

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1 (2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)

ARCHITECTURAL INSTITUTE OF JAPAN (AIJ)

JASS 5 (2015) Reinforced Concrete Work

JASS 6 (2015) Structural Steelwork Specification for Building Construction

JAPANESE STANDARDS ASSOCIATION (JSA)

JIS B 1111 (2017) Cross Recessed Machine Screws

JIS B 1112 (2019) Cross-Recessed Head Wood Screws

JIS B 1180 (2014) Hexagon Head Bolts and Hexagon Screws

JIS B 1186 (2013) Sets of High Strength Hexagon Bolt, Hexagon Nut and Plain Washers for Friction Grip Joints

JIS B 1198 (2011) Headed Studs

JIS B 1220 (2015) Set of Anchor Bolt for Structures

JIS B 1250 (2008) Plain Washers for General Bolts, Machine Screws and Nuts - Overall System

JIS B 1251 (2018) Spring Lock Washers

JIS G 3101 (2020) Rolled Steels for General Structure

JIS G 3302 (2022) Hot Dip Zinc Coated Steel Sheet and Strip

JIS G 3312 (2019) Prepainted Hot-Dip Zinc-Coated Steel Sheet and Strip

JIS G 3317 (2019) Hot-Dip Zinc-5 Percent Aluminum Alloy-Coated Steel Sheet and Strip

JAPAN EDITED SPECIFICATIONS (JES)  
MAY 2026 EDITION

JIS G 3323	(2019) Hot-dip Zinc-Aluminium-Magnesium Alloy-Coated Steel Sheet and Strip
JIS G 3444	(2021) Carbon Steel Tubes for General Structure
JIS G 3466	(2021) Carbon Steel Square and Rectangular Tubes for General Structure
JIS G 3475	(2021) Carbon Steel Tubes for Building Structure
JIS G 5501	(2020) Grey Iron Castings
JIS G 5702	(1998) Blackheart Malleable Iron Castings
JIS H 4001	(2006) Painted and Baked Aluminum and Aluminum Alloy Sheets and Strips
JIS H 4040	(2015) Aluminum and Aluminum Alloy Bars and Wires
JIS H 5202	(2010) Aluminum Alloy Castings
JIS H 8601	(1999) Anodic Oxide Coatings on Aluminum and Aluminum Alloys
JIS H 8602	(2010) Combined Coatings of Anodic Oxide and Organic Coatings on Aluminum and Aluminum Alloys
JIS H 8641	(2021) Hot Dip Galvanized Coatings
JIS K 5553	(2006) Thick Film Zinc Rich Paint
JIS Z 0310	(2016) Abrasive Blast Cleaning Methods for Surface Preparation
JIS Z 3801	(2018) Standard Qualification Test and Acceptance Requirements for Manual Welding Technique
JIS Z 3821	(2018) Standard Qualification Test and Acceptance Requirements for Welding Technique of Stainless Steel
JIS Z 3841	(2018) Standard Qualification Test and Acceptance Requirements for Semi-Automatic Welding Technique

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM (MLIT)

MLIT-SS Chapter 7	(2019) Public Building Construction Standard Specifications - Ch.7 Steel Frame Work
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U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Occupational
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Health (SOH) Requirements

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Structural Steel Door Frames, Fabrication Drawings; G[, [\_\_\_\_\_]]

Cover Plates and Frames, Installation Drawings; G[, [\_\_\_\_\_]]

Expansion Joint Covers, Installation Drawings; G[, [\_\_\_\_\_]]

Floor Gratings, Installation Drawings;

Roof Walkways, Installation Drawings;

Bollards/Pipe Guards; G[, [\_\_\_\_\_]]

Wheel Guards, Installation Drawings; G[, [\_\_\_\_\_]]

Window[ and Door] Guards, Installation Drawings;

Embedded Angles and Plates, Installation Drawings; G[, [\_\_\_\_\_]]

Roof Hatches, Installation Drawings; G[, [\_\_\_\_\_]]

SD-03 Product Data

Corner Guards

Cover Plates and Frames;

Expansion Joint Covers

Floor Gratings;

Roof Walkways;

Structural Steel Door Frames;

Wheel Guards

Window[ and Door] Guards;

Roof Hatches;

SD-04 Samples

Expansion Joint Covers

## SD-07 Certificates

[            Certified Mill Test Reports for Chemistry and Mechanical  
             Properties; G[, [\_\_\_\_]]  
]

### 1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with JIS Z 3801, JIS Z 3821, or JIS Z 3841.  
Use procedures, materials, and equipment of the type required for the work.

### 1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store  
items in an enclosed area free from contact with soil and weather. Remove  
and replace damaged items with new items.

### 1.5 MISCELLANEOUS REQUIREMENTS

#### 1.5.1 Fabrication Drawings

Submit fabrication drawings showing layout(s), connections to structural  
system, and anchoring details as specified in MLIT-SS Chapter 7 and/or  
JASS 6.

#### 1.5.2 Installation Drawings

Submit templates, erection, and installation drawings indicating  
thickness, type, grade, class of metal, and dimensions. Show construction  
details, reinforcement, anchorage, and installation in relation to the  
building construction.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Provide exposed fastenings of compatible materials (avoid contact of  
dissimilar metals). Coordinate color and finish with the material to  
which fastenings are applied.[ Submit the manufacturer's certified mill  
reports which clearly show the applicable ASTM mechanical and chemical  
requirements together with the actual test results for the supplied  
materials.]

#### 2.1.1 Structural Carbon Steel

Provide in accordance with JIS G 3101, SS 400, 235 MPa.

#### 2.1.2 Structural Tubing

Provide in accordance with JIS G 3466, SKTR 400, 245 MPa.

#### 2.1.3 Steel Pipe

Provide in accordance with JIS G 3444 STK 400 and 235 MPa or JIS G 3475,  
STKN400B and 235 MPa.

#### 2.1.4 Fittings for Steel Pipe

Provide standard malleable iron fittings in accordance with JIS G 5702.

#### 2.1.5 Gratings

- a. Provide gray cast iron in accordance with JIS G 5501, FC300.
- b. Provide metal plank grating, non-slip requirement, [aluminum in accordance with KS651-T6 or KD610-T6[DM1]] [steel in accordance with JIS G 3302 Z27].

#### 2.1.6 Floor Plates, Patterned

Provide steel plate not less than 1.9 mm.

#### 2.1.7 Anchor Bolts

Provide in accordance with JIS B 1220. Where exposed, provide anchor bolts of the same material, color, and finish as the metal to which they are applied.

##### 2.1.7.1 [Expansion Anchors] [Sleeve Anchors] [Adhesive Anchors]

Provide [\_\_\_\_\_]mm diameter [expansion anchors] [sleeve anchors] [adhesive anchors]. Minimum [concrete] [masonry] embedment of [\_\_\_\_\_]mm. Design values listed are as tested in accordance with JASS 5.

- a. Provide minimum [ultimate] [allowable] pullout value of [\_\_\_\_\_]kN. Calculate pullout capacity according to JASS 5.
- b. Provide minimum [ultimate] [allowable] shear value of [\_\_\_\_\_]kN. Calculate shear capacity according to JASS 5.

##### 2.1.7.2 Lag Screws and Bolts

Provide in accordance with JIS lag screws, type and grade best suited for the purpose.

##### 2.1.7.3 Toggle Bolts

Provide in accordance with ASME B18.2.1.

##### 2.1.7.4 Bolts, Nuts, Studs and Rivets

Provide in accordance with JIS B 1180, JIS B 1186, or JIS B 1220.

##### 2.1.7.5 Screws

Provide in accordance with JIS B 1111 and JIS B 1112.

##### 2.1.7.6 Washers

Provide plain washers in accordance with JIS B 1250. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers in accordance with JIS B 1251.

##### 2.1.7.7 Welded Headed Shear Studs

Provide in accordance with JIS B 1198.

#### 2.1.8 Aluminum Alloy Products

Provide in accordance with JIS H 4040 for extrusions and JIS H 5202 or JIS H 5202 for castings. Provide aluminum extrusions at least 3 mm thick and aluminum plate or sheet at least 1.3 mm thick.

### 2.2 FABRICATION FINISHES

#### 2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Provide galvanizing in accordance with JIS G 3302, JIS G 3312, JIS G 3317, JIS G 3323 and/or JIS H 8641 Z27.

#### 2.2.2 Galvanize

Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

#### [2.2.3 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint in accordance with JASS 6 12.4 and JIS K 5553 or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat, with a torch, surfaces to which stick or paste material will be applied. Heat to a temperature sufficient to melt the metals in the stick or paste. Spread molten material uniformly over surfaces to be coated and wipe off excess material.

#### ]2.2.4 Shop Cleaning and Painting

##### 2.2.4.1 Surface Preparation

Blast clean surfaces in accordance with JIS Z 0310. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned by means of power tools. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete must be free of dirt and grease prior to embed. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints. Shop coat these surfaces with rust prevention.

##### 2.2.4.2 Pretreatment, Priming and Painting

Apply pre-treatment, primer, and paint in accordance with manufacturer's printed instructions. [On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 0.03 mm. Tint additional prime coat with a small amount of tinting pigment.]

#### 2.2.5 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

## 2.2.6 Aluminum Surfaces

### 2.2.6.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

### 2.2.6.2 Aluminum Finishes

Unexposed sheet, plate and extrusions may have mill finish as fabricated. Sandblast castings' finish, medium, JIS H 8601, JIS H 8602 or JIS H 4001. Unless otherwise specified, provide all other aluminum items with a[ standard mill finish][ hand sanded or machine finish to a 240 grit][ anodized finish]. Provide a coating thickness not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish, min. 0.7 mil for items used in exterior locations. Provide in accordance with JIS H 8601, JIS H 8602 or JIS H 4001. Provide a polished satin finish on items to be anodized.

## 2.3 CORNER GUARDS

For jambs and sills of openings and edges of platforms provide steel shapes and plates anchored in masonry or concrete with welded steel straps or end-weld stud anchors. Form corner guards for use with glazed or ceramic tile finish on walls with 1.6 mm thick corrosion-resisting steel with[ polished][ or][ satin] finish, extend 1.5 m above the top of cove base or to the top of the wainscot, whichever is less, and securely anchor to the supporting wall. Provide [galvanized][\_\_\_\_\_] corner guards on exterior.[ Provide interior corner guards as indicated in Section 10 26 00 WALL AND DOOR PROTECTION.]

## 2.4 COVER PLATES AND FRAMES

Fabricate cover plates of [6][\_\_\_\_\_] mm thick rolled steel weighing not more than 45 kg per plate with a [selected raised pattern nonslip top surface][slip-resistant, carbon steel in accordance with JIS G 3101. Provide aluminum oxide or silicon carbide on wearing surfaces]. Provide [galvanized][shop painted] plate. Reinforce to sustain a live load of [\_\_\_\_\_] MPa. Provide structural steel shapes and plates for frames, [with bent steel bars or headed anchors welded to frame for anchoring to concrete][securely fastened to the structure as indicated]. Miter and weld all corners. Butt joint straight runs. Allow for expansion on straight runs over 4500 mm.[ Provide holes for lifting tools.][ Provide flush drop handles for removal where indicated; form from 6 mm round stock.][ Provide holes and openings with 13 mm clearance for pipes and equipment.] Remove sharp edges and burrs from cover plates and exposed edges of frames. Weld all connections and grind top surface smooth. Weld bar stops every 152 mm. Provide 3 mm clearance at edges and between cover plates.

## 2.5 EXPANSION JOINT COVERS

Provide expansion joint covers constructed of extruded aluminum with anodized satin aluminum finish for walls and ceilings and standard mill finish for floor covers and exterior covers. Furnish plates, backup angles, expansion filler strips and anchors as indicated.[ Provide a

[\_\_\_\_\_] -hour fire-rating for expansion joints.]

## 2.6 FLOOR GRATINGS AND ROOF WALKWAYS

Design [steel] [aluminum] grating in accordance with manufacturer's charts for plank grating. [Galvanize steel floor gratings.]

- a. Design floor gratings to support a stress live load of [\_\_\_\_\_] MPa for the spans indicated, with maximum deflection of  $L/240$ .
- [ b. In accordance with the manufacturer's standard for trim [unless otherwise indicated]. Design tops of bearing bars, cross or intermediate bars to be in the same plane and to match grating finish.
- ] [b. Band ends of gratings with bars of the same or greater thickness than the metal used for grating. Weld banding bars to bearing bars or channels at least every fourth bar or channel and in every corner. Tack weld intervening bars or channels. Band diagonal or round cuts by welding bars of the same or greater thickness as the grating and in accordance with the manufacturer's standard for trim [unless otherwise indicated].
- ] [c. [Attach gratings to structural members with welded-on anchors.] [Anchor gratings to structural members with bolts, toggle bolts, or expansion shields and bolts.] [Attach grating in accordance with manufacturer's roof attachment system.]
- ] d. Provide slip resistant surface finishes.
- [ e. Rooftop walkway: Minimum 600 mm wide, 1.8 mm, JIS G 3302, Z27 steel with slip resistant surface. Furnish all brackets, connectors and other accessories. Support at minimum 1500 mm intervals on hard rubber pads in accordance with manufacturer's instructions.

## ] 2.7 BOLLARDS/PIPE GUARDS

Provide [\_\_\_\_\_] mm [galvanized] [prime coated] [standard] [extra strong] weight steel pipe in accordance with JIS G 3444, STK 400 and 235 MPa or JIS G 3475, STKN400B and 235 MPa. Anchor posts in concrete [as indicated] and fill solidly with concrete with minimum compressive strength of 17 MPa.

## 2.8 DOWNSPOUT TERMINATIONS

Provide [102 x 102 mm], [102 x 152 mm] [and] [or] [152 x 152 mm] [\_\_\_\_\_] aluminum downspout tile adapter with [mill] [manufacturer's standard powder coated] finish. Units shall have all seams welded.

Provide [nickel bronze] [polished bronze] [chrome plated] cast downspout nozzle and flange.

Provide [100 x 76 mm], [125 x 100 mm] [and] [or] [100 mm diameter] [\_\_\_\_\_] [cast iron] [galvanized cast iron] downspout boot with cleanout access and manufacturer's standard cast iron strap.

## 2.9 MISCELLANEOUS PLATES AND SHAPES

Provide items that do not form a part of the structural steel framework, such as lintels, sill angles, [support framing for ceiling-mounted toilet partitions,] miscellaneous mountings and frames. Provide lintels



fabricated from structural steel shapes over openings in masonry walls and partitions [as indicated and] as required to support wall loads over openings. Provide with connections and [fasteners] [welds]. Construct to have at least [\_\_\_\_\_] mm [200 mm] bearing on masonry at each end.

Provide angles and plates in accordance with JIS G 3101 SS400, 235 MPa, for embedment as indicated. Galvanize embedded items exposed to the elements in accordance with JIS H 8641.

## 2.10 SAFETY CHAINS

Construct safety chains of galvanized steel, straight link type, minimum 5 mm diameter, with a minimum of twelve links per 300 mm, and snap hooks on each end. Provide boat type snap hooks. Provide galvanized 10 mm bolt with 20 mm eye diameter for attachment of chain, anchored as indicated. Supply two chains, 100 mm longer than the anchorage spacing, for each guarded area.

## 2.11 SECURITY GRILLES

Fabricate of channel frames with not less than two masonry anchors at each jamb and 12 mm hardened steel bars spaced not over 100 mm both ways and welded to frame. Provide 18 by 16 mesh screen and two layers of 6 mm hardware cloth clamped to frame.

## 2.12 STEEL PLATE WAINSCOTS FOR CONCRETE OR MASONRY COLUMNS

Shop bend to radius for round columns and at right angles for square and rectangular columns with slight 6 mm radius on corners, with no horizontal joints and not more than 2 vertical joints single strapped and butt welded with a thickness of [\_\_\_\_\_] mm.

## 2.13 STRUCTURAL STEEL DOOR FRAMES

- [ a. Provide frames as indicated. Unless otherwise indicated, construct frames of structural shapes, or shape and plate composite, to form a full depth channel shape with at least 40 mm outstanding legs. For single swing doors, provide continuous 16 by 40 mm bar stock stops at head and jambs. For freight elevator hoistway entrance, include a non-skid metal sill. Provide extruded metal frames as required by the elevator manufacturer.
- ] b. Provide support where track, guides, hoods, hangers, operators, and other accessories are required.
- c. Provide jamb anchors near top, bottom, and at not more than 600 mm intervals. Provide the bottom of each jamb member with a clip angle welded in place with two 12 mm diameter floor bolts for adjustment.
- [ d. Provide spreaders between bottoms of floor jamb members. When floor construction permits, spreaders may be left in place and concealed in the floor.
- ] ]
- [ Provide frames of rolled shapes as indicated. Miter and weld heads to jambs, or provide riveted clip angle connections concealed in the finished work. Provide frames for swinging doors with 16 by 40 mm solid bar stops secured to the frame by welding or by 6 mm diameter countersunk machine screws spaced not more than 300 mm on centers. Stiffen head openings greater than 900 mm as necessary to limit deflection to not more than 2 mm.

Secure frames to masonry with zinc-coated metal anchors spaced not more than 750 mm on centers. Where necessary to engage the threads of machine screws for fastening hardware, back frames on inside faces with steel plates of suitable thickness. Tap frames and reinforcing plates as necessary for the installation of hardware and other work. Countersink rivets and screw heads where they will be exposed in the finished work. Grind welds smooth.

#### ]2.14 WHEEL GUARDS

Provide wheel guards of hollow, heavy-duty type cast iron with shaped, [rounded ][half round ][three quarters round ]top, at least 450 mm high, and designed to provide a minimum of 150 mm of protection.

#### [2.15 ROOF HATCHES (SCUTTLES)

Provide [aluminum][zinc-coated steel] sheets not less than 1.9 mm with 75 mm beaded flange, welded and ground at corners. Provide a minimum clear opening of 760 by 900 mm. Insulate cover and curb with 25 mm thick rigid fiberboard insulation, covered and protected by [aluminum sheet][zinc-coated steel liner] of not less than 0.45 mm. Provide with 300 mm high curb, formed with 75 mm mounting flanges with holes for securing to the roof deck.

#### ]2.16 WINDOW[ AND DOOR] GUARDS, DIAMOND-MESH TYPE

Provide diamond-mesh window[ and door] guards constructed of woven steel wire [or expanded metal ]framed with hot-rolled or cold-formed structural steel shapes. Provide woven wire panels of 3.3 mm, 40 mm mesh secured through weaving bar to 25 by 12 by 3 mm thick channel frame.[ Provide expanded metal panels in accordance with ASTM F1267.] Miter and weld corners of frames.[ Mount window[ and door] guards on interior of window[ and door] frame with not less than two tamperproof hinged butts mounted on wood jambs with 6 mm lag bolts, to masonry jamb with toggle bolts, or welded to metal jambs.][ Mount window[ and door] guards on exterior of window frame with not less than two tamperproof hinged butts mounted on 25 by 12 by 3 mm jamb channel attached as indicated to 50 by 6 mm plate anchored to wood jamb with 6 mm lag bolts; to masonry jamb with toggle bolts, or to concrete jambs and solid masonry jambs with expansion shields and bolts.] Provide one additional butt for each 900 mm internal length of guard over 1500 mm. Provide one tamperproof hasp and padlock, with access from the interior, for each butt used and installed on the jamb opposite to that hinged.[ Provide galvanized guards and accessories.]

#### 2.17 WINDOW[ AND DOOR] GUARDS

Provide woven wire window[ and door] guards of size as necessary to completely fill opening. Construct guards with 10 mm round rod frame and 40 mm diamond-mesh of No. 10 U.S. Gage 3.4 mm wire. Provide all materials with zinc coating. Provide a minimum of three hinge side clips on one side and two lock ring hasps on the opposite side.

#### 2.18 CLEANOUT DOORS

Provide [galvanized ][cast iron ]cleanout doors with frames, sized to match flues unless otherwise indicated. Provide continuous flange and anchors for securing frames to masonry. Provide smokeproof, hinged doors with[ lockable] fastening devices to hold doors closed[ and secured].

## 2.19 COAL HOPPER DOORS

Provide coal hopper doors of [galvanized][\_\_\_\_\_] steel plates and shapes. Provide complete assemblies including frames, stops, wall boxes, hinges, and hasp or lock-type latches. Weld joints and attachments.

## 2.20 GUY CABLES

Provide guy cables as pre-stretched, galvanized wire rope of sizes indicated. Provide wire rope high strength grade. Guys must have a factory attached clevis top-end fitting, a factory attached open-bridge strand socket bottom-end fitting, and must be complete with oval eye, threaded anchor rods. Provide hot-dip galvanized fittings and accessories.

## 2.21 WINDOW SUB-SILL

Provide window sub-sill of extruded aluminum alloy, standard mill finish, of size(s) and design(s) indicated. Provide a minimum of two anchors per window section for securing to mortar joints of masonry sill course. Provide sills with protective coating for shipment, of two coats of a clear, colorless, methacrylate lacquer applied to all surfaces of the sills.

## 2.22 WINDOW WELLS

Provide window wells in a minimum 1.5 mm, corrugated sheet steel, hot-dip galvanized after fabrication, with top edge of window well walls with a 19 mm bead or rolled top. Provide window wells with radiused corners and of sizes that overlap each window by a minimum of 75 mm on each side. Provide removable covers, hot-dipped galvanized after fabrication, consisting of steel bar grate, with bars spaced at not more than 50 mm centers and welded to 25 by 6 mm frame. Frames must fit into, and rest on top edge of, window wells.

# PART 3 EXECUTION

## 3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated in accordance with manufacturer's instructions. Verify all field dimensions prior to fabrication. Include materials and parts necessary to complete each assembly, whether indicated or not. Miss-alignment and miss-sizing of holes for fasteners is cause for rejection. Conceal fastenings where practicable. Joints exposed to weather must be watertight.

## 3.2 WORKMANSHIP

Provide miscellaneous metalwork that is true and accurate in shape, size, and profile. Make angles and lines continuous and straight. Make curves consistent, smooth and unfaceted. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections. Unless otherwise indicated and approved, provide a smooth finish on exposed surfaces. Provide countersunk rivets where exposed. Provide coped and mitered corner joints aligned flush and without gaps.

## 3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage as necessary, whether indicated or not, for fastening

miscellaneous metal items securely in place. Include slotted inserts, expansion shields, powder-driven fasteners, toggle bolts (when approved for concrete), through bolts for masonry, JIS B 1198 welded headed shear studs, machine and carriage bolts for steel, through bolts, lag bolts, and screws for wood. Do not use wood plugs. Provide non-ferrous attachments for non-ferrous metal. Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals), that generally match in color and finish the surfaces to which they are applied. Conceal fastenings where practicable. Provide all fasteners flush with the surfaces they fasten, unless indicated otherwise.[ Test a minimum of 2 bolt, nut, and washer assemblies from each certified mill batch in a tension measuring device at the job site prior to the beginning of bolting start-up.]

### 3.4 BUILT-IN WORK

Where necessary and not otherwise indicated, form built-in metal work for anchorage with concrete or masonry. Provide built-in metal work in ample time for securing in place as the work progresses.

### 3.5 WELDING

Perform welding, welding inspection, and corrective welding in accordance with JASS 6. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation. Provide welded headed shear studs in accordance with JASS 6, Clause 7, except as otherwise specified. Provide in accordance with the safety requirements of EM 385-1-1.

### 3.6 DISSIMILAR METALS

Where dissimilar metals are in contact, protect surfaces with a coating to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect with asphalt-base emulsion. Clean surfaces with metal shavings from installation at the end of each work day.

### 3.7 PREPARATION

#### 3.7.1 Material Coatings and Surfaces

Remove rust preventive coating just prior to field erection, using a remover approved by the metal manufacturer. Surfaces, when assembled, must be free of rust, grease, dirt and other foreign matter.

#### 3.7.2 Environmental Conditions

Do not clean or paint surfaces when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than minus 15 degrees C above the dew point of the surrounding air, or when surface temperature is below 7 degrees C or over 35 degrees C, unless approved by the Contracting Officer. Metal surfaces to be painted must be dry for a minimum of 48 hours prior to the application of primer or paint.

### 3.8 EXPANSION JOINT COVERS

Provide in accordance with manufacturer's written instructions[ and with seismic requirements indicated]. Verify installation allows specified movement prior to completion of work

### 3.9 COVER PLATES AND FRAMES

Provide tops of cover plates and frames flush with finished surface. Test for trip hazards and adjust for any encountered lippage.

### 3.10 WHEEL GUARDS

Anchor guards to concrete or masonry in accordance with manufacturer's instructions. Fill hollow cores solid with concrete with minimum compressive strength of 17 MPa.

### [3.11 ROOF HATCH (SCUTTLES)

Construction and accessories as follows:

- a. Provide insulated cover and curb with mounting flanges for securing to roof deck. Provide curbs with integral metal cap flashing of the same gage and metal as the curb, fully welded and ground at corners for weather tightness.
- b. Provide hatches completely assembled, with pintle hinges, compression spring operators enclosed in telescopic tubes, positive snap latches with turn handles on inside and outside, and neoprene draft seals. Provide fasteners for padlocking from the inside. Provide covers with automatic hold-open arms complete with grip handle to permit one hand release. Cover action must be smooth through its entire range of motion with an operating pressure of approximately 130 N.

### ]3.12 DOOR GUARD FRAME

Mount door guard frames over glazed openings using 6 mm lag bolts on the interiors of wood doors or tamperproof through bolts on the interiors of metal doors.

### 3.13 INSTALLATION OF BOLLARDS/PIPE GUARDS

Set bollards/pipe guards vertically in concrete piers. Fill hollow cores with concrete having a minimum compressive strength of 21 MPa.

### 3.14 INSTALLATION OF DOWNSPOUT TERMINATIONS

Secure downspouts terminations to downspouts and substrate per manufacturer's instructions.

### 3.15 MOUNTING OF SAFETY CHAINS

Provide safety chains where indicated. Mount the top chain 1050 mm [\_\_\_\_\_] above the [floor][ground] and mount the lower chain 600 mm [\_\_\_\_\_] above the [floor][ground].

### 3.16 STRUCTURAL STEEL DOOR FRAMES

Secure door frames to the floor slab by means of angle clips and expansion bolts. Provide any necessary reinforcements and drill and tap frames as required for hardware. Clean metal shavings from finished surfaces at the end of each work day.

For freight elevator hoistway entrances, include a non-skid metal sill installed in accordance with the elevator manufacturer's written

installation instructions.

### 3.17 INSTALLATION OF WHEEL GUARDS

Fill wheel guards with concrete and anchor to slab in accordance with manufacturer's recommendations.

### 3.18 BAR-GRILLE WINDOW GUARDS

Securely anchor bar-grille window guards to masonry with 13 mm diameter prison-type screws or bolts and expansion shields, or other type of fastenings if the ends of such fastenings are welded to the adjoining metal grilles or otherwise made tamperproof in manner as approved by the Contracting Officer. Spanner-head screws or bolts are not considered prison-type fasteners.

### 3.19 DIAMOND MESH WINDOW [AND DOOR ]GUARDS

Provide diamond mesh window guards on [interior window frames with not less than two tamperproof hinged butts mounted on wood jambs.][exterior of window frames with not less than two tamperproof hinged butts mounted on 25 by 300 by 3 mm jamb channel attached to 50 by 6 mm plate anchored][ to wood jambs with 6 mm lag bolt,] to masonry jamb with toggle bolts[, or to concrete jambs and solid masonry jambs with expansion shields and bolts]. Provide one additional butt for each 900 mm internal length of guard over 1500 mm. Install hasp and padlock jamb opposite the hinged side.

### 3.20 INSTALLATION OF WINDOW WELLS

Provide window wells with walls securely anchored to foundation surface. Excavate the area within the well to the bottom of the well and cover with a 100 mm thick layer of coarse gravel or crushed rock.

### 3.21 INSTALLATION MISCELLANEOUS PLATES AND SHAPES

Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions[ as indicated and] as required to support wall loads over openings. Provide with connections and [fasteners][welds]. Construct to have at least 200 mm bearing on masonry at each end.

-- End of Section --