| Coil ID: | 508 mm (610mm available on request) |

2. HDG Steel grades available and equivalent specification standards

2.1. Commercial grades

| Steel Category | EURONORM | ASTM | JIS | ISO |
|----------------|--------------------|-------------------------------------------------------------------|-------------------|-------------|
| Group A | EN 10346 DX 51 D+Z | ASTM A653 CS Type A ASTM A653 CS Type B ASTM A653 CS Type C | JIS G3302 SGCC | ISO 3575 01 |

2.1. Drawing grades

| Steel Category | EURONORM | ASTM | JIS | ISO |
|----------------|-----------------------------------------------|--------------------------------------------|-------------------|-------------|
| Group B | EN10346 DX52, DX53, DX54 D+Z , HX260 | ASTM A653 FS Type A ASTM A653 FS Type B | JIS G3302 SGCD | ISO 3575 02 |

2.2. Structural grade

| Steel Category | EURONORM | ASTM | JIS | ISO |
|----------------|---------------------|------------------------|-------------------|-----------------------|
| Group C | EN 10346 S220 GD | ASTM A653 SQ33 / SS230 | JIS G3302 SGCH | ISO 4998 Grade 220 |

| | | | | |
|---------|---------------------|------------------------|----------------------|-----------------------|
| Group D | EN 10346 S250 GD | ASTM A653 SQ37 / SS250 | JIS G3302 SGC 340 | ISO 4998 Grade 250 |
| Group E | EN 10346 S280 GD | ASTM A653 SQ40 / SS275 | JIS G3302 SGC 400 | ISO 4998 Grade 280 |
| Group F | EN 10346 S350 GD | ASTM A653 SQ50 / SS340 | JIS G3302 SGC 440 | ISO 4998 Grade 350 |
| Group G | EN 10346 S550 GD | ASTM A653 SQ80 / SS550 | JIS G3302 SGC 570 | ISO 4998 Grade 550 |

Above respective Steel Category is used for the purpose of the product range in order to distinguish between groups of equivalent steel grades available.

3. Coating Qualities and Surface Finishes

A chemical treatment (passivation) is used to protect galvanized products against corrosion during transport and storage. Untreated galvanized should be oiled with rust preventative oil to protect the surface from corroding. Duferco Steel Processing (DSP) is able to supply untreated and not oiled galvanized products on request by the customer. However, DSP cannot be held liable for corrosion related claims thereof.

DSP offers two different types of passivation protection mediums; hexavalent based (chrome 6) and trivalent based (chrome 3). Both products provide adequate passivation protection.

Coating qualities and codes:

- NA: normal / regular spangle coating; as coated
- NB: normal / regular spangle coating with improved surface finish (skin passed)
- MA: minimized spangle coating, as coated
- MB: Minimized spangle coating with improved surface finish (skin passed)

| Surface quality | Codes | Remarks |
|------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------|
| Regular spangle | NA | Normal zinc crystal spangles as a result of the unrestricted growth of zinc crystals during normal solidification. |
| Minimized spangle | MA | Zinc crystal spangles obtained by restricting normal spangle growth during solidification. |
| Regular spangle with improved surface | NB | Regular spangle surface that has been skin passed to improve the consistency of strip surface quality. |
| Minimized spangle with improved surface (May be perceived as Zero spangle/no spangle) | MB | Minimised spangle surface that has been skin passed to improve the consistency of strip surface quality. |

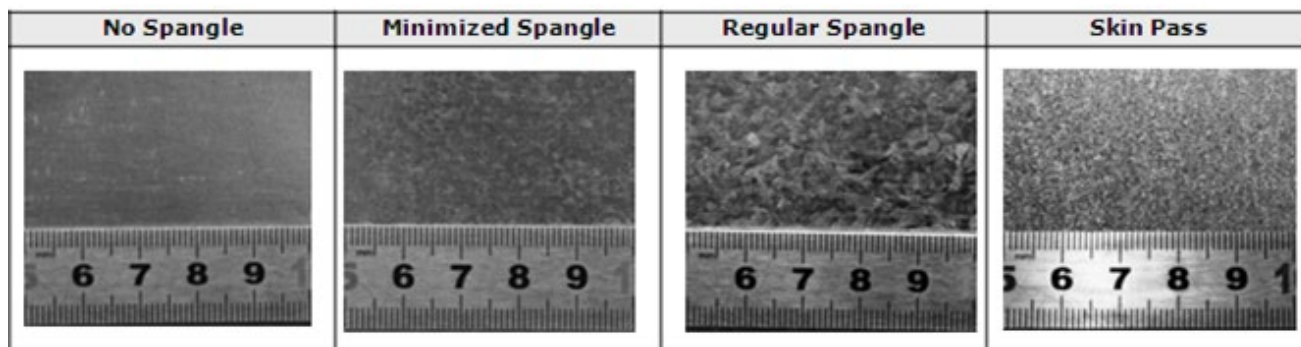
- A range of surface roughness (Ra values) is available and may be agreed at the time of enquiry. This is only applicable to improved surface finishes.

Surface quality guarantees:

| Surface quality | Guarantees |
|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Regular spangle with improved surface (NB) | Light surface imperfections such as, slight levelling breaks, light scratches, marks, pimples, light passivation stains, inconsistent spangle size and appearance, etc. are considered normal and permissible. |
| Minimized spangle with improved surface (May be perceived as Zero spangle/no spangle)- (MB) | Claims on surface imperfections will be considered. |

- Coating sags can be expected regardless of the surface quality requested; predominant on thicker coatings and gauges.

Typical spangle coatings:



Roughness range

| Type | EN Ra values | ASTM Ra values |
|----------------------|----------------|----------------|
| Normal / Matt finish | 0.60 - 1.20 Ra | 1.016-1.651 Ra |
| Rough finish | 1.20 - 1.80 Ra | 1.20 - 1.80 Ra |

Surface treatment

| |
|---------------------------------|
| Type |
| Hexavalent chromate type (Cr 6) |
| Trivalent chromate type (Cr 3) |
| Not chromated |
| Oiled |
| Not oiled |

Notes

- Localized colour variations as a result of chromate surface treatments are permissible and do not impair the quality of zinc coating.
- DSP cannot be held liable for corrosion related claims (white rust) on products that are not chromated and not oiled. Refer to DSP PO-MARK-001 Claims allowance policy.

Oil coating weight

| | | |
|---------------|---------------------------------------|--------------------------------------------------------------------------------------------|
| Lightly oiled | Approx. 0.7 g/m ² per side | Temporary form of corrosion protection and cold forming aid for medium forming operations. |
| Normal oiled | Approx. 1.2 g/m ² per side | Temporary form of corrosion protection and cold forming aid for heavy forming operations. |

Notes:

- Although the oil is distributed evenly, certain amounts of oil will invariably spread across the length and width of the strip and some oil from heavily oiled strip will be shed between the surface during transportation and storage, this is technically unavoidable.
- **Maximum weight of 5MT will be supplied for gauges ≥ 0.23mm <0.30 (lightly oiled mini spangle skin passed products; no regular spangle).**
- Products with thickness of <0.23mm cannot be supplied in oiled condition.
- It is also recommended that minimized spangle with improved surface material be supplied in oiled condition to avoid fret marks formation during transportation. Refer to DSP PO-MARK-001 Claims allowance policy.

Zinc coating weight and nominal thickness table

| Total coating weight on both sides | Z70 | Z90 | Z100 | Z120 | Z140 | Z150 | Z160 | Z180 | Z200 | Z275 |
|------------------------------------------------------------------------------|-----|-----|------|------|------|------|------|------|------|------|
| Minimum coating weight in triple spot test on both sides (g/m ²) | 70 | 90 | 100 | 120 | 140 | 150 | 160 | 180 | 200 | 275 |
| Nominal coating thickness per side (µm) | 5 | 6 | 7 | 8 | 10 | 11 | 12 | 13 | 14 | 20 |

Zinc coating mass of 100g/m² on both surfaces corresponds to a zinc coating thickness of approximately 7.0 µm per side.

Coating designations tabulated below is based on the EN10346 specification standard (with the exception of Z120, Z150, Z160 and Z180 coating designations which DSP can supply). ASTM A653, JIS3302, ISO3575 and ISO4998 specific coating designations are available, and can be supplied on request.

3.1. Applicable to **GROUP A – GROUP F** grades

| Gauge | Coating designations |
|----------------|-------------------------------|
| <0.4mm | Z70 - Z150 (G30) |
| ≥0.4mm – 2.0mm | Z70 - Z275 (G30- G90) |
| >2.0mm - 2.4mm | Z70 – Z200 (G30) |

Notes

- <Z70 may be supplied on request.
- Z350 (for order thicknesses of ≥1.0mm) may be supplied on request (surface appearance not guaranteed).
- Gauges >1.20mm with coating ≥275 surface appearance not guaranteed.

Coating application and exceptions:

- Regular coating spangle (NA) and normal coating spangle with improved surface (NB) may be produced for all commercial grades, drawing grades and structural grades.
- Minimized coating spangle (MA) may be unintentionally achieved in designations Z70 until Z120 in thicknesses thinner than 0.30mm.
- Minimized coating spangle with improved surface (MB), can ONLY be produced on widths ≥900mm, and gauges ≥0.23mm.

3.2. Applicable to **GROUP G** grades

| Gauge | Coating designations |
|---------------|------------------------|
| <0.4mm | Z70 - Z150 (G30) |
| ≥0.4 - <1.6mm | Z70 - Z275 (G30 – G90) |

Notes:

- <Z70 may be supplied on request
- Z350 (for order thicknesses of ≥1.0mm) may be supplied on request (surface appearance not guaranteed).

Coating application and exceptions:

- Regular coating spangle surface (NA) with improved surface (NB) may be produced on full hard grades.
- Minimized spangle (MA) may be unintentionally achieved in designations ≤Z70, Z90, Z100 and Z120 in thicknesses thinner than 0.30mm.

4. Product dimensional and shape tolerances
 - 4.1. ASTM designated dimensional and shape tolerances are supplied according to the ASTM A924 specification standard; **standard product produced to nominal thickness tolerances.**
 - 4.2. EN designated dimensional and shape tolerances are supplied according to the EN 10143 specification standard.
 - 4.3. ISO designated dimensional and shape tolerances are supplied according to the ISO 16163 specification standard.
 - 4.4. JIS designated dimensional and shape tolerances are supplied according to the JIS G3302 specification standard.

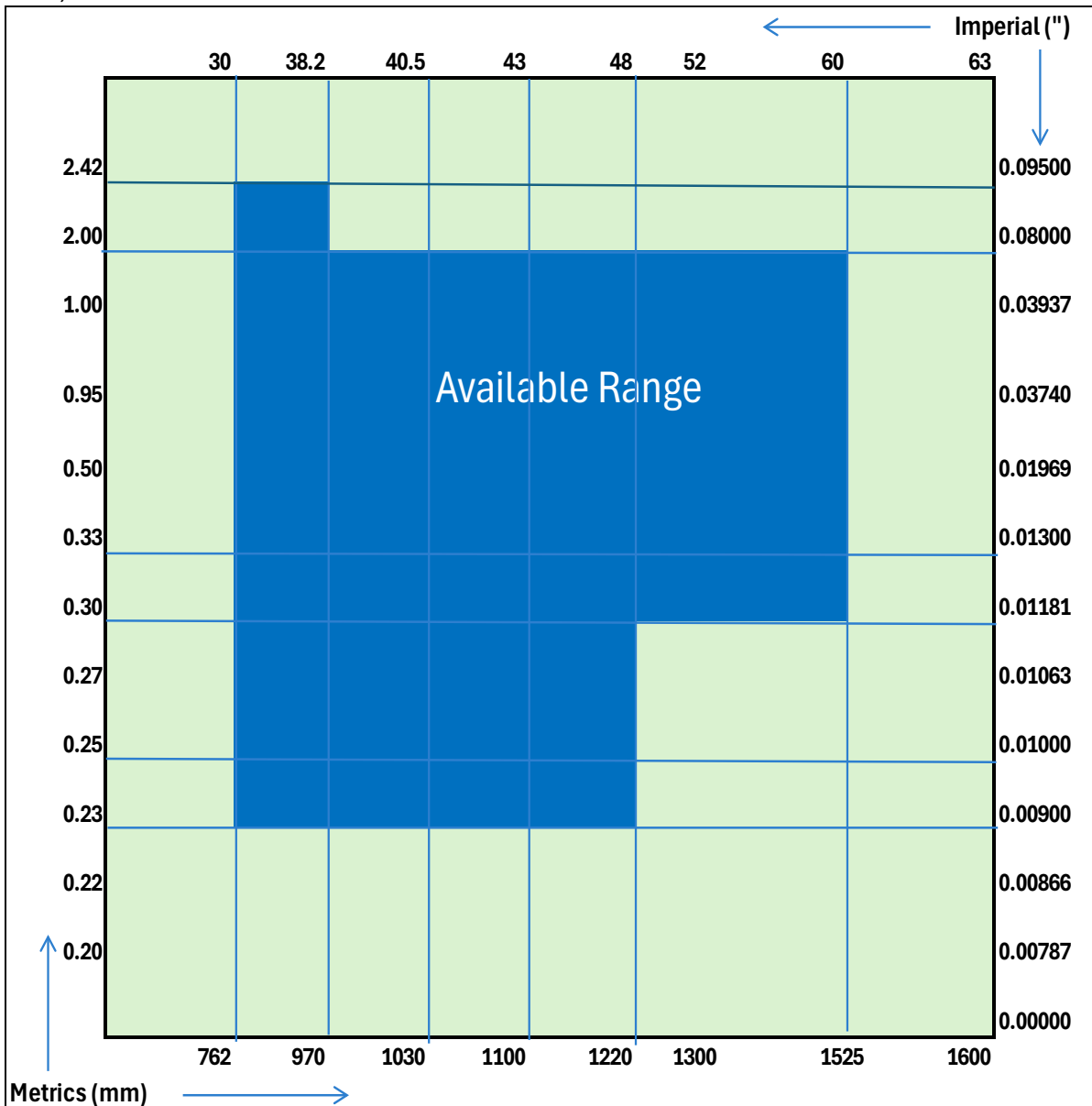
5. Mechanical properties
 - 5.1. The Customer should refer to respective material quality specification standards for the applicable mechanical property limits, taking into account the relevant footnotes.
 - 5.2. DSP may provide the customer with typical mechanical properties achievable, for respective equivalent grades, on request.

6. Test Certificates/reports
 - 6.1. Test certificate accompanies each final product produced and may be supplied to the Customer on request; as prescribed by EN 10204:2004 Type 3.1 specification standard.
 - 6.2. Information available on the test certificates / reports includes:
 - Customer order detail
 - Material quality
 - Material identification number
 - Dimensional characteristics
 - Coating weight (customer ordered)
 - Chemical composition
 - Mechanical properties results
 - Coating adherence results
 - Net mass (Mt)

7. Applicable product ranges (based on nominal order gauge)

7.1. GROUP A grades (Commercial Steel grades)

Applicable Quality standards: ASTM A653 CS (Type A, B, & C); EN10346 DX51 D+Z; JIS G3302 SPCC; ISO 3575 01.

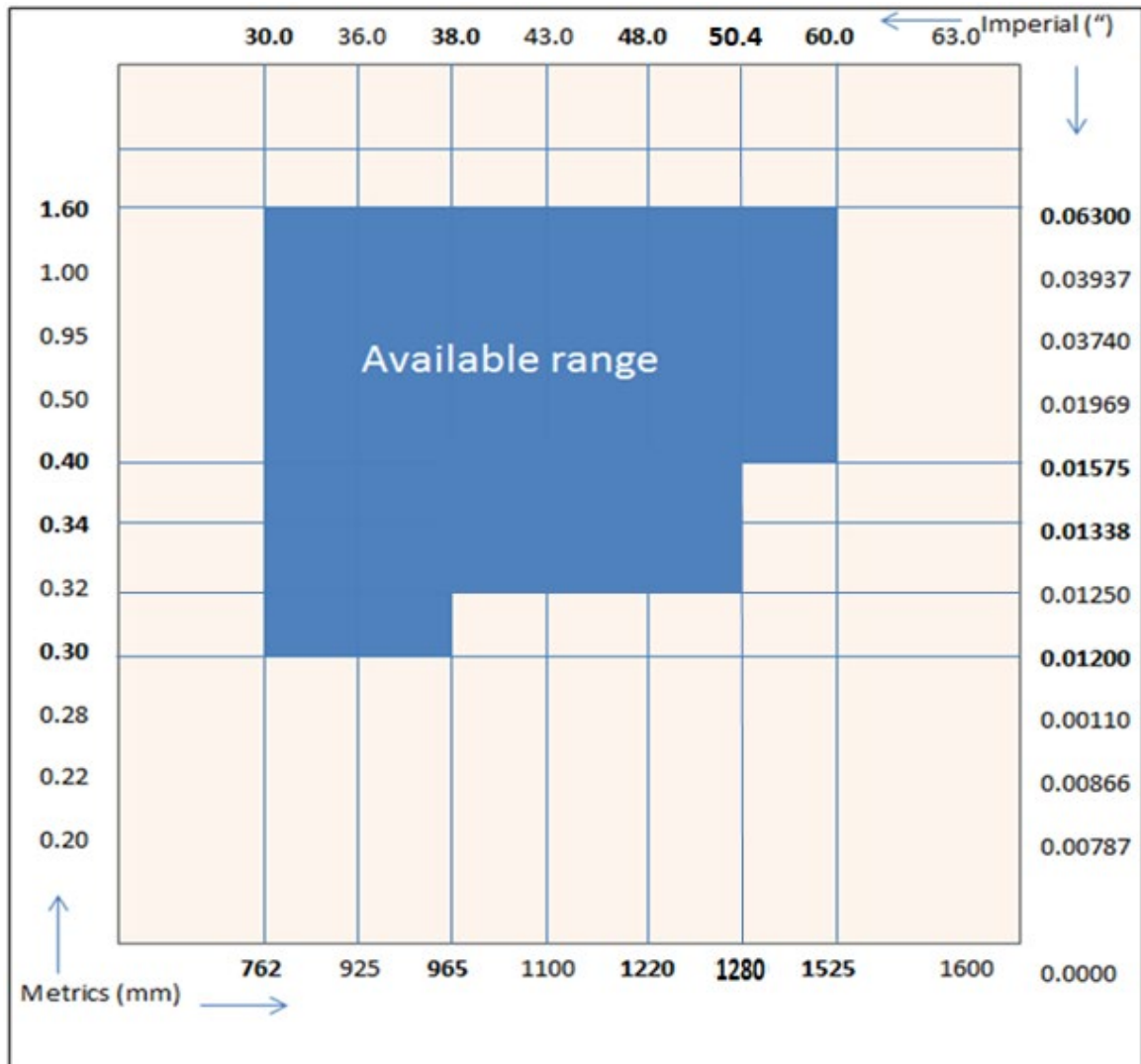


Notes

Maximum thickness orders (as per ASTM specification) are not achievable for total coated thicknesses \leq 0.23mm.

7.2. GROUP B grades (Drawing Steel grades)

Applicable Quality standards: AS 1397 G2; ASTM A653 FS (Type A - B); EN10346 DX52, DX53, DX54 D+Z; JIS G3302 SGCD 1; ISO 3575 02 ,HX260



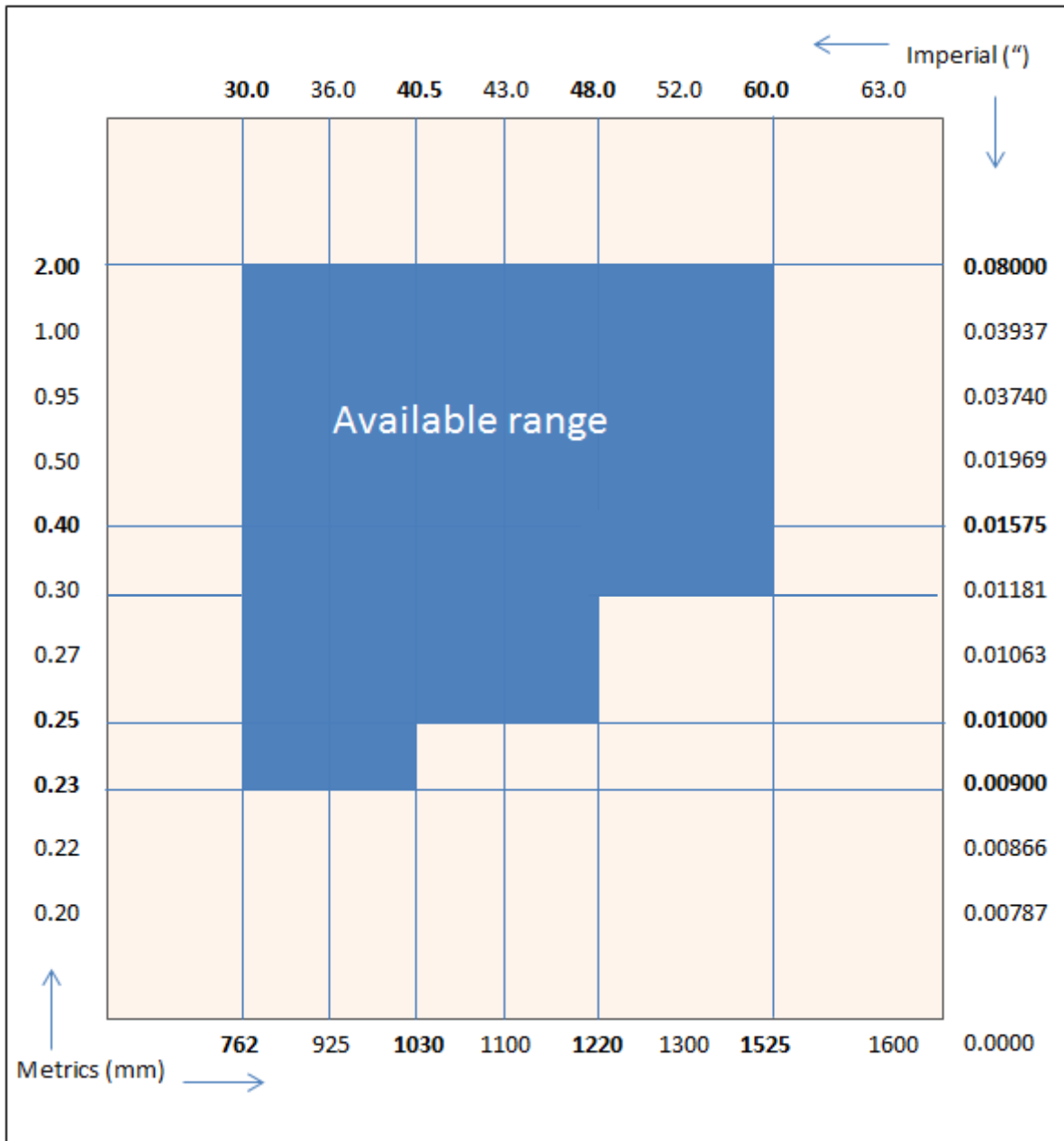
Notes

Applicable HRC as per automotive trial data/HRC quality table to be used for automotive DX53/DX54 grades.

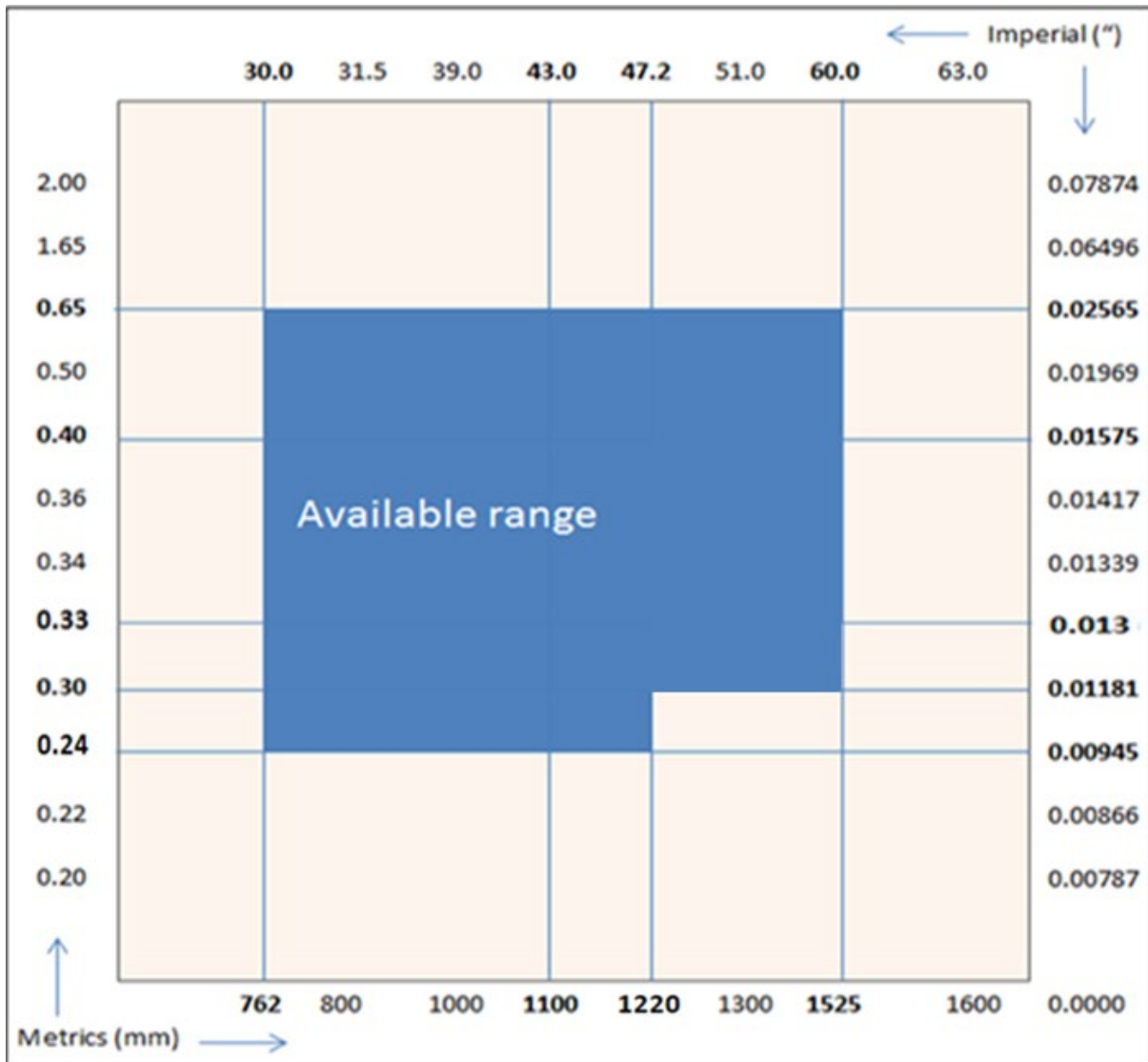
7.3. Structural Steel grades

7.3.1. GROUP C, D & E grades

Applicable Quality standards: ASTM A653 SQ33 – 37 (SS230 – SS275); EN10346 S220GD – S280GD; ISO 4998 Gr. 220 – Gr.280

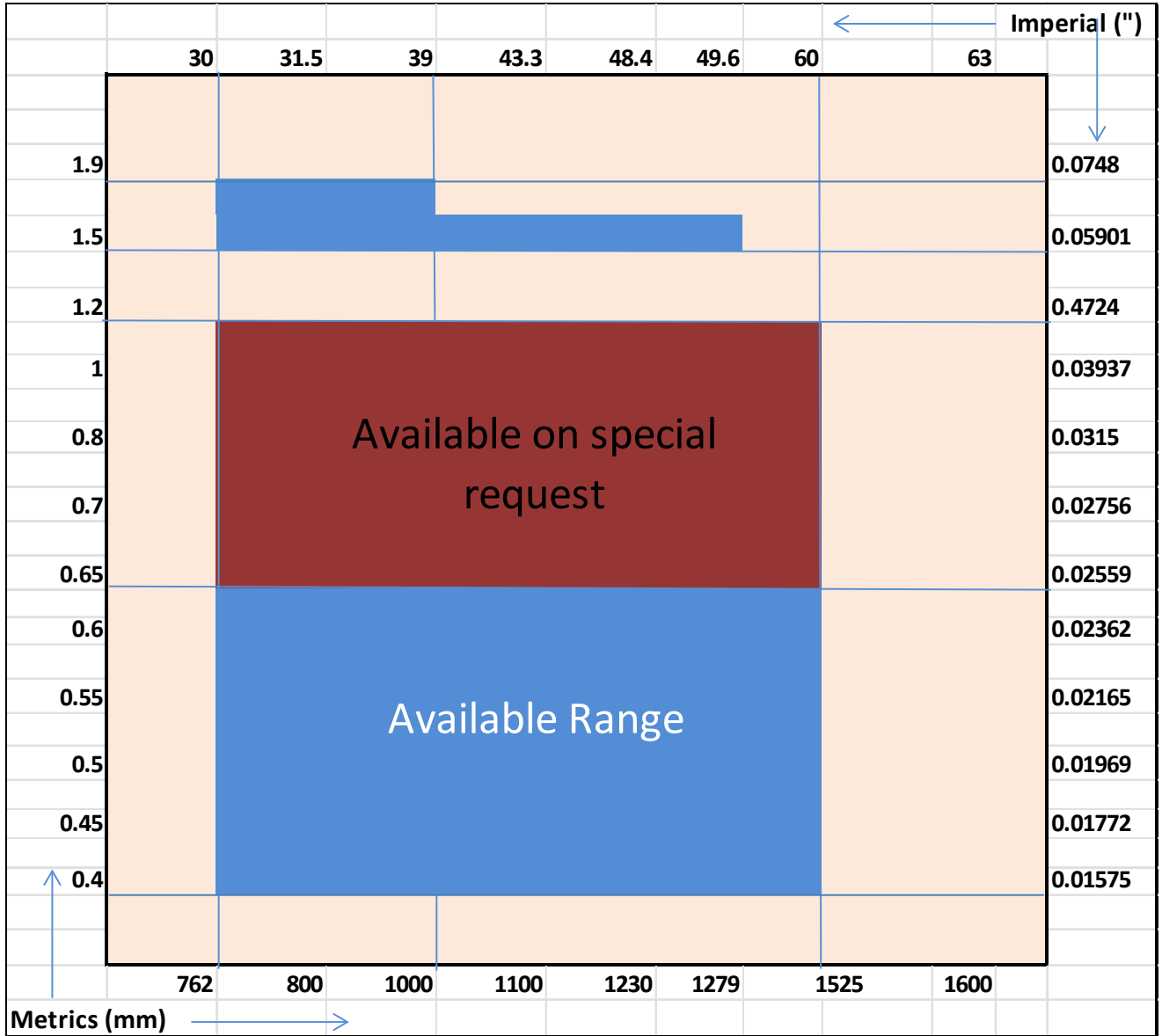


7.3.2. ASTM A653 SQ40 [SS275] ONLY

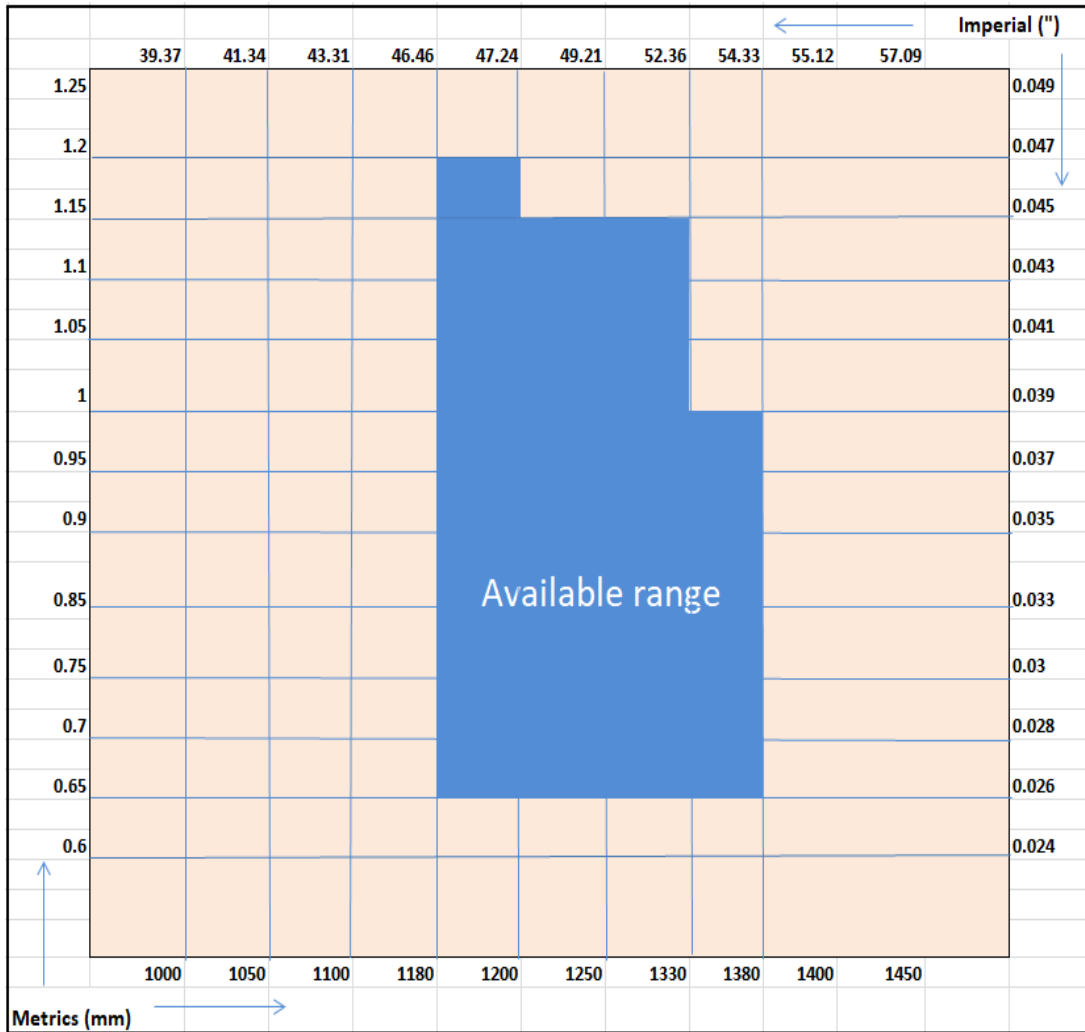


7.3.3. **GROUP F**

Applicable Quality standards: ASTM A653 SQ50/Gr. SS340 (available on gauges $\leq 1.20\text{mm}$) Class 1, Class 2, & Class 4; EN10346 S320GD & S350GD; JIS 3302 SGC440; ISO 4998 Gr. 350

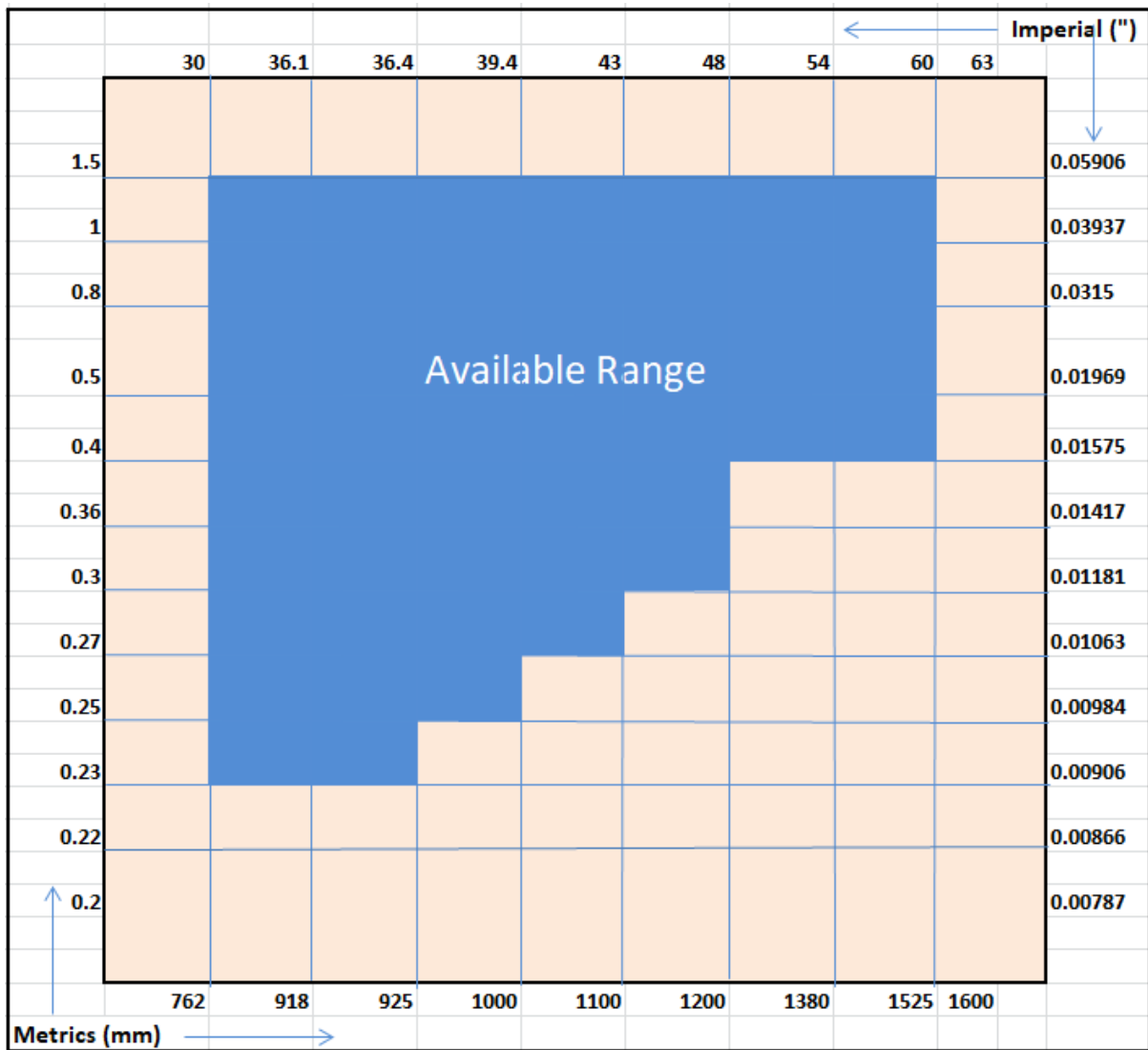


Applicable Quality standards: EN10346, HX300, HX340



7.3.4. GROUP G (Full Hard Steel grades)

Applicable Quality standards: ASTM A653 SQ 50 / Gr.550 (Class 1 - 2); EN10346 S550GD; JIS G3302 SG570; ISO 4998 Gr. 550



8. General Notes

8.1. Fretting corrosion

Mutual friction between strips of hot-dip galvanized steel during transportation can cause dark spots on the zinc surface. These affect the appearance but do not adversely affect the quality of the corrosion protection. The tendency toward fretting corrosion can be minimized by oiling the hot-dip-galvanized steel strip.

8.2. Formation of white rust

When hot-dip galvanized steel strip is subjected to humidity for a longer period of time with reduced ventilation, a loose, mat grey to whitish material called white rust forms on the surface. Large area of the strip surface could be attacked particularly when condensation forms and wetness occurs between the sheets or the coil layers. There is a limited possibility of white rust forming as long as the coils are stored properly. Refer to DSP PO-MARK-001 Claims allowance policy.