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DIVISION 08 - OPENINGS

SECTION 08 22 20

FIBERGLASS REINFORCED PLASTIC (FRP) DOORS AND FRAMES

11/19

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Preparing Activity: USACE

Superseding
UFGS-08 22 20 (May 2015)

References are in agreement with UMRL dated July 2023

SECTION 08 22 20

FIBERGLASS REINFORCED PLASTIC (FRP) DOORS AND FRAMES
11/19

NOTE: This guide specification covers fiberglass reinforced plastic (FRP) doors and frames. Some paragraphs may need to be supplemented to meet project requirements.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

NOTE: On the drawings, show:

1. Sizes of door openings, thicknesses of doors and frames, swings, and travels of doors, and design of doors, whether flush panel, full flush, paneled, glazed, or louvered.

2. Details of structural or non-structural frame; head, jamb, and removable astragal.

2. Details of fire rated or non-fire rated frame; head, jamb, and removable astragal.

3. Type and thickness of glazing required; whether or not insulating glass units are required.

4. Method, type, and spacing required for anchoring

door frames to adjoining construction.

5. Lintels and reinforcement required to support walls or partitions above doors.

6. Type of shop finish surfaces.

7. Free area for louvers in doors.

8. Complete door schedule. Schedule should assign a separate number for each opening and should indicate door type and style, material, design, size, thickness, glazed or unglazed, class fire rating for fire doors, hardware set number, threshold material, if any, and material for frames; head, jamb, and astragal.

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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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 SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-16	(2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM D256	(2010; R 2018) Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics

ASTM D635	(2018) Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D695	(2010) Standard Test Method for Compressive Properties of Rigid Plastics
ASTM D696	(2016) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer
ASTM D790	(2017) Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D2344/D2344M	(2016) Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2023) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E1300	(2016) Standard Practice for Determining Load Resistance of Glass in Buildings
ASTM E2074	(2000e1) Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies
ASTM E2112	(2023) Standard Practice for Installation of Exterior Windows, Doors and Skylights
ASTM F1642/F1642M	(2017) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings
ASTM F2248	(2012) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.115	(2016) Hardware Preparation in Steel Doors and Steel Frames

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(2022) Standard for Fire Doors and Other Opening Protectives
NFPA 101	(2021; TIA 21-1) Life Safety Code
NFPA 105	(2022) Standard for Smoke Door Assemblies and Other Opening Protectives
NFPA 241	(2022) Standard for Safeguarding Construction, Alteration, and Demolition Operations
NFPA 252	(2022) Standard Methods of Fire Tests of Door Assemblies

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1926	Safety and Health Regulations for Construction

UNDERWRITERS LABORATORIES (UL)

UL 10B	(2008; Reprint May 2020) Fire Tests of Door Assemblies
UL Fire Resistance	(2014) Fire Resistance Directory

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Pre-Installation Meeting

Within [30] [_____] days of Contract Award, the Contracting Officer will schedule a Pre-Installation meeting. For that meeting, submit the following Shop Drawings for review and approval:

a. Doors

b. Frames

[c. Door Hardware Components and Accessories

][d. Weather-stripping

][e. Smoke Seals

] Include fabrication, installation details, schedule and location for doors, frames, hardware components and accessories, showing plans, elevations, sections, details, method of glazing within the door, construction and installation attachments to other work.

Submit manufacturer's catalog data, including material descriptions for doors, frames, and accessories, dimensions of individual components and profiles, and finishes for each type of door, frame, hardware components and accessories of size, design, and location indicated.

Submit documentation substantiating that the items provided within this section are from a manufacturer having a minimum of [5] [10] [_____] years experience in the design and manufacture of similar products and systems.

Submit a Sample Warranty.

1.3 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that

will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

****
NOTE: When door hardware components and accessories, weatherstripping, and smoke seals are specified in Section 08 71 00 DOOR HARDWARE delete the bracketed item "Door Hardware Components and Accessories""Weatherstripping" and "Smoke Seals".
****

SD-02 Shop Drawings

Doors[; G[, [____]]]

Frames[; G[, [____]]]

[Door Hardware Components and Accessories[; G[, [____]]]

][Weather-stripping[; G[, [____]]]

][Smoke Seals[; G[, [____]]]
]

****
NOTE: When door hardware components and accessories, weatherstripping, and smoke seals are specified in Section 08 71 00 DOOR HARDWARE delete the bracketed items "Door Hardware Components" "Weatherstripping" and "Smoke Seals".
****

SD-03 Product Data

Doors[; G[, [____]]]

Calculations[; G[, [____]]]

Frames[; G[, [____]]]

[Door Hardware Components and Accessories[; G[, [____]]]

][Weather-stripping[; G[, [____]]]

][Smoke Seals[; G[, [____]]]

][Thresholds[; G[, [____]]]]

Fire Resistance Rating for Doors and Frames[; G[, [____]]]

SD-04 Samples

Product Samples[; G[, [____]]]

SD-07 Certificates

Sample Warranty[; G[, [____]]]

Warranty[; G[, [____]]]

1.4 QUALITY CONTROL

1.4.1 Product Samples

Submit two sets of color chips representing specified colors and finishes.

Submit samples of each type, consisting of FRP door corner construction, minimum 152.4 mm by 152.4 mm 6 inch by 6 inch legs.

Where color or texture variations are anticipated, such as anodized finishes, include two or more units in each set of samples indicating extreme limits of variations.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver FRP doors, frames, components and accessories in manufacturer's original unopened packaging. Mark and remove damaged materials from the project site. Where materials are covered by a referenced specification, label the package with the specification number, type, and class, as applicable. Deliver materials in sufficient quantity to allow work to proceed without interruption.

1.5.2 Storage

Protect materials against moisture absorption and contamination or other damage.

Store all materials on clean raised platforms or pallets one level high in dry locations with adequate ventilation, such as an enclosed building or closed trailer.

Do not store materials in buildings under construction until concrete, mortar, and plaster work is finished and dry.

Do not store materials outdoors unless approved by the Contracting Officer. Completely cover materials stored outdoors, with waterproof canvas protective covering. Tie covering securely to pallets to ensure complete weatherproofing is met. Provide sufficient ventilation to prevent condensation. Do not use polyethylene sheet as a covering.

Do not store materials in contact with other materials that might cause staining, denting, or other surface damage.

1.5.3 Handling

Prevent damage to corners, edges and ends of materials. Do not install damaged materials in the work. Select and operate material handling equipment to prevent damage to materials.

1.6 PROJECT/SITE CONDITIONS

1.6.1 Existing Conditions

Take Field measurements prior to the preparation of drawings and fabrication.

1.7 WARRANTY

Submit sample material and workmanship warranties meeting specified requirements. Provide revision or amendment to standard manufacturer warranty as required to comply with the specified requirements.

Furnish the manufacturer's [5] [10] [_____] year no dollar limit for materials and installation, workmanship, and deterioration of factory-applied finishes within specified warranty period. Provide warranty directly to the Government and commence warranty effective date at time of Government's acceptance of the work.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide door and frame components including, but not limited to, astragals, cores, faces, stiles, rails, heads, jambs, and internal reinforcement, which are FRP structural shapes manufactured by the pultrusion process. Ensure all structural shapes are composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements in accordance with ASCE 7-16, [ICC IBC] and dimensions specified.

Ensure fiberglass reinforcements are a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

Verify resins are of isophthalic polyester with chemical formulation necessary for corrosion resistance, strength and other physical properties as required.

2.1.1 Design Requirements

2.1.1.1 Finish Surfaces

Ensure all finished surfaces of FRP items and fabrications are smooth, resin-rich, free of voids and without dry spots, cracks, and un-reinforced areas. Completely cover all glass fibers with resin to protect against their exposure due to wear or weathering. All stiles, rails, heads, jambs, and internal reinforcement are to be integrally pigmented [yellow] [_____].

2.1.1.2 Ultraviolet Protection

Provide documentation that all pultruded structural shapes are further protected from ultraviolet (UV) attack with:

a. Integral UV inhibitors within the resin

b. Synthetic surfacing veil to help produce a resin rich surface

c. UV resistant coating for outdoor exposures.

2.1.1.3 Flame Spread Rating

All FRP products to have a flame spread rating of 25 or less as per ASTM E84Tunnel Test.

2.1.1.4 Structural Properties

Meet minimum longitudinal structural properties with structural shapes in the door and frame system as follows:

Tensile Strength	ASTM D638	30,000 psi
Compressive Strength	ASTM D695	30,000 psi
Flexural Strength	ASTM D790	30,000 psi
Flexural Modulus	ASTM D790	1,600,000 psi
Short Beam Shear	ASTM D2344/D2344M	4,500 psi
Impact, Notched	ASTM D256	25 ft-lb/in
Thermal Expansion	ASTM D696	.000008 in/in/F
Fire Resistance	ASTM E84	Class I

2.1.1.5 Fire Resistance Rating for Doors and Frames

Provide complete [swing-type] [sliding-type] FRP doors with frames of the size, design and location indicated, including but not limited to, framing members, subframes,[transom,] [door light,] [adjoining side light,] [trim,] [molding,] [panel and plant,] and accessories.

[Provide complete door hardware schedule, design and location as specified in specification Section [08 71 00 DOOR HARDWARE] [08 71 63 DETENTION HARDWARE] [08 71 63.10 ELECTRICAL LOCKING CONTROL FOR BRIGS].

][Provide complete door [glazing] [louver] schedule, design and location as specified in specification Section [08 81 00 GLAZING] [08 88 53 DETENTION AND SECURITY GLAZING][08 91 00 METAL [WALL] [AND] [DOOR] LOUVERS].

] a. FRP Door

Provide and install a seamless press-molded constructed FRP door. Laminate FRP face sheets to be applied while wet and uncured to an internal door stile and rail subframe/core assembly which is pressure molded under heat. Integrally fuse the composite door panel over the entire surface area, do not adhesive-bond at the perimeter stile and rail.

Provide door stiles and rails which are high-modulus pultruded FRP square or rectangular tube subframe. Miter and join tubes internally at the corners with solid polymer blocks to yield a one piece unit. Provide a mid-rail tube across the width of the door at lockset height and additional horizontal rails where specified. Chemically weld all connections. No mechanical fastening at the tube joints is permitted.

Provide a triangular shaped .375 cm 3/8 inch phenolic resin impregnated kraft paper honeycomb cell core for maximum rigidity and compressive strength. Use of polyurethane foam or balsa wood cores are not permitted.

Provide internal reinforcement composed of high-modulus pultruded tubular FRP or high-density polymer compression blocks at all hardware and corner

locations. No aluminum, steel, or wood blocking for reinforcement is permitted. A minimum pull-out force strength of 900 pounds per screw is required for all hinge locations.

Door faces are to utilize a chemical resistant thermosetting polyester resin with fiberglass reinforcing layers. Provide structural reinforcement which is knitted multi-layer material with layers of unidirectional fiberglass orientated in both vertical and horizontal directions for high stiffness, impact and warp resistance. Furnish door faces as indicated by the door elevation drawings.

Ensure the exposed finish of the FRP door faces are to be an ultra-violet light stabilized marine grade Neopentyl Glychol (NPG)-isophthalic polyester gelcoat integrally molded to a 25/30 mil wet thickness.

[Provide an integral heavy pultruded FRP astragal on the stile edge of the inactive leaf for double doors of the same materials as specified for door stiles and rails.

][Cutouts for door lights and louvers are to be manufactured and not field fabricated. Cutouts are to be totally enclosed by internal pultruded FRP stiles and rails as specified and incorporated into the door subframe with the opening completely fused to both door faces.

][Provide raised panel door as indicated by the door elevation drawings and schedule. Plants to be applied by the manufacturer as an integral part of the door face and not field applied. All molding and plants are to be a rein material and installed by the manufacturer to resemble a raised panel door.

] b. FRP Frame

Provide FRP Door Frame utilizing a high-modulus pultruded structural FRP shape. Fabricate pultruded frame with a wall thickness of not less than 5 mm 3/16 inch. Frames are to be one piece factory constructed with molded stop. Jambs and header to utilize miter corner connections chemically welded with FRP material ground for a visibly smooth frame face. Post and beam or mechanical fastened corners and joints are not acceptable. Provide sizes and shapes as detailed on the approved drawings.

Provide hardware reinforcement connections utilizing a chemical weld with FRP material at required locations. A minimum pull-out force strength of 1,100 lbs per screw is required for all hardware locations.

Frame finish is to be identical to door color and finish.[Integrally mold a [15] [20] [25] wet mil resin rich gel coat into the frame during manufacturing.]

[2.1.1.6 Fire-Rated Labeled FRP Door

Provide a Fire-Rated Door Assembly with a [20] [45] [60] [90] minute rating complying with NFPA 80 and UL Fire Resistance that are listed and labeled by [a qualified testing agency][Underwriters Laboratories (UL)] [Factory Mutual Engineering and Research (FM)] [Warnock Hersey International (WHI)], for the fire-protection ratings indicated in the door and frame schedule. Base the door testing [at positive pressure] [as close to neutral pressure as possible] according to [ASTM E2074] [NFPA 252] [and] [UL 10B]. Provide certification for Oversized Fire-Rated Door Assembly units exceeding the size of tested assemblies, by a qualified

testing agency, that the door complies with standard construction requirements for tested and labeled fire-rated door assemblies except for the size. Ensure door labels are permanently affixed at the factory to the hinge edge of the door and do not paint.

Provide and install a seamless press-molded constructed FRP door. Laminate FRP face sheets to be applied while wet and uncured to an internal door stile and rail subframe/core assembly which is pressure molded under heat. Integrally fuse the composite door panel over the entire surface area; do not adhesive-bond at the perimeter stile and rail.

Ensure door is provided with a fire resistant mineral core for maximum rigidity and compressive strength. Molding pressure and resin gel time are to be sufficient to allow for full penetration of resin into the cellular structure of the core to maximize shear and peel strengths at the door faces and core to reduce the possibility of delamination. Verify that the mineral core has been completely enclosed with an intumescent and FRP laminated edge perimeter, with the intumescent molded into the FRP door structure with a minimum 3.1 mm 1/8 inch thick perimeter FRP edge banding prior to machining. Only Category A type door construction is permitted. Category B type construction with exposed edge intumescent components or products is prohibited.

Hardware reinforcement to be high-modulus pultruded tubular FRP or high-density polymer compressions blocks at all hardware and corner locations. No aluminum, steel, or wood blocking for reinforcement is permitted. A minimum pull-out force strength of 1,100 lbs per screw is required for all hinge locations.

Door faces are to utilize a chemical resistant thermosetting polyester resin formulated for the specified environment with a maximum flame spread of 25 in accordance with ASTM E84, and self-extinguishing in accordance with ASTM D635 with fiberglass reinforcing layers. Provide structural reinforcement of knitted multi-layer material with layers of unidirectional fiberglass orientated in both vertical and horizontal directions for high stiffness, impact and warp resistance. Furnish door faces as indicated by the door elevation drawings.

Ensure the exposed finish of the FRP door faces with an ultra-violet light stabilized marine grade Neopentyl Glychol (NPG)-isophthalic polyester gelcoat integrally molded to a 25/30 mil wet thickness.

[Provide an integral heavy pultruded FRP astragal on the stile edge of the inactive leaf for double doors of the same materials as specified for door stiles and rails.

][Provide raised panel door as indicated by the door elevation drawings and schedule. Plants are to be applied by the manufacturer as an integral part of the door face and not field applied. All molding and plants are to be a rein material and installed by the manufacturer to resemble a raised panel door.

]][2.1.1.7 Fire Rated Labeled FRP Frame

Provide a Fire-Rated Door Frame with a [20] [45] [60] [90] minute rating complying with NFPA 80 that are listed and labeled by [a qualified testing agency][Underwriters Laboratories (UL)] [Factory Mutual Engineering and Research (FM)] [Warnock Hersey International (WHI)], for the fire-protection ratings indicated in the door and frame schedule.

Permanently affix frame labels, at the factory, to the hinge side of the door jamb. Do not paint.

Provide a Fire-Rated Door Frame utilizing a high-modulus pultruded structural FRP shape. Fabricate pultruded frame with a wall thickness of not less than 5 mm 3/16 inch. Provide one piece factory constructed frames with molded stop. Utilize miter corner door jambs and header connections chemically welded with FRP material ground for a visibly smooth frame face. Post and beam or mechanical fastened corners and joints are not acceptable. Provide sizes and shapes to be as detailed on the approved drawings.

Provide a minimum density of 0.4 kg per liter 25 pounds per cubic foot fire resistant composite formulated core for the specified environment with a maximum flame spread of 25 in accordance with ASTM E84, and self-extinguishing as per ASTM D635.

Frame finish is to be identical to door color and finish. Ensure a [15] [20] [25] wet mil resin rich gel coat is integrally molded into door frame during manufacturing.

]2.1.1.8 Frame Anchors

Provide anchorage devices and fasteners where necessary for fastening fabricated FRP door frame to the adjacent construction-in-place as recommended by the FRP frame manufacturer.

2.1.1.9 Jamb Anchors

[Provide anchors of the material, type, number, and spacing as required by the FRP frame manufacturer.

][Provide Masonry Anchors of [corrosive-resistant] [hot-dip galvanized] steel [corrugated or perforated straps not less 50 mm 2 inches wide by 250 mm 10 inches long] [wire a minimum of 5 mm 3/16 inch diameter] [adjustable loop] [T-shaped] minimum of 1.3 mm 18 gauge thick.

][Provide hot-dip galvanized steel Stud-Wall Type anchors designed to engage the [wood] [cold-formed steel] wall framing; not less than 1.3 mm 18 gauge thick.

][Provide Expansion Type Anchor for [concrete] [masonry] of [corrosive-resistant] [hot-dip galvanized] steel a minimum 9.5 mm 3/8 inch diameter bolt with expansion shield or insert.

][Provide a Powder-Actuated Anchorage System suitable for the application in [concrete] [steel] fabricated from [corrosive-resistant] [hot-dip galvanized] steel with clips or other accessory devices for attaching FRP frames.

]2.1.1.10 Hardware Preparation

Provide hardware reinforcing as specified. Prepare doors and frames for hardware in accordance with the applicable requirements of the FRP door and frame manufacturer. For additional requirements refer to ANSI/BHMA A156.115.

[Provide [door hardware components and accessories] as indicated on the drawings[.][, including [weather-stripping] [smoke seals] [thresholds]

[_____].]

]2.1.2 Performance Requirements

2.1.2.1 Structural

****
NOTE: Include the bracketed statement for static load, frame deformation, minimum glazing frame bite,and frame connection requirements when personnel density is greater than one person per 40 square meters 430 square feet and minimum AT/FP standoff distances are met. This provision is not required for guard type facilities, single and duplex detached family housing. The requirements are specified in UFC 4-010-01, "Department of Defense Minimum Antiterrorism Standards for Buildings".
****

[Design exterior doors, frames and hardware to resist equivalent static design loads in accordance with ASTM F1642/F1642M, with frame deflections not to exceed L/160 of the unsupported member lengths. Use equivalent static design loads for connections of the door frame to the surrounding walls or hardware and associated connections, in accordance with ASTM F2248 and ASTM E1300. Design supporting elements and their connections based on their ultimate capacities. Provide calculations prepared by a Professional Engineer that substantiates compliance with these requirements, including insulation materials. Use frames that provide an equivalent level of performance.]Provide framing members with shape and thickness sufficient to withstand [a design wind load of not less than [1.4] [_____] kPa [30] [_____] pounds per square foot of supported area] [the design wind load indicated] with a deflection of not more than 1/175 times the length of the member and a safety factor of not less than 1.65. Provide glazing beads, moldings, and trim of not less than 1.25 mm 0.050 inch nominal thickness.

[Design doors and frames to withstand the specified design wind load acting normal to the plane of the entrance wall either inward or outward, in accordance with ASCE 7-16[and ICC IBC].

]2.1.2.2 Air Infiltration

When tested in accordance with ASTM E283, air infiltration cannot to exceed 2.63 by 10-5 cms per square meter 0.06 cubic feet per minute per square foot of fixed area at a test pressure of 0.30 kPa 6.24 pounds per square foot 80 kilometers 50 mile per hour wind.

2.1.2.3 Water Penetration

When tested in accordance with ASTM E331, no water penetration is allowed, at a pressure of 0.38 kPa 8 pounds per square foot of fixed area.

2.1.2.4 Provisions for Thermal Movement

Design doors and frames to provide for expansion and contraction of the component parts caused by an ambient temperature range of minus 17.8 to 37.8 degrees C 0 to 100 degrees Fcausing buckling, opening of joints, overstressing of fasteners, or other harmful effects.

PART 3 EXECUTION

3.1 INSTALLATION

Conform all work to the requirements of 29 CFR 1910, 29 CFR 1926,and NFPA 241.

3.1.1 FRP Frame

Set FRP door frame plumb and true, aligned, and secured with the adjacent construction-in-place, in conformance with ASTM E2112. Anchor frame as specified and in accordance with the FRP door manufacturer's requirements.

Installation Tolerances

a. Squareness: Plus or minus 1.6 mm 1/16 inch, measure at the door rabbet on a line 90 degrees from the jamb perpendicular to the frame head.

b. Alignment: Plus or minus 1.6 mm 1/16 inch, measure at the jamb on a horizontal line parallel to the wall plane.

c. Twist: Plus or minus 1.6 mm 1/16 inch, measure at the opposite face corners of the jambs on parallel lines, and perpendicular to the wall plane.

d. Plumb and True: Plus or minus 1.6 mm 1/16 inch, measure at the jambs to the floor.

3.1.2 FRP Door

Fit and hang door in accordance with clearances specified below:

Clearance Tolerances

a. Jambs and Head: Plus 3 mm 1/8 inch or minus 1.6 mm 1/16 inch.

b. Pairs of Doors: Plus 3 mm 1/8 inch or minus 1.6 mm 1/16 inch.

c. Bottom of Door and Top of Threshold: Maximum 9.5 mm 3/8 inch.

d. Bottom of Door and Top of finish floor (No Threshold: Maximum 19 mm 3/4 inch.

[3.1.3 Labeled Door and Frame

Install fire-rated door and frame, including hardware, in accordance with NFPA 101 [NFPA 80] [and] [NFPA 105].

]3.2 ADJUSTING AND CLEANING

Check and re-adjust all operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including all FRP that is warped, bowed, or otherwise unacceptable to the Contracting Officer.

3.3 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to final completion and acceptance of the project or replace with new, as directed by the Contracting Officer. Thoroughly clean all surfaces of the door and frame prior to final completion and acceptance of the project.

3.4 CLOSEOUT ACTIVITIES

3.4.1 Warranty

Submit the approved Warranty made out to the Government, to the Contracting Officer no later than [10] [_____] days prior to final inspection.

-- End of Section --