RECOMMENDED SPECIFICATIONS FOR LEAD-LINED STEEL DOORS AND FRAMES (FOR RADIATION SHIELDING)

Edition 2025-04

PURPOSE

The purpose of this publication is to establish basic requirements for the specification, manufacture and installation of radiation shielding lead-lined steel doors, frame products and related items, for the guidance of Architects, Specifiers, users and producers.

SCOPE

Members of the Canadian Steel Door Manufacturer's Association (CSDMA) utilize this Specification as the minimum manufacturing standard for commercial, industrial, institutional lead-lined steel doors and frame products.

This publication contains information regarding materials, fabrication, handling and other related work, in accordance with Construction Specifications Canada's format for the National Master Specification (NMS), except where otherwise indicated.

This Specification contains certain options and items not applicable to every project. Therefore, it is not intended to be duplicated verbatim, but to be selectively edited and compiled, after due consideration of all factors relating to performance, function and architectural requirements.

The first two (2) pages of this document are provided as reference material only, and should not appear in project specifications.

All dimensions indicated are nominal. Requirements are stated in both imperial and corresponding hard metric values. Each is considered the standard for its measurement system. Specifiers are advised not to mix measurement systems.
All products, constructions and options included in this Specification are not necessarily available from each member manufacturer. Architects and Specifiers are encouraged to contact member manufacturers to assist in product selection to meet their project requirements.

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SPECIFICATIONS - SECTION 08 34 49
LEAD-LINED STEEL DOORS AND FRAMES

SPEC NOTE: Coordinate design and drawing requirements and Related Work of other Sections with the following CSDMA publications:
- *"Recommended Dimensional Standards for Commercial Steel Doors and Frames"*
- *"Selection and Usage Guide for Steel Doors and Frames"*
- *"Canadian Fire Labeling Guide"*

PART 1 - GENERAL

1.1 Work Included

As detailed or scheduled in the contract documents, supply only of:

.1 Lead-lined (radiation shielding) steel frame products including frames, transom frames (glazed or paneled), sidelight and window assemblies, fire-rated and non-rated.

.2 Lead-lined (radiation shielding) steel panels, fixed or removable, flush or rabbetted, similar in construction to steel doors, for use in frame product.

SPEC NOTE: 'Flush' doors are defined as those without visible seams on faces of doors.

.3 Lead-lined (radiation shielding) steel doors, swing type, flush, with or without glazed openings, fire-rated, and non-rated.

1.2 Related Sections

.1	Building-in [and grouting] frame product into masonry	04 05 00
.2	Building-in frame product in [wood] [steel] stud walls	[06 10 00] [09 20 00]
.3	Installation of doors and hardware	06 20 00
.4	Drilling and tapping of doors and frame product for surface mounted hardware	06 20 00
.5	Caulking of joints between frame product and other building components	07 90 00
.6	Stainless steel doors and frame product	08 11 19
.7	Sound retardant steel door and frame assemblies	08 34 73
.8	Steel doors and frames	08 11 13
.9	Blast retardant steel door and frame assemblies	08 39 53
.10	Builders hardware	08 71 00
.11	Weather stripping and seals	08 71 00
.12	Glass and glazing materials	08 80 00
.13	Field painting	09 90 00
.14	Wiring and/or conduit for electronic hardware	[ ]
15	Field measurements	[ ]
.16	Insulation of exterior frame product perimeter members	[ ]
.17	Fasteners for frame product in previously placed concrete, masonry or structural steel	[ ]
.18	Lintels, posts, columns, or other load bearing elements	[ ]

1.3 Defining Opening Sizes

SPEC NOTE: See the CSDMA publication, "Recommended Dimensional Standards for Commercial Steel Doors and Frames", for detailed listings of standard Metric (SI) and Imperial sizes. Non-standard (custom) metric and imperial sizes are available. Metric and imperial sizes should not be mixed.

.1 Width - Widths of openings shall be measured from inside to inside of frame jamb rabbets. (Referred to as "frame rabbet width" or "nominal door width")

.2 Height - Heights of openings shall be measured from the finished floor (exclusive of floor coverings) to the head rabbet of the frame. (Referred to as "frame rabbet height" or "nominal door height")

.3 Door Sizes - Doors shall be sized so as to fit the above openings and allow a 3 mm (0.125") nominal clearance at jambs and head of frame. A clearance of 19 mm (0.75") maximum shall be allowed between the bottom of the door and the finished floor (exclusive of floor coverings).

.4 Tolerances - Doors and frame product shall be manufactured and installed in accordance with the CSDMA's, "Recommended Dimensional Standards for Commercial Steel Doors and Frames".

1.4 References

SPEC NOTE: The publications listed in Section 1.4 form part of this Specification to the extent referenced. The publications are referenced in the text by basic designation only. When a more recent Standard is available, the Specifier must verify its applicability to the Specification prior to its inclusion.

.1 ANSI/NFPA 80, Standard for Fire Doors and Fire Windows
.2 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
.3 ASTM B29, Specifications for Refined Lead
.4 ASTM B749, Specification for Lead and Lead Alloy Strip, Sheet and Plate Products
.5 CAN/ULC-S104 Standard Method for Fire Tests of Door Assemblies
.6 CSA W59, Welded Steel Construction (Metal Arc Welding)
.7 CSDMA, Recommended Dimensional Standards for Commercial Steel Doors and Frames,
.8 CSDMA, Selection and Usage Guide for Steel Doors and Frames,
.9 CSDMA, Recommended Specifications for Commercial Steel Door and Frame Products,

SPEC NOTE: The approved submittal drawings and the approved hardware schedule are the versions that have been provided to the contractor responsible for supply of steel door and frame products at the time of release for fabrication. These drawings and schedules are considered part of the contract documents.

1.5 Submittals

.1 Submit shop drawings in accordance with Section 01 33 23.
.2 Indicate each type of door, frame, steel, construction and core.
.3 Indicate material thickness, mortises, reinforcements, anchorages, locations of exposed fasteners, glazed or paneled openings, and arrangement of standard hardware.
.4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule of the Architect.
.5 Contractor responsible for coordination and installation of products provided under this Section shall;
  .1 Verify and provide to the contractor responsible for the supply of steel door and frame products, actual opening sizes and field conditions by field measurement before fabrication. Submittal drawings shall reflect measurements and conditions provided, and product manufactured accordingly. Coordinate field measurements with fabrication and construction schedules to avoid delays.
  .2 Verify that substrate conditions, whether existing or installed under other Sections, are as detailed in the Architect's drawings, and are acceptable for product installation in accordance with the manufacturer's instructions.
.6 Manufacturer shall not proceed with fabrication without receipt of approved submittal drawings and approved hardware schedule.

1.6 Warranty

Materials and workmanship shall be warranted by the manufacturer for a period of one (1) year from date of shipment, when stored and installed in accordance with the manufacturer's recommendations, and Sections 3.1 and 3.2 of this Specification.

PART 2 - PRODUCTS

2.1 Materials

.1 Acceptable Materials

Steel doors and frame product manufactured in accordance with this Specification by CSDMA members, are eligible for use on this project.

.2 Steel

Commercial grade steel to ASTM A653, CS, Type B, Coating Designation ZF75 (A25) minimum. Minimum steel thicknesses shall be in accordance with Appendix 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.3 Door Core Materials - Standard

SPEC NOTE: Sheet leads are specified by weight per square meter (foot) and/or nominal thickness. Commercially available sheet lead, specified for radiation shielding, conforms to the following standards:

Weight	*Thickness*
9.8 kg/m^2 (2 PSF)	*0.8 mm (.031") (1/32")*
14.6 kg/m^2 (3 PSF)	*1.2 mm (.047") (3/64")*
19.5 kg/m^2 (4 PSFf)	*1.6 mm (.063") (1/16")*

.1 Lead

Cast or rolled pure lead meeting [ASTM B29] [ASTM B749]. Weights or thickness as specified to shield against radiation types and levels determined by the Architect or Radiation Consultant.

.2 Composites

Balance of core materials used in conjunction with lead shall be in accordance with manufacturer's proprietary design.

.4 Primers

Rust inhibitive touch-up only.

.5 Miscellaneous

Door Silencers

Single stud rubber/neoprene type.

2.2 Fabrication - Frame Products

SPEC NOTE: "Frame Products" include steel frames, transom frames, sidelight and window assemblies. Section 2.2.1 applies to all construction 'types', unless indicated otherwise.

.1 General

SPEC NOTE: Refer to the CSDMA, "Selection and Usage Guide for Steel Doors and Frames", and Table 1 of the CDSMA, "Recommended Specifications for Commercial Steel Door and Frame Products" for guidance on the selection of appropriate frame gauges.

.1 Frames shall be 16 gauge welded type construction. [9.9 kg/m^2/0.8 mm] [14.6 kg/m^2/1.2 mm] [19.5 kg/m^2/1.6 mm] lead shall be securely attached to the inside of the frame profile, from return to stop/soffit intersection (inclusive), on the door side of the frame only.

.2 Frame products shall be mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

.3 Mortised cutouts shall be protected with steel guard boxes (may be omitted on dry wall applications).

.4 Frame products shall be reinforced only, where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware. Drilling and tapping is by others, on site, at time of installation.

.5 Provide anchorage appropriate to floor, wall and frame construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb. For rebate opening heights up to and including 1520 mm (60") provide two (2) anchors, and an additional anchor for each additional 760 mm (30") of height or fraction thereof, except as indicated below. Frames in previously placed concrete, masonry or structural steel shall be provided with anchors located not more than 150 mm (6") from the top and bottom of each jamb, and intermediate anchors at 660 mm (26") on centre maximum. Fasteners for such anchors shall be provided by others.

.6 Minimum reinforcing, anchor and other component gauges shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.7 Each door opening shall be prepared for single stud rubber door silencers, three (3) for single door openings, two (2) for double door openings, except on gasketed frame product.

.8 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

SPEC NOTE: The following are not available as fire-rated lead-lined product: transoms, sidelights or window assemblies.

.9 Fire-rated lead-lined frames shall be provided for those openings requiring fire protection as determined and scheduled by the Architect. Lead-lined frames shall be listed for conformance with CAN/ULC-S104. All fire-rated lead-lined frames shall bear the label of, and be listed by an accredited testing agency having a factory inspection service. Labeling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Fire-rated lead-lined frames shall be constructed as listed for labeling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.

2.2.2 Welded Type

.1 Frame product shall be accurately mitered or mechanically jointed.

SPEC NOTE: Refer to Appendix 2 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products", for illustrations of the weld types defined below.

.2 As defined in Appendix 2 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products", frame product perimeter corner joints shall be profile welded; punch-mitered - continuously welded on the profile faces, rabbets, returns and soffit intersections, or saw-mitered - continuously welded on the profile faces, rabbets, returns, stops and soffit intersections. Punch or saw-mitered, at the manufacturer's discretion. All profile welded frame product exposed faces shall be filled and ground to a smooth, uniform, seamless surface.

.3 Joints at mullions, sills and center rails shall:

.1 Be coped accurately, butted and tightly fitted.

.2 At intersecting flush profile faces, be securely welded, filled and ground to a smooth, uniform, seamless surface.

.3 At intersecting recessed profile faces, be securely welded to concealed reinforcements, with exposed hairline face seams.

.4 At all other intersecting profile elements, have exposed hairline face seams.

.4 Welding shall conform to CSA W59.

.5 Where frame product is to be installed prior to the adjacent partition, a floor anchor shall be securely attached to the inside of each jamb profile. Each floor anchor shall be provided with two (2) holes for securing to the floor. For conditions that do not permit the use of a floor anchor, an additional wall anchor, located within 150 mm (6") of the base of the jamb, shall be substituted.

.6 Weld in two (2) temporary jamb spreaders per door opening to maintain proper alignment during shipment and handling, which shall not be used for installation.

.7 Glazing stops shall be formed steel channel, minimum 16 mm (0.625") height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.8 When required due to site access, when advised by the contractor responsible for coordination or installation, as specified on the Architect's drawings or due to shipping limitations, frame product for large openings shall be fabricated in sections as designated on the approved submittal drawings, with splice joints for field assembly and welding by others.

.9 Prior to shipment, mark each frame product with an identification number as shown on the approved submittal drawings.

2.3 Fabrication - Doors

SPEC NOTE: Section 2.3.1 applies to all construction 'types', unless otherwise indicated.

.1 General

.1 Doors shall be laminated core construction.

SPEC NOTE: Specify longitudinal edge seams as either visible or not visible.

.2 Longitudinal edges shall be [[mechanically inter-locked] [mechanically inter-locked, adhesive assisted] [mechanically interlocked, tack welded at top and bottom of door, above and below each edge cutout and at 150 mm (6") on center] with visible edge seams]], [[tack welded at top and bottom of door, above and below each edge cutout and at 150 mm (6") on center, filled and sanded] [continuously welded, filled and sanded] with no visible edge seams]].

SPEC NOTE: Hardware must be carefully selected for use on lead-lined steel door and frame product. Hinges must be specified to suit the weight and size of the doors specified. All other hardware must be lead-lined to ensure the integrity of the opening.

.3 Doors shall be mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

.4 Holes 12.7 mm (0.5") diameter and larger shall be factory prepared, except mounting and through-bolt holes, which are by others, on site, at time of hardware installation. Holes less than 12.7 mm (0.5") diameter shall be factory prepared only when required for the function of the device (for knob, lever, cylinder, thumb or turn pieces) or when these holes over-lap function holes.

.5 Doors shall be reinforced only, where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware. Drilling and tapping is by others, on site, at time of installation.

.6 Top and bottom of doors shall be provided with inverted, recessed, welded, lead-lined channels and flush steel top and bottom caps.

.7 Minimum reinforcing and component gauges shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".

.8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.9 Fire-rated doors shall be provided for those openings requiring fire protection and temperature rise ratings, as determined and scheduled by the Architect. Such products shall be listed for conformance with CAN/ULC-S104. All fire-rated doors shall bear the label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labeling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Fire-rated doors shall be constructed as listed for labeling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.

.10 Prior to shipment, mark each door with an identification number as shown on the approved submittal drawings.

2.3.2 Laminated Core Construction

SPEC NOTE: Refer to the CSDMA publication, "Selection and Usage Guide for Steel Doors and Frames", for guidance on the selection of appropriate face sheet gauges. ***Laminated vertical stiffener core doors are not considered to be thermally insulated.*** *Thermally broken doors are not available.*

.1 Both face sheets shall be formed from a sheet of [16] [18] gauge steel.

.2 Core shall be a composite of [9.9 kg/m^2/0.8 mm] [14.6 kg/m^2/1.2 mm] [19.5 kg/m^2/1.6 mm] sheet lead and the manufacturer's proprietary design, laminated under pressure to face sheets.

PART 3 - EXECUTION

3.1 Site Storage and Protection of Materials

SPEC NOTE: Site storage and the protection of materials are not the responsibility of the steel door and frame manufacturer. The following is provided for the direction of the contractor responsible for site storage and protection of materials.

.1 Doors and frame product shall be removed from their wrappings or coverings upon receipt on site, be stored in a vertical position, and be spaced with blocking to permit air circulation between them.

.2 All materials shall be thoroughly inspected upon receipt and all discrepancies, deficiencies and/or damages shall be immediately reported, in writing, to the supplier.

.3 All damages incurred during shipment shall be noted on the carrier's Bill of Lading and immediately reported, in writing, to the supplier.

.4 Any scratches or disfigurement of doors or frame products caused by shipping or handling shall be promptly cleaned and touched-up with a zinc-rich primer.

.5 All materials shall be properly stored on planks or dunnage, out of water and covered to protect from damage from any cause.

3.2 Installation

SPEC NOTE: Wall systems for lead-line steel door and frame product must provide sufficient structural stability to support the weight and operation of these assemblies. Refer to the manufacturer's installation instructions for detailed recommendations. Installation is not the responsibility of the steel door and frame manufacturer. The following is provided as recommendations for the contractor responsible for installation of these products.

.1 Prior to installation, remove temporary shipping spreaders.
.2 Prior to installation, the area of floor on which the frame is to be installed, and within the path of the door swing, shall be checked and corrected for flatness.
.3 Door and frame product shall be checked for correct size, swing, rating and opening number.
.4 The supplier shall be advised of any discrepancies prior to installation.
.5 The contractor responsible for installation shall ensure the integrity of the lead-lining between the interior of the frame and the wall assembly.
.6 Set frames plumb, square, level and at correct elevation.
.7 Fire-rated door and frame product shall be installed in accordance with the terms of their listings, NFPA-80, or the local Authority Having Jurisdiction (AHJ).
.8 Secure anchorages and connections to adjacent construction.
.9 Brace frames rigidly in position while building-in. Install wood spreaders at third points of frame rebate height to maintain frame width. Provide vertical support at centre of head for openings exceeding 1200 mm (48") in width.
.10 During the setting of frame product, check and correct as necessary for opening width, opening height, square, alignment, twist and plumb, in accordance with the CSDMA, "Recommended Dimensional Standards for Commercial Steel Doors and Frames".
.11 Remove wood spreaders after frames have been built-in.

SPEC NOTE: The use of water-based masonry grout, with or without antifreeze agents, should be carefully weighed during the specification process. The grouting of mullions and other closed sections is not recommended, and plaster based grouts should not be used. Grouting is not required for fire-rated frame product.

.12 Make allowance for deflection to ensure structural loads are not transmitted to frame product.
.13 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.
.14 Adjust operable parts for correct clearances and function.
.15 Install glazing.
.16 Finish paint in accordance with Section 09 90 00.

END OF SECTION 08 34 49