

CAN/ULC-S105:2016

**STANDARD SPECIFICATION FOR FIRE DOOR FRAMES
MEETING THE PERFORMANCE REQUIRED BY CAN/ULC-S104**

Prepared and Published by:



Approved by:



Standards Council of Canada
Conseil canadien des normes

Underwriters Laboratories of Canada (ULC) was established in 1920 by letters patent issued by the Canadian Government. It maintains and operates laboratories and certification services for the examination, testing and certification of appliances, equipment, materials, constructions and systems to determine their relation to life, fire and property hazards as well providing inspection services.

Underwriters Laboratories of Canada is accredited by the Standards Council of Canada as a Certification Organization, a Testing Organization, and an Inspection Body under the National Standards System of Canada.

ULC Standards develops and publishes standards and other related publications for building construction, security and burglar protection, environmental safety, electrical equipment, fire protection equipment, gas and oil equipment, thermal insulation products, materials and systems, energy use in the built environment and electrical utility safety.

ULC Standards is a not-for-profit organization and is accredited by the Standards Council of Canada as a Standards Development Organization.

National Standards of Canada developed by ULC Standards conform to the criteria and procedures established by the Standards Council of Canada. Such standards are prepared using the consensus principle by individuals who provide a balanced representation of interests relevant to the subject area on a national basis.

ULC is represented across Canada as well as many countries worldwide. For further information on ULC services, please contact:

Customer Service: 1-866-937-3852

National Standard of Canada

A National Standard of Canada is a standard developed by an SCC-accredited Standards Development Organization (SDO), and approved by the Standards Council of Canada (SCC), in accordance with SCC's: *Requirements and Guidance-Accreditation for Standards Development Organizations*, and *Requirements and Guidance-Approval of National Standards of Canada Designation*. More information on National Standard requirements can be found at www.scc.ca.

An SCC-approved standard reflects the consensus of a number of experts whose collective interests provide, to the greatest practicable extent, a balance of representation of affected stakeholders. National Standards of Canada are intended to make a significant and timely contribution to the Canadian interest.

SCC is a Crown corporation within the portfolio of Industry Canada. With the goal of enhancing Canada's economic competitiveness and social well-being, SCC leads and facilitates the development and use of national and international standards. SCC also coordinates Canadian participation in standards development, and identifies strategies to advance Canadian standardization efforts. Accreditation services are provided by SCC to various customers, including product certifiers, testing laboratories, and standards development organizations. A list of SCC programs and accredited bodies is publicly available at www.scc.ca.

Users should always obtain the latest edition of a National Standard of Canada from the standards development organization responsible for its publication, as these documents are subject to periodic review.

CORPORATE HEADQUARTERS

Underwriters Laboratories of Canada
7 Underwriters Road
Toronto, Ontario M1R 3A9
Telephone: (416) 757-3611
Fax: (416) 757-9540

REGIONAL OFFICES

PACIFIC OFFICE

13775 Commerce Parkway, Suite 130
Richmond, British Columbia V6V 2V4
Telephone: (604) 214-9555
Fax: (604) 214-9550

EASTERN OFFICE

6505, Rte Transcanadienne, Suite 330
St-Laurent, Québec H4T 1S3
Telephone: (514) 363-5941
Fax: (514) 363-7014

For further information on ULC standards, please contact:

ULC STANDARDS

171 Nepean Street, Suite 400
Ottawa, Ontario K2P 0B4
Telephone: (613) 755-2729
Fax: (613) 231-5977
E-mail: customerservice@ulc.ca
Web site: www.ulc.ca

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

Copies of this National Standard of Canada may be ordered from ULC Standards.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

STANDARD SPECIFICATION FOR FIRE DOOR FRAMES MEETING THE
PERFORMANCE REQUIRED BY CAN/ULC-S104

ICS 13.220.50; 91.060.50

Prepared and Published by:



Approved by:



First Edition.....April 1979
Second Edition.....January 1985
Third Edition.....July 2009
FOURTH EDITION.....FEBRUARY 2016

Copyright © 2016

ULC Standards

All rights reserved. No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without prior permission.

TABLE OF CONTENTS

ULC STANDARDS COMMITTEE ON FIRE TESTS	.I
ULC STANDARDS TASK GROUP ON FIRE DOORS	.II
PREFACE	.III
1 SCOPE	.1
2 REFERENCE PUBLICATIONS	.1
3 GENERAL	.2
4 DESCRIPTION OF FRAMES	.2
4.1 SINGLE-UNIT TYPE PRESSED-STEEL FRAMES	.2
4.2 MULLION	.3
4.3 SINGLE-UNIT TYPE STEEL-CHANNEL FRAMES	.3
4.4 TWO-SECTION TYPE FRAMES WITH STEEL-CHANNEL ROUGH BUCKS	.4
4.5 TWO-SECTION TYPE FRAMES WITH PRESSED-STEEL ROUGH BUCKS	.4
4.6 PRESSED-STEEL PANEL TRANSOM FRAME	.4
4.7 PRESSED-STEEL GLAZED TRANSOM FRAME	.5
4.8 HEAD AND JAMB CORNER JOINTS	.6
4.8.1 Welded Corner Joints	.6
4.8.2 Knocked-Down Corner Joints	.6
4.8.3 Mechanically Fastened Corner Joints	.6
4.9 STAINLESS STEEL	.7
4.10 HARDWARE REINFORCEMENTS	.7
4.10.1 Hinge Reinforcements	.7
4.10.2 Strike-Plate Reinforcements	.8
4.11 DOOR-CLOSER AND CO-ORDINATOR REINFORCEMENTS	.9
4.12 WALL ANCHORS	.9
4.12.1 General	.9
4.12.2 Adjustable Masonry Wall Anchors	.9
4.12.3 Fixed Flat Masonry Wall Anchors	.9
4.12.4 Fixed-Rod Concrete Wall Anchors	.9
4.12.5 Channel Clip Wall Anchors	.10
4.12.6 "Z" Clip Wall Anchors	.10
4.12.7 Wood-Stud Wall Anchors	.10
4.12.8 Steel-Stud Wall Anchors	.10
4.12.9 Expansion-Shell Wall Anchors	.11
4.12.10 Base Anchors	.11
4.13 CEILING STRUTS	.11
4.13.1 General	.11
4.13.2 Strut Design	.12
4.13.3 Strut Guides	.12
4.13.4 Wedges	.12
4.14 RUBBER SILENCERS	.12
4.15 TERMINATED STOPS	.12
4.16 SCREWS	.12
4.17 PAINTING	.13

5 MARKING 13

TABLES 14

FIGURES 17

.....

ULC STANDARDS COMMITTEE ON FIRE TESTS

NAME	AFFILIATION	REGION	CATEGORY
A. Laroche (Chair)	Canadian Codes Centre, National Research Council Canada	Canada	Regulator
C. Andersson	Health Canada	Canada	Regulator
B. Bulley	Canadian Steel Door Manufacturers Association	Canada	Producer
S. Craft	CHM Fire Consultants Ltd.	Ontario	General Interest
T. Crimi	A.C. Consulting Solutions Inc.	Ontario	General Interest
C. Dagenais	FPIInnovations	Canada	User
D. Falconer	Falconer Engineering & Testing	Ontario	General Interest
G. Frater	Canadian Steel Construction Council	Canada	Producer
G. Gardin	Canadian Plastics Industry Association	Canada	Producer
M. Gilfillan	Canadian Fire Safety Association	Canada	General Interest
G. Hadjisophocleous	Carleton University	Ontario	General Interest
L. Hamre	PLC Fire Safety Solutions	New Brunswick	General Interest
J. Humpries	City of Toronto	Ontario	Regulator
G. Loughheed	National Research Council Canada	Canada	User
M. McClure	ThermoFire Systems Inc.	Ontario	General Interest
R. McGrath	Cement Association of Canada	Canada	Producer
G. Morinville	National Defence and the Canadian Armed Forces	Canada	User
L. Nadeau	Ontario Building Officials Association	Ontario	Regulator
E. Randsalu	Office of the Fire Marshal and Emergency Management	Ontario	Regulator
J. Roberts	LRI Engineering Inc.	Canada	User
I. Smith	Exova Canada Inc.	Canada	User
P. Shinkoda	CGC Inc.	Canada	Producer
I. Van Zeeland	Canadian Wood Council	Canada	Producer
N. Benichou (Associate Member)	National Research Council Canada	Canada	Non-Voting
M. Birk (Associate Member)	Queen's University	Ontario	Non-Voting
K. Kooner (Associate Member)	Intertek	Canada	Non-Voting
H. Locke (Associate Member)	Locke & Locke Inc.	British Columbia	Non-Voting
E. Sopeju (Associate Member)	Underwriters Laboratories of Canada	Canada	Non-Voting
J. Su (Associate Member)	National Research Council Canada	Canada	Non-Voting
B. Weckman (Associate Member)	University of Waterloo	Ontario	Non-Voting
K. Wu (Project Manager)	ULC Standards	Canada	Non-Voting

This list represents the membership at the time the Committee balloted on the final text of this edition. Since that time, changes in the membership may have occurred.

ULC STANDARDS TASK GROUP ON FIRE DOORS

MEMBER

REPRESENTING

B. Bulley (Chair)	Canadian Steel Door Manufacturers Association, Canada
S. Craft	CHM Fire Consultants Ltd., Ontario
T. Crimi	A.C. Consulting Solutions Inc., Ontario
C. Dagenais	FPIInnovations, Canada
L. Hamre	PLC Fire Safety Solutions, New Brunswick
J. Humphries	City of Toronto, Ontario
H. Locke	Locke & Locke Inc., British Columbia
G. Loughheed	National Research Council Canada, Canada
J. Roberts	LRI Engineering Inc., Canada
E. Sopeju	Underwriters Laboratories of Canada, Canada
H. Spice	Underwriters Laboratories of Canada, Canada
I. Van Zeeland	Canadian Wood Council, Canada
L. Woods	Underwriters Laboratories Inc., USA

STANDARD SPECIFICATION FOR FIRE DOOR FRAMES MEETING THE PERFORMANCE REQUIRED BY CAN/ULC-S104

PREFACE

This is the Fourth Edition of the Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104, CAN/ULC-S105.

This Edition of the Standard was developed by the ULC Standards Task Group on Fire Doors and has been formally approved by the ULC Standards Committee on Fire Tests.

This Standard has been developed in compliance with the requirements of SCC for accreditation of a Standards Development Organization.

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

This Fourth Edition National Standard of Canada is based on, and now supersedes, the Third Edition.

Attention is drawn to the possibility that some of the elements of this Canadian standard may be the subject of patent rights. ULC Standards shall not be held responsible for identifying any or all such patent rights.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a “yes” or “no” answer based on the literal text of the requirement concerned.

The review and action to revise or reaffirm this Standard will not exceed 5 years from the date of publication, unless the Standard is identified as fitting within a stabilized category, whereby the review will commence within the appropriate time frame set out by ULC Standards.

This Standard is intended to be used for conformity assessment.

1 SCOPE

1.1 The requirements in this Standard apply to frame assemblies for swinging fire doors. These frame assemblies have demonstrated performance in fire tests sufficient to warrant their use with fire doors which have been assigned a fire-protection rating of up to and including 3 h when tested in accordance with CAN/ULC-S104, Standard Method for Fire Tests of Door Assemblies. The frames may include provision for transoms or mullions.

1.2 Requirements for the installation of these frames are in accordance with NFPA 80, Standard for Fire Doors and Other Opening Protectives.

2 REFERENCE PUBLICATIONS

2.1 The documents shown below are referenced in the text of this Standard. Unless otherwise stated elsewhere in this Standard such reference shall be considered to indicate the edition and/or revisions of the document available at the date on which the Committee approved this ULC Standard.

Documents Published by the American Society for Testing and Materials (ASTM International)
100 Barr Harbour Drive, PO Box C700, West Conshohocken, PA 19428-2959 U.S.A.
Telephone: (610) 832-9585
www.astm.org

- ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
- ASTM A1008/A1008M-15, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
- ASTM A1011/A1011M-14, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

Document Published by the National Fire Protection Association (NFPA)
1 Batterymarch Park, Quincy, MA 02169-7471 U.S.A.
Telephone: (617) 770-3000; Fax: (617) 770-0700
www.nfpa.org

- NFPA 80-2016, Standard for Fire Doors and Other Opening Protectives

Documents Published by ULC Standards
171 Nepean Street, Suite 400, Ottawa, ON K2P 0B4 Canada
Telephone: (416) 757-3611, ext. 61744; Fax (613) 231-5977, "ATTN: Publications"
E-mail: publications@ulc.ca
www.ulc.ca

- CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

- CAN/ULC-S104-15, Standard Method for Fire Tests of Door Assemblies
- CAN/ULC-S106-15, Standard Method for Fire Tests of Window and Glass Block Assemblies

Document Published by the Canadian Institute of Steel Construction (CISC-ICCA)
3760 14th Avenue, Suite 200, Markham, ON L3R 3T7 Canada
Telephone: (905) 946-0864
www.cisc-icca.ca

- Handbook of Steel Construction, Tenth Edition (September 2012)

3 GENERAL

3.1 Terminology used in describing these frames follows that commonly employed by the hollow metal trades in Canada. Figure 1 illustrates some of these terms.

3.2 Pressed-steel or steel-channel frames of the single-unit type or frames of the two-section type are intended for use with steel-faced composite, hollow-metal, metal-clad (Kalamein), and sheet-metal (flush or panelled types) doors.

3.3 Steel-channel frames of the single-unit type are intended for use with tin-clad and sheet-metal (corrugated-type) doors.

3.4 Pressed-steel frames of the single-unit type are intended for use with composite (wood or plastic-faced) doors and solid wood core doors.

3.5 A fire-door frame shall be of a design and construction that, when in combination with a suitable fire door and hardware, the assembly will protect the opening in which it is installed against the passage of flame for the period of time appropriate to the assigned classification or rating.

3.6 A fire-door frame which conforms with the following requirements is considered to comply with the requirement of Clause 3.5.

3.7 A fire-door frame which conforms to the Conditions of Acceptance specified in CAN/ULC-S104, Standard Method for Fire Tests of Door Assemblies, when tested in accordance with the provisions of that Standard, is considered to comply with Clause 3.5 even though it does not comply with all of the following design and construction requirements.

4 DESCRIPTION OF FRAMES

4.1 SINGLE-UNIT TYPE PRESSED-STEEL FRAMES

4.1.1 Single-unit type pressed-steel frames for walls at least 50 mm thick shall consist of head and jambs, hinge reinforcements, closer reinforcement, base and wall anchors, a strike-plate reinforcement when intended for installation with single-swing doors, and a co-ordinator and flushbolt reinforcement may be required when intended for installation with pairs of doors swinging in the same direction.

4.1.2 The wall anchors provided shall be adjustable or fixed masonry wall anchors, bolts with expansion shells, channel clips, "Z" clips, wood-stud wall anchors, or steel-stud wall anchors located, as described in Subsection 4.12, Wall Anchors, and as shown in Figure 2.

4.1.3 The head and jambs shall be constructed, as shown in Figure 3, of steel or stainless steel not less than 1.6 mm thick nor more than 2.8 mm thick for the door frame rebate opening sizes specified in Table 1.

4.1.4 A stainless-steel cladding not to exceed the thickness of the jambs may be applied over the steel head and jambs.

4.1.5 Ceiling struts, strut guides, and wedges (see Subsection 4.13, Ceiling Struts) shall be required for frames for single-swing doors over 2450 mm in height and all frames for pairs of doors for installation in walls 90 mm thick. The use of ceiling struts is optional on frames for walls thicker than 90 mm or single swing frames for door sizes less than 2450 mm in height for walls less than 90 mm thick.

4.2 MULLION

4.2.1 Welded single-unit type pressed-steel frames may be provided with a fixed mullion to provide two rebate openings for two single-swing doors opening in the same direction, each door of a size not exceeding 1250 mm in width and 2450 mm in height.

4.2.2 Frames equipped with a fixed mullion shall consist of head and jambs, hinge reinforcements, base anchors, wall anchors, and a fixed mullion provided with a base anchor and strike reinforcements.

4.2.3 The mullion shall be constructed of steel not less than 1.6 mm thick and not more than 2.8 mm thick as shown in Figures 4, 5 and 6.

4.2.4 Two base anchors made of steel not less than 2.8 mm thick, as shown in Figure 7, or a one-piece base anchor of the same thickness and dimensions except for depth, which is to match the depth of the mullion minus two times the thickness of the steel used in the mullion, shall be provided.

4.2.5 These base anchors are to permit fastening to the floor with M10 bolts and steel expansion shells.

4.2.6 Sheet-metal screws of $M4 \times 0.7$ mm are to be provided with the mullion to permit fastening the base clip to the base of the mullion.

4.2.7 Doors shall not be hinged from the mullion.

4.3 SINGLE-UNIT TYPE STEEL-CHANNEL FRAMES

4.3.1 Single-unit type steel-channel frames for walls at least 90 mm thick shall consist of head and jambs, base anchors, bar stops, and adjustable or fixed masonry or fixed-rod concrete wall anchors.

4.3.2 The rebate opening for single-swing doors shall not exceed 1850 mm in width and 3660 mm in height. The rebate opening for doors swinging in pairs shall not exceed 3050 mm in width and 3660 mm in height.

4.3.3 The head and jambs shall be constructed of structural-steel channel as shown in Figure 8. Steel channels used for frames shall conform to the requirements for standard channels as described under the Properties and Dimensions in the Handbook of Steel Construction of the Canadian Institute of Steel Construction.

4.3.4 The head and jambs shall be provided with steel stops secured with 10 mm steel rivets or 13 mm diameter plug welds spaced not to exceed 75 mm from each end and 300 mm on centres.

4.4 TWO-SECTION TYPE FRAMES WITH STEEL-CHANNEL ROUGH BUCKS

4.4.1 Two-section type frames with steel-channel rough bucks for walls at least 90 mm thick shall consist of two heads and four jambs, hinge reinforcements, a strike-plate reinforcement when intended for installation with single-swing doors, base anchors, and adjustable or fixed masonry or concrete wall anchors. See Figure 9.

4.4.2 The rebate opening for single-swing doors and doors swinging in pairs shall not exceed the size specified in Table 2.

4.4.3 The head and jambs (rough and finished buck) shall be constructed of steel, as shown in Figure 9, of the thickness specified in Table 2; or the rough buck may be constructed of a structural-steel channel. Steel channels used for frames shall conform to the requirements for standard channels as described under the Properties and Dimensions in the Handbook of Steel Construction of the Canadian Institute of Steel Construction. The same thickness of stainless steel shall be used when the finished buck is fabricated of stainless steel.

4.4.4 A stainless-steel cladding, not to exceed the thickness of the jambs, may be applied over the head and jambs of the finished bucks.

4.4.5 The finished bucks shall be drilled with clearance holes for assembling to the rough bucks with M4 × 0.7 mm sheet-metal screws. The holes shall be spaced not more than 75 mm from each end and not more than 250 mm on centres.

4.5 TWO-SECTION TYPE FRAMES WITH PRESSED-STEEL ROUGH BUCKS

4.5.1 Two-section type frames with pressed-steel rough bucks for walls at least 90 mm thick shall consist of two heads and four jambs, hinge reinforcements, a strike-plate reinforcement when intended for installation with single-swing doors, bracket reinforcements for the hinges and the strikes, and bolts with expansion shells. See Figure 10.

4.5.2 The rebate opening for single-swing doors and doors swinging in pairs shall not exceed the sizes specified in Table 3.

4.5.3 The head and jambs (rough and finished buck) shall be constructed, as shown in Figure 10, of steel or stainless steel of the thickness specified in Table 3.

4.5.4 A stainless-steel cladding not to exceed the thickness of the jambs may be applied over the head and jambs of the finished bucks.

4.5.5 The finished buck shall be drilled with clearance holes for assembling to the rough bucks with M4 × 0.7 mm sheet-metal screws. The holes shall be spaced not more than 75 mm from each end and not more than 250 mm on centres.

4.6 PRESSED-STEEL PANEL TRANSOM FRAME

4.6.1 Pressed-steel panel transom frames for walls at least 90 mm thick, shall consist of head and jambs, a transom mullion, hinge reinforcements, a strike-reinforcement plate when intended for installation with single-swing doors, base anchors, suitable wall anchors, fixed panel transom, and glazing beads. See Figure 11.

4.6.2 The door-transom rebate opening for a panel transom frame assembly shall not exceed 3050 mm in height.

4.6.3 The door rebate opening for a single swing door shall not exceed 1250 mm in width. For pairs of doors the door rebate opening shall not exceed 2450 mm in width.

4.6.4 Pressed steel panel transom frame assemblies may be provided with a fixed vertical mullion as shown in Figures 4 and 6 to provide two rebate openings for two single swing doors opening in the same direction, each door of a size not to exceed 1250 mm in width and 2450 mm in height.

4.6.5 The head and jambs shall be constructed of steel or stainless steel not less than 1.6 mm thick as shown in Figures 12 and 13, and welded as shown in Figure 14.

4.6.6 The transom mullion shall be constructed of steel or stainless steel not less than 1.6 mm thick as shown in Figure 15.

4.6.7 The transom mullion shall be welded to the jambs as shown in Figure 16.

4.6.8 A stainless-steel cladding not to exceed the thickness of the jambs may be applied over the steel head, transom mullion, and jambs.

4.6.9 The fixed transom panel shall not exceed 815 mm in height and shall be constructed of steel or stainless steel not less than 0.9 mm thick nor more than 1.6 mm thick adhered to and completely covering both faces of a single piece of 10 mm thick inorganic reinforced cement board having a nominal density of 1500 to 1760 kg/m³, flame spread rating of 0 and smoke developed rating of 0, as determined by CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

4.6.10 The adhesive used shall be sodium silicate, or the equivalent, applied at a pressure of not less than 480 Pa.

4.6.11 The wall anchors provided shall be adjustable or fixed masonry wall anchors, bolts with expansion shells, "Z" clips, wood stud wall anchors, or steel-stud wall anchors as described in Subsection 4.12, Wall Anchors, and shown in Figure 11.

4.7 PRESSED-STEEL GLAZED TRANSOM FRAME

4.7.1 Pressed-steel transom frames for walls at least 90 mm thick shall consist of head and jambs, a transom mullion, hinge reinforcements, a strike-reinforcement plate for installation with single-swing doors, base anchors, suitable wall anchors, glass stops, and glazing beads for a glazed transom. See Figure 17.

4.7.2 The door-glazed transom rebate opening for a transom frame assembly provided with a single-swing door shall not exceed 1250 mm in width and 3050 mm in height.

4.7.3 The head and jambs shall be constructed of steel or stainless steel not less than 1.6 mm thick as shown in Figures 12 and 13.

4.7.4 The transom mullion shall be constructed of steel or stainless steel not less than 1.6 mm thick, as shown in Figure 15.

4.7.5 The transom mullion shall be welded to the jambs as shown in Figure 16.

4.7.6 A stainless-steel cladding not to exceed the thickness of the jambs may be applied over the steel head, transom, and jambs.

4.7.7 The glazing for transom lights, when provided, shall be 6 mm thick wired glass which conforms to the Conditions of Acceptance specified in CAN/ULC-S106, Standard Method for Fire Tests of Window and Glass Block Assemblies.

4.7.8 The maximum area of exposed glass shall not exceed 0.84 m² as measured from the outer face of the glazing bead.

4.7.9 The groove formed for retaining the glass shall be in accordance with Table 4.

4.7.10 The wall anchors provided shall be adjustable or fixed masonry wall anchors, bolts with expansion shells, "Z" clips, wood-stud wall anchors, or steel-stud wall anchors as described in Subsection 4.12, Wall Anchors, and shown in Figure 17.

4.8 HEAD AND JAMB CORNER JOINTS

4.8.1 Welded Corner Joints

4.8.1.1 The corner joints between the head and jambs of single-unit type pressed-steel frames, including stainless-steel cladding, shall be mitred or butted and continuously welded, as shown in Figure 14(A), (B), or (C).

4.8.1.2 The corner joints between the head and jambs of pressed-steel panel or glazed transom frames, including stainless-steel cladding, shall be mitred or butted and continuously welded, as shown in Figure 14(A), (B), or (C).

4.8.1.3 The corner joints between the head and jambs of single-unit type steel-channel frames shall be butted and continuously welded, as shown in Figure 14(C).

4.8.2 Knocked-Down Corner Joints

4.8.2.1 The corner joints between the head and jambs of single-unit type pressed-steel frames, including stainless-steel cladding, shall be mitred and constructed as shown in Figure 18 for joining together in the field.

4.8.2.2 Each corner reinforcement shall be not less than 1.6 mm thick steel and shall be secured with four spot welds positioned as shown in Figure 18.

4.8.3 Mechanically Fastened Corner Joints

4.8.3.1 The corner joints between the head and jambs of single-unit pressed-steel frames shall be constructed to provide for being mechanically fastened together as shown in Figure 19.

4.8.3.2 The corner joints between the head and jambs of single-unit type steel-channel frames shall be constructed to provide for being mechanically fastened together as shown in Figure 19.

4.8.3.3 The 38 mm by 38 mm by 5 mm thick angle shall be secured to the jamb with not less than four 6 mm long welds.

4.8.3.4 The intersection of the head and jambs of the rough and finished bucks, including stainless-steel cladding, of the two-section type frames shall be cut to intersect, as shown in Figure 20.

4.9 STAINLESS STEEL

4.9.1 Steel employed for frame members, hardware reinforcements, wall and base anchors shall be cold-rolled, hot-rolled or zinc-coated in accordance to ASTM A 653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; ASTM A1008/A1008M, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; and ASTM A1011/A1011M, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength, respectively.

4.9.2 Stainless-steel employed for frame members, hardware reinforcements, wall and base anchors and cladding shall comply with ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar, Types 304 or 316.

4.9.3 The jambs and head of single-unit type pressed-steel frames, glazed or paneled transom frames, or the finished buck of two-section type steel frames may be clad with stainless steel, which shall not be thicker than 1.6 mm.

4.9.4 Stainless-steel spats not exceeding 200 mm in height may be provided on the bottom of the jambs and/or vertical mullions.

4.9.5 Stainless-steel cladding shall be spot-welded to the base steel frame with a minimum of one weld at the top, one at the bottom, and two equidistant apart per each rabbet for each jamb, and one weld at each corner and the middle per each rabbet for the head, and four welds on the inside edge spaced approximately the same as the rabbet welds on each return of the jambs and head.

4.9.6 Stainless-steel cladding shall follow the profile of the frame, including the returns and stop.

4.10 HARDWARE REINFORCEMENTS

4.10.1 Hinge Reinforcements

4.10.1.1 All single-unit type pressed-steel frames and the finished bucks of the two-section type shall be provided with hinge reinforcements as specified below.

4.10.1.2 Single-unit type steel-channel frames are intended for surface-mounted hinges.

4.10.1.3 Hinge reinforcements for single-swing doors shall be provided on one jamb, and for doors swinging in pairs on both jambs.

4.10.1.4 Two reinforcements shall be provided for door rebate openings not exceeding 1525 mm in height, and an additional reinforcement shall be provided for each additional 760 mm of height or fraction thereof.

4.10.1.5 Hinge reinforcements shall be constructed, as shown in Figure 21, of not less than 2.8 mm thick steel. They shall be not less than 28 mm wide for 35 mm doors and not less than 32 mm wide for 45 mm or thicker doors. They shall be secured to the inside face of the jamb over the cut out with not less than three spot welds at each end, as shown in Figure 21, or continuously welded across both ends and one side of each end.

4.10.1.6 The height and depth of the hinge cut outs shall correspond with the size of the door frame rebate opening as specified in Table 5. These sizes apply for single-swing doors and for doors swinging in pairs (minimum size of hinges for installation of fire doors as specified in NFPA 80, Standard for Fire Doors and Other Opening Protectives).

4.10.1.7 The hinge reinforcements for two-section type frames with pressed-steel rough buck shall be provided with a countersunk hole, as shown in Figure 21.

4.10.1.8 The pressed-steel rough buck of two-section type frames shall be provided with bracket reinforcements located and spaced as specified for hinges in Clauses 4.10.1.3 and 4.10.1.4.

4.10.1.9 The brackets shall be constructed, as shown in Figure 10, not less than 2.8 mm thick steel and not less than 300 mm in length.

4.10.1.10 The brackets shall be secured to the inside of the rough buck with not less than three welds at each end, and one of the welds at each end shall secure the bracket to the leg of the rough buck.

4.10.2 Strike-Plate Reinforcements

4.10.2.1 All single-unit type pressed-steel frames and the finished bucks of the two-section type shall be provided with strike-plate reinforcements as specified below.

4.10.2.2 Rabbet-edge strike-plate reinforcements for single-swing doors and the top-bolt reinforcement for the inactive door of doors swinging in pairs shall be constructed, as shown in Figure 22, of not less than 2.8 mm thick steel. They shall be not less than 28 mm wide for 35 mm thick doors and not less than 32 mm wide for 45 mm or thicker doors. They shall be secured to the inside rabbet face of the head or jamb over the cutout with not less than three spot welds at each end or continuously welded across both ends.

4.10.2.3 If the door to be mounted in the frame is to be provided with surface-mounted hardware, the inside face of the frame shall be reinforced with a plate of not less than 2.8 mm thick steel secured with not less than three spot welds or a continuous weld at each end, in the location required for the surface-mounted strike. The holes required for machine screws to attach the surface-mounted strike shall be drilled and tapped. If surface-mounted strike reinforcements are provided, rabbet-edge reinforcements are not required for that individual hardware part.

4.10.2.4 If the lock or door is to be provided with a dead bolt in addition to the latch bolt, a rectangular hole, reinforced as described in Clause 4.10.2.2, shall be provided.

4.10.2.5 The strike-plate reinforcements for two-section type frames with pressed-steel rough bucks shall be provided with a countersunk hole, as shown by Figure 22.

4.10.2.6 The pressed-steel, two-section type frames shall be provided with bracket reinforcement for the strike-plate reinforcement and the top-bolt reinforcement for the inactive door of doors swinging in pairs.

4.10.2.7 The bracket for the strike-plate reinforcement shall be constructed, as shown in Figure 10, of not less than 2.8 mm thick steel not less than 300 mm in length, and it shall be provided with a rectangular hole to provide clearance for the latch bolt of single-swing doors or the top bolt of doors swinging in pairs.

4.10.2.8 The brackets shall be secured to the inside of the rough buck with not less than three welds at each end, and one of the welds at each end shall secure the bracket to the leg of the rough buck.

4.10.2.9 Single-unit type steel-channel frames intended to receive the latch bolt of single-swing doors or the top bolt of doors swinging in pairs shall be provided with a rectangular hole to receive the bolt or latch.

4.10.2.10 Reinforcements for the latch bolt or top bolt are not required on steel-channel frames.

4.11 DOOR-CLOSER AND CO-ORDINATOR REINFORCEMENTS

4.11.1 Door-closer and co-ordinator reinforcements shall be constructed of not less than 2.8 mm thick steel. See Figure 23. The closer reinforcement shall be not less than 28 mm wide and not less than 200 mm in length. The co-ordinator reinforcement shall be not less than 28 mm wide and not less than 150 mm in length.

4.11.2 The closer reinforcement shall be located not more than 200 mm from the hinge jamb stop, and the co-ordinator reinforcement shall be in the centre of the head for doors swinging in pairs.

4.11.3 Door-closer and co-ordinator reinforcements shall be secured to the inside face of the head with at least two spot welds at each end or two 6 mm long welds at each end.

4.11.4 Reinforcements for door closers and co-ordinators are not required on steel-channel or two-section type frames.

4.12 WALL ANCHORS

4.12.1 General

4.12.1.1 Each jamb of the door frame shall be provided with wall anchors to suit the wall construction to which that part of the door frame (jamb) will be fastened. Except where otherwise indicated below, each anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb as shown in Figure 2.

4.12.1.2 Each jamb for over-all frame heights up to and including 1575 mm high shall be provided with two wall anchors, and an additional anchor shall be provided on each jamb for each additional 760 mm of height or fraction thereof.

4.12.2 Adjustable Masonry Wall Anchors

4.12.2.1 Adjustable masonry wall anchors shall be constructed, as shown in Figure 24, of not less than 1.6 mm thick steel. They may be flat or corrugated and may be provided with one or more 25 mm (or smaller) square or round holes.

4.12.2.2 The strap with its anchor shall be secured to the inside soffit face of the jambs with not less than two spot welds at each end or a continuous weld across each end.

4.12.3 Fixed Flat Masonry Wall Anchors

4.12.3.1 Fixed flat masonry wall anchors shall be constructed, as shown in Figure 25, of not less than 1.6 mm thick steel. They may be provided with one or more 25 mm maximum square cutouts or round holes.

4.12.3.2 These wall anchors shall be secured to the inside rabbet faces of the jambs with not less than three spot welds or three 6 mm long welds.

4.12.4 Fixed-Rod Concrete Wall Anchors

4.12.4.1 Fixed-rod concrete wall anchors shall be constructed, as shown in Figure 26, of not less than 15 mm diameter steel round bars.

4.12.4.2 Each fixed-rod concrete wall anchor shall be secured to the inside of the steel channel by a continuous weld.

4.12.5 Channel Clip Wall Anchors

4.12.5.1 Channel clips shall be constructed, as shown in Figure 27, of not less than 1 mm thick steel.

4.12.5.2 The bottom and intermediate (when required) clips shall be located immediately above the hinge reinforcement on the hinge jamb and directly opposite on the strike jamb.

4.12.5.3 The top channel clip on the hinge jamb shall be located immediately below the top-hinge reinforcement and directly opposite on the strike jamb.

4.12.5.4 The head shall be provided with two channel clips located 100 mm from the inside corners of the opening, as shown in Figure 28.

4.12.5.5 The channel clips shall be secured to the inside face of the head and jambs with not less than three spot welds per clip or one 5 mm weld at each end.

4.12.6 "Z" Clip Wall Anchors

4.12.6.1 "Z" clips shall be constructed, as shown in Figure 29, of not less than 1.2 mm thick steel.

4.12.6.2 "Z" clip shall be located at the top of the hinge and strike jambs, and an additional clip shall be located on each jamb not less than 600 mm nor more than 760 mm from the top of the head, as shown on Figure 30.

4.12.6.3 The "Z" clips shall be secured to the inside rabbet face of the jambs with not less than two spot welds per clip or two 5 mm long welds.

4.12.7 Wood-Stud Wall Anchors

4.12.7.1 Wood-stud clips shall be constructed, as shown in Figure 31 or 32, of not less than 1.2 mm thick steel.

4.12.7.2 The bottom, top, and intermediate (if required) wall anchors shall be located immediately above or below the hinge reinforcement on the hinge jamb and directly opposite on the strike jamb.

4.12.7.3 The wood-stud wall anchors shall be secured to the inside rabbet face of the jambs with not less than four spot welds per clip or one 6 mm weld at each end.

4.12.8 Steel-Stud Wall Anchors

4.12.8.1 Steel-stud wall anchors shall be constructed, as shown in Figure 33 or 34, of not less than 1.2 mm thick steel.

4.12.8.2 The bottom, top, and intermediate (if required) wall anchors shall be located immediately above or below the hinge reinforcement on the hinge jamb and directly opposite on the strike jamb.

4.12.8.3 The steel-stud wall anchors shall be secured to the inside rabbet face of the jambs with not less than four spot welds per clip or one 6 mm weld at each end.

Copyright Underwriters' Laboratories of Canada
Provided by IHS Markit under license with ULC
No reproduction or networking permitted without license from IHS
Full document details: ULC S105:2016 2016

4.12.9 Expansion-Shell Wall Anchors

4.12.9.1 If expansion-shell wall anchors are used, the soffit of each stop of each jamb shall be provided with 11 mm countersunk holes located not more than 150 mm from the top and bottom, with intermediate holes spaced at a maximum of 660 mm on centre. Each hole shall be reinforced on the inside of the soffit face for the bolt, as shown in Figure 35 or 36.

4.12.9.2 A minimum 10 mm by minimum 45 mm malleable-iron or steel expansion shell and M10 flathead bolt shall be provided for each hole in the jamb stop of single-unit type pressed-steel frames.

4.12.9.3 A minimum 10 mm by minimum 45 mm malleable iron or steel expansion shell and M10 roundhead bolt shall be provided for each hole in the bracket leg attached to the back surface of the rough buck of the two-section pressed-steel frame.

4.12.9.4 The length of the M10 flathead bolt will vary, depending on the width of the frame face for single-unit type pressed-steel frames, but shall not be less than 75 mm in length.

4.12.9.5 The length of the M10 roundhead bolt used in two-section type rough bucks of pressed steel shall be not less than 45 mm.

4.12.10 Base Anchors

4.12.10.1 Base anchors for single-unit type pressed-steel, double rabbet frames shall be constructed, as shown in Figure 37, of not less than 1.6 mm thick steel.

4.12.10.2 These base anchors shall be secured to the inside rabbet face of each jamb with not less than two spot welds or two 6 mm long welds at each end.

4.12.10.3 Base anchors for single-unit type pressed-steel, single-rabbet frames shall be constructed, as shown in Figure 38, of not less than 1.6 mm thick steel.

4.12.10.4 These base anchors shall be secured to the inside rabbet face of each jamb with not less than two spot welds or two 6 mm long welds.

4.12.10.5 Base anchors for single-unit type steel-channel frames for walls at least 90 mm thick shall be constructed of 65 mm by 50 mm by 5 mm steel angles, as shown in Figure 39.

4.12.10.6 These anchors shall be secured to the inside face of each jamb with not less than four 6 mm long welds.

4.12.10.7 Base anchors are not required for two-section type frames with a pressed-steel rough buck.

4.12.10.8 Base anchors are not required for single-section type frames and transom frames provided with expansion-shell anchors.

4.13 CEILING STRUTS

4.13.1 General

4.13.1.1 All single-unit type pressed-steel single swing frames exceeding 2450 mm in height and pairs for walls less than 90 mm in thickness, except those provided with fixed or adjustable masonry or expansion shell wall anchors, shall be provided with two ceiling struts. See Figures 28 and 30.

4.13.2 Strut Design

4.13.2.1 The ceiling struts shall be constructed, as shown in Figure 40, of 6 mm by 25 mm thick steel. The length shall be sufficient to reach the ceiling and shall extend at least 100 mm below the second strut guide, "Z" clip, or steel-stud clip.

4.13.3 Strut Guides

4.13.3.1 Strut guides shall be provided on all frames for walls less than 90 mm in thickness equipped with channel clips of steel-stud wall anchors and shall be constructed, as shown in Figure 41, of not less than 1.2 mm thick steel.

4.13.3.2 Strut guides shall be located at the top of the hinge and strike jambs and also immediately below the uppermost anchor on both jambs as shown in Figure 28.

4.13.3.3 The strut guide shall be secured to the inside face of the jambs with not less than two spot welds per strut guide or two 6 mm continuous welds.

4.13.4 Wedges

4.13.4.1 Two wedges shall be provided with each jamb equipped with ceiling struts as shown in Figures 28 or 30.

4.13.4.2 The wedges shall be constructed of 5 mm thick steel, as shown in Figure 42.

4.14 RUBBER SILENCERS

4.14.1 Single-unit type pressed-steel frames, single-unit type steel-channel frames, and two-section type steel frames may be provided with 10 mm diameter rubber silencers.

4.14.2 If 13 mm diameter rubber silencers are provided, correctly sized holes not exceeding 7 mm in diameter shall be drilled or punched in the appropriate stop location for the insertion of the rubber silencer.

4.14.3 On a frame for single swing doors, a maximum of three rubber silencers may be provided on the strike jamb stop, with the top silencer a minimum of 100 mm and a maximum of 200 mm down from the head, the bottom silencer a minimum of 100 mm and a maximum of 300 mm up from the base of the frame, and the centre silencer located 50 to 200 mm above the centre line of the strike-reinforcement plate.

4.14.4 On a frame for pairs of doors, a maximum of four rubber silencers may be provided on the head-piece stop, two for each door, the first positioned a minimum of 75 mm and a maximum of 125 mm, and the second a minimum of 125 mm and a maximum of 175 mm from the vertical centre line of the pair-of-doors opening.

4.15 TERMINATED STOPS

4.15.1 Single-unit type pressed-steel frames and transom frames, and two-section type frames may be provided with terminated stops. See Subsection 4.8.3, Mechanically Fastened Corner Joints. The stops shall terminate not more than 150 mm above the floor line and shall be closed with a 45° or 90° angle.

4.16 SCREWS

4.16.1 A M4 × 0.7 mm, 13 mm long, sheet-metal screw shall be provided for each of the clearance holes in the finished bucks of the head and jambs of two-section type frames.