Special Specification 4195
Sliding Metal Fire Doors

1. DESCRIPTION

Furnish and install single-leaf Type 316 stainless steel, fire-rated, tunnel sliding door.

2. REFERENCES

2.1. **National Fire Protection Association (NFPA).** NFPA references include:

- NFPA 80, "Standard for Fire Doors and Other Opening Protectives,"
- NFPA 105, "Standard for Smoke Door Assemblies and Other Opening Protectives,"
- NFPA 252, "Standard Methods of Fire Tests of Door Assemblies," and
- NFPA 502, "Standard for Road Tunnels, Bridges, and Other Limited Access Highways."

2.2. **Underwriters Laboratory (UL).** UL references include:

- UL 10B, "UL Standard for Fire Tests of Door Assemblies,"
- UL 10C, "UL Standard for Positive Pressure Fire Tests of Door Assemblies," and
- UL 555S, "Standard for Smoke Dampers."

2.3. **American Society for Testing and Materials (ASTM).** ASTM references include:

- ASTM A 167, "Specification for Stainless and Heat Resisting Chromium Nickel Steel Plate, Sheet, and Strip," and
- ASTM E 783, "Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors."

2.4. **American Institute of Steel Construction (AISC) Standards.** Comply with AISC standards.

2.5. **European Standards (EN).** EN references include:

- EN 1363-1, "Fire resistance tests for building material – Part 1: General requirements (resistance tests),"
- EN 1363-2, "Fire resistance tests – Part 2: Alternative and additional procedures,"
- EN 13501-2, "Fire classification of construction products and building elements. Classification using data from fire resistance tests, excluding ventilation services,"
- EN 1634-1, "Fire resistance and smoke control tests for door and shutter assemblies, openable windows, and elements of building hardware – Part 1: Fire resistance test for door and shutter assemblies and openable windows,"
- EN 1634-3, "Fire resistance and smoke control tests for door and shutter assemblies, openable windows, and elements of building hardware – Part 3: Smoke control test for door and shutter assemblies,"
- EN 14351-1, "Windows and doors – Product standard, performance characteristics – Part 1: Windows and external pedestrian door sets,"
- EN 1090-2, "Execution of steel structures and aluminum structures. Technical requirements for steel structures,"
- EN 10088-2, "Stainless steels – Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes,"
- EN 12207, "Windows and doors – Air permeability – Classification,"

- EN 12944, "Paints and varnishes. Corrosion protection of steel structures by protective paint systems,"
- EN 179, "Building hardware. Emergency exit devices operated by a lever handle or push pad, for use on escape routes. Requirements and test methods,"
- EN 1125, "Building hardware – Panic exit devices operated by a horizontal bar, for use on escape routes – requirements and test methods,"
- EN 1303, "Building hardware. Cylinders for locks. Requirements and test methods,"
- EN 998-2, "Specification for mortar for masonry – Part 2: Masonry mortar,"
- EN ISO 17025, Testing and Calibration Laboratories,"
- EN ISO 7020, Conformity assessment – Requirements for the operation of various types of bodies performing inspection,"
- EN 16034, Pedestrian doorsets, industrial, commercial, garage doors, and openable windows – Product standard, performance characteristics - fire resisting and/or smoke control characteristics," and
- EN 10346, Continuously hot-dip coated steel flat products for cold forming – technical delivery conditions."

2.6. **Texas Department of Transportation (TxDOT) Special Specifications.** Refer to Special Specification "Tunnel Ventilation - Testing and Commissioning."

3. SUBMITTALS

3.1. **Product Data.** Provide manufacturer's technical product data and installation instructions for sliding metal fire doors. Provide data substantiating that all products comply with requirements of the plans and this Specification. Submit a summary of forces and loads imposed on walls by sliding doors.

3.1.1. **Fire-Rated Doors**. Submit a description of fire-release system, including testing and resetting instructions, certified against Rijkswaterstaat (RWS) temperature curve or another approved similar curve showing compliance with NFPA 502 Section 7.16.5.5. Provide a matrix of compliance the referenced codes and requirements.

3.2. **Shop Drawings.** On the shop drawings, show all fabrication and installation of bottom-rolling, labeled sliding fire doors, including plans, elevations, sections, details of components, hardware, operating mechanism, limit switches, and attachments to the other units of work. Make provisions and coordinate with door signage. Door signage must not compromise the fire rating of the door. Demonstrate that none of the door components could be subject to vehicle impact. Indicate field measurements on the shop drawings**.**

3.3. **Product Certificates.** Provide certificates for sliding metal fire doors, signed by the product manufacturer.

3.4. **Qualification Data.** Provide the following data for the installer and the testing agency:

- Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Chapter 5.
- Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.
- Submit copy of the Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certificate.
- Alternatively, provide qualification data according to EN ISO/IEC 17025, EN 16034, or EN 13501-2.

3.5. **Oversize Construction Certification.** Provide certification for fire-rated door assemblies that exceed size limitations of labeled assemblies. Certification must be signed by an authorized representative of the testing agency.

3.6. **Operation and Maintenance Data.** Provide data for sliding metal fire doors to include in emergency, operation, and maintenance manuals. Include a list of recommended spare parts.

3.7. **Product Test Reports.** Submit test results performed by a qualified testing agency indicating compliance with performance requirements. Include factory quality control reports and field quality control reports.

3.8. **Closeout information.** Provide a list of fire-rated door numbers and the applicable locations and numbers to which each door accesses.

3.9. **Manufacturer Qualifications.** Provide documentation that the manufacturer has a minimum of 5 yrs. of experience manufacturing fire-rated metal sliding doors for tunnel applications.

3.10. **Installer Qualifications.** Provide documentation that the installer is an experienced, authorized representative of the door manufacturer for both the installation and maintenance of the type of door units required for this project, complying with NFPA 80 requirements.

3.11. **Oversize Fire-Rated Sliding Door Assemblies.** For units that exceed the sizes of the tested assemblies, provide certification by a testing agency acceptable to the authorities with jurisdiction (AHJ) that doors comply with all standard construction requirements of tested and labeled fire-rated door assemblies except for size.

3.12. **Warranty.** Submit an approved form detailing the manufacturer's standard guarantee for the door construction and operation. Guarantee must be for a period of 5 yrs. and begin following the date of final acceptance of the work.

4. MATERIALS

4.1. **Fire-Rated Sliding Door Assemblies.** Provide assemblies installed in accordance with NFPA 80 that are identical to the door assemblies tested for fire-test-response characteristics according to NFPA 502 Section 7.16.5.5 requirements, and that are listed and labeled for fire ratings indicated by UL, Factory Mutual Global (FMG), Intertek Testing Services (ITS), or another testing agency acceptable to the AHJ.

4.2. **Manufacturers.** Select a manufacturer to provide doors that comply with requirements. Manufacturers offering products that may be incorporated into the work include Hodapp GmbH & Co., KG InterDam, Merford, or approved equal.

4.3. **Schedule.** The sizes and locations for sliding metal fire doors are indicated on the drawings.

4.4. **Source Limitations.** Obtain sliding metal fire doors through one source from a single manufacturer.

4.5. **Stainless Steel Sheets.** Provide stainless steel sheets in accordance with ASTM A 240/A 240M, Type 316; stretcher-leveled standard of flatness; No. 4 satin finish or according to EN 10088-2.

4.6. **Hardware and Fasteners.** Provide Type 316 stainless steel hardware and fasteners meeting the requirements of EN 10204 or equivalent.

4.7. **Performance Requirements.** Provide assemblies that meet the following requirements.

4.7.1. **Environmental Conditions.** Provide doors able to withstand tunnel environmental conditions, including a temperature range from -12°F to +140°F under normal conditions and RWS time-temperature fire curve or similar under fire emergency conditions, humidity, moisture, dust, soot, vibration, and pressure fluctuations from traffic (piston effect). The doors must operate below the maximum opening force with Americans with Disabilities Act (ADA) assistance mechanisms.

4.7.2. **Structural Performance**. Provide horizontal sliding doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:

- Vehicle Piston Load. Resist wind and pressure loads from passing vehicles of ±52 lb. of force (lbf) per square foot (±2.5 kilopascals), acting inward or outward and applied to unseating direction pushing the door away from the gasket.
- Fan Wind Loads. Resist uniform pressure (velocity pressure) of 2,200 ft. per minute from the tunnel side pressure from ventilation fans.

- Load Cycles. Design doors for aerodynamic load of 5,000,000 cycles of pressure pulses at the vehicle piston load of Section 4.6.2.1. Life expectancy must be a minimum of 25 yrs.

4.7.3. **Leakage.** Perform factory leakage test in accordance with UL 555S and submit certifications and test results. Door assemblies must remain airtight to maintain a leakage rate of 3 cu. ft. per minute per square foot at a pressure of 55 psf applied to unseating direction pushing the door away from the gasket.

4.7.4. **Deflection.** The maximum allowable deflection must not exceed 1/120 of the span. Fiber stresses in main members are limited to 27,000 lb. per square inch. Design steel frames in accordance with the AISC "Steel Construction Manual" or allowable deflection according to EN 1363-1/EN 1634-1.

4.7.5. **Fire-Rated Assemblies**. Install assemblies per NFPA 80 (or EN 1634-1), NFPA 502 Item 7.16.5.5. The assemblies must be listed and labeled by a qualified testing agency acceptable to the AHJ for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA252 (or EN 1634-3) or UL 10C. Label units with temperature-rise ratings.

4.7.6. **Smoke- and Draft-Control Assemblies.** Provide an assembly with gaskets listed and labeled for smoke and draft control by an accredited testing agency, based on testing according to UL 1784. Install in compliance with NFPA 105 (or EN 1634-3).

4.7.7. **Door Opening Force.** Provide opening force of must be less than 50 lbf (222 Newtons) with tunnel ventilation system operating and less than 30 lbf under neutral pressure conditions (ventilation system inactive).

4.7.8. **Operating System.** Provide a counterbalanced operating system.

4.7.9. **Bottom-Support Doors**. Provide bottom-support, tubular-frame-type construction fire door assemblies with drainable floor track, top guides, and the following fire-protection rating specified in Section 4.7.5, temperature-rise rating, and face sheet material and thickness.

4.7.10. **Fire-Protection Rating**. Provide the fire rating specified in Section 4.7.5 for both sides of the door.

4.7.11. **Panel Facing**. Provide stainless-steel panel facing with a minimum, 0.050-in. nominal thickness.

4.7.12. **Operating Hardware.** Provide manufacturer's standard, labeled, automatic-closing-type, sliding fire door assemblies complete with track, adjustable roller guides, binders, floor stops, cables, sheaves, counterweights, and fusible links. Furnish necessary hangers, fittings, and fasteners required for attaching hardware to door and for door sliding operation, including latch or handle for manual operation. Provide stainless steel hardware. Provide door opening mechanisms in compliance with ADA requirements.

4.7.13. **Weight Boxes**. Provide 0.064-in. thick, metallic-coated steel counterweight boxes or guards sized for the counterweights and clearance.

4.7.14. **Track Hood**. Provide formed, stainless steel; track hoods sized for clearance and to protect tracks from dust and water accumulation. Finish to match the door.

4.7.15. **Weather Stripping**. Provide UL-classified weather stripping or seals with attachments for mounting at head, jambs, and bottom surface of door.

4.7.16. **Brushes**. Install dust-cleaning brushes. Design to clean top and bottom tracks and prevent dust accumulations.

4.8. **Fabrication.** Provide assemblies that meet these requirements for the type of door provided:

- Composite-Type Doors: Fabricate in modular panels. Bond face materials to both sides of core and reinforce perimeter with minimum 0.043-in. thick, internal steel channel. Encase panel edges with

minimum 0.067-in. thick, steel channel. Back joints in face sheets with minimum 0.043-in. thick, steel H column. Connect panels with H column and cover plate. Attach armor edges and astragals to doors.

- Hollow-Metal Doors: Bond face materials to both sides of core and reinforce perimeter with minimum 0.043-in. thick, internal steel channel. Back joints in face sheets with minimum 0.043-in. thick, steel H column. Weld and fill joints and grind exposed welds smooth. Attach armor edges and astragals to doors.
- Tubular-Frame Doors: Fabricate perimeter frame and internal stiffeners of minimum 0.043-in. thick steel tubes. Miter corner joints in frame and weld frame and stiffener joints. Locate joints in face sheets over stiffeners. Weld and fill joints and grind exposed welds smooth. Attach armor edges and astragals to doors.
- Core Construction: Core materials must comply with fire-protection-rating and temperature-rise requirements. Provide manufacturer's standard core material (according to fire protection approval).
- Door Thickness: Doors must have a minimum nominal thickness of 1-3/4 in.
- Face Sheets: Steel sheet must be a minimum of 16-gauge stainless steel No. 4 finish.
- Interior Framing: Interior framing channel must be a minimum of 14-gauge A-60 galvannealed steel.
- Flush Pulls: Factory weld or screw the flush pulls, minimum 14-gauge armor edge, trail door interlock, and bottom guide channel to the panels. Meet ADA and NFPA requirements.
- Multiple Panels: Field assemble using an H channel splice column with no exposed fasteners. Lock one panel into the other to form a solid one-piece unit.

4.9. **Steel Finishes.** Comply with National Association of Architectural Metal Manufacturers' (NAAMM's) "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes or EN 12944. Apply system that does not support combustion or smoke generation. Apply system immediately after cleaning and pretreating.

4.9.1. **Prime Finish**. Apply manufacturer's standard rust-inhibiting primer on steel doors for field painting.

4.9.2. **Baked-Enamel Finish**. Apply manufacturer's standard 2-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with manufacturer's written instructions for applying and baking.

4.9.3. **Color and Gloss.** Provide color and gloss as indicated by manufacturer's designations.

4.10. **Hardware.** Fire door hardware must conform to NFPA 80 and NFPA 502 and be as specified or according to EN 16034. All non-stainless-steel hardware for the door must have a primer for preparation of painting, galvanized, or zinc-plated finish. The hardware must include:

- counterweight automatic closing system,
- a minimum of 14-gauge stainless steel box track,
- adjustable track brackets,
- adjustable wall brackets,
- jamb binders,
- 10-gauge frame interlocks,
- adjustable concealed stay rollers,
- one pair of four-wheel ball bearing hangers,
- mounting hardware including wall washers and through wall bolts with nuts and washers,
- 6 in. by 6 in. wall washers, and
- wall bolts.

4.11. **Options.** Provide door assemblies with the following options:

- dual blade-type gasket seals at head, jambs, and sill,
- sliding door mortise lock or hook bolt lock, per fire protection approval,
- door-limit switches to detect door position – fully open or fully closed, and

- door-opening mechanisms in compliance with ADA requirements.

5. CONSTRUCTION

5.1. Coordination**.** Coordinate work in this section with door hardware sizes, types, and installation. Coordinate anchorage installation for stainless steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to project site in time for installation.

Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems. Coordinate door installation schedule with construction manager. Door installation must not impact egress and safety operation of running tunnel.

5.2. **Delivery, Storage, and Handling.** Store delivered materials and equipment in dry locations with adequate ventilation, free from dust and water. Permit access for inspection and handling. Handle materials carefully Provide resilient packaging to prevent damage.

5.3. **Examination.** Confirm the floor under the door is level for the full travel of the door. Confirm that the track assembly location and area behind door is smooth and in same plane for the full travel of door. Proceed with installation only after unsatisfactory conditions have been corrected.

5.4. **Installation.** Install sliding metal fire doors according to NFPA 80 (or EN 1634) and manufacturer's written instructions for type of door operation indicated and fire-protection rating required.

Maintain any protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

Drill necessary holes cleanly, with no broken areas or spalls, for the installation of fasteners in concrete or masonry. Remove and replace damaged masonry as directed.

Install bottom-rolling labeled sliding fire doors in strict accordance with the approved drawings by qualified door erection crews. Prepare all door openings completely before the installation of the doors.

Set doors plumb, level, and square with all parts properly fastened and mounted. All moving parts must be tested, adjusted, and left in good operating condition.

Prepare door leaf for the installation of contact switches for the monitoring of the closed and locked position of the door leaf. Mount and connect the contacts onsite by an approved installer.

5.5. **Adjusting and Cleaning.** Test sliding metal fire doors upon completion of installation. Ensure satisfactory operation. Check moving parts for proper alignment and lubrication. Adjust for smooth, easy operation. Clean surfaces and refinish abraded or damaged surfaces to match factory finish.

5.6. **Installer Inspection and Testing.** Inspect doors and conduct a complete operating test in the presence of the general contractor and Engineer when the erection is complete. Note and correct any defects identified. Protect the installed door assemblies from damage by ongoing construction activities. Immediately repair any damage that occurs.

5.7. **Field Tests.** Submit the field test procedure before conducting the tests. Submit field test report after the field tests have been completed satisfactorily. Submit a field test report each time a door is completed. Include instrumentation and calibration certificates with the test report results. The field tests must include:

- operating force (force to open the doors) tests,
- free sliding and swinging and latching tests, and
- air leakage tests in accordance with ASTM E 783 (or EN 12207).

5.7.1. **Operating Force Test.** Measure the force required to open the door using a spring scale dial weight or equal. This force must be less than 50 lbf with the tunnel ventilation system in operation and 30 lbf under neutral pressure conditions (ventilation system inactive).

5.7.2. **Free Swinging and Latching Test**. All doors must slide/swing easily and freely. Test the operation of all doors:

- open each door to the maximum allowable angle/width,
- verify that the door latches shut without external assistance,
- adjust counterweights and door mechanisms as required to meet the requirements, and
- repeat these three steps for a total of 25 times (in accordance with international practice).

5.7.3. **Witnessing.** Notify Engineer no later than 15 days before the test for witnessing.

5.7.4. **Onsite Field Acceptance Report.** Contractor must provide an Onsite Field Acceptance Report upon completion of field testing. For every door, document air leakage test results, operating force test results; pass or fail free slide or swing and latching test results, and any visual inspection notes.

6. MEASUREMENT

This item will be measured by each door, completed-in-place, tested, and made fully operational.

7. PAYMENT

Materials furnished in accordance with this Item will be paid as "Sliding Metal Fire Door" and measured as provided under "Measurement." The price will include the cost of all related work specified in this item.