



Standard Specification for Design, Testing, Manufacture, Selection, and Installation of Fabricated Metal Access Hatches for Utility, Water, and Wastewater Structures^{1,2}

This standard is issued under the fixed designation C1802; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

ε¹ NOTE—Editorial corrections were made throughout in April 2015.

1. Scope

1.1 This specification covers the design, testing, manufacture, selection, and installation of fabricated metal access hatches for utility, water, and wastewater structures including utility vaults, drainage structures, valve vaults, meter vaults, wet wells, pump enclosures, utility trenches, piping trenches, and drainage trenches.

1.2 This specification is applicable to various configurations of access hatches constructed of fabricated metal of various materials and grades for various loading conditions, traffic speeds, or both.

1.3 Engineering design and testing criteria are provided for access hatches to be located in various areas subjected to various loading conditions, traffic speed, frequency, or combinations thereof.

1.4 Proof loading criteria is provided to allow the access hatches to be designed by engineering calculation and/or by ultimate strength load testing.

1.5 Production loading criteria is provided to allow the access hatches to be tested to verify the load capacity of the manufactured hatches.

1.6 Hatch loading selection guidelines are included to allow selection of the proper hatch design loading for the conditions of the actual area of placement.

1.7 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical

conversions to SI units that are provided for information only and are not considered the standard.

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:³

- A36/A36M Specification for Carbon Structural Steel
- A53/A53M Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- A123/A123M Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- A176 Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip (Withdrawn 2015)⁴
- A240/A240M Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- A242/A242M Specification for High-Strength Low-Alloy Structural Steel
- A276 Specification for Stainless Steel Bars and Shapes
- A325 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- A490 Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
- A500/A500M Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- A514/A514M Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding

¹ This specification is under the jurisdiction of ASTM Committee C27 on Precast Concrete Products and is the direct responsibility of Subcommittee C27.10 on Utility Structures.

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² This specification is primarily a design, testing, manufacturing, selection, purchasing, and installation specification. The successful performance of this product depends upon the proper selection of the loading criteria based on the product's actual use and the products proper installation. The purchaser of the fabricated metal access hatches specified herein is cautioned that proper correlation of the loading conditions, proper installation for the hatch specified, and provision for inspection of the installation at the construction site, are required.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

⁴ The last approved version of this historical standard is referenced on www.astm.org.

A529/A529M Specification for High-Strength Carbon-Manganese Steel of Structural Quality
A572/A572M Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
A588/A588M Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance
A618/A618M Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing
A656/A656M Specification for Hot-Rolled Structural Steel, High-Strength Low-Alloy Plate with Improved Formability
A666 Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
A786/A786M Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates
A847/A847M Specification for Cold-Formed Welded and Seamless High-Strength, Low-Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance
A852/A852M Specification for Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi [485 MPa] Minimum Yield Strength to 4 in. [100 mm] Thick (Withdrawn 2010)⁴
A913/A913M Specification for High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST)
A992/A992M Specification for Structural Steel Shapes
B209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate
B210 Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes
B211 Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire
B221 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
B241/B241M Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
B247 Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings
B308/B308M Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles
B316/B316M Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods
B429/B429M Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
B632/B632M Specification for Aluminum-Alloy Rolled Tread Plate
B928/B928M Specification for High Magnesium Aluminum-Alloy Sheet and Plate for Marine Service and Similar Environments
C478 Specification for Circular Precast Reinforced Concrete Manhole Sections
C857 Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
C890 Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures

E4 Practices for Force Verification of Testing Machines
E2309/E2309M Practices for Verification of Displacement Measuring Systems and Devices Used in Material Testing Machines
F467 Specification for Nonferrous Nuts for General Use
F468 Specification for Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws, and Studs for General Use
2.2 *AASHTO Standards and Specifications*:⁵
AASHTO Standard Specifications for Highway Bridges (current edition)
AASHTO LRFD Bridge Design Specification (current edition)
2.3 *The American Institute of Steel Construction Specifications*:⁶
ANSI/AISC 360 Specification for Structural Steel Buildings (current edition)
2.4 *ASCE Specifications*:⁷
SEI/ASCE 8 Specification for the Design of Cold-Formed Stainless Steel Structural Members (current edition)
2.5 *The Aluminum Association*:⁸
Aluminum Design Manual (current edition)
2.6 *The American Welding Society Codes*:⁹
D1.1 Structural Welding Code—Steel (current edition)
D1.2 Structural Welding Code—Aluminum (current edition)
D1.6 Structural Welding Code—Stainless Steel (current edition)
2.7 *The U.S. Department of Transportation Federal Aviation Administration Advisory Circulars*:¹⁰
Advisory Circular No. 150/5320-6E

3. Terminology

3.1 Definitions:

3.1.1 *AA, n*—Aluminum Association.

3.1.2 *access hatch, n*—an assembly of a hatch door and optional frame providing a horizontal structural covering of an opening that provides access to the structure below.

3.1.3 *access hatch door, n*—the access hatch horizontal cover that is either removable or hinged to provide access to the structure below.

3.1.4 *access hatch frame, n*—the perimeter fabrication around an access hatch door that provides attachment to the opening in the structure below.

3.1.5 *AISC, n*—American Institute of Steel Construction.

3.1.6 *ASCE, n*—American Society of Civil Engineers.

3.1.7 *ASTM, n*—ASTM International.

⁵ Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, <http://www.transportation.org>.

⁶ Available from American Institute of Steel Construction (AISC), 1 East Wacker Drive, Suite 3100, Chicago, Illinois 60601, <http://www.aisc.org>.

⁷ Available from American Society of Civil Engineers (ASCE), 1801 Alexander Bell Drive, Reston, Virginia, 20191, <http://www.asce.org>.

⁸ Available from The Aluminum Association (AA), 1525 Wilson Blvd Suite 600, Arlington Virginia, 22209, <http://www.aluminum.org>.

⁹ Available from The American Welding Society (AWS), 8669 NW 36 Street no. 130, Doral, Florida, 33166, <http://www.aws.org>.

¹⁰ Available from The U.S. Department of Transportation Federal Aviation Administration, <http://www.faa.gov>.

3.1.8 *ASD*, *n*—allowable stress design.

3.1.9 *AWS*, *n*—American Welding Society.

3.1.10 *fabricated metal*, *n*—an assembly of cut, bent, or machined metal parts that are welded or bolted together to become the final assembly.

3.1.11 *finite element modeling*, *n*—to numerically three dimensionally model an assembly by subdividing the assembly into smaller elements and applying a load to determine the stresses in each of the elements.

3.1.12 *load level*, *n*—a number between one and ten that corresponds to the description of the loads and applicable use in this specification.

3.1.13 *LRFD*, *n*—load and resistance factor design.

3.1.14 *production loading*, *v*—test loading to a force level less than yield strength to verify the load capacity of the manufactured hatch.

3.1.15 *proof loading*, *v*—test loading to a force level of the load times a safety factor to prove the design of an access hatch.

3.1.16 *protective coatings*, *n*—galvanizing, painting, or powder coating metal surfaces to provide corrosion and environmental protection.

3.1.17 *purchaser*, *n*—the person or entity buying an access hatch from the manufacturer.

3.1.18 *structural stiffeners*, *n*—structural metallic shapes or bent metallic shapes attached to the bottom of the top plate surface of an access door to strengthen its structural properties.

3.1.19 *top plate*, *n*—the metallic top surface of an access door that receives the pedestrian or vehicular load directly.

3.1.20 *ultimate strength*, *n*—the stress of a metallic material when failure occurs.

3.1.21 *ultimate strength load*, *n*—the “safety” factored load obtained by applying a load factor to the load.

3.1.22 *weld filler*, *n*—the material deposited by a welding operation.

3.1.23 *working stress load*, *n*—load applied without load factors, but with capacity reduction factors applied to the materials being utilized.

3.1.24 *yield strength*, *n*—the stress of a metallic material when permanent deflection first occurs and as tested at 0.2 % offset.

4. Significance and Use

4.1 This specification is intended to standardize the minimum load level criteria for structural design of fabricated metal access hatches.

4.2 The users are cautioned that they must properly identify the anticipated current and future anticipated field loading conditions and requirements with the design loads. It is not prohibited for field conditions to dictate loads greater than the minimum load levels presented here.

5. Designation

5.1 The fabricated metal hatches manufactured in accordance with this specification shall be legibly marked with the manufacturer’s name or trademark, the specification designation, the load level, the nominal opening dimensions unless included in the part number, and the month and year of manufacture or a serial number on the inside of the access hatch cover or frame as described in Section 21.

6. Basis of Acceptance

6.1 Acceptability of the access hatches shall be determined based on the design in accordance with Section 9, the physical requirements described in Sections 13 – 18, the material requirements described in Section 7, and physical inspection of the access hatches.

6.2 Access hatches shall be considered ready for acceptance when they conform to all requirements of this specification.

7. Materials

7.1 The material of each component of the access hatch assembly shall be suitable for its specific application within the assembly, to be determined by the expected function, the required strength, and the environmental exposure.

7.2 Steel Access Hatches:

7.2.1 The minimum yield strength of all steel components of the access hatch shall be 36 000 psi (248.22 MPa) and the yield strengths utilized shall be stated on the calculations and fabrication drawings.

7.2.2 Material specifications and grades shall be selected based on required design yield strength, formability, and weld ability.

7.2.3 The following materials are considered to be appropriate materials for this application:

- (1) Specification A36/A36M carbon steel plates, bars, structural shapes, and threaded rods,
- (2) Specification A53/A53M Grade B carbon steel pipes,
- (3) Specification A242/A242M corrosion resistant high strength low alloy steel plates, bars, and structural shapes,
- (4) Specification A325 steel bolts,
- (5) Specification A490 steel bolts,
- (6) Specification A500/A500M Grade B carbon steel HSS rectangles and rounds,
- (7) Specification A514/A514M quenched and tempered alloy steel plates,
- (8) Specification A529/A529M carbon steel plates, bars, and structural shapes,
- (9) Specification A572/A572M high strength low alloy steel plates, bars, and structural shapes,
- (10) Specification A588/A588M corrosion resistant high strength low alloy steel plates, bars, and structural shapes,
- (11) Specification A618/A618M high strength low alloy steel HSS rectangles and rounds,
- (12) Specification A656/A656M high strength low alloy steel plates,
- (13) Specification A786/A786M steel floor plate meeting the strength requirements of Specifications A36/A36M, A572/A572M, or A588/A588M,

(14) Specification **A847/A847M** corrosion resistant high strength low alloy steel HSS rectangles and rounds,

(15) Specification **A852/A852M** quenched and tempered low alloy steel plates,

(16) Specification **A913/A913M** high strength low alloy steel structural shapes, and

(17) Specification **A992/A992M** high strength low alloy steel structural shapes.

7.2.4 Weld filler materials shall have a minimum tensile strength of 70 000 psi (482.65 MPa) and be selected based on the various combinations of base material welded in accordance with the requirements of the American Welding Society D1.1 structural welding code.

7.2.5 If corrosion protection is provided by galvanizing, the process and material shall meet the requirements of Specification **A123/A123M** and have a minimum coating weight of 2.0 oz/ft² (0.61 kg/m²).

7.3 *Stainless Steel Access Hatches:*

7.3.1 The minimum yield strength of all stainless steel components of the access hatch shall be 30 000 psi (206.85 MPa) and the yield strengths utilized shall be stated on the calculations and fabrication drawings.

7.3.2 Material specifications and grades shall be selected based on required design yield strength, formability, weld ability, and corrosion resistance.

7.3.3 The following materials are considered to be appropriate materials for this application:

(1) **A176** stainless and heat-resisting chromium steel plate, sheet, and strip,

(2) **A240/A240M** chromium and chromium nickel stainless steel plate, sheet, and strip ,

(3) **A276** stainless steel bars and shapes, and

(4) **A666** annealed or cold worked austenitic stainless steel sheet, strip, plate, and flat bar.

7.3.4 The following material grades are considered to be appropriate materials for this application:

(1) 304 stainless steel,

(2) 304L stainless steel,

(3) 308 stainless steel,

(4) 308L stainless steel,

(5) 316 stainless steel, and

(6) 316L stainless steel.

7.3.4.1 The specific material grade used shall meet the chemical and mechanical properties included in the specifications referenced in 7.3.3.

7.3.5 Weld filler materials shall have a minimum ultimate tensile strength of 70 000 psi (482.65 MPa) and be selected based on the various combinations of base material welded in accordance with the requirements of the American Welding Society D1.6 structural welding code.

7.4 *Aluminum Access Hatches:*

7.4.1 The minimum tensile yield strength shall be 23 000 psi (158.585 MPa) and the minimum compressive yield strength shall be 21 000 psi (144.795 MPa) for all aluminum components of the access hatch. The yield strengths utilized shall be stated on the calculations and fabrication drawings.

7.4.2 Material specifications, alloys, and tempers shall be selected based on required design yield strengths, formability, weld ability, corrosion resistance, and potential temperature exposure.

7.4.3 The following materials are considered to be appropriate materials for this application:

(1) Specification **B209** aluminum and aluminum alloy sheet and plate,

(2) Specification **B210** aluminum and aluminum alloy drawn seamless tubes,

(3) Specification **B211** aluminum and aluminum alloy extruded bar, rod, and wire,

(4) Specification **B221** aluminum and aluminum alloy extruded bars, rods, wire, profiles, and tubes,

(5) Specification **B241/B241M** aluminum and aluminum alloy seamless pipe and seamless extruded tube,

(6) Specification **B247** aluminum and aluminum alloy die forgings, hand forgings, and rolled ring forgings,

(7) Specification **B308/B308M** aluminum-alloy 6061-T6 standard structural profiles,

(8) Specification **B316/B316M** aluminum and aluminum alloy rivet and cold heading wire and rods,

(9) Specification **B429/B429M** aluminum and aluminum alloy extruded pipe and tube,

(10) Specification **B632/B632M** aluminum and aluminum alloy rolled tread plate,

(11) ASTM **B928/B928M** high magnesium aluminum alloy sheet and plate for marine service and similar environments,

(12) Specification **F467** nonferrous bolts, hex cap screws and studs, and

(13) Specification **F468** nonferrous nuts.

7.4.4 The following designated alloys and tempers are considered to be appropriate alloys and tempers for this application:

(1) Alloy 3004 Temper H38 wrought aluminum sheets,

(2) Alloy 5052 Temper H32 wrought aluminum sheets,

(3) Alloy 5052 Temper H36 wrought aluminum sheets

(4) Alloy 5083 Temper H321 wrought aluminum sheets and plates,

(5) Alloy 5086 Temper H34 wrought aluminum sheets, plates, and drawn tubes,

(6) Alloy 5086 Temper H116 wrought aluminum sheets,

(7) Alloy 5456 Temper H116 wrought aluminum sheets and plates,

(8) Alloy 5456 Temper H321 wrought aluminum sheets and plates,

(9) Alloy 6005 Temper T5 wrought aluminum extrusions,

(10) Alloy 6005A Temper T61 wrought aluminum extrusions,

(11) Alloy 6061 Temper T6 wrought aluminum sheets, plates, extrusions, rods, bars, drawn tubes, and pipes,

(12) Alloy 6061 Temper T651 wrought aluminum sheets, plates, extrusions, rods, bars, drawn tubes, and pipes, and

(13) Alloy 6063 Temper T6 wrought aluminum extrusions and pipes

7.4.4.1 The specific material alloy and temper used shall meet the chemical and mechanical properties included in the specifications referenced in 7.4.3.

7.4.5 Weld filler materials shall have a minimum tensile strength of 31 000 psi (213.75 MPa), a minimum ultimate shear strength of 17 000 psi (117.22 MPa), and be selected based on the various combinations of base material welded in accordance with the requirements of the American Welding Society D1.2 structural welding code.

7.4.6 Protective coatings shall be provided for the exterior portion of aluminum frames and skirts that are to be cast in fresh concrete to prevent corrosion.

8. Material Certification

8.1 All metal material deliveries to the manufacturer's facilities shall include mill certification documentation that includes the material specification designation, the chemical analysis, the yield strength, and the ultimate strength from the material's test results.

8.2 The mill certification documents shall be reviewed by the manufacturer's quality control personnel to assure compliance with the required specifications and any material not meeting the specification shall be rejected and returned to the source.

8.3 Mill certifications shall be marked with the date the material is received and maintained by the hatch manufacturer for a minimum period of seven years.

8.4 If requested by the purchaser at the time of request for quotation, specific material mill certifications for the hatches provided shall be provided by the manufacturer at the time of access hatch delivery.

9. Load Levels and Design Requirements

9.1 *Load Levels*—The following are designated load levels with their appropriate applications.

9.1.1 Load Level 1—Light Pedestrian Load:

9.1.1.1 It is not prohibited to utilize Load Level 1 designs in walkways and other areas that are totally inaccessible to all vehicle traffic. Examples of appropriate use include the interiors of buildings, elevated walkways, and elevated platforms with top surfaces a minimum of one foot above finished grade. Appropriate locations for Load Level 1 access hatches are shown in Fig. 1.

9.1.1.2 *Level 1 Loading*—A design loading of 150 psf (7.18 kPa) and a concentrated design load of 300 lbf (136.08 kgf) applied to a 5.50 by 5.50 in. (139.70 by 139.70 mm) area shall be analyzed non-simultaneously. If structural stiffeners are utilized, the access cover top plate shall be designed as a span between structural stiffener webs and as a cantilever at the perimeter of the cover for an applied uniform load of 10 psi (68.95 kPa).

9.1.1.3 Level 1—Applicable Design Methods:

(1) Steel access hatches shall be designed by calculation utilizing the Allowable Stress Design method as specified in ANSI/AISC 360 Specification for Structural Steel Buildings, the Load and Resistance Factor Design method as specified in ANSI/AISC 360 Specification for Structural Steel Buildings, the methods included in the AASHTO Standard Specifications for Highway Bridges, or the methods included in the AASHTO LRFD Bridge Design Specification.

(2) Stainless steel access hatches shall be designed by calculation utilizing the American Society of Civil Engineers SEI/ASCE 8 Specification for the Design of Cold-Formed

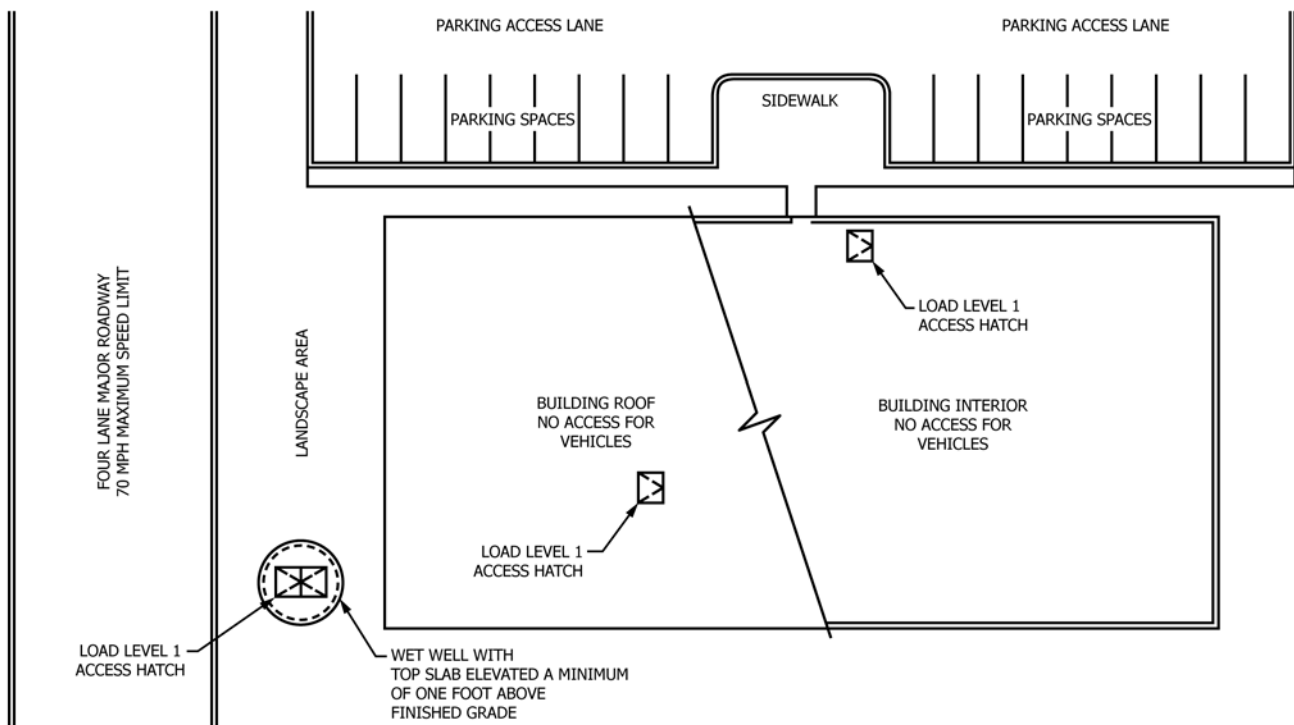


FIG. 1 Plan Showing Appropriate Locations for Load Level 1 Access Hatches—Light Pedestrian Load

Stainless Steel Structural Members Allowable Stress Design method, the American Society of Civil Engineers SEI/ASCE Specification for the Design of Cold-Formed Stainless Steel Structural Members Load and Resistance Factor Design method, the methods included in the AASHTO Standard Specifications for Highway bridges, or the methods in the AASHTO LRFD Bridge Design Specification.

(3) Aluminum access hatches shall be designed by calculation utilizing the Aluminum Association's Aluminum Design Manual Allowable Strength method, the Aluminum Association's Aluminum Design Manual Load and Resistance Factor design method, the methods included in the AASHTO Standard Specifications for Highway Bridges, or the methods in the AASHTO LRFD Bridge Design Specification. Weld affected areas of aluminum access hatches shall be considered in the calculation as specified in the applicable design method.

(4) It is not prohibited that steel, stainless steel, or aluminum access hatches be designed, instead of by calculation, by prototype proof loading to a force of 1.60 times the applicable loads, 240 psf load (11.49 kPa) and 480 lbf (217.73 kgf) on a 5.50 by 5.50 in. (139.70 by 139.70 mm) area non-simultaneously, without permanent deflection greater than 0.02 in. (0.51 mm) or cracking. Each proof loading test shall be repeated ten times on the same fabrication to demonstrate that progressive failure does not occur.

9.1.1.4 *Level 1 Deflection*—Live load deflection by calculation or by loading at working stress levels, 150 psf (7.18 kPa) and a design load of 300 lbf (136.08 kgf) applied to a 5.50 by 5.50 in. (139.70 by 139.70 mm) area applied non-simultaneously, shall not exceed the lesser of the span divided by 200 or $\frac{3}{16}$ in. (4.76 mm).

9.1.2 *Load Level 2—Pedestrian Load:*

9.1.2.1 It is not prohibited to utilize Load Level 2 designs in any Load Level 1 application and in areas restricted to pedestrian use and light maintenance vehicle use. Examples of appropriate use include walkways and landscape areas where curbs, bollards, or both restrict vehicle access. Appropriate locations for Load Level 2 access hatches are shown in Fig. 2.

9.1.2.2 *Level 2 Loading*—A design loading of 300 psf (14.36 kPa) and a concentrated design load of 600 lbf (272.16 kgf) applied to a 5.50 by 5.50 in. (139.70 by 139.70 mm) area shall be analyzed non-simultaneously. If structural stiffeners are utilized, the access cover top plate shall be designed as a span between structural stiffener webs and as a cantilever at the perimeter of the cover for an applied uniform load of 20 psi (139.70 kPa).

9.1.2.3 *Level 2—Applicable Design Methods:*

(1) Steel access hatches shall be designed by calculation utilizing the Allowable Stress Design Method as specified in ANSI/AISC 360 Specification for Structural Steel Buildings, the Load and Resistance Factor Design method as specified in ANSI/AISC 360 Specification for Structural Steel Buildings, the methods included in the AASHTO Standard Specifications for Highway Bridges, or the methods included in the AASHTO LRFD Bridge Design Specification.

(2) Stainless steel access hatches shall be designed by calculation utilizing the American Society of Civil Engineers SEI/ASCE 8 Specification for the Design of Cold-Formed Stainless Steel Structural Members Allowable Stress Design method, the American Society of Civil Engineers SEI/ASCE 8 Specification for the Design of Cold-Formed Stainless Steel Structural Members Load and Resistance Factor Design

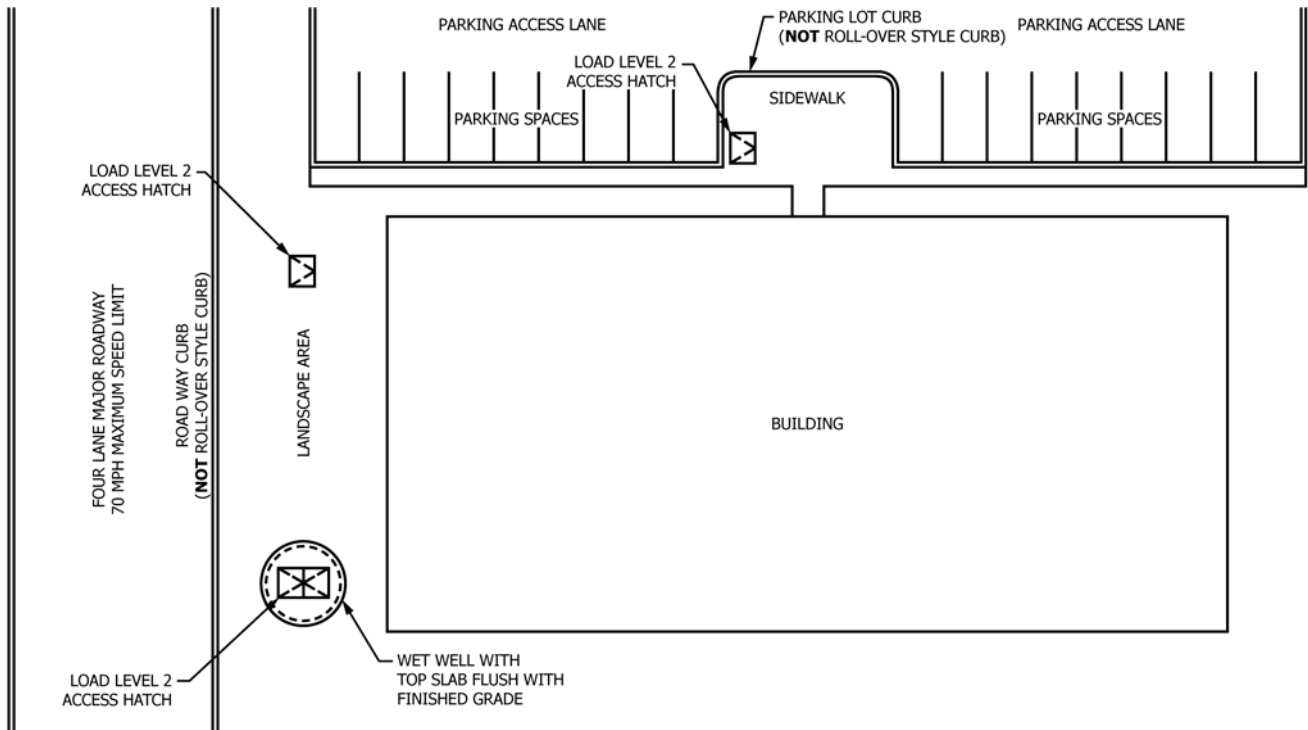


FIG. 2 Plan Showing Appropriate Locations for Load Level 2 Access Hatches—Pedestrian Load

method, the methods included in the AASHTO Standard Specifications for Highway bridges, or the methods in the AASHTO LRFD Bridge Design Specification.

(3) Aluminum access hatches shall be designed by calculation utilizing the Aluminum Association's Aluminum Design Manual Allowable Strength method, the Aluminum Association's Aluminum Design Manual Load and Resistance Factor design method, the methods included in the AASHTO Standard Specifications for Highway Bridges, or the methods in the AASHTO LRFD Bridge Design Specification. Weld affected areas of aluminum access hatches shall be considered in the calculation as specified in the applicable design method.

(4) It is not prohibited that steel, stainless steel, or aluminum access hatches be designed, instead of by calculation, by prototype proof loading to a force of 1.60 times the applicable loads, 480 psf (22.98 kPa) and 960 lbf (435.46 kgf) on a 5.50 by 5.50 in. (139.70 by 139.70 mm) area non-simultaneously, without permanent deflection greater than 0.02 in. (0.51 mm) or cracking. Each proof loading test shall be repeated ten times on the same fabrication to demonstrate that progressive failure does not occur.

9.1.2.4 *Level 2 Deflection*—Live load deflection by calculation or by loading at working stress levels, 300 psf load (14.36 kPa) and a design load of 600 lbf (272.16 kgf) applied to a 5.50 by 5.50 in. (139.70 by 139.70 mm) area applied non-simultaneously, shall not exceed the lesser of the span divided by 200 or $\frac{3}{16}$ in. (4.76 mm).

9.1.3 *Load Level 3—Light Vehicular Traffic:*

9.1.3.1 It is not prohibited to utilize Load Level 3 designs in any Level 1 or Level 2 application, parking spaces that are accessible only to passenger vehicles and areas that are protected within close proximity of roadways. This Level 3 loading is not applicable to unrestricted parking lot access lanes or other areas that can be accessed by heavily loaded

truck traffic. Appropriate locations for Load Level 3 access hatches are shown in Fig. 3.

9.1.3.2 *Level 3 Loading:*

(1) A concentrated design loading of an 8000 lbf load (3628.80 kgf) without a dynamic (impact) load applied to a 10 by 10 in. (254 by 254 mm) footprint. The footprint shall be positioned to produce both the maximum moment and the maximum shear.

(2) If the span of an access hatch exceeds 48 in. (1219 mm), an additional load case of two 8000 lbf (3628.80 kgf) loads without a dynamic (impact) allowance applied to 10 by 10 in. (254 by 254 mm) footprints at 48 in. (1219 mm) on center span shall be investigated. The footprints shall be positioned to produce both the maximum moment and the maximum shear.

(3) If structural stiffeners are utilized, the access hatch top plate shall be designed as a span between structural stiffener webs and as a cantilever at the perimeter of the hatch for an applied uniform load of 80 psi (551.60 kPa).

9.1.3.3 *Level 3—Applicable Design Methods:*

(1) Steel access hatches shall be designed by calculation utilizing the Allowable Stress Design method as specified in ANSI/AISC 360 Specification for Structural Steel Buildings, the Load and Resistance Factor Design method as specified in ANSI/AISC 360 Specification for Structural Steel Buildings, the methods included in the AASHTO Standard Specifications for Highway Bridges, or the methods included in the AASHTO LRFD Bridge Design Specification.

(2) Stainless steel access hatches shall be designed by calculation utilizing the American Society of Civil Engineers SEI/ASCE 8 Specification for the Design of Cold-Formed Stainless Steel Structural Members Allowable Stress Design method, the American Society of Civil Engineers SEI/ASCE 8 Specification for the Design of Cold-Formed Stainless Steel

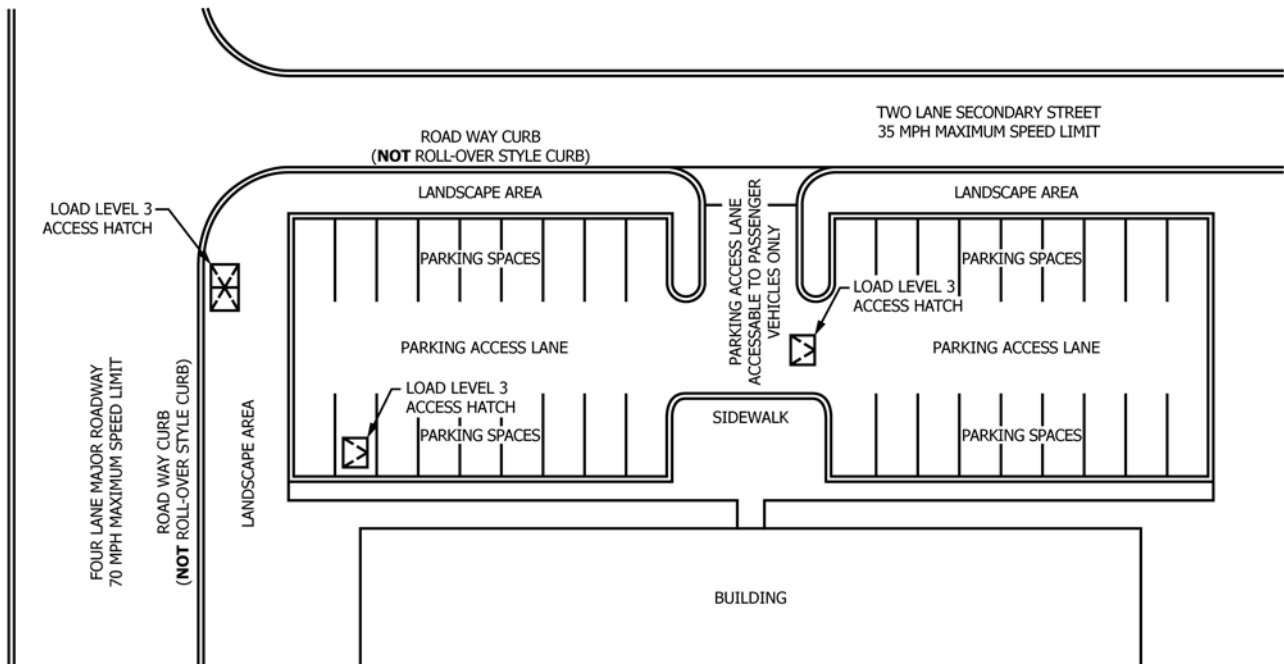


FIG. 3 Plan Showing Appropriate Locations for Load Level 3 Access Hatches—Light Vehicular Traffic

Structural Members Load and Resistance Factor Design method, the methods included in the AASHTO Standard Specifications for Highway Bridges, or the methods included in the AASHTO LRFD Bridge Design Specification.

(3) Aluminum access hatches shall be designed by calculation utilizing the Aluminum Association's Aluminum Design Manual Allowable Strength method, the Aluminum Association's Aluminum Design Manual Load and Resistance Factor design method, the methods included in the AASHTO Standard Specifications for Highway Bridges, or the methods in the AASHTO LRFD Bridge Design Specification. Weld affected areas of aluminum access hatches shall be considered in the calculation as specified in the applicable design method.

(4) It is not prohibited that steel, stainless steel, or aluminum access hatches be designed, instead of by calculation, by prototype proof loading to a force of 1.60 times the applicable load, 12 800 lbf load (5806.08 kgf), without permanent deflection greater than 0.02 in. (0.51 mm) or cracking. If the span of an access hatch exceeds 48 in. (1219 mm), the additional load cases described in 9.1.3.3 shall be prototype proof loaded to a force of 1.60 times the applicable load. The loads shall be tested in the position that produces the maximum moment and in the position that produces the maximum shear. Each proof loading test shall be repeated ten times on the same fabrication to demonstrate that progressive failure does not occur.

9.1.3.4 *Level 3 Deflection*—Live load deflection by calculation or by loading at working stress levels, 8000 lbf load (3548.80 kgf), shall not exceed the lesser of the span divided by 250 or $\frac{3}{16}$ in. (4.76 mm).

9.1.4 *Load Level 4—Occasional Truck Traffic:*

9.1.4.1 It is not prohibited to utilize Load Level 4 designs in any Level 1, 2, or 3 application, unrestricted parking spaces, and areas within close proximity of roadways. This Level 4 loading is not applicable to unrestricted parking lot access

lanes or other areas that can be frequently traveled by heavily loaded truck traffic. Appropriate locations for Load Level 4 access hatches are shown in Fig. 4.

9.1.4.2 *Level 4 Loading:*

(1) A concentrated design loading of a 16 000 lbf load (7257.60 kgf) without a dynamic (impact) load applied to a 10 by 20 in. (254 by 508 mm) footprint with traffic both parallel and perpendicular to the span. The footprint shall be positioned to produce both the maximum moment and the maximum shear.

(2) If the span of an access hatch exceeds 48 in. (1219 mm), an additional load case of two 16 000 lbf (7257.60 kgf) loads without a dynamic (impact) allowance applied to 10 by 20 in. (254 by 508 mm) footprints at 48 in. (1219 mm) on center with traffic perpendicular to the span shall be investigated, and an additional load case of two 12 000 lbf (5443.20 kgf) loads without a dynamic (impact) allowance applied to 10 by 20 in. (254 by 508 mm) footprints at 48 in. (1219 mm) on center with traffic parallel to the span shall be investigated. The footprints shall be positioned to produce both the maximum moment and the maximum shear.

(3) If structural stiffeners are utilized, the access hatch top plate shall be designed as a span between structural stiffener webs and as a cantilever at the perimeter of the hatch for an applied uniform load of 80 psi (551.60 kPa).

9.1.4.3 *Level 4—Applicable Design Methods:*

(1) Steel access hatches shall be designed by calculation utilizing the Allowable Stress Design method as specified in ANSI/AISC 360 Specification for Structural Steel Buildings, the Load and Resistance Factor Design method as specified in ANSI/AISC 360 Specification for Structural Steel Buildings, the methods included in the AASHTO Standard Specifications for Highway Bridges, or the methods included in the AASHTO LRFD Bridge Design Specification.

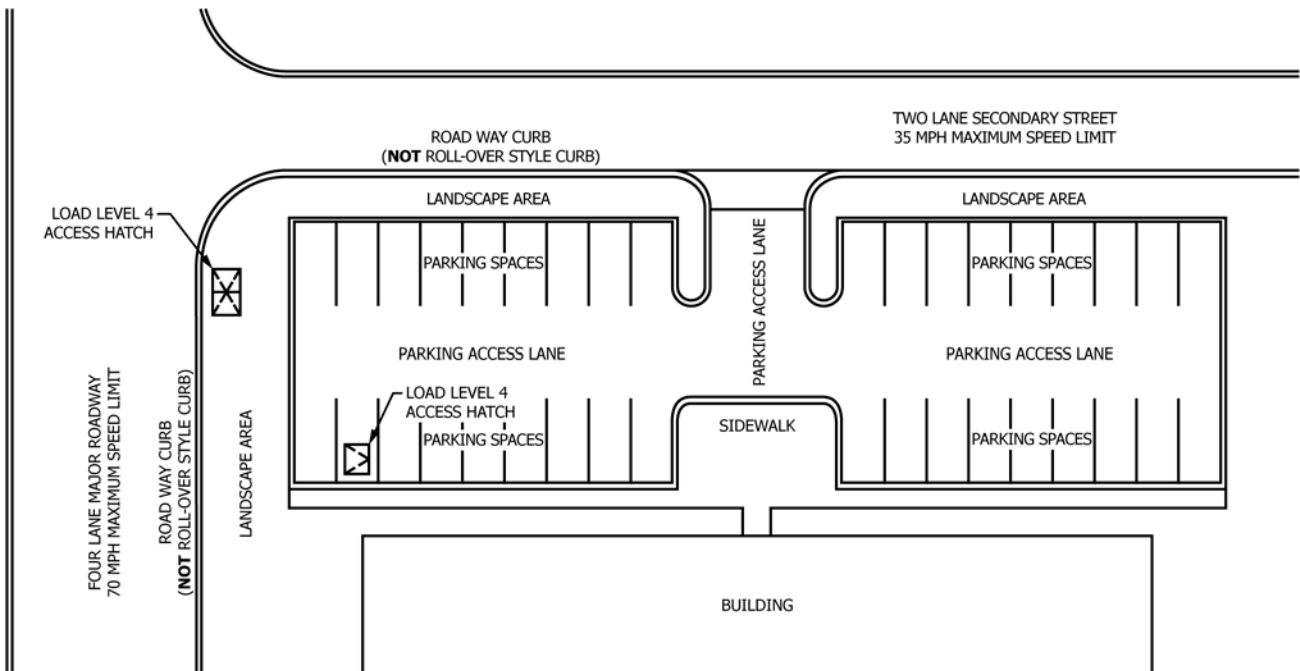


FIG. 4 Plan Showing Appropriate Locations for Load Level 4 Access Hatches—Occasional Truck Traffic

(2) Stainless steel access hatches shall be designed by calculation utilizing the American Society of Civil Engineers SEI/ASCE 8 Specification for the Design of Cold-Formed Stainless Steel Structural Members Allowable Stress Design method, the American Society of Civil Engineers SEI/ASCE 8 Specification for the Design of Cold-Formed Stainless Steel Structural Members Load and Resistance Factor Design method, the methods included in the AASHTO Standard Specifications for Highway Bridges, or the methods included in the AASHTO LRFD Bridge Design Specification.

(3) Aluminum access hatches shall be designed by calculation utilizing the Aluminum Association's Aluminum Design Manual Allowable Strength method, the Aluminum Association's Aluminum Design Manual Load and Resistance Factor design method, the methods included in the AASHTO Standard Specifications for Highway Bridges, or the methods in the AASHTO LRFD Bridge Design Specification. Weld affected areas of aluminum access hatches shall be considered in the calculation as specified in the applicable design method.

(4) It is not prohibited that steel, stainless steel, or aluminum access hatches be designed, instead of by calculation, by prototype proof loading to a force of 1.60 times the applicable load, 25 600 lbf load (11 612.16 kgf), without permanent deflection greater than 0.02 in. (0.51 mm) or cracking. If the span of an access hatch exceeds 48 in. (1219 mm), the additional load cases described in 9.1.4.2 shall be prototype proof loaded to a force of 1.60 times the applicable load. The loads shall be tested in the position that produces the maximum moment and in the position that produces the maximum shear. Each proof loading test shall be repeated ten times on the same fabrication to demonstrate that progressive failure does not occur.

9.1.4.4 *Level 4 Deflection*—Live load deflection by calculation or by loading at working stress levels, 16 000 lbf load (7257.60 kgf), shall not exceed the lesser of the span divided by 250 or $\frac{3}{16}$ in. (4.76 mm).

9.1.5 Load Level 5—Off Street Truck Traffic:

9.1.5.1 It is not prohibited to utilize Load Level 5 designs in any Level 1, 2, 3, or 4 application, as well as in unrestricted parking access lanes, and alleyways where the traffic speed is limited to 15 mph (24.14km/h). Appropriate locations for Load Level 5 access hatches are shown in Fig. 5.

9.1.5.2 Level 5 Loading:

(1) A concentrated design loading of a 16 000 lbf (7257.60 kgf) load plus a 30 % dynamic (impact) allowance [20 800 lbf (9434.88 kgf) total load] applied to a 10 by 20 in. (254 by 508 mm) footprint with traffic both parallel and perpendicular to the span. The footprint shall be positioned to produce both the maximum moment and the maximum shear.

(2) If the span of an access hatch exceeds 48 in. (1219 mm), an additional load case of two 16 000 lbf (7257.60 kgf) loads, plus a 30 % dynamic (impact) allowance, 20 800 lbf (9434.88 kgf) each load, applied to 10 by 20 in. (254 by 508 mm) footprints at 48 in. (1219 mm) on center with traffic perpendicular to the span shall be investigated, and an additional load case of two 12 000 lbf (5443.20 kgf) loads plus a 30 % dynamic (impact) allowance, 15 600 lbf (7076.16 kgf) each load, applied to 10 by 20 in. (254 by 508 mm) footprints at 48 in. (1219 mm) on center with traffic parallel to the span shall be investigated. The footprints shall be positioned to produce both the maximum moment and the maximum shear.

(3) If structural stiffeners are utilized, the access hatch top plate shall be designed as a span between structural stiffener webs and as a cantilever at the perimeter of the hatch for an applied uniform load of 104, 80 × 1.30, psi (717.08 kPa).

9.1.5.3 Level 5—Applicable Design Methods:

(1) Steel access hatches shall be designed by calculation utilizing the Allowable Stress Design method as specified in ANSI/AISC 360 Specification for Structural Steel Buildings, the Load and Resistance Factor Design method as specified in ANSI/AISC 360 Specification for Structural Steel Buildings, the methods included in the AASHTO Standard Specifications

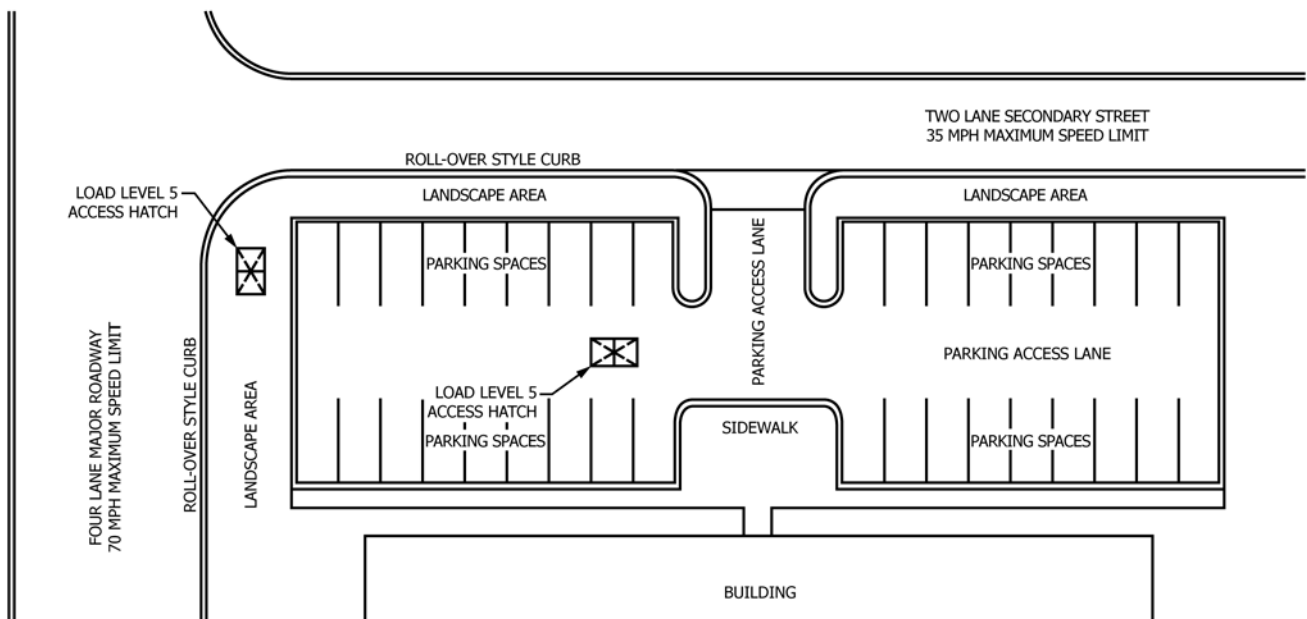


FIG. 5 Plan Showing Appropriate Locations for Load Level 5 Access Hatches—Off Street Truck Traffic

for Highway Bridges, or the methods included in the AASHTO LRFD Bridge Design Specification.

(2) Stainless steel access hatches shall be designed by calculation utilizing the American Society of Civil Engineers SEI/ASCE 8 Specification for the Design of Cold-Formed Stainless Steel Structural Members Allowable Stress Design method, the American Society of Civil Engineers SEI/ASCE 8 Specification for the Design of Cold-Formed Stainless Steel Structural Members Load and Resistance Factor Design method, the methods included in the AASHTO Standard Specifications for Highway Bridges, or the methods included in the AASHTO LRFD Bridge Design Specification.

(3) Aluminum access hatches shall be designed by calculation utilizing the Aluminum Association's Aluminum Design Manual Allowable Strength method, the Aluminum Association's Aluminum Design Manual Load and Resistance Factor design method, the methods included in the AASHTO Standard Specifications for Highway Bridges, or the methods in the AASHTO LRFD Bridge Design Specification. The safety factor Ω utilized shall be the safety factor for bridge structures and fatigue shall be analyzed if the Aluminum Association's methods are utilized. Weld affected areas of aluminum access hatches shall be considered in the calculation as specified in the applicable design method.

(4) It is not prohibited that steel, stainless steel or aluminum access hatches be designed, instead of by calculation, by prototype proof loading to a force of 1.60 times the applicable load, 33 280 lbf load (15 095.81 kgf), without permanent deflection greater than 0.02 in. (0.51 mm) or cracking. If the span of an access hatch exceeds 48 in. (1219 mm), the additional load cases described in 9.1.5.2 shall be prototype proof loaded to a force of 1.60 times the applicable load. The load shall be tested in the position that produces the maximum moment and in the position that produces the maximum shear.

Each proof loading test shall be repeated ten times on the same fabrication to demonstrate that progressive failure does not occur.

9.1.5.4 *Level 5 Deflection*—Live load deflection by calculation or by loading at working stress levels, 20 800 lbf load (9434.88 kgf), shall not exceed the lesser of the span divided by 300 or $\frac{3}{16}$ in. (4.76 mm).

9.1.6 *Load Level 6—Two-lane Vehicular / Truck Traffic:*

9.1.6.1 It is not prohibited to utilize Load Level 6 designs in any Level 1, 2, 3, 4, or 5 application, as well as in roadways with a maximum of two lanes (one lane in each direction) where the posted speed limit is 35 mph (56.32km/h) or less and the shoulders or medians of other roadways. Appropriate locations for Load Level 6 access hatches are show in Fig. 6.

9.1.6.2 *Level 6 Loading:*

(1) A concentrated design loading of a 16 000 lbf (7257.60 kgf) load plus a 33 % dynamic (impact) allowance [21 280 lbf total load (9652.61 kgf)] applied to a 10 by 20 in. (254 by 508 mm) footprint shall be applied with traffic both parallel and perpendicular to the span. The footprint shall be positioned to produce both the maximum moment and the maximum shear.

(2) If the span of an access hatch exceeds 48 in. (1219 mm), an additional load case of two 16 000 lbf (7257.60 kgf) loads, plus a 33 % dynamic (impact) allowance, 21 280 lbf (9652.61 kgf) each load, applied to 10 by 20 in. (254 by 508 mm) footprints at 48 in. (1219 mm) on center with traffic perpendicular to the span shall be investigated, and an additional load case of two 12 500 lbf (5670.00 kgf) loads plus a 33 % dynamic (impact) allowance, 16 625 lbf (7541.10 kgf) each load, applied to 10 by 20 in. (254 by 508 mm) footprints at 48 in. (1219 mm) on center with traffic parallel to the span shall be investigated. The footprints shall be positioned to produce both the maximum moment and the maximum shear.

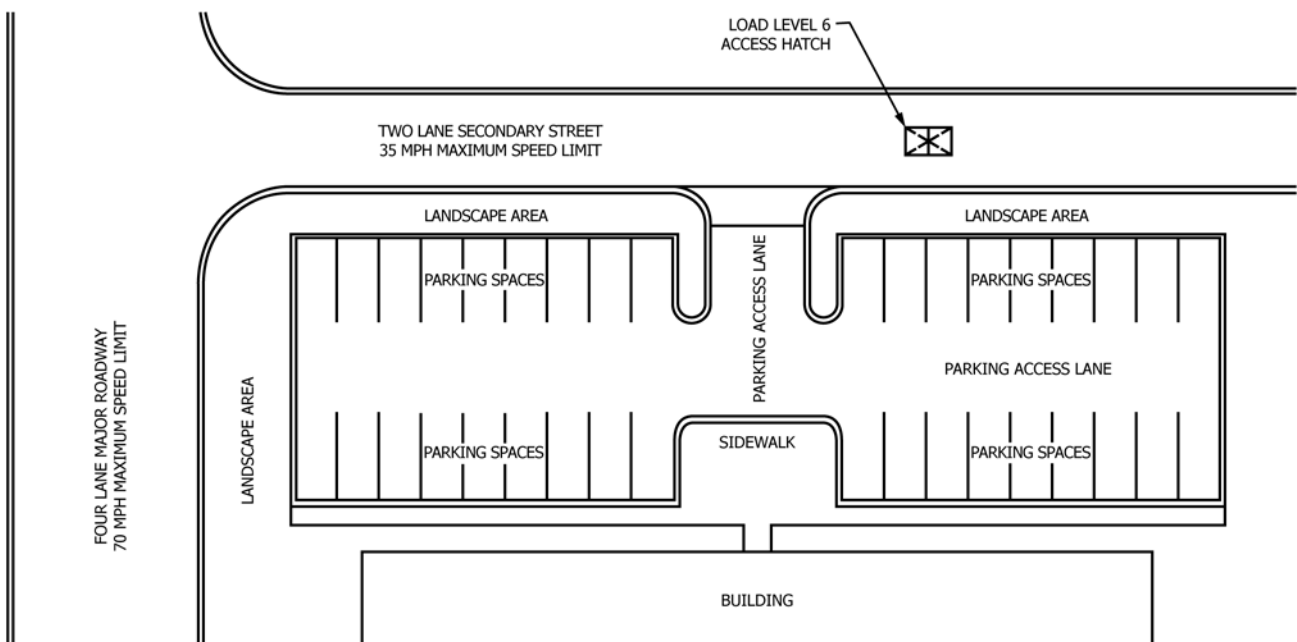


FIG. 6 Plan Showing Appropriate Locations for Load Level 6 Access Hatches—Two-lane Vehicular Traffic

(3) If structural stiffeners are utilized, the access hatch top plate shall be designed as a span between structural stiffener webs and as a cantilever at the perimeter of the hatch for an applied uniform load of 106.40 (80 × 1.33) psi (733.628 kPa).

9.1.6.3 Level 6 Applicable Design Methods:

(1) Steel, stainless steel, and aluminum access hatches shall be designed by calculation utilizing the methods included in the AASHTO LRFD Bridge Design Specification or be prototype proof loaded to a force of 2.00 times the applicable load, 42 560 lbf load (19 305.22 kgf), without permanent deflection greater than 0.02 in. (0.51 mm) or cracking. If the span of an access hatch exceeds 48 in. (1219 mm), the additional load cases described in 9.1.6.2 shall be prototype proof loaded to a force of 2.00 times the applicable load. Each load shall be tested in the position that produces the maximum moment and in the position that produces the maximum shear. Each proof loading test shall be repeated ten times on the same fabrication to demonstrate that progressive failure does not occur. The design calculation shall include a fatigue load analysis as described in the AASHTO LRFD Bridge Design Specification based on a 75-year life, 225 trucks per day, and two stress cycles per truck.

(2) If the span of an access hatch exceeds 120 in. (3048.00 mm), the access hatch shall be designed as a bridge in accordance with the loading combinations, design criteria, and methods included in the AASHTO LRFD Bridge Design Specification.

9.1.6.4 Level 6 Deflection—Live load deflection by calculation or by loading at working stress levels, 21 280 lbf load (9652.61 kgf), shall not exceed the lesser of the span divided by 800 or $\frac{3}{16}$ in. (4.76 mm).

9.1.6.5 Level 6 Production Test Loading—At the purchaser's request at the time of request for quotation, it is not prohibited that individually produced hatches be specified to be tested to 1.25 times the applicable load, 26 600 lbf load (12 065.76 kgf), to verify the load capacity of the manufactured hatch. The product shall be considered acceptable if permanent deflection in excess of 0.02 in. (0.51 mm) or cracking is not observed.

9.1.7 Load Level 7—Full Traffic:

9.1.7.1 It is not prohibited to utilize Load Level 7 designs in any Level 1, 2, 3, 4, 5, or 6 application, as well as in multi-lane roadways with posted speed limits of up to 70 mph (112.63 km/h). Appropriate locations for Load Level 7 access hatches are shown in Fig. 7.

9.1.7.2 Level 7 Loading:

(1) A concentrated design loading of a 16 000 lbf (7257.60 kgf) load plus a 33 % dynamic (impact) allowance, 21 280 lbf (9652.61 kgf) total load, applied to a 10 by 20 in. (254 by 508 mm) footprint shall be applied with traffic both parallel and perpendicular to the span. The footprint shall be positioned to produce both the maximum moment and the maximum shear.

(2) If the span of an access hatch exceeds 48 in. (1219 mm), an additional load case of two 16 000 lbf (7257.60 kgf) loads plus a 33 % dynamic (impact) allowance, 21 280 lbf (9652.61 kgf) each load, applied to 10 by 20 in. (254 by 508 mm) footprints at 48 in. (1219 mm) on center with traffic perpendicular to the span shall be investigated, and an additional load case of two 12 500 lbf (5670.00 kgf) loads plus a 33 % dynamic (impact) allowance, 16 625 lbf (7541.10 kgf) each load, applied to 10 by 20 in. (254 by 508 mm) footprints

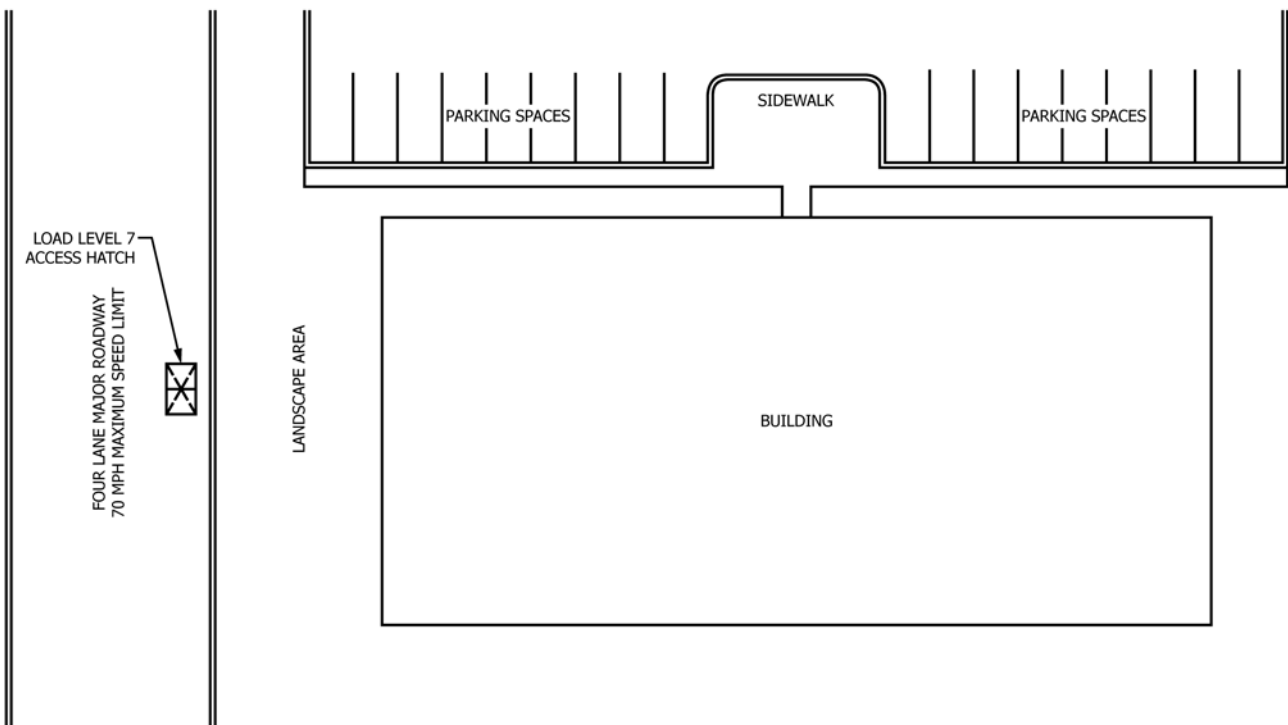


FIG. 7 Plan Showing Appropriate Locations for Load Level 7 Access Hatches—Full Traffic

at 48 in. (1219 mm) on center with traffic parallel to the span shall be investigated. The footprints shall be positioned to produce both the maximum moment and the maximum shear.

(3) If structural stiffeners are utilized, the access hatch top plate shall be designed as a span between structural stiffener webs and as a cantilever at the perimeter of the hatch for an applied uniform load of 106.40 (80 × 1.33) psi (733.63 kPa).

9.1.7.3 Level 7 Applicable Design Method:

(1) Steel, stainless steel, or aluminum access hatches shall be designed by calculation utilizing the methods included in the AASHTO LRFD Bridge Design Specification and be prototype proof loaded to a force of 2.00 times the applicable load, 42 560 lbf load (19 305.22 kgf), without permanent deflection greater than 0.02 in. (0.51 mm) or cracking. If the span of an access hatch exceeds 48 in. (1219 mm), the additional load cases described in 9.1.7.2 shall be prototype proof loaded to a force of 2.00 times the applicable load. Each load shall be tested in the position that produces the maximum moment and in the position that produces the maximum shear. Each proof loading test shall be repeated ten times on the same fabrication to demonstrate that progressive failure does not occur.

(2) The design calculation shall include a fatigue load analysis as described in the AASHTO LRFD Bridge Design Specification based on a 75-year life, 535 trucks per day, and two stress cycles per truck.

(3) If the span of an access hatch exceeds 120 in. (3048.00 mm), the access hatch shall be designed as a bridge in accordance with the loading combinations, design criteria, and methods included in the AASHTO LRFD Bridge Design Specification.

9.1.7.4 Level 7 Deflection—Live Load deflection by calculation and by loading at working stress levels, 21 280 lbf (9652.61 kgf) load, shall not exceed the lesser of the span divided by 800 or three sixteenths of an in. (4.76 mm).

9.1.7.5 Level 7 Production Test Loading—At the purchaser's request at the time of request for quotation, it is not prohibited that individually produced hatches be specified to be tested to 1.25 times the applicable load, 26 600 lbf (12 065.76 kgf) load, to verify the load capacity of the manufactured hatch. The product shall be considered acceptable if permanent deflection greater than 0.02 in. (0.51 mm) or cracking is not observed.

9.1.8 Load Level 8—Occasional Aircraft Loads:

9.1.8.1 It is not prohibited to utilize Level 8 designs in unpaved runway safety zones. Appropriate locations for Load Level 8 access hatches are shown in Fig. 8.

9.1.8.2 Level 8 Loading—If airport specific design criteria are not available, it is not prohibited that the following as taken from the FAA Advisory Circular No. 150/5320-6E Appendix 3 for the design of structures for heavy airplanes be used if approved by the authorized airport personnel.

(1) For spans of two feet (609.60 mm) or less in the least direction, a uniform load of 250 psi (1723.75 kPa) without a dynamic (impact) load shall be used.

(2) For spans greater than two feet (609.60 mm) in the least direction the design shall be based on the number of wheels that can be placed in the span with a single wheel load of 75 000 lbf (34 020.00 kgf) with 250 psi (1723.75 kPa) tire pressure without a dynamic (impact) load. Based on a review of current aircraft wheel patterns and the information presented in the FAA Advisory Circular No. 150/5320-6E, it is not prohibited for a wheel spacing of 44 in. (1117.60 mm) side to side and 57 in. (1447.80 mm) front to rear be utilized.

(3) If the span of an access hatch exceeds the design aircraft wheel spacing in any direction, additional load cases of multiple 75 000 lbf (34 020.22 kgf) concentrated loads without a dynamic (impact) allowance shall be investigated. The footprints shall be positioned to produce both the maximum moment and the maximum shear.

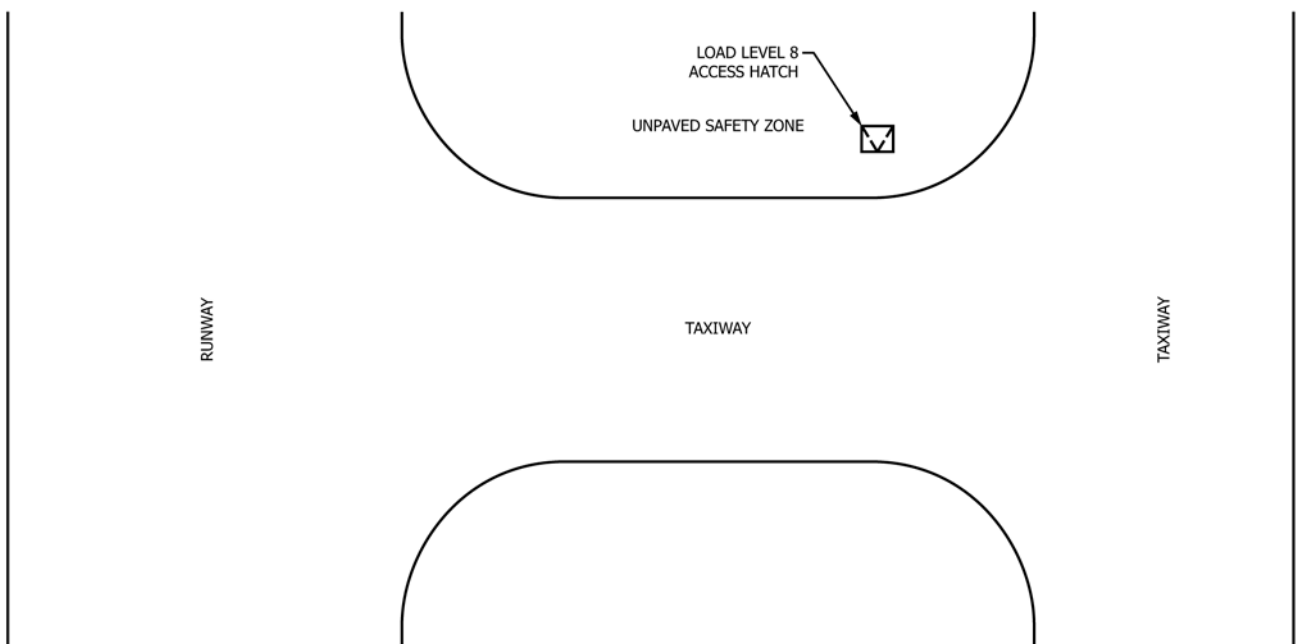


FIG. 8 Plan Showing Appropriate Locations for Load Level 8 Access Hatches—Occasional Aircraft Loads

(4) If structural stiffeners are utilized, the access hatch top plate shall be designed as a span between structural stiffener webs and as a cantilever at the perimeter of the hatch for an applied uniform load of 250 psi (1723.75 kPa).

9.1.8.3 Level 8 Applicable Design Method:

(1) Steel, stainless steel or aluminum access hatches shall be designed by calculation utilizing the methods included in the AASHTO LRFD Bridge Design Specification and be prototype proof loaded to a force of 2.00 times the applicable load, 500 psi (3447.50 kPa) or 150 000 lbf (68 040 kgf) for the footprint load if FAA loads are used, without permanent deflection greater than 0.02 in. (0.51 mm) or cracking. If the span of an access hatch exceeds the design aircraft wheel spacing, the additional load cases described in 9.1.8.2 shall be prototype proof loaded to a force of 2.00 times the applicable load. Each load shall be tested in the position that produces the maximum moment and in the position that produces the maximum shear. Each proof loading test shall be repeated ten times on the same fabrication to demonstrate that progressive failure does not occur.

(2) The design calculation shall include a fatigue load analysis as described in the AASHTO LRFD Bridge Design Specification based on a 75-year life, 250 wheels per day, and two stress cycles per wheel.

9.1.8.4 Level 8 Deflection—Deflection by calculation and by loading at working stress levels, 250 psi (1723.75 kPa) or 75 000 lbf (34 020 kgf) for the footprint load if FAA loads are used, shall not exceed the lesser of the span divided by 800 or $\frac{3}{16}$ in. (4.76 mm).

9.1.8.5 Level 8 Production Test Loading—At the purchaser's request at the time of request for quotation, it is not prohibited that individually produced hatches be specified to be tested to 1.25 times the applicable load, 313 psi (2158.14 kPa) or 93 750 lbf (42 525 kgf) for the footprint load if FFA loads are used, to verify the load capacity of the manufactured hatch.

The product shall be considered acceptable if permanent deflection greater than 0.02 in. (0.51 mm) or cracking is not observed.

9.1.9 Load Level 9—Aircraft Loads:

9.1.9.1 It is not prohibited to utilize Load Level 9 designs in any Load Level 8 application and in airport areas including taxiways and aprons. This level 9 load is not applicable to aircraft runways. Appropriate locations for Load Level 9 access hatches are shown in Fig. 9.

9.1.9.2 Level 9 Loading—If airport specific design criteria are not available, it is not prohibited that the following as taken from the FAA Advisory Circular No. 150/5320-6E Appendix 3 for the design of structures for heavy airplanes be used if approved by the authorized airport personnel.

(1) For spans of two feet or less in the least direction, a uniform load of 250 psi (1723.75 kPa) plus a 33 % dynamic (impact) allowance, 332.50 psi (2292.59 kPa), and 0.70 gravity braking loads shall be used.

(2) For spans greater than two feet in the least direction the design shall be based on the number of wheels that can be placed in the span with a single wheel load of 75 000 lbf (34 020 kgf) plus a 33 % dynamic (impact) allowance, 99 750 lbf (45 246.60 kgf), with 250 lbf (1723.75 kPa) tire pressure plus 33 % dynamic (impact), 332.50 psi (2292.59 kPa), and a 0.70 gravity braking load. Based on a review of current aircraft wheel patterns and the information presented in the FAA Advisory Circular it is not prohibited for a wheel spacing of 44 in. (1117.60 mm) side to side and 57 in. (1447.80 mm) front to rear be utilized.

(3) If the span of an access hatch exceeds the design aircraft wheel spacing in any direction, additional load cases of multiple 75 000 lbf (34 020 kgf) plus a 33 % dynamic (impact) allowance, 99 750 lbf (45 246.60 kgf), shall be investigated. The footprints shall be positioned to produce both the maximum moment and the maximum shear.

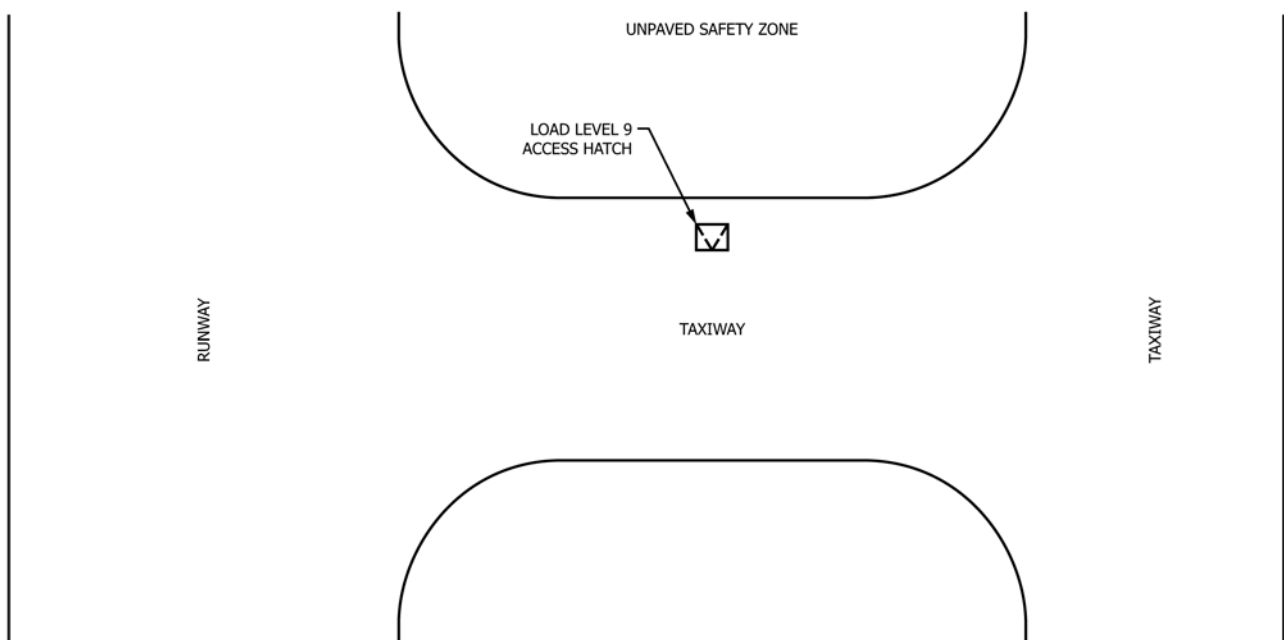


FIG. 9 Plan Showing Appropriate Locations for Load Level 9 Access Hatches—Aircraft Loads

(4) If structural stiffeners are utilized, the access hatch top plate shall be designed as a span between structural stiffener webs and as a cantilever at the perimeter of the hatch for an applied uniform load of 332.50, 250 × 1.33, psi (2292.59 kPa).

9.1.9.3 Level 9 Applicable Design Method:

(1) Steel, stainless steel, or aluminum access hatches shall be designed by calculation utilizing the methods included in the AASHTO LRFD Bridge Design Specification and be prototype proof loaded to a force of 2.00 times the applicable load, 665 psi (4585.18 kPa) or 199 200 lbf (90 357.12 kgf) for the footprint load if FAA loads are used, without permanent deflection greater than 0.02 in. (0.51 mm) or cracking. If the span of an access hatch exceeds the design aircraft wheel spacing, the additional load cases described in 9.1.9.2 shall be prototype proof loaded to a force of 2.00 times the applicable load. Each load shall be tested in the position that produces the maximum moment and in the position that produces the maximum shear. Each proof loading test shall be repeated ten times on the same fabrication to demonstrate that progressive failure does not occur.

(2) The design calculation shall include a fatigue load analysis as described in the AASHTO LRFD Bridge Design Specification based on a 75-year life, 250 aircraft per day, and two stress cycles per aircraft.

9.1.9.4 Level 9 Deflection—Deflection by calculation and by loading at working stress levels, 332.50 psi (2292.59 kPa) or 99 750 lbf (45 246.60 kgf) for the footprint load if FAA loads are used, shall not exceed the lesser of the span divided by 800 or $\frac{3}{16}$ in. (4.76 mm).

9.1.9.5 Level 9 Production Test Loading—At the purchaser's request at the time of request for quotation, it is not prohibited that individually produced hatches be specified to be tested to 1.25 times the applicable load, 415.63 psi (2865.77 kPa) or 124 688 lbf (56 558.48 kgf) for the footprint load if FFA loads are used, to verify the capacity of the manufactured hatch. The product shall be considered acceptable if permanent deflection greater than 0.02 in. (0.51 mm) or cracking is not observed.

9.1.10 Load Level 10—Special Equipment Loads:

9.1.10.1 It is not prohibited that Load Level 10 designs be utilized for special equipment loading such as mining equipment, marine port equipment, cranes, and earth-moving equipment.

9.1.10.2 Level 10 Loading—The required loading information is shown in Fig. 10.

(1) Specific loading shall be based on the axle load, the axle spacing, wheel spacing, footprint width, footprint length, and the tire pressure of the actual designated design equipment.

(2) The design loading shall be the actual wheel loads plus a 33 % (impact) allowance.

(3) If the span of an access hatch exceeds the design wheel or axle spacing in any direction, additional load cases of multiple footprints shall be investigated. The multiple footprints shall be positioned to produce both the maximum moment and the maximum shear.

(4) If structural stiffeners are utilized, the access hatch top plate shall be designed as a span between structural stiffener webs and as a cantilever at the perimeter of the hatch for an

applied uniform load equal to the tire pressure of the equipment plus a 33 % dynamic (impact) allowance.

9.1.10.3 Level 10 Applicable Design Method:

(1) Steel, stainless steel or aluminum access hatches shall be designed by calculation utilizing the methods included in the AASHTO LRFD Bridge Design Specification and shall be prototype proof loaded to a force of 2.00 times the applicable load without permanent deflection greater than 0.02 in. (0.51 mm) or cracking.

(2) The load shall be tested in the position that produces the maximum moment and in the position that produces the maximum shear. Each proof loading test shall be repeated ten times on the same fabrication to demonstrate that progressive failure does not occur.

(3) The design calculation shall include a fatigue load analysis as described in the AASHTO LRFD Bridge Design Specification based on a 75-year life, 250 vehicles per day, and two stress cycles per vehicle.

9.1.10.4 Level 10 Deflection—Deflection by calculation and by loading at working stress levels shall not exceed the lesser of the span divided by 800 or $\frac{3}{16}$ in. (4.76 mm).

9.1.10.5 Level 10 Production Test Loading—At the purchaser's request at the time of request for quotation, it is not prohibited that individually produced hatches be specified to be tested to 1.25 times the applicable load to verify the capacity of the manufactured hatch. The product shall be considered acceptable if permanent deflection greater than 0.02 in. (0.51 mm) or cracking is not observed.

9.2 Modified Load Levels:

9.2.1 The purchaser may modify the load levels at the time of request for quotation to obtain different design loads as required. The following are examples of modified load levels:

9.2.1.1 Load Level 3—Light Vehicular Traffic except with a 30 % dynamic load allowance.

9.2.1.2 Load Level 3—Light Vehicular Traffic except with a 12 000 lbf wheel load, a 10 by 20 in. footprint, and with a 30 % dynamic load allowance.

9.2.1.3 Load Level 6—Two-lane Vehicular / Truck Traffic except with a 20 000 lbf wheel load.

10. Load Footprint to Structural Stiffener Distribution

10.1 If single web structural stiffeners are utilized, and if the total number of members used is attached to a single top plate, the distribution shall be limited depending upon the number of structural stiffeners directly under the load, unless finite element modeling is used to determine the stresses. If the footprint load is on interior members, the number of structural stiffeners shall be limited to the number of structural stiffeners directly under the footprint plus two members. If the footprint load is on exterior, free edge members, the number of structural stiffeners shall be limited to the number of structural stiffeners directly under the footprint plus one member (see Fig. 11).

10.2 If two web structural stiffeners are utilized, and if the total number of members used is attached to a single top plate, the distribution shall be limited depending upon the number of structural stiffeners directly under the load, unless finite element modeling is used to determine the stresses. If the footprint load is on interior members, the number of structural stiffeners

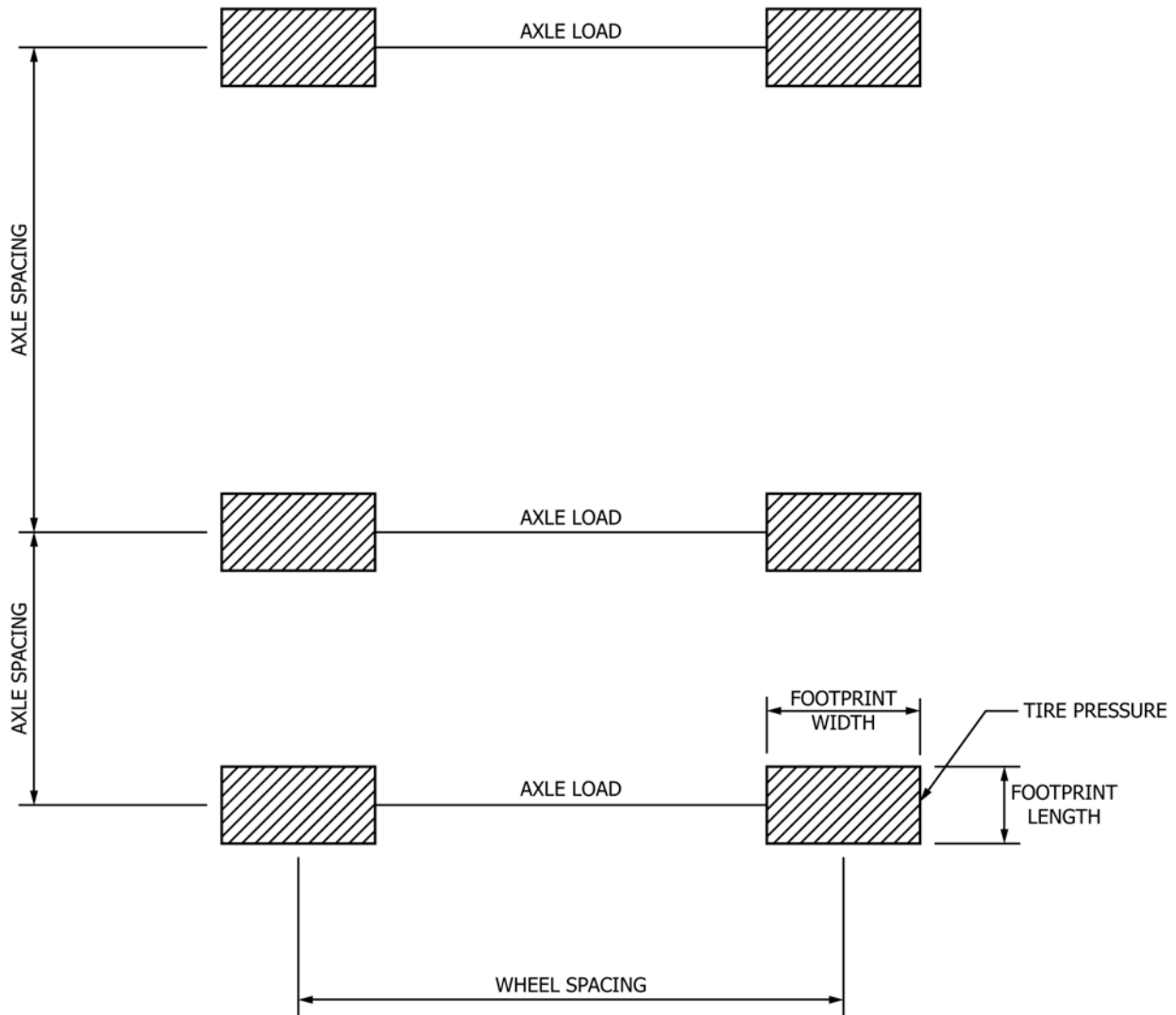


FIG. 10 Dimensions and Loads Required for Load Level 10 Access Hatches—Special Equipment Loads

shall be limited to the number of structural stiffeners directly under the footprint plus one member. If the footprint load is on exterior, free edge members, the number of structural stiffeners shall be limited to the number of structural stiffeners directly under the footprint plus one-half member (see Fig. 13).

10.3 Figs. 12 and 14 show the number of structural stiffeners used if the total number of stiffeners is limited under a single top plate.

10.4 The footprint load shall be investigated at interior member areas and at free edge members as shown in Fig. 15.

11. Testing

11.1 Test Loading Equipment:

11.1.1 The test load frame shall be designed for a load that exceeds the load test requirements with a minimum safety factor of 1.50 and be of sufficient bed dimensions to accommodate the access hatch with hydraulic cylinders arranged to position the load at the various load positions on the access

hatch shown in Fig. 15 with the hatch fully supported at the perimeter of its bearing surfaces or at opposite ends of its spans if intermediate support is not provided.

11.1.2 The hydraulic cylinders, pumps, and gauges shall be capable of providing a loading force of 1.50 times the required test load force. The gauge shall be a precision digital test gauge with a maximum of 0.10 % accuracy over its full scale and include a zeroing function at start-up to eliminate any sensor offset.

11.1.3 The hydraulic cylinders, pumps and gauges shall be calibrated in accordance with the requirements of Practices E4 at a maximum of twelve month intervals. The resulting current calibration curve shall be used to convert psi (kPa) to lbf (kgf).

11.1.4 A minimum 1.00 in. (25.40 mm) thick steel bearing plate shall be used to transfer the force from the hydraulic cylinders to the access hatch top plate. The bearing plates shall be the footprint dimensions of the applicable wheel load footprints. The bearing plates shall be placed on a minimum

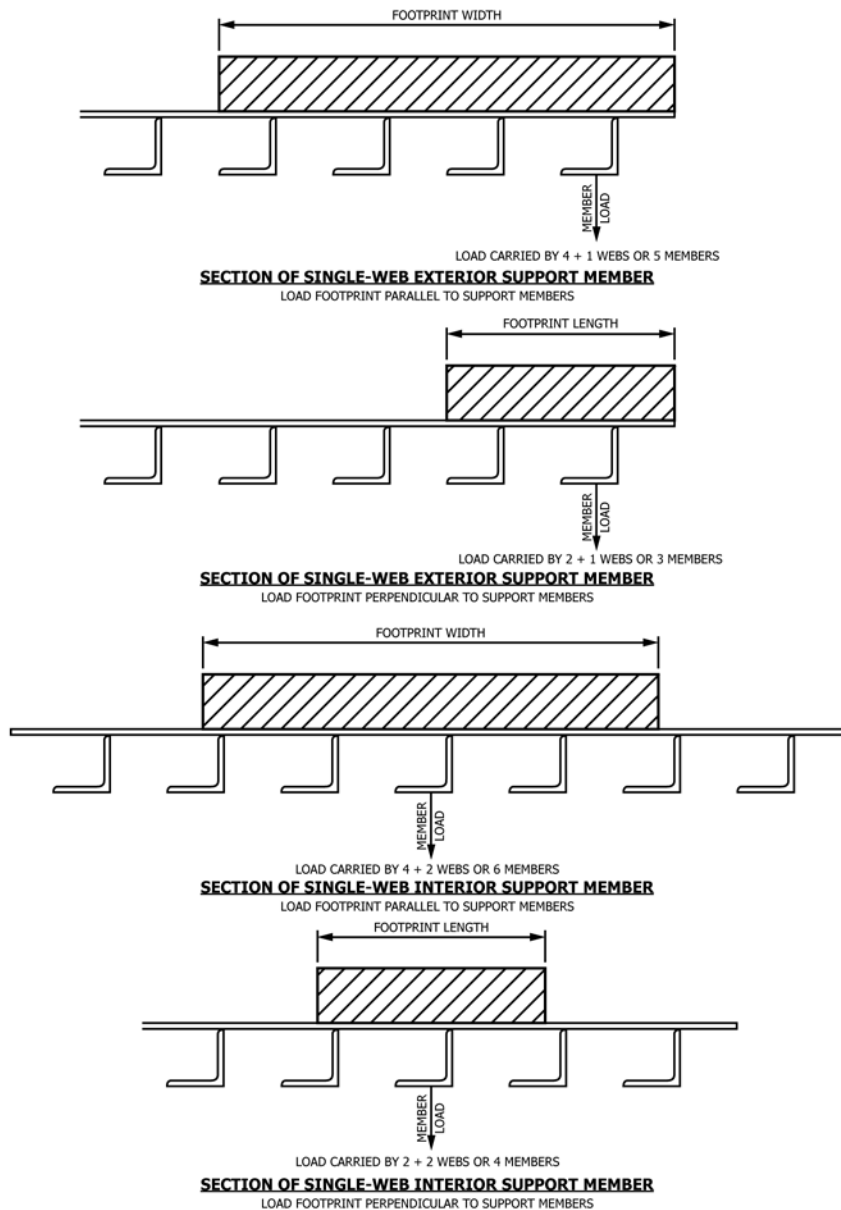


FIG. 11

0.50 in. (12.70 mm) thick neoprene bearing pads to uniformly distribute the load to the wheel load footprints on the top plate of the access hatch.

11.1.5 For the fully uniform loading designs applicable to Load Level 1 and 2, it is not prohibited for sand bags or water filled bladders to be utilized instead of hydraulic jack induced forces.

11.1.6 An aluminum or steel straight edge with movable support frame and a dial indicator capable of reading and storing maximum values in 0.001 in. (0.025 mm) increments shall be used for measuring deflections.

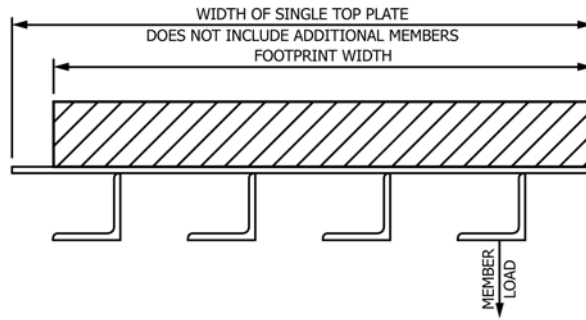
11.1.7 The dial indicator calibration shall be tested at a maximum of twelve month intervals in accordance with the requirements of Practice E2309/E2309M.

11.2 Prototype Proof Load Testing:

11.2.1 The applicable prototype test loading, load positions, and load footprints shall be determined based on the applicable load level as given in Section 9 of this specification.

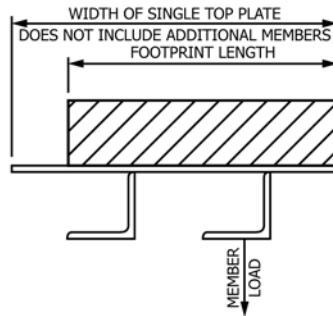
11.2.2 The prototype access hatch shall be positioned for each applicable load placement and 50 % of the load shall be initially applied, held for a minimum of two minutes and released. The dial indicator shall be positioned to take deflection readings directly adjacent to the neoprene bearing pad on the centerline of the load footprint. After the initial load has been released the dial indicator shall be zeroed or the value shall be recorded to establish the zero deflection benchmark.

11.2.3 The full prototype load shall be applied for the number of cycles required by the applicable load level and held for each cycle for a minimum of two minutes. At the end of each load cycle the loaded hydraulic pressure shall be recorded



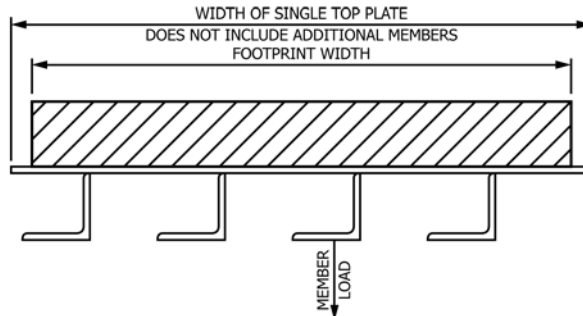
LOAD CARRIED BY 4 WEBS OR 4 MEMBERS

SECTION OF SINGLE-WEB EXTERIOR SUPPORT MEMBER
LOAD FOOTPRINT PARALLEL TO SUPPORT MEMBERS WITHOUT ADDITIONAL MEMBERS



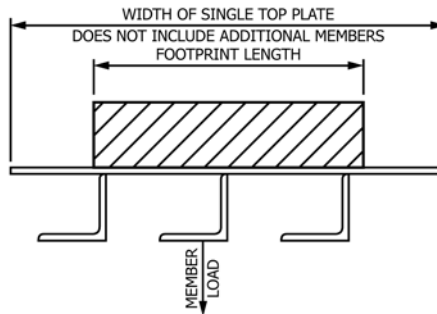
LOAD CARRIED BY 2 WEBS OR 2 MEMBERS

SECTION OF SINGLE-WEB EXTERIOR SUPPORT MEMBER
LOAD FOOTPRINT PERPENDICULAR TO SUPPORT MEMBERS WITHOUT ADDITIONAL MEMBERS



LOAD CARRIED BY 4 WEBS OR 4 MEMBERS

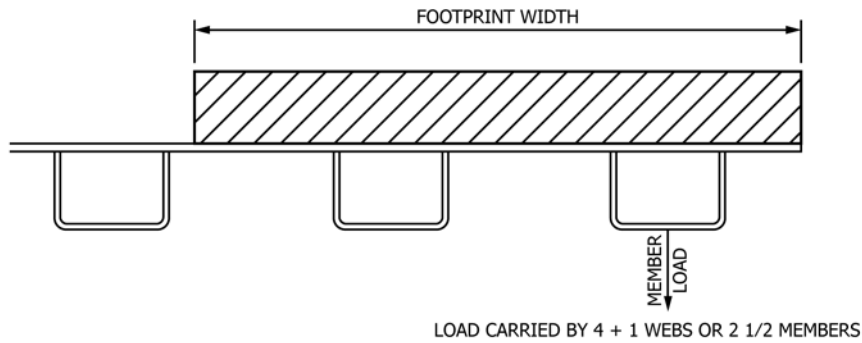
SECTION OF SINGLE-WEB INTERIOR SUPPORT MEMBER
LOAD FOOTPRINT PARALLEL TO SUPPORT MEMBERS WITHOUT ADDITIONAL MEMBERS



LOAD CARRIED BY 3 WEBS OR 3 MEMBERS

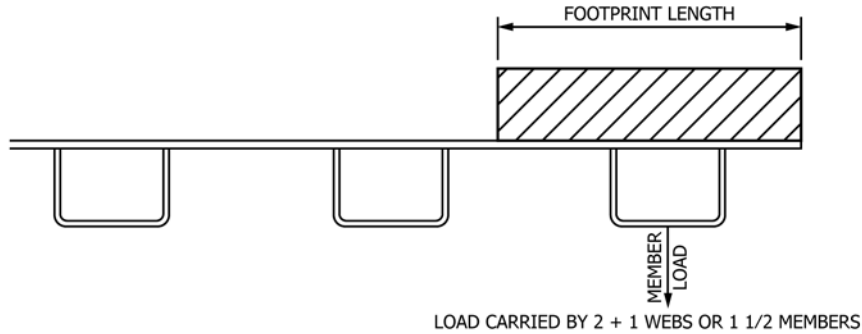
SECTION OF SINGLE-WEB INTERIOR SUPPORT MEMBER
LOAD FOOTPRINT PERPENDICULAR TO SUPPORT MEMBERS WITHOUT ADDITIONAL MEMBERS

FIG. 12



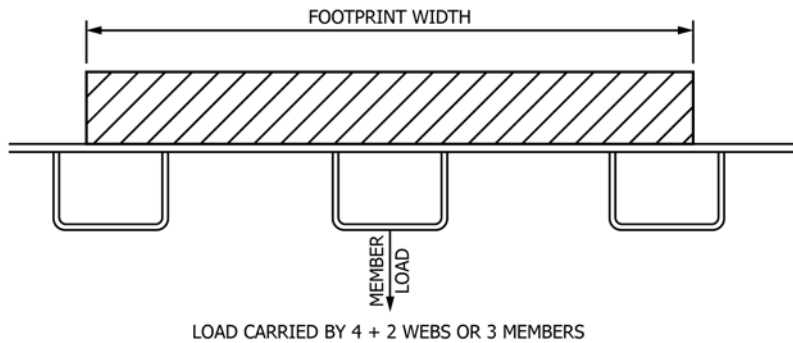
SECTION OF TWO-WEB EXTERIOR SUPPORT MEMBER

LOAD FOOTPRINT PARALLEL TO SUPPORT MEMBERS



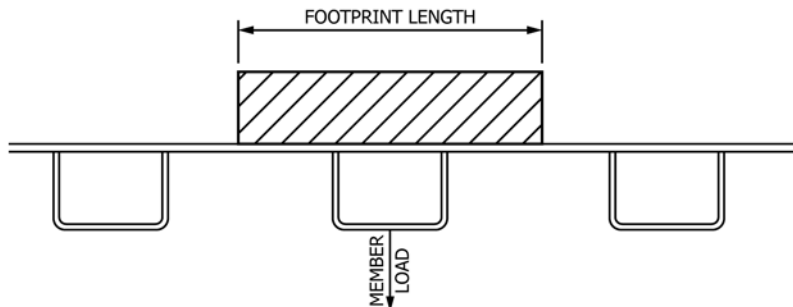
SECTION OF TWO-WEB EXTERIOR SUPPORT MEMBER

LOAD FOOTPRINT PERPENDICULAR TO SUPPORT MEMBERS



SECTION TWO-WEB OF INTERIOR SUPPORT MEMBER

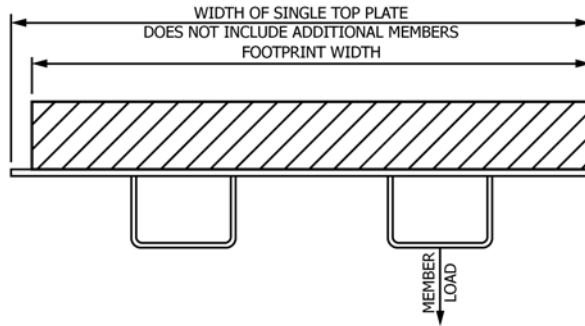
LOAD FOOTPRINT PARALLEL TO SUPPORT MEMBERS



SECTION OF TWO-WEB INTERIOR SUPPORT MEMBER

LOAD FOOTPRINT PERPENDICULAR TO SUPPORT MEMBERS

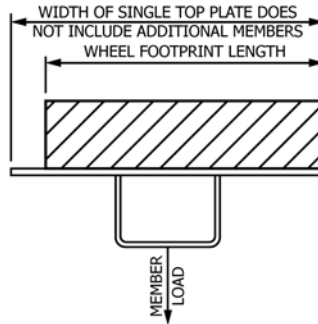
FIG. 13



LOAD CARRIED BY 4 WEBS OR 2 MEMBERS

SECTION OF TWO-WEB EXTERIOR SUPPORT MEMBER

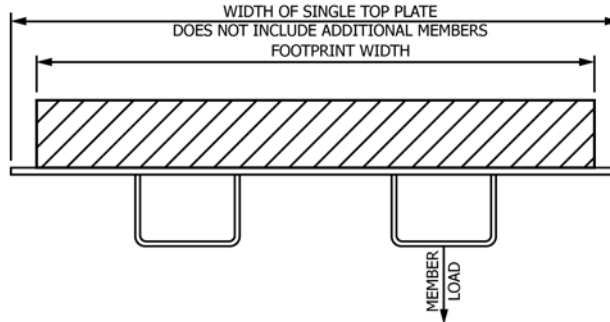
LOAD FOOTPRINT PARALLEL TO SUPPORT MEMBERS WITHOUT ADDITIONAL MEMBERS



LOAD CARRIED BY 2 WEBS OR 1 MEMBERS

SECTION OF TWO-WEB EXTERIOR SUPPORT MEMBER

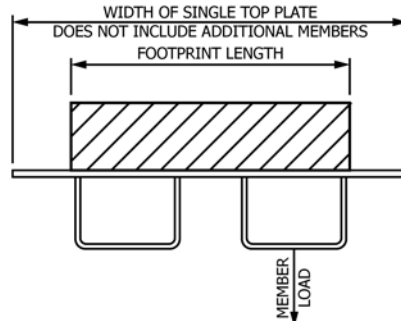
LOAD FOOTPRINT PERPENDICULAR TO SUPPORT MEMBERS WITHOUT ADDITIONAL MEMBERS



LOAD CARRIED BY 4 WEBS OR 2 MEMBERS

SECTION TWO-WEB OF INTERIOR SUPPORT MEMBER

LOAD FOOTPRINT PARALLEL TO SUPPORT MEMBERS WITHOUT ADDITIONAL MEMBERS

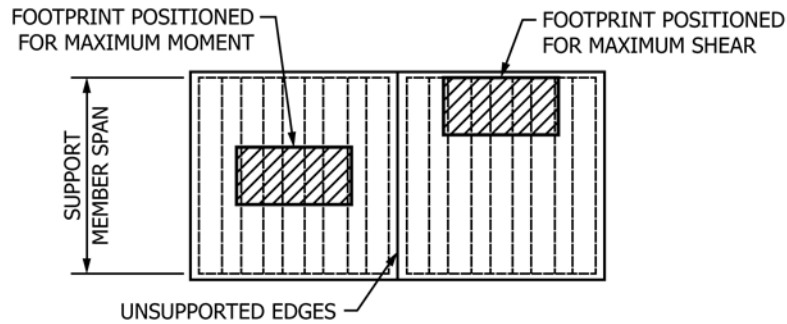


LOAD CARRIED BY 4 WEBS OR 2 MEMBERS

SECTION OF TWO-WEB INTERIOR SUPPORT MEMBER

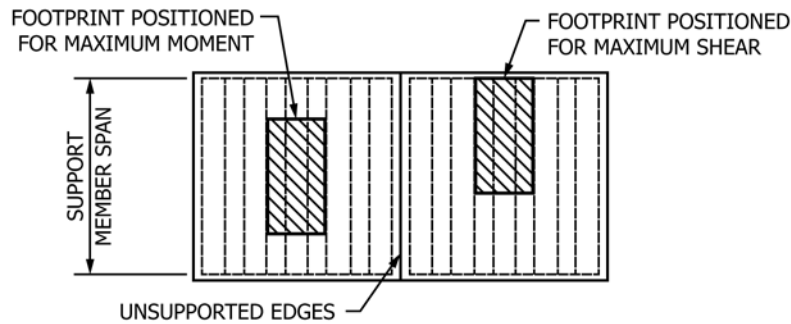
LOAD FOOTPRINT PERPENDICULAR TO SUPPORT MEMBERS WITHOUT ADDITIONAL MEMBERS

FIG. 14



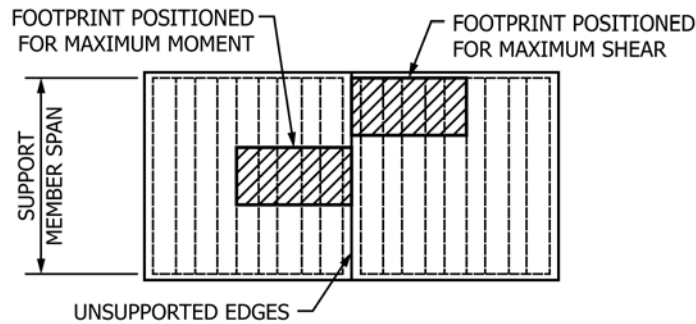
PLAN OF ACCESS HATCH WITH LOADED INTERIOR MEMBERS

LOAD FOOTPRINT PARALLEL TO SUPPORT MEMBERS



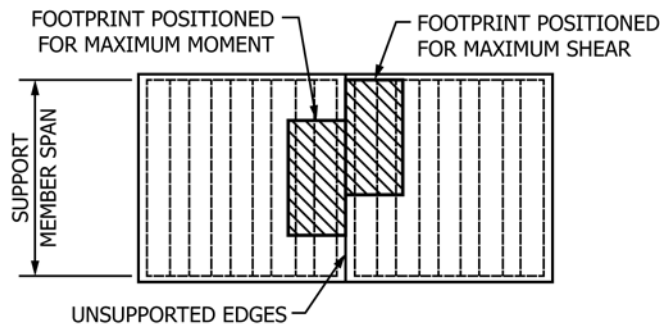
PLAN OF ACCESS HATCH WITH LOADED INTERIOR MEMBERS

LOAD FOOTPRINT PERPENDICULAR TO SUPPORT MEMBERS



PLAN OF ACCESS HATCH WITH LOADED EXTERIOR MEMBERS

LOAD FOOTPRINT PARALLEL TO SUPPORT MEMBERS



PLAN OF ACCESS HATCH WITH LOADED EXTERIOR MEMBERS

LOAD FOOTPRINT PERPENDICULAR TO SUPPORT MEMBERS

FIG. 15

and converted to pounds force and the loaded deflection shall be recorded. The load shall be released and after two minutes the permanent deflection shall be recorded for each cycle.

11.2.4 At each load application placement after the prototype loading cycles are complete the working stress load shall be applied and after two minutes the working stress load deflection shall be recorded. It is not prohibited to determine the test frame deflection without the access hatch in place at the working stress load level and deducting this test frame deflection from the working stress deflection with the access hatch in place to determine the actual working stress deflection attributable to the access hatch. If the working stress deflection exceeds the allowable design deflection for the applicable load level the prototype design failed to pass the load test.

11.2.5 After all load cycles at each position are complete the access hatch shall be inspected for deformation and material or weld cracks. The access hatch top plate shall be checked for permanent deflection with a straight edge and the dial indicator between reinforcing members and in top plate cantilever areas for each of the load placement locations.

11.2.6 If any permanent deflection exceeds 0.02 in. (0.51 mm) the prototype design failed to pass the load test.

11.2.7 For any access hatch that fails to pass the prototype load test, it is not prohibited for the access hatch to be straightened, additional reinforcing members may be added, and it is not prohibited for additional welding to be added and the access hatch retested.

11.2.8 Any access hatch that fails to pass the prototype load test because of structural member cracks or permanent deflection shall be cut in a manner that it is unusable after testing and scrapped. If an access hatch fails to pass the prototype load test because of permanent deflection, it is not prohibited to straighten the access hatch and to retest the hatch for a lower load prototype design.

11.3 *Production Load Testing:*

11.3.1 If the access hatches are designed to Load Level 6, 7, 8, 9, or 10, and if the purchaser requests at the time of quotation, it is not prohibited for the individually produced hatches to be tested to 1.25 times the applicable load to verify the capacity of the manufactured hatch. The product shall be considered acceptable if permanent deflection does not exceed 0.02 in. (0.51 mm) and cracking is not observed. Production load testing does not replace any required design calculation and prototype testing requirements.

11.3.2 The applicable production test loading, load positions, and load footprint shall be determined based on the applicable load level as given in Section 9 of this specification.

11.3.3 The production access hatch shall be positioned for each applicable load placement and 50 % of the load shall be initially applied, held for a minimum of one minute and released. The dial indicator shall be positioned to take deflection readings directly adjacent to the neoprene bearing pad on the centerline of the load footprint. After the initial load has been released the dial indicator shall be zeroed or the value shall be recorded to establish the zero deflection benchmark.

11.3.4 The full production test load shall be applied for two cycles and held for each cycle for a minimum of one minute. At the end of each load cycle the loaded hydraulic pressure

shall be recorded and converted to pounds force and the loaded deflection shall be recorded. The load shall be released and after one minute the permanent deflection shall be recorded for each cycle.

11.3.5 At each load application placement after the production loading cycles are complete the working stress load shall be applied and after one minute the working stress load deflection shall be recorded. It is not prohibited to determine the test frame deflection without the access hatch in place at the working stress load level and deducting this test frame deflection from the working stress deflection with the access hatch in place to determine the actual working stress deflection attributable to the access hatch. If the working stress deflection exceeds the allowable design deflection for the applicable load level, the production access hatch design failed to pass the load test.

11.3.6 After all load cycles at each position are complete the access hatch shall be inspected for deformation and material or weld cracks. The access hatch top plate shall be checked for permanent deflection with a straight edge and the dial indicator between reinforcing members and in top plate cantilever areas for each of the load placement locations. The product shall be considered acceptable if permanent deflection does not exceed 0.02 in. (0.51 mm) and cracking is not observed.

11.3.7 If any permanent deflection exceeds 0.02 in. (0.51 mm) the access hatch design failed to pass the production load test.

11.3.8 It is not prohibited for any access hatch that fails to pass the production load test because of weld cracks to be repaired by welding and retested.

11.3.9 Any access hatch that fails to pass the production load test because of structural member cracks or permanent deflection greater than 0.02 in. (0.51 mm) shall be cut in a manner that it is unusable after testing and scrapped. If an access hatch fails to pass the production load test because of permanent deflection, it is not prohibited to straighten the access hatch and to retest the hatch for a lower load rating.

12. **Quality Control**

12.1 The access hatch manufacture shall have and perform quality control operations based on a written quality control program that includes the following:

12.1.1 Review and rejection of incoming materials based on certified mill test reports and visual inspection.

12.1.2 Frequency of inspection and inspection requirements for cut or cut and bent subassemblies and parts for hatch construction.

12.1.3 Frequency of inspection and inspection requirements for assembly welding.

12.1.4 Frequency of inspection and inspection requirements for completed hatch assemblies.

12.2 All quality control inspection reports shall be dated and maintained by the hatch manufacturer for a minimum period of seven years.

12.3 All prototype test records for custom hatches and all production test records shall be dated and maintained by the hatch manufacturer for a minimum period of seven years.

12.4 All prototype test records for the manufacturer's standard access hatch designs shall be permanently archived.

12.5 If requested by the purchaser at the time of request for quotation the written quality control program and the quality control inspection reports during the period of the purchaser's access hatch, manufacturing shall be provided.

13. Manufacturing

13.1 All materials used during the access hatch manufacturing shall be identified by thickness, size, and grade to assure that the appropriate materials are used specific to the hatch design being manufactured.

13.2 It is not prohibited that materials for the access hatches be cut to size and shape by sawing, shearing, plasma arc cutting, water cutting, router cutting or laser cutting as is appropriate to the material and the specific manufacturer's process.

13.3 It is not prohibited that materials be shaped by press break bending, punching, machining, or drilling. Careful attention is required to assure that the minimum bend radius based on the material grade and thickness is maintained.

13.4 All welding procedures and welders shall be tested and qualified by an American Welding Society Certified Welding Inspector. If robotic welding is utilized the procedures shall be qualified by an American Welding Society Certified Welding Inspector.

14. Physical Requirements

14.1 The design of the assembly of components of the access hatch and fabrication shall conform to provide the structural integrity of the product as determined by the load rating, maximum deflection, allowable flexure stress and allowable shear stress values.

15. Permissible Variations

15.1 The tolerances given in this section are maximum tolerances and if a tolerance given causes the final assembly to fail to seat, close, open, or function in the manner intended, the required tolerance shall be reduced by the manufacturer.

15.2 The tolerances for metal materials used in the fabrication including plate, sheet, strips, and structural shapes shall be the tolerances specified in the applicable ASTM material specifications.

15.3 The tolerance for width, length, and diagonally measured square of cut plates, sheet, or strips shall be 0.125 in. (3.18 mm) over or under.

15.4 The tolerance for width, length, height, and diagonally measured square of bent plates, sheet, or strips shall be 0.125 in. (3.18 mm) over or under.

15.5 The tolerance for bent radiuses shall be 0.0625 in. (1.59 mm) over and 0.00 in. (0.00 mm) under.

15.6 The tolerance for length of cut structural shapes shall be 0.0625 in. (1.59 mm) over or under.

15.7 The tolerance for opening placement in both directions shall be 0.0625 in. (1.59 mm) over or under.

15.8 The tolerance for weld size and length is unlimited over and 0.00 in. (0.00 mm) under.

15.9 The tolerance for weld spacing is 0.00 in. (0.00 mm) over and unlimited under.

15.10 The tolerance for warping in assembled hatches and frames is 0.125 in. (3.18 mm) over the entire surface.

16. Repairs

16.1 Repairs by Welding:

16.1.1 Repairs shall be made using qualified welding procedures and their specifications by an American Welding Society certified welder.

16.1.2 The deposited weld metal shall be similar to that of the product material and it is not prohibited for the deposited weld material to be suitably alloyed to achieve the desired corrosion resistance and mechanical properties as determined by the original design and the application requirements.

16.2 Mechanical Repairs:

16.2.1 Repairs involving modification to the shape of any component of the access hatch assembly shall not compromise the structural integrity of the product in its initial state.

16.2.2 Repairs that alter the original configuration or location of components to the degree that result in a change in design of the access hatch assembly must not compromise the structural integrity of product in its initial state and must be approved by qualified personnel, to include but not limited to the purchaser.

17. Inspection

17.1 The manufacturer shall afford the purchaser's inspector all reasonable facilities necessary to satisfy that the product is being produced and furnished in accordance with the applicable specification. Inspection by the purchaser shall not interfere unnecessarily with the manufacturer's operations. Unless specifically requested by the purchaser for a custom product, all required normal tests and inspections required by this specification are the responsibility of manufacturer.

18. Rejection

18.1 Access Hatches are subject to rejection for failure to conform to any of the specification requirements. Individual access hatches are subject to rejection because of any of the following:

18.1.1 Fractures or cracks passing through any structural section or any required weld.

18.1.2 Doors or devices that because of improper workmanship fail to seat, close, open, or function in the manner intended.

19. Optional Features

19.1 It is not prohibited for the purchaser to request at the time of request for quotation, that the following optional features are provided as part of the access hatch design:

- (1) Single door hatch assemblies,
- (2) Double door hatch assemblies,
- (3) Door hatch assemblies hinged on long side,
- (4) Slip resistant top plate surfaces,

- (5) Exposed hinges,
- (6) Concealed hinges,
- (7) 180° hinges,
- (8) Torsion lift assist springs,
- (9) Horizontal lift assist springs,
- (10) Vertical lift assist springs,
- (11) Pneumatic lift assist springs,
- (12) Spring enclosures,
- (13) Hatch door hold open mechanisms,
- (14) Safety barrier chains and barrier posts,
- (15) Safety nets or safety grates,
- (16) Slam lock assemblies and operating keys,
- (17) Cam latch assemblies,
- (18) Recessed cylinder locks,
- (19) Surface mounted padlock staples,
- (20) Recessed padlock staples and compartments,
- (21) Door bolt assemblies,
- (22) Tamper proof bolts,
- (23) Door lifting holes,
- (24) Flush door lifting handles,
- (25) Recessed door lifting pins,
- (26) Custom lettering or name plates,
- (27) Debris gaskets,
- (28) Oder reduction gaskets,
- (29) Water proof gaskets,
- (30) Noise dampening cushions,
- (31) Frame skirts,
- (32) Headed studs for frame anchorage into concrete,
- (33) Frame lifting eyes,
- (34) Special specified paint finishes,
- (35) Galvanized finishes,
- (36) Powder coated finishes,
- (37) Drop in frames,
- (38) Frameless hatch hatches,
- (39) Cast in frames,
- (40) Neoprene bearing pads,
- (41) Leveling bolts, and
- (42) Grounding connections.

19.2 If lift assist springs are requested, the purchaser, at the time of request for quotation, shall specify the minimum and the maximum allowable manual lifting force.

20. Submittal Drawings

20.1 If requested by the purchaser submittal drawings are required as outlined as follows:

20.1.1 General layout drawings shall be provided that show the overall frame dimensions, the opening at the base of the frame, the clear opening size, the thickness of the frame and the overall height of the frame including the skirt if applicable.

20.1.2 The general layout drawings shall show any optional features that have been requested by the purchaser and any standard features that are provide by the manufacturer.

20.1.3 The manufacturer's model number, the materials of construction, the load level design, and the approximate weight of the assembly shall be noted on the submittal drawings and the general layout drawings.

20.2 If requested by the purchaser at the time of request for quotation, it is not prohibited for design calculations, witnessed

prototype test results, design details sealed by a registered engineer, or combinations thereof be submitted.

21. Marking

21.1 All required markings shall be welded, permanently stamped or engraved on metallic tags, permanently printed, permanently painted, or hot stamped on plastic tags that shall be attached by permanently gluing or riveting to the inside of the access hatch or access hatch frame.

21.2 As a minimum requirement the tags shall include the following:

21.2.1 The manufacturer's name or trademark, location, and telephone contact number.

21.2.2 The manufacturer's model number.

21.2.3 This ASTM specification designation.

21.2.4 The Load Level that the access hatch is designed for.

21.2.5 If the Load Level has been modified as allowed by 9.2, the description of the modification shall be included on the marking.

21.2.6 The nominal hatch opening dimensions if it is not included in the manufacturer's model number.

21.2.7 The date of manufacturer or a serial number that can be tracked to the date of manufacture or both.

22. Load Level Selection

22.1 It is the responsibility of the purchaser to determine the required load level rating required for the actual access hatch application. Careful attention to load level selection and access hatch load protective barriers, as is demonstrated in Figs. 1-9, is required to assure the structural success of the installation.

22.2 For Load Level 10 the specific vehicle footprint, axle spacing, wheel spacing, axle loads, and tire pressure must be provided by the purchaser as shown in Fig. 10.

22.3 When load levels are selected attention shall be given to protection from construction loads and to assure that protective curbing or other access hatch load barriers will be maintained in the future to assure that heavier vehicles cannot create future structural failure.

23. Installation

23.1 The purchaser of the fabricated metal access hatches is cautioned that proper installation for the hatch specified, and provision for inspection of the installation at the construction site are required.

23.2 When leveling bolts are used to raise access hatches to slope or not sloped finished grades, the area under the frame must be grouted utilizing properly bonded non-shrink grout to assure uniform bearing around the entire load bearing surface of the frame. If access hatch frames must be surrounded by or embedded in concrete to function properly, the manufacturer's installation instructions or installation drawings shall indicate the extent required and the installation requires the field concrete installation.

23.3 Frames or frameless access hatch hatches that are placed on irregular surfaces must be grouted utilizing properly bonded non-shrink grout to assure uniform bearing around the

entire load bearing surface of the frame or uniform support under each load bearing hatch member.

23.4 Structures that frames or frameless access hatch covers bear on must be properly designed to fully support the load levels imposed in both moment and shear with appropriate consideration for the thinner supporting member under the frame when it is cast in. The design of these supporting

structures shall comply with the design requirements of Specification **C478**, Practices **C857** and **C890**, the applicable building codes, or bridge design specifications for the appropriate loads.

23.5 Protective coatings shall be provided for the exterior portion of aluminum frames and skirts that are to be cast in fresh concrete to prevent corrosion.

APPENDIX

(Nonmandatory Information)

X1.

X1.1 **Table X1.1** and **Table X1.2** are provided as an aid to the specification user and the access hatch design engineer.

TABLE X1.1 Access Hatch Load Level, Area of Use, Loading, and Deflections

Load Level	Area of Use	Design Loading and Allowable Deflections
Load Level 1	Light Pedestrian Load Restricted to walkways and other areas that are totally inaccessible to all vehicle traffic	150 pounds per square foot and 300 pounds on a 5.50 by 5.50 in. area Deflection limited to span/200 not to exceed 3/16 in.
Load Level 2	Pedestrian Load Restricted to pedestrian and light maintenance vehicle use and are inaccessible to all other vehicle traffic	300 pounds per square foot and 600 pounds on a 5.50 by 5.50 in. area Deflection limited to span/200 not to exceed 3/16 in.
Load Level 3	Light Vehicular Traffic Restricted to parking spaces accessible only to passenger vehicles and protected areas within close proximity of roadways	8000 pounds on a 10 by 10 in. footprint without a dynamic (impact) load Deflection limited to span/250 not to exceed 3/16 in.
Load Level 4	Occasional Truck Traffic Restricted to parking spaces and areas within close proximity of roadways	16 000 pounds on a 10 by 20 in. footprint without a dynamic (impact) load Deflection limited to span/250 not to exceed 3/16 in.
Load Level 5	Off Street Truck Traffic Restricted to unrestricted parking lanes and alleyways where traffic speed is limited to 15 mph	16 000 pounds on a 10 by 20 in. footprint with a 30 % dynamic (impact) load Deflection limited to span/300 not to exceed 3/16 in.
Load Level 6	Two-lane Vehicular / Truck Traffic Restricted to two-lane streets with a maximum posted speed limit of 35 mph	16 000 pounds on a 10 by 20 in. footprint with a 33 % dynamic (impact) load Deflection limited to span/800 not to exceed 3/16 in.
Load Level 7	Full Traffic For use in multi-lane roadways with a maximum posted speed limit of 70 mph	16 000 pounds on a 10 by 20 in. footprint with a 33 % dynamic (impact) load Deflection limited to span/800 not to exceed 3/16 in.
Load Level 8	Occasional Aircraft Loads For use in unpaved runway safety zones only	75 000 pounds with 250 pounds per square in. tire pressure without a dynamic (impact) load or the specific airport design criteria Deflection limited to span/800 not to exceed 3/16 in.
Load Level 9	Aircraft Loads For use in taxiways and aprons, <u>not for use in runways</u>	75 000 pounds with 250 pounds per square in. tire pressure with a 33 % dynamic (impact) load and a 0.70 gravity braking load or the specific airport design criteria Deflection limited to span/800 not to exceed 3/16 in.
Load Level 10	Special Equipment Loads such as mining equipment, port equipment, cranes, and earth-moving equipment	The axle loads, axle spacing, tire width, and tire pressure to be provided by the purchaser A 33 % dynamic (impact) load shall be utilized Deflection limited to span/800 not to exceed 3/16 in.

TABLE X1.2 Access Hatch Allowable and Required Design Methods

Load Level	Design By Calculation	Design By Prototype Testing
Lead Level 1, 2, 3, and 4	Allowed utilizing: AISC Allowable Stress Method for Steel AISC LRFD Method for Steel	Optional to design by calculation or to design by prototype testing
	AASHTO Standard Specification for Highway Bridges	
	AASHTO LRFD Bridge Design Specification	
	SEI/ASCE 8 Allowable Stress Method for Stainless Steel	
	SEI/ASCE 9 LRFD Method for Stainless Steel	
	Aluminum Association Allowable Strength Design Method Aluminum Association LRFD Design Method	
Load Level 5	Allowed utilizing: AISC Allowable Stress Method for Steel AISC LRFD Method for Steel	Optional to design by calculation or to design by prototype testing
	AASHTO Standard Specification for Highway Bridges	
	AASHTO LRFD Bridge Design Specification	
	SEI/ASCE 8 Allowable Stress Method for Stainless Steel	
	SEI/ASCE 8 LRFD Method for Stainless Steel	
	Aluminum Association Allowable Strength Design Method with the Safety Factor for Bridge Structures and Fatigue Design	
Load Level 6	Allowed utilizing: AASHTO LRFD Bridge Design with Fatigue Design	Optional to design by calculation or to design by prototype testing
Load Level 7, 8, 9, and 10	Required utilizing: AASHTO LRFD Bridge Design with Fatigue Design	Required to design by calculation and verify by prototype testing

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