SECTION 05500
METAL FABRICATIONS (BASIC)

PART 1 GENERAL

1.01 SUMMARY

A. Comply with Division 1, General Requirements.

B. Metal Fabrications (Structural): Refer to Section 05502, Metal Fabrications (Structural).

1.02 REFERENCES

A. Comply with the latest edition of the following statutes codes and standards and all amendments thereto.

1. CAN/CGSB-1.105 Quick-Drying Primer.
2. CGSB 1-GP-181 Ready-Mixed Organic Zinc-Rich Coating.
3. CAN/CGSB-1.184 Coal Tar-Epoxy Coating.
4. CAN/CSA-S16 Limit States Design of Steel Structures.
5. CAN/CSA G40.20/G40.21 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
6. CSA G164-M Hot Dip Galvanizing of Irregularly Shaped Articles.
7. CSA S157/S157.1 Strength Design in Aluminum/Commentary on CSA S157-05, Strength Design in Aluminum.
8. CSA W47.1 Certification of Companies for Fusion Welding of Steel.
9. CSA W47.2-M Certification of Companies for Fusion Welding of Aluminum.
10. CSA W55.3 Resistance Welding Qualification Code for Fabricators of Structural Members used in Buildings.
11. CSA W59 Welded Steel Construction (Metal Arc Welding).
12. CSA W59.2-M Welded Aluminum Construction.
13. ASTM A36 Standard Specification for Carbon Structural Steel.
14. ASTM A48 Standard Specification for Gray Iron Castings.
15. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
16. A108 Standard Specification for Steel Bars, Carbon and Alloy, Cold-Finished.
17. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
18. ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
19. ASTM A193 Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High Pressure Service and other Special Purpose Applications.

20. ASTM A194 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
21. ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile Strength.
22. ASTM A312 Standard Specification for Seamless, Welded and Heavily Cold Worked Austenitic Stainless Steel Pipe.
23. ASTM A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
24. A429 Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
25. ASTM A511 Standard Specification for Seamless Stainless Steel Mechanical Tubing.
26. ASTM A525 Standard Specification for General Requirements for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process.
27. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts.
28. ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
29. ASTM A743 Standard Specification for Castings, Iron-Chromium, Iron-Chromium - Nickel, Crossion-Resistant, for General Application.
30. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
31. A786 Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
32. A793 Standard Specification for Rolled Floor Plate, Stainless Steel.
33. A1008 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
34. A1011 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
35. ASTM B26 Standard Specification for Aluminum-Alloy Sand Castings.
36. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
37. ASTM B221 Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
38. ASTM B241 Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
39. B308 Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
40. ASTM B316 Standard Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods.
41. ASTM A429 Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
42. ASTM B468 Standard Specification for Welded UNS N08020, N08024 and N08026 Alloy Tubes.

43. ASTM B632 Standard Specification for Aluminum-Alloy Rolled Tread Plate.
44. ASTM B766 Standard Specification for Electrodeposited Coatings of Cadmium.
45. ASTM F436 Standard Specification for Hardened Steel Washers.
46. ASTM F467 Standard Specification for Nonferrous Nuts for General Use.
47. ASTM F468 Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.
48. ASTM F738 Standard Specification for Stainless Steel Metric Bolts, Screws, and Studs.
49. ASTM F1136 Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners.
50. ANSI B36.10 Pipe, Steel.
51. ANSI/NAAMM MBG 531-88/NAAMM Metal Bar Grating Material.
52. CISC/CPMA 2-75a A Quick-Drying Primer for use on Structural Steel.

1.03 SYSTEM DESCRIPTION

A. Design Requirements

1. Design miscellaneous metal items in accordance with applicable standards.
2. Design work of this Section, which will support other items or will be required to support structural loads of any nature, by a professional structural engineer licensed in the Province of Manitoba. Affix professional seal and signature to shop drawings for such items.
3. Design connections and splices using high-strength bolts or welds. Use bearing type bolts for bolted connections.
4. Design connections for moments, shears and axial loads indicated or specified.
5. Where no moments, shears or axial loads are indicated design in accordance with CAN3 S16 requirements for Simple Construction. Design connection for greater than half the shear capacity of the member unless indicated otherwise.
6. Design connection for Hollow Structural Sections to develop full strength of member in tension or compression.
7. Unless design loads are indicated, design splices for the full strength of the member in bending, shear and axial load.
8. Unless design loads are indicated, design end connections and/or splices in bracing members for the full axial strength of the member.
9. Where overlapping or contacting surfaces cannot be avoided, completely seal weld these surfaces. Where there is any evidence of rusting or deterioration of finish in such areas, carry out remedial seal welding and refinishing.
10. Design aluminum work to CSA S157/S157.1 and CSA W59.2-M.

1.04 SUBMITTALS

A. Shop Drawings: Submit shop drawings before fabrication commences of each metal fabrication item, showing in large scale fabrication details, thickness, anchors, location, dimensions, erection details, connections and jointing details, and finishes.

B. Submit welding procedure specification for each type of material.

C. Submit sample of aluminum railing including a welded joint to the Contract Adminstrator for acceptance. Commence fabrication only after acceptance has been obtained.

D. Samples: Submit two samples of each finish.

1.05 QUALITY ASSURANCE

A. Ensure workmanship of the highest quality throughout by employing only metal workers that have demonstrated the highest skills in this type of work and qualified welders certified to weld the materials used in fabrication of the miscellaneous metals.

B. Welding Procedure for Steel and Stainless Steel:

1. Submit certificate that companies which will be welding stainless steel are CSA accepted.
2. Comply with CSA W47.1 and W59.

C. Welding Procedure for Aluminum:

1. Submit certification that companies which will be welding aluminum are CSA accepted.
2. Comply with CSA W47.2-M, W59 and CSA W59.2-M.

1.06 DELIVERY, STORAGE AND HANDLING

A. Provide protective coating on stainless steel and aluminum items. Coordinate deliveries with construction schedule and arrange ahead for off-the-ground, covered storage locations.

B. Handle and store metal materials at job site to prevent damage to other materials, existing buildings, structure, finishes or property.

C. Handle components with care, and provide protection for surfaces against marring or other damage. Ship and store members with cardboard or other resilient spacers between surfaces.

D. Use removable coatings or wrappings to protect exposed surfaces of prefinished metal work which does not receive site finishing. Use materials recommended by finishers or manufacturers to ensure that method is sufficiently protective, easily removed, and harmless to the finish.

E. Prevent the formation of wet storage stain on galvanized members with the following measures:

1. Stack members or bundle to allow air between the galvanized surfaces during transport from supplier. Load materials in position that continuous drainage could occur.
2. Raise members from the ground and separate with strip spacers to provide free access of air to most parts of the surface. Incline in a manner which will allow continuous drainage. Do not lay galvanized steel on cinders, clinkers, wet soil or decaying vegetation.
3. Handle galvanized members in such a manner as to avoid any mechanical damage and to prevent distortion.

1.07 COORDINATION

A. Supply to concrete, masonry and/or other Sections, materials requiring setting and/or building-in in concrete, masonry or other trades. This includes inserts, anchors, frames, sleeves, etc. Verify locations of these materials on site before fabrication and erection.

1.08 WARRANTY

A. Submit a 5-year warranty for prefinished aluminum work against defects in materials and workmanship including but not limited to fading or non-uniformity of color, cracking, peeling or other corrosion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Where anchors, lifting hooks, screws, bolts, nuts, washers, hangers and other fasteners are not specifically shown or specified, provide such items with at least the strength and corrosion resistance properties of the metal fabrication for which they are required.

B. Structural Shapes, Plates, Etc.: ASTM A992, Grade 345 MPa (50 ksi) for W and H shapes, and ASTM A36 Grade 248 MPa (36 ksi) for other shapes, and plates.

C. Hollow Structural Sections: CSA-G40.20/G40.21, Grade 350W, Class C

D. Cast Iron: ASTM A48 Class 30, grey galvanized steel.

E. Neoprene: Premium grade Durometer A 40.

F. Fasteners: ASTM F1136, galvanized, 19 mm diameter minimum.

G. Stainless Steel: Alloy 316.

Item	ASTM	UNS Designations
Structural	A666	S31600
Architectural	A666	S31600
Plates, Sheets and Strips	A167	S31600
		Grade
Fasteners	F738, F1136, A193, A194	B8A
Castings	A743	CF-8M
Tubing	A511	MT 316 or MT 316L

H. Primer: CISC/CPMA 2-75a unless otherwise required for finish coating under Section 09900.

I. Isolation coating: CAN/CGSB-1.184, Coal Tar-Epoxy Coating.

J. Zinc-rich primer: CGSB 1-GP-181M, Sealtight Galvafroid Zinc-Rich Coating by W.R. Meadows Ltd.

2.02 FINISHES

A. Rough Edges and Mill Scale:

1. Following completion of fabrication of any item, grind rough edges straight and finish smooth. Remove mill scale and rust.

B. Electrolytic Corrosion:

1. Backpaint metal surfaces in contact with dissimilar metal or concrete or masonry, with coal tar-epoxy coating, 1.0 mm (40 mil) DFT minimum.
2. Paint galvanized metal surfaces to be in contact with or encased in concrete with rust inhibitive epoxy coating ICI Devoe Coating: Devran 201. Prepare surfaces to SSPC SP1, apply paint to 125 microns DFT.

C. Carbon Steel:

1. Where carbon steel is intended to be exposed to atmospheric conditions or sewage, hot-dip galvanize the metal fabrications.
2. Where carbon steel is intended to be in contact with either concrete, brick or mortar, hot-dip galvanize the surfaces to be in such contact.

D. Galvanizing:

1. Hot-dip galvanize items after fabrication. Galvanize steel scheduled for exposure to exterior conditions or corrosive materials.
2. Clean surfaces to be galvanized of slag and impurities immediately before being galvanized or cadmium plated.
3. Where specified or detailed, galvanize plates and other structural shapes in accordance with CSA G164M. Where fabrications are too large to be hot-dipped, employ zinc metallizing.

E. Repair of Damaged Galvanized Surfaces:

1. Repair hot-dip galvanized coatings damaged by welding, cutting, rough handling during shipping or erection or otherwise, in accordance with ASTM A780 using organic zinc-rich primer. Dry film thickness on repairs to exceed original coating thickness by 25 percent.

F. Cadmium – Plating:

1. Clean surfaces, to be cadmium plated, of slag and impurities immediately before being cadmium plated.
2. Where specified or detailed, cadmium-plate metal fabrications and fasteners in accordance with ASTM B766. Use coating thickness on threaded articles equivalent to Type TS. For surfaces other than threaded areas provide coating thickness equivalent to Type NS.

G. Anodized finish: Anodizing Architectural Class I Anodic Coating 0.018 mm (0.7 mil) thickness, one-hour coating 215 RI (AA-C22A41 clear) preceded by a caustic etch.

H. Stainless Steel:

1. Remove rust and postweld discoloration from stainless steel by grinding, using only stainless steel tools.
2. Passivate stainless steel, which was cleaned by grinding, with a solution of 12-15 percent nitric acid and 3 percent hydroflouric acid.

I. Steel Finish:

1. Where shop finishing is specified or indicated, after fabrication or forming, prepare surfaces, shop prime, and factory finish in Stelcolor 8,000 Series
2. Shop finishing: Performed by an accepted applicator. Minimum dry film thickness – 30 microns (1.2 mil).
3. Color: To later selection.
4. After installation, touch-up shop finished surfaces damaged during construction.

J. Aluminum

1. Restore aluminum to original mill finish after fabrication. Buff and brighten exposed aluminum surfaces, which have been damaged during construction.
2. Where aluminum is intended to be in contact with either dissimilar metal, concrete, or masonry, paint the surface to be in such contact with aluminum coloured coal tar-expony coating.
3. Using anodizing quality aluminum where anodizing is required.

2.03 ANCHORS AND FASTENERS

A. Anchors, Studs, Taps and Bolts:

1. For structural connections at platforms, support frames and similar items, use ASTM A325 carbon steel high strength bolts with nuts and washers.
2. Where such structural connections will be normally exposed to atmospheric conditions use ASTM A325 carbon steel bolts hot-dip galvanized to ASTM A153.
3. Unless otherwise specified or detailed use hot-dip galvanized or stainless steel anchors and fasteners.

B. Nuts: ASTM A563 and the recommended nut grade and style listed in Appendix X1, Table X1 thereof. Where connections will be normally exposed to atmospheric conditions use Grade C3 or DH3.

C. Washers: Bolted connections - hardened steel washers conforming to ASTM F436. Hot-dip galvanized washers with galvanized or cadmium-plated bolts.

D. Common or Ordinary Bolts and Anchor Bolts for General Applications: Unfinished bolts conforming with ASTM A307, Grade A, with hexagon heads and nuts where exposed in the finish work. Use hot dipped galvanized in exterior connections or in unheated areas inside the building:

1. Common Bolts: Lengths required to suit thickness of material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.
2. Anchor Bolts: Of lengths noted, but projecting not less than 13 mm beyond nut unless otherwise noted.

E. Grout: Set by Master Builders Technologies Ltd. M-Bed Standard by Sternson Ltd., Sika Grout 212 by Sika Canada Inc.

F. Drilled anchors: Hilti stainless steel HVA, HSL, or Kwik bolts as indicated or accepted. Hilti “HSL” heavy-duty anchors installed in accordance with

manufacturer's directions, to sizes shown. Load capacity when embedded in 25 MPa concrete shall not be less than:

Diameter	Pullout kN	Shear kN
8 mm	30.0	36.0
10 mm	43.6	57.2
12 mm	53.6	82.8
16 mm	83.6	149.6
20 mm	119.6	205.6

G. Anchor grout for submerged and exterior conditions: Epoxy acrylate resin HVA by Hilti Ltd.

2.04 FABRICATION - GENERAL

A. Where possible, verify dimensions on site before preparing shop drawings or proceeding with shop work. Fit and shop assemble insofar as possible various sections of the work and deliver to the project site in the largest practical sections.

B. The general dimensions and details of the metal fabrications are shown on the Drawings where practical. Such details and dimensions are suggested concepts for design.

C. Assume responsibility for the correctness of the actual detailed dimensions used in fabrication and carefully check the same, by field measurement.

D. Variations from suggested details are subject to acceptance in writing by the Contract Administrator. Such acceptance does not in any way waive the above mentioned responsibility.

E. Wherever overlapping or contacting surfaces cannot be avoided, completely seal weld these surfaces. Rusting or deterioration of finish in such areas will require remedial seal welding and refinishing.

F. Fabricate the work true to dimensions and square. Accurately fit members with hairline joints, and join using adequate fastening. Assemble members without twists or open joints.

G. Construct finished work free from distortion and defects detrimental to appearance and performance.

H. Stainless steel grain direction: One direction throughout.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Install work of this Section using skilled craftsmen and in accordance with manufacturer's recommendations where applicable.

B. Install metal fabrications in the correct locations and positions, plumb, level, structurally sound, securely fastened, free from defects detrimental to finished appearance and to acceptance of the Contract Administrator.

C. Perform drilling of steel, concrete or masonry to fasten the work of this Section.

D. For aluminum and stainless steel items, and exterior locations, use stainless steel anchors.

E. After installation, spot prime bolt heads and nuts, field rivets, field welds and any abrasions or damage to the shop coat of primer.

F. Touch-up galvanized steel where galvanizing is damaged during installation with zinc rich primer.

G. Apply isolation coating to surfaces between dissimilar metals, and between metal and concrete, mortar, grout or masonry.

H. Where items are specified to be installed by other Sections, fabricate items to the appropriate trade with necessary instructions and templates required for proper installation. Include required fastenings, such as screws, bolts, expansion shields and similar items.

I. Tolerances: CAN/CSA S16.

J. Deliver items to be cast into concrete with instructions for setting.

3.02 INSTALLATION - ANCHORS AND FASTENERS

A. Arrange bolts with sufficient length to embed minimum of 100 mm or as shown on drawings in the structural floor slab and to project the threaded position a minimum of 50 mm above the proposed elevation of the base plate or mounting plate.

B. Set anchor bolts accurately in holes in concrete using plywood templates prepared from manufacturer's shop drawings. Set items in grout. Use anchor grout for submerged and exterior conditions.

C. Do not offset bolts by deformation.

D. Secure lateral support units for masonry walls at 600 mm o.c.

E. For submerged conditions where bolts are used, use lock nuts or nuts with lock washer.

3.03 FIELD QUALITY CONTROL

A. Paint bolt heads, washers, nuts, field welds and previously unprimed items. Touch up shop primer and galvanizing damaged during transit and installation with material to match shop primer or galvanize coating.

B. Clean off dirt on installed metal surfaces.

END OF SECTION

SECTION 05502
METAL FABRICATIONS (STRUCTURAL)

PART 1 GENERAL

1.01 SUMMARY

A. Comply with Section 05500, Metal Fabrications (Basic).

1.02 REFERENCES

A. Refer to Section 05500, Metal Fabrication (Basic).

PART 2 PRODUCTS

2.01 STAIRS

A. Fabricate stairs as detailed on drawings and install using stainless steel anchor bolts.

B. Design the tread sections to limit deflection to 1/180th of the span under a concentrated load of 1.0 kN at the centre.

C. Fabricate stairs with open grating treads of welded grating with slip-resistant, 32 mm cross hatch solid nosing.

1. Manufacturers:
   a. Borden Metal Products Ltd.
   b. Fisher & Ludlow Ltd.

2.02 HANDRAILING

A. Provided handrailing as shown on drawing

2.03 LIFTING HOOKS

A. Design hooks to withstand loads imposed with a minimum safety factory of 3.

B. Hot-dip galvanize steel lifting hooks after fabrication.

C. Cast hooks into concrete slab or beams at location shown. Do not weld hook to structural steel beam without written authorization from Contract Administrator.

2.04 PROTECTIVE STEEL ANGLE

A. Fabricate hot-dip galvanized steel angles for casting into concrete as indicated on drawings.

B. Use headed anchor studs of minimum 12 mm diameter by 150 mm long. Space studs at 400 mm.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Paint bolt heads, washers, nuts, field welds and previously unprimed items. Touch up shop primer and galvanizing damaged during transit and installation with material to match shop primer or galvanize coating.

B. Clean off dirt on installed miscellaneous metal surfaces.

END OF SECTION

SECTION 05530
METAL GRATING

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Association of State Highway and Transportation Officials (AASHTO): Standard Specifications for Highway Bridges, 14th Edition.
2. American Society for Testing and Materials (ASTM):
   a. A36, Standard Specification for Structural Steel.
   b. A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   c. A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   d. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   e. A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
   f. A194, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
   g. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
   h. A525, Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
   i. A569/A569M, Standard Specification for Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.
   j. B221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
   k. F844, Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.
3. Canadian Standards Association (CSA):
   a. G164-M Hot Dip Galvanizing of Irregularly Shaped Articles.
   b. S16.1-M Limit States Design of Steel Structures.
   c. S157-M Strength Design in Aluminum.
4. National Association of Architectural Metal Manufacturers (NAAMM):
   a. ANSI MBG 531, Metal Bar Grating Manual.
   b. ANSI MBG 532, Heavy-Duty Metal Bar Grating Manual.

1.02 SUBMITTALS

A. Shop Drawings:

1. Grating: Show dimensions, weight, and size, and location of connections to adjacent grating, supports, and other Work.
2. Catalog information and catalog cuts.

1.03 PREPARATION FOR SHIPMENT

A. Insofar as is practical, factory assemble items provided.

B. Package and clearly tag parts and assemblies that are of necessity shipped unassembled and protect the materials from damage, and facilitate identification and final assembly in the field.

PART 2 PRODUCTS

2.01 FOOT TRAFFIC GRATING

A. Design:

1. Uniform Service Load: 9.6 kN/m^2 minimum, unless otherwise shown.
2. Maximum Deflection: 6 mm, unless otherwise shown.
3. Space bearing bars at 30 mm center-to-center.
4. Banding: 5 mm minimum.

B. Material:

1. Galvanized Steel Bar Type Grating: Press-locked, deep rectangular crossbar design, as manufactured by IKG Industries, Ltd.; Type B or Type F.

2.02 ACCESSORIES

A. Anchor Bolts and Nuts:

1. Stainless Steel: ASTM A193 and ASTM A194, Type 316.

2.03 FABRICATION

A. General:

1. Exposed Surfaces: Smooth finish and sharp, well-defined lines.
2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in a neat, substantial manner.
3. Conceal fastenings where practical.
4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
5. Weld Connections: Not permitted on grating except at banding bars.

B. Design:

1. Field measure areas to receive grating, verify dimensions of new fabricated supports, and fabricate to dimension required for specified clearances.
2. Section Length: Sufficient to prevent its falling down through clear opening when oriented in the span direction when one end is touching either the concrete or the vertical leg of grating support.
3. Minimum Bearing: ANSI/NAAMM MBG 531.
4. Metal Crossbar Spacing: 100 mm maximum, unless otherwise shown or specified.
5. Crossbars: Flush with top of main bar and extend downward a minimum of 50 percent of the main bar depth.
    a. Swaged Crossbars:
        1) Within 6 mm of top of grating with 12 mm minimum vertical dimension after swaging, and minimum before swaging dimension of 8 mm square.
        2) Crossbar Dimension After Swaging: Minimum 3 mm wider than the opening at minimum of two corners at each side of each square opening in main bar.
        3) Crossbars may be a special extruded shape so that after swaging the top will be flat, 5 mm wide and will be flush with the top surface of the bearing bars for a minimum of 16 mm at center between bearing bars.
        4) Flush crossbar meeting all of the above except that after swaging, overlaps one corner by a minimum of 3 mm. Test sample of one bearing bar and one crossbar shall be tested by holding the bearing bar and pulling on the crossbar. The crossbar to bearing bar must sustain a minimum of 1.3 kN without pullout of the bearing bar.
        5) Tightly fit main bars and crossbars allowing no differential movement.
6. Do not use weld type crossbars.
7. Banding: Same material as grating; ANSI/NAAMM MBG 531 and ANSI/NAAMM MBG 532.

PART 3 EXECUTION

3.01 PREPARATION

3.02 INSTALLATION

A. Install supports such that grating sections have a solid bearing on both ends, and that rock and wobble grating movement does not occur under designed traffic loading.

B. Install plumb or level as applicable.

C. Install welded frames with anchors to straight plane without offsets.

D. Anchor grating securely to supports using minimum of four fastener clips and bolts per grating section.

E. Use stainless steel anchors and accessories with aluminum gratings.

F. Ensure completed installation is rigid and neat in appearance.

G. Should coating become marred, prepare and touch up surface in accordance with paint manufacturer’s instructions.

END OF SECTION