International Door, Inc.

8001 RONDA DRIVE • CANTON, MICHIGAN 48187 • (734)459-3000 • FAX (734)459-8962

BOTTOM ROLLING HORIZONTAL SLIDING HANGAR DOORS

(GROUP OPERATED)

SECTION 08301 – HORIZONTAL SLIDING HANGAR DOORS

Part 1 – General

1.1 Related Documents

A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 specifications apply to this section.

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

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC S325	(2017) Steel Construction Manual
AISC 360	(2016) Specification for Structural Steel Buildings

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG03-3	(2002: suppl 2001-2004; R2008) Cold-Formed Steel Design Manual set.

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2017) Minimum Design Loads for Buildings and other Structures.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(2014) Carbon Structural Steel
ASTM A 1008/A1008M	(2016) Specifications' for steel sheet, cold-Rolled, carbon, structural, High-strength Low-Alloy, high- strength Low –Alloy with improved Formability, solution hardened, and bake hardened.
ASTM A 1011/A1011M	(2017) 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.
ASTM A 123/A123M	(2017) Specification for Zinc (Hot-Dip Galvanized) coatings on Iron and steel products.
ASTM A 653/A653M	(2017) Specifications for steel sheet, zinc-coated (Galvanized) or Zinc Iron alloy coated (Galvannealed) by the hot-dip process.
ASTM C920	(2014a) Specifications for Elastomeric Joint Sealants.
ASTM E84	(2017) Test Method for surface burning characteristics of Building Materials

AMERICAN WELDING SOCIETY, INC. (AWS)

AWS D1.1/D1.1M	(2015; Errata 1 2015: Errata 2 2016) Structural Welding code- Steel

NATIONAL ELECTRICAL MANUFACTUERERS ASSOCIATION (NEMA)

Systems-General	NEMA ICS 1	(2000; R 2015) Industrial Control and Requirements
	NEMA ICS 2	(2000; R 2005; Errata 2008) Industrial control & system Controllers Contractors and Overload Relays, Rated 600V
	NEMA ICS 6	(1993; R 2016) Industrial Control and Systems. Enclosures
	NEMA MG 1	(2016; SUPP 2016) Motors and generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 220	(2018) Standard on types of Building Construction
NFPA 409	(2016; ERTA 2016) Standard on Aircraft Hangars
NFPA 70	(2017; ERTA1-2 2017.TIA 17-1; TIA17-2; TIA 17-3; TIA 17-4 ;) TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14) National Electrical Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-200-01	(2016) General Building Requirements
UFC 3-301-01	(2013; with change 3) Structural Engineering

UNDERWRITERS LABORATORIES INC. (UL)

UL 506	(2017) UL standard for safety specialty transformers

1.2 Summary

A. Sections includes: Rolling Steel Hangar Doors – Door leaf structure, rails, electro-mechanical drive/brake control systems – fabrication, installation – operation, testing and inspection.

B. Scope of Work:

Work Included:

1. Structural framework, including all brackets, bracing, and field fasteners.
2. Rolling hardware, including bottom rollers and top guide rollers.
3. Miscellaneous hardware, including bumpers, stops, pulls, locks and track cleaners.
4. Flexible weathering for door head, jambs and sills.
5. Electric power drives and accessories.
6. Electric control, warning devices and emergency stop edges.
7. Electric power feed.
8. Bottom rails and tie angles, with anchor bolts.
9. Personnel doors, frames, and hardware.
10. Top guides.
11. Interleaf connecting cable operator system.

Work not included:

1. Structural steel members at jambs of building, door pockets, steel supporting members and closures at head of doors.
2. Insulation for doors.
3. Prefinished metal siding on doors.
4. Field painting of door members or accessories for doors.
5. Field wiring materials (conduit, wire j boxes, etc.), installation of trolley duct and labor to install and connect electrical power, control, safety and warning devices furnished by the door manufacturer.
6. Top guide structural supports.

1.3 Quality Assurance

1.3.1 Manufacturer's Qualifications

A. Only Hangar door manufacturers who have had at least 15 years experience in the manufacture of Hangar doors and who are now regularly engaged in the design and manufacturing of the type of door specified and can submit evidence of ten (10) actual installations of comparable design, construction and size with proven durability will be qualified for work of this section.

B. Acceptable Manufacturer: International Door, Inc. – Canton, MI, USA.

1.3.2 Installer's Qualifications

The installation supervisor shall be an authorized representative of the door manufacturer. Mechanics shall be skilled and experienced in the erection of hangar doors of type and size required for this project.

1.4 Delivery, Storage and Handling

Deliver materials which are not shop installed in containers, boxes, or crates bearing the manufacturer's name, brand, and model number. Store materials and equipment in locations with adequate ventilation, free from dust and water, and so as to permit access for inspection and handling. Handle with care to prevent damage. Remove damaged items that cannot be restored to like-new condition and provide new items.

1.5 Submittals

A. General: Submit each item in this article according to the conditions of the contract and division 1 specification sections.

B. Product data includes but not limited to the following:

1. Submit drawings showing details of Construction, installation, and operation;
   Size, shape and thickness of materials; joints and connections; reinforcing; hardware; mechanical devices; electrical devices; and design and detail data for work of other trades affected by hangar doors.
2. Diagrams and performance and characteristic curves of equipment and systems.
3. Shop painting and finishing specifications.
4. Design data, catalog cuts and descriptive literature edited to show fully, but only, the hangar door components required.
5. Engineering design calculations for structural, mechanical & door drive system.

6. Submit complete schematic wiring diagram, with complete location of controls with the runs of conduit, location of junction boxes, and full details of control mountings.

7. Submit complete manuals containing instructions for proper operation and maintenance of the doors to the owner.

They shall contain complete:

A. Operating instructions
B. Maintenance & lubrication instructions
C. A suggested list of spare parts
D. A manufacturer's catalog for each component in or on the doors

1.6 Guarantee

The equipment furnished under the specifications shall be guaranteed for a period of one year, from the date of acceptance there of, either for beneficial use or final acceptance, whichever is earlier against defective materials and workmanship. Upon receipt of notice from the owner of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be repaired or replaced by and at the expense of the contractor.

1.7 Design Requirements

A. Door Design: The hangar doors shall be designed by the manufacturer in accordance with the criteria specified. Doors shall operate without binding, interference, or damage to weather stripping. Doors shall fit closely and be free from warping.

B. Steel Design: AISC S325, AISI SG03-3.

C. Loading: Design doors as a system to withstand the wind pressure as indicated by the engineer of record. Design all door components to withstand both the highest positive and negative pressure based on actual tributary area from the wind load indicated. The deflection shall not exceed the height of the door divided by 120. Design door system to withstand the upward and downward deflections of the door header structure. Fiber stresses due to combined dead load and wind load shall not exceed the recommended design stresses for the material used and type of loading sustained.

D. Connection: Design connections at top and bottom guide rails to withstand the positive and negative design pressures. Design for an inward and outward seismic force according to the requirements for exterior nonstructural wall elements and connections in ASCE 7. The governing force (wind or seismic) must be concurrent with the door self-weight and must be factored according to ASCE 7 load combinations.

E. Cold-Formed Steel Members: Cold-formed steel primary framing members shall be not less than ¼ inch thick.

F. Performance: Maximum leakage rate of installed shall not exceed 4 cfm per lineal foot of door leaf. Flow rates are at a pressure difference of 0.30 inch of water.

Part 2 – Products

2.1 Hangar Doors

A. Structural Steel: AISC 360 and ASTM A36/A36M

B. Formed Steel: AISI SG03-3

C. Sheet Steel: ASTM A 1011/A1011M hot-rolled steel sheet, commercial quality, or ASTM A 1008/A1008M cold-rolled steel sheet, stretcher grade, commercial quality.

D. Galvanized Steel: ASTM A 653/A 653M, coating designation G 90 galvanized steel sheet, commercial quality.

E. Exterior Covering: See architectural drawings and exterior metal wall specification(s). **(OPTION: Flat galvanized sheet steel not lighter than #14 GA.)**

F. Interior Covering: See architectural drawings and exterior metal wall specification(s). **(OPTION: Flat galvanized sheet steel not lighter than #14 GA.)**

G. Insulation: Provide insulation that:
   1. Contains no asbestos;
   2. Is permanently secured in place behind the exterior covering; and
   3. Has a flame spread rating of 75 or less and a smoke-developed rating of 100 or less when tested in accordance with ASTM E 84.

H. Hardware: Provide hangar door hardware to accommodate actual dead loads plus wind loads specified. Provide top guide rollers, bottom wheels, interleaf cable operator, tractor pulls, track cleaners, and bottom rail/top guide bumpers as required for a complete and operational installation.

I. Wheel Assemblies: Bottom wheels shall be of steel plate having a minimum tread diameter as required for the actual wheel loading where the height-to-width ratio of the door leaf exceeds three. The wheels assemblies shall be vertically adjustable. Construct wheel assemblies to permit removal of the wheel without removing the door leaf from its position on the rail.

   1. Treads: Machine wheel treads concentric with bearing seats. The clear distance between flanges shall not exceed the width of the rail by more than 1/8 inch at the tread nor more than ¼ inch at the edge of the flange. Machine internal bearing seats accurately for a press fit. Heat treat wheels 18 inches or greater in diameter to obtain a rim hardness of 320 Brinnel.
   2. Wheel bearings. Provide tapered rollers or spherical bearings, either internal or cartridge type, arranged so that both horizontal and vertical loads shall be transferred to the rail only through the bearing. Bearings shall be tightly sealed and equipped with high-pressure grease fittings.

J. Bottom Rails shall be ASCE rails as defined in the AISC Manual of Steel Construction and shall be of the size and weight as shown on the drawings, unless heavier rails are required as a result of the Hangar Door Supplier's analysis. Length of rails splices and guides shall provide for the maximum expected overrun in either the opening or closing operations.

K. Door Stops: Provide stops embedded in concrete to stop each leaf at each door pocket as indicated on the structural drawings.

L. Top Guide Rollers: Horizontal type with single or double steel rollers of a suitable diameter and thickness for satisfactory performance under the designated load conditions including live and dead loads, and rise and fall of the door truss. Provide permanently factory-lubricated and sealed ball or roller bearings. Include both horizontal and vertical rollers built into a frame which is connected in such a manner as to transmit the specified wind loads from the door to the hangar structure and to prevent disengagement of the door from the top of the guide.

M. Provide bumpers connected to the upper guide rail to stop each leaf in the open and closed position. Provide neoprene bumpers to make proper contact with the main leaf structure. Bumpers shall be designed to withstand lateral impact loads without damage occurring to the hangar doors or to adjoining structures for the intended door design life of the normal operation or in case of the limit switch failure.

N. Personnel Doors: The hangar door manufacturer shall provide structural frames and electrical interlock for personnel doors where indicated.

O. Doors and Frames: Specified in Section 08 11 13, "Steel Doors and Frames".

P. Hardware for Personnel Doors: Specified in Section 08 71 00, "Finish Hardware".

Electrical Interlock: Provide each personnel door with an electrical interlock switch to prevent motor operation of the leaf or group in which it is located when the personnel door is open. Provide an identified indicator light at each door leaf control station indicating when the personnel door is in the open position.

Q. Weather Stripping: Provide adjustable and readily replaceable material. Provide on vertical edges, sills and heads to afford a weather tight installation.

R. Neoprene: Use flap-type, two-ply, cloth-inserted neoprene or extruded, double flap, single or dual opposed solid neoprene material on vertical edges and sills. The two-ply material shall have a minimum thickness of 1/8 inch and shall be retained continuously for its full length and secured with rust-resistant fasteners 12 inches o.c. Extruded weather stripping with heavy center section shall be attached at 12 inches o.c., but continuous bar may be omitted. Clearance between metal parts on vertical edges of leaves and between leaves and jambs which are to be weather-stripped shall be as indicated.

S. Metallic: Form head weather stripping material between each leaf and the top guide system of not lighter than 16 gage galvanized sheet steel or flap-type, cloth-inserted neoprene, as indicated.

T. Fasteners: Either zinc-coated or cadmium-plated steel.

U. Sealant: Single-component or multicomponent elastomeric type conforming to ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT. Provide a sealant that has been tested on the types of substrate to which it will be applied.

V. Primer: Shall be manufacturer's standard primer. Product shall conform to current air quality management district (AQMD) rules and regulations.

W. Starters: Provide magnetic reversing starters in NEMA ICS 6, Type 12 enclosures equipped with access door-controlled, fused safety disconnect switches. Starters shall be factory wired with overload and under voltage protection, mechanical and electrical interlocks, auxiliary contacts, relays and timing devices as required, control circuit transformers, and a numbered terminal strip. The control circuit transformer shall reduce the voltage in the control circuits to 115 volts or less, and shall conform to UL 506.

Y. Electrical: Provide conduit, wire, flexible cables, boxes, devices, and accessories, and install trolley duct in accordance with applicable Division 26 specification sections(26.20.00 INTERIOR DISTRIBUTION SYSTEM). If permanent electrical power is not available when door installation is complete, provided temporary power as necessary for testing and adjusting the doors

2.2 Fabrication

A. Doors

1. Frames and Framing: Door leaves shall be of welded or bolted construction. Joints shall develop 100 percent of the strength of the framing members. Vertical members shall be continuous throughout the height of the door. When required, prepare splices to facilitate field assembly in accordance with standard practice. Frames and framing members shall be true to dimensions and square in all directions; no leaf shall be bowed, warped or out of line in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Provide diagonal bracing so that the completed leaf assembly will be braced to withstand shipping, assembly and operational loads. Exposed welds and welds which interfere with the installation of various parts such as cover sheets shall be ground smooth.

2. Exterior Covering and Interior Liner Sheets: Where flat sheets are attached as either exterior covering or interior liner sheets, the clear unsupported area attached as exterior covering or interior liner sheets, the clear unsupported area shall not exceed 25 square feet. Make edges of exterior sheets weather tight with sealant where corrugated wall cladding is employed, connections and pattern requirements similar to flat panel system. If and where corrugated wall cladding is indicated, connections and their pattern shall meet requirements for flat panels.

3. Locking Devices: Do not provide locking devices on motor-operated hangar doors.

4. Tractor Pulls: Provide tractor pulls so that leaves can be pulled by a tractor or similar equipment in the event of power failure

5. Track Cleaners: Provide a device to clear the debris from the rail head and wheel flange grooves as the leaf is moved.

6. Insulation: Secure insulation to doors with clips, studs or adhesives.

7. Cable System: The minimum size for the cable which interconnects the leaves shall be 3/8 inch; the cables shall be improved plow steel with lubricated hemp centers or wire rope cores. Sheaves over which the cables shall operate shall have a pitch diameter of at least 18 cable diameters and shall have either ball- or roller- type bearings or graphite bronze bearings of a sufficient capacity for the operating loads. Grease fittings shall be provided for the sheave bearings unless permanently lubricated bearings are used.

2.3 Operation

A. Group Operated Door System: Each group of leaves shall have a traction-driven operating unit located in the lead leaf of the group and driving one or more wheels of the lead leaf and with interconnecting cable system. All leaves in each group shall start to move at the same time and arrive at their fully-open or fully-closed positions simultaneously. All necessary cables, fittings, sheaves, housings, guards, pickups, brackets, anchors, and miscellaneous hardware shall be provided. Externally mounted rubber tire motor operators are absolutely not acceptable.

B. Operating Units: Each operating unit shall move its lead leaf at a speed of approximately 60 feet per minute at a zero wind load conditions and to be operable up to and including a maximum wind load of 8 pounds per square foot. The operating units shall consist of either a separate motor and gear reducer or a gear head motor, high speed shaft brake, and necessary roller chains and sprockets. The systems shall be provided with overload protection for the drive units and a means for emergency tractor towing operation.

1. Motors shall be single speed, squirrel-cage type of sufficient size to operate the leaves under zero wind load conditions at not more than 75 percent of their rated capacity.

2. Gear reduction units shall allow a reversal of effort through the gears without damage to the units (e.g. should not be damaged if door is pulled by the tractor).

3. Operating mechanisms shall be covered on the interior side of the leaf by a hinged 16 gage flat steel cover.

C. Braking System: Braking systems shall be designed to ensure stoppage of the leaves under normal, dry rail conditions within the safety edge over travel limit. The braking system shall be a magnetic, spring-set, solenoid-released brake. Provide a hand release to release the brake when it becomes necessary to move the leaf with an outside force. The hand release shall be an automatic reset type so that the brake will be operable during subsequent electrical operation of the door.

D. Controls: Doors shall be controlled by constant pressure, mushroom head push buttons mounted on the door leaves. Removing pressure from the button shall stop the movement of the movement of the leaves. The control equipment shall conform to NEMA ICS 1 and 2. Al interior push buttons shall be in heavy-duty, oil-tight enclosures conforming to NEMA ICS 6, Type 12 or Type 4, except that contractor enclosures shall be Type 12.

E. Push Buttons for Anchored Group Doors: Each group shall be controlled by a two-button push button station marked "OPEN" and "CLOSE" mounted near the inside leading edge of the lead leaf.

F. Limit Switches: Provide limit switches to prevent over travel and bumping. Safety edges shall not be used as limit switches. Provide for anchored group doors to stop the travel of each group in the fully open and fully closed positions. The limit switches shall be positive acting, snap action, lever arm type with actuating cams designed with sufficient over travel to permit the group to come to a complete stop without over traveling the limit switches. The limit switches shall be mounted on the leaves and the actuating cams mounted on the top guides overhead.

G. Warning Devices: Provide a clearly audible signal on lead leaf of a group operated system. The warning device shall:

1. Operate when the push button is actuated for movement of the door system in either direction;

2. Sound 5 seconds before the door moves, and while the door is moving; and consist of not less than a 6 inch diameter bell (min. 100 dB at 10 feet) or equivalent decibel-rated horn, loud enough to be heard in the hangar and on the apron.

I. Emergency Operation: Hangar doors shall be constructed and equipped so that they can be operated by on-site emergency power or manually by tractor pulls. Manual operation of hangar doors shall be designed to avoid damage to door leaves/electrical system.

J. Electrical Work: The door manufacturer shall provide the proper electrical equipment and controls built in accordance with the latest NEMA standards. Equipment, control circuits, and safety edge circuits shall conform to NFPA 70. Where located 18 inches or less above the floor, they shall be explosion-proof as defined in NFPA 70, Article 513. Manual or automatic control devices necessary for motor operation of the doors shall be provided, including push button stations, limit switches, combination fused disconnect switches and magnetic reversing starters, control circuit transformers, relays, timing devices, warning devices, and trolley ducts with collectors or trolleys.

K. Power and Grounding: Power shall be provided by junction boxes on end of the door leaves. Electrical for doors described above are 480 volts, three phase, three wire, 20 amperes, 60 hertz (each). Power shall be delivered to the rolling leaves by a trolley device carried along by lead door leaf in the door canopy. The trolley duct electrical characteristics shall be 480 volts, three phase, four pole, 60 amperes, with the fourth pole (rail) being for grounding purposes. Electrical work and equipment shall be grounded and bonded in conformance with UL 467.

L. Trolley Ducts: Provide runs of trolley duct as required for the door system indicated. Ducts shall have solid copper conductors in protective steel or polyvinyl chloride housing. Locate ducts as shown on door manufacturer's drawings. Provide adequate clearances in the top guide system for the ducts.

1. Each run shall consist of the required number of sections of straight track, a section of dropout track, feed boxes, end caps, couplings, hangers and other accessories to make the system complete and workable.

2. Furnish one self-supporting collector for each group-operated door, complete with spring-loaded brush contacts. Provide trolley pulling brackets and corrosion-protected chains attached from each side of the pulling bracket to each side of the support bracket for self bracket for self-supporting collectors.

2.3.1 Safety Edges

Provide safety edges on leading edge of lead leaf from one inch above the floor to the top of the door leaf. For leaves 12 inches thick or less, provide a single run of safety edge. For leaves over 12 inches thick, provide a double run of safety edges spaced to provide the maximum degree of safety in stopping the leaves.

A. Design: Provide safety edges to provide a minimum of 3 ½ inches of over travel after actuation until solid resistance is met. Safety edges shall be electric type.

B. Actuation of a safety edge shall lock out the motor control in the direction of travel until reset, but shall permit the door to be reversed away from the obstruction which tripped the safety edge. Safety edges shall be reset by moving doors away from the obstruction. The lower portion of the safety edges to a height of approximately 5 feet shall be independently removable for convenience in servicing or repair. The remainder of the edge may be in one piece up to a maximum of 20 feet.

2.4. Signage

A. Provide a placard sign immediately adjacent to the controls explaining how to operate the door and indicating the following.

Notice:
(1) Doors must be closed and not operated when wind speeds above 60 MPH are expected.

Part 3 - Execution

3.1 Protective Coatings

3.1.1 Shop Painting

Before shipment all steel members and hardware shall be painted one (1) sprayed on coat of rust-inhibitive manufacturer's standard primer. All steel shall be thoroughly cleaned prior to painting to remove all oil, rust and other foreign material. Machined surfaces and neoprene weathering shall not be painted.

3.2 Erection

Assemble doors and accessories in accordance with approved shop drawings. Do not erect doors until the work of other trades in preparing the opening has been completed, the hangar roof is under full dead load, and the top guide and rail systems are within specified tolerances.

3.2.1 Touch-Up & Finish Painting

After completing erection and before starting field painting, clean interior and exterior door surfaces. Clean abraded surfaces, field welds, and field bolts; and coat with priming paint. Field painting as specified in Section 09 97 13.27, "Painting".

3.3 Field Quality Control

A. Manufacturer's Field Services: Provide an authorized representative of the door manufacturer to supervise erection of doors.

B. Acceptance Test

1. Contractor shall perform complete operating tests for all door leaves. Perform no less than three complete opening and closing cycles, all safety controls, emergency manual operational system, and such other tests as specified in the Contractor's approved door test procedure plan. Notify the Owner's Representative a minimum of seven (7) days prior to the beginning of door tests.

2. Any defects disclosed by the tests shall be corrected; final adjustments of the doors and operating equipment shall be turned over to the Owner in a completely acceptable and proper operating condition. Tests of previously defective items repaired or replaced by the Contractor shall be accomplished at no additional cost to the owner.

3.4 Electrical Work

NFPA 70. Provide all conduits, wiring and mounting of controls in accordance with section 26.20.00 INTERIOR DISTRIBUTION SYSTEM.

END OF SECTION 08301