**6. ENGINEERING SYSTEMS REQUIREMENTS**

**B20 EXTERIOR ENCLOSURE**

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SYSTEMS REQUIREMENTS
EXTERIOR ENCLOSURE TEMPLATE 09/22

Instructions for using this template: There are template files for each UNIFORMAT Level 2 Group Elements. This template is for Group Element B20-EXTERIOR ENCLOSURE. Text such as this is hidden text that will not print when the hidden text box in "Print/Options" is un-checked.

The Architectural Team Member must edit this template for the requirements of the project. The SYSTEMS REQUIREMENTS are intended to define items that are required throughout the facility or on a system wide basis that is common to several rooms. Room-specific requirements are defined in the Part 3 Chapter 5 ROOM REQUIREMENTS section. Coordinate with the lead programmer for ROOM REQUIREMENTS. Editing is required where brackets [ ] appear. Delete all building elements that are not required for the project. If additional elements or sub-elements are required for the project that do not appear in the template, refer to the NIST UNIFORMAT II publication for additional building element numbers and descriptions. The Uniformat II Work Breakdown Structure can be found at** [**www.wbdg.org/ndbm/**](http://www.wbdg.org/ndbm/) **. Coordinate with the PERFORMANCE TECHNICAL SPECIFICATION SECTION B20 to ensure that performance requirements are provided for all of the Building Elements listed here and that paragraph numbering matches.

Provide for systems to be utilized by coordination with Part 3, Chapter 4.3 Exterior Character in allowance for the desired requirements for exterior appearance.
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NOTE: Consider each exterior enclosure component relative to Part 2 UFGS Section 01 33 29, *Sustainability Requirements and Reporting*and UFC 1-200-02, *High Performance and Sustainable Building Requirements*.
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**SYSTEM DESCRIPTION**
This system consists of the exterior shell of the facility, which includes all vertical and horizontal exterior closure such as exterior walls, exterior windows, and exterior doors. This system excludes roofing (See System B30, *Roofing*). Include load bearing exterior walls here, and not in System B10, *Superstructure*. Structural frame elements at exterior such as columns, beams, and spandrels are included in Superstructure, with only the applied exterior finishes (e.g., paint, stucco) being included here. Finishes to the inside face of walls which are not an integral part of the wall construction will be included in System C30, *Interior finishes*.

**GENERAL SYSTEMS REQUIREMENTS**
 **B2010 EXTERIOR WALLS**

[Provide a ventilated, rain-screen, exterior wall system composed of the Exterior Closure and the Exterior Wall Backup Construction indicated below.]

[Provide cavity wall exterior wall systems composed of the Exterior Closure and Exterior Wall Backup Construction indicated below.]

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NOTE: Barrier wall systems indicated below should only be used for storage, warehouse, and other types of facilities where moisture intrusion is acceptable. Use one of the two above systems for all critical facilities.
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[Provide a single thickness, barrier wall composed of the Exterior Closure construction indicated below.]

 **B201001 EXTERIOR CLOSURE**

Provide Exterior Closure system as described below.

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NOTE: Use caution when allowing or designing mixture of clay brick and concrete masonry unit veneers in same elevation. Their different densities, absorption, and expansion/contraction rates can yield facade cracks that might not occur otherwiseUse caution when allowing or designing mixture of clay brick and concrete masonry unit veneers in same elevation. Their different densities, absorption, and expansion/contraction rates can yield facade cracks that might not occur otherwise.
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[Provide brick masonry veneer as [a [minimum] [maximum] of \_\_\_\_\_% of] the Exterior Closure.] [Provide brick masonry details consistent with the existing adjacent building[s].]

[ Provide [glass block] [[split face] [ground face] [standard] concrete masonry unit veneer] as [a [minimum] [maximum] of \_\_\_\_\_% of] the Exterior Closure.]

[Provide [sheet] [prefabricated panel] metal as [a [minimum] [maximum] of \_\_\_\_\_% of] the Exterior Closure with [exposed][concealed] fasteners.]

[Provide a [cast-in-place] [precast] concrete water table [to match existing adjacent structures][to match Building \_\_\_\_\_].

[Provide architectural precast concrete [veneer] as [a [minimum] [maximum] of \_\_\_\_\_% of] the Exterior Closure.].]

[Provide stucco as [a [minimum] [maximum] of \_\_\_\_\_% of] the Exterior Closure.]

[EIFS may be used as [a [minimum] [maximum] of \_\_\_\_\_% of] the Exterior Closure.]

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NOTE: Consider the following paragraph for residential construction as a way of increasing the visual appearance at a reasonable cost.

Wood siding should only be used in historical applications.
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[Provide wood siding as [a [minimum] [maximum] of \_\_\_\_\_% of] the Exterior Closure.]

[Provide vinyl siding as [a [minimum] [maximum] of \_\_\_\_\_% of] the Exterior Closure.]

[Provide cementitious siding as [a [minimum] [maximum] of \_\_\_\_\_% of] the Exterior Closure.]

[Provide [horizontal siding] [or vertical sheet panels] of manufactured faced panels system as [a [minimum] [maximum] of \_\_\_\_\_% of] the Exterior Closure.]

 **B201002 EXTERIOR WALL BACKUP CONSTRUCTION**

Provide Exterior Wall Back-up Construction System (back-up systems for Exterior Closure) including [cast-in-place concrete][pre-cast concrete][unit masonry] [metal framed][wood framed][sheathed] wall systems [with insulation] when integral with [shop fabricated wall systems][expansion control] as described below:

[Exterior bearing walls consisting of metal studs as the primary floor or roof supporting structural element are not permitted.]

[Provide load-bearing metal framing including top and bottom tracks, bracing, fastenings, and other accessories necessary for complete installation. Framing members must have the structural properties indicated. Where physical structural properties are not indicated, provide as necessary to withstand all imposed loads. Design framing in accordance with American Iron and Steel Institute (AISI) SG-673. Install load-bearing metal framing in accordance with the Designer of Record (DOR)-approved shop drawings and manufacturer’s installation instructions.]

 **B201003 INSULATION & VAPOR RETARDER**

Provide continuous insulation, vapor retarder, water-resistive barrier, and air barrier to meet or exceed requirements of project's energy savings requirements as indicated by applicable American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 90.1 calculations called for in Unified Facilities Criteria (UFC) 1-200-02, *High Performance and Sustainable Building Requirements*, and meeting minimum building envelope insulation requirements of UFC 3-101-01, *Architecture*.

Provide a continuous air barrier to control air leakage into, and out of conditioned spaces. The air barrier must encompass all elements of the facility that are exposed to the outside environment or outside environmental conditions such as roof, walls, floors, and compartmentalized unconditioned portions of the facility such as garages, and negatively pressurized spaces. Permanently seal penetrations through the air barrier, joints in the air barrier, adjoining construction, and transitions to different air barrier materials.

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NOTE: Barrier materials can provide an air barrier function, a moisture barrier/ vapor retarder function, a water resistive barrier function, or any combination of the three functions. Barrier materials can serve more than one function therefore the air barrier may be combined with a moisture barrier or water resistive barrier, if the barrier material chosen can provide multiple functions. A moisture barrier and the water resistive barrier can only be effective in a prescribed locations, the air barrier can be located anywhere in the wall assembly.

NOTE: Include the bracketed sentence below if the facility meets the requirements stated in UFC 3-101-01, *Architecture* and the air barrier is to be field tested in accordance with RFP Part 4, B20).
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[Confirm air barrier compliance with Air Barrier Performance Test in RFP Part 4 B20, *Exterior Enclosure*.]

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NOTE: Building envelope thermal imaging is a step towards achieving designed potential energy savings and comfort. Include the bracketed sentence below if thermal imaging of building envelope is required. Coordinate with air barrier performance testing and construction schedule, as thermal imaging after interior finishes are being applied is not conducive to remedies.
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[Provide thermal envelope performance testing through infrared thermography in accordance with RFP Part 4. Coordinate thermal imaging testing with air barrier testing construction schedule.]

Provide a continuous water resistive barrier in accordance with UFC 3-101-01, *Architecture*. The water resistive barrier must resist liquid (bulk) water from being absorbed into the back-up wall assembly if water leaks, penetrates, or seeps past the exterior enclosure cladding system.

Provide a vapor pressure analysis and hygrothermal analysis in accordance with UFC 3-101-01, *Architecture.* Determine if a moisture barrier/ vapor retarder is required and where it would be located. Include analysis and conclusion in the design analysis for the project, refer to Part 2 Section 01 33 10.05 20*, Design Submittal Procedures*. If required by the analysis, provide a moisture barrier/ vapor retarder to restrict the flow of moisture through the exterior enclosure.

Include written and graphic descriptions of exterior enclosure barrier materials and location within the wall as a part of the Contractor provided design analysis. Identify in the analysis the continuous boundary limits of the air barrier and of the zone or zones to be field tested for building air tightness.

Provide contract drawings that indicate each exterior enclosure barrier location and the materials that make up the barriers. Detail the following barrier conditions;

1. Typical conditions at wall sections.

2. Barrier treatment at wall openings.

3. Intersections with other exterior enclosure assemblies and materials. Include intersections at roof and floors.

4. Intersections with counter flashing.

5. Inside and outside corners.

6. Preservation of air and water tightness at anchors for materials that cover the barrier.

7. Treatment to seal barrier penetrations such as conduits, pipes, electric boxes, and fixtures.

8. Indicate air barrier perimeter, if facility is segmented into areas that are not within the air barrier envelope.

 **B201004 PARAPETS**

[Provide parapets for exterior wall construction, where required for low-slope roofs].

 **B201005 EXTERIOR LOUVERS & SCREENS**

Provide exterior louvers and screens, where required, that match the finish of the existing windows and detailed to integrate with the architecture of the building, as appropriate to the design of the building.

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NOTE: Use the following where the building will be subject to hurricane force winds, or where extra storm protection would be desirable.
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[Provide [[manually] [electrically] operated roll type ]storm shutters for all exterior windows [and doors].]

 **B201006 BALCONY WALLS & HANDRAILS**

[Provide balcony walls compatible with the exterior architecture of the building.] Provide complete [concrete] [masonry] [metal] or [wood] balcony walls and [non-corrosive metal] [wood] [glass] railing systems including anchors and attachment sleeves and fasteners. [Provide ornamental railing to harmonize with the existing railing of the existing building.]

Handrails and guardrails must be finished to withstand extreme wear conditions.

Provide [metal] [Fiberglass Reinforced Plastic (FRP)] ladders and railings complying with Occupational Safety and Health Administration (OSHA) requirements for access and protection to any exterior mechanical mezzanines or other similar spaces.

 **B201007 EXTERIOR SOFFITS**

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NOTE: Use a gypsum board soffit for low cost residential construction, when budget is the sole criteria.
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[Provide exterior soffit system [metal] [vinyl] [painted exterior grade gypsum board].

 **B201009 EXTERIOR PAINTING AND COATINGS**

Provide field applied exterior coatings for all items that are not prefinished, and to prefinished items when required to provide a color other than a standard prefinished color.

 **B201010 EXTERIOR JOINT SEALANTS**

Provide exterior application of joint sealants to seal joints and prepare for finish material installation.

 **B201011 SUN CONTROL DEVICES (EXTERIOR)**

[Provide [fixed] [horizontal] [vertical] [operable] [demountable] type. Detail sun control devices to integrate with the architectural wall system.]

 **B201012 SCREEN WALL**

[Provide screen walls to screen mechanical units, electrical substations, loading docks, and trash receptacles. Provide screen walls compatible with the exterior architecture of the building. Design rooftop mechanical screens to minimize roofing penetrations.]

 **B2020 EXTERIOR WINDOWS**

[Provide windows in each area of the building that is regularly occupied, to enhance the working environment, without compromising visual acuity and comfort.] [Natural daylighting is [not] preferred, except at the entry and \_\_\_\_\_\_\_\_.] [Exterior windows are not permitted.] Exterior windows must be [prefinished aluminum] [plastic] [vinyl or aluminum-clad wood] [primed and painted wood]. [Windows must meet Antiterrorism requirements.]

[If approved by the DOR, the sample window may be installed in an opening in a framed wall, and the mock-up may be left during construction as a cut-away of the installation. For masonry walls, install the sample window in the masonry sample panel. ]

 **B202001 WINDOWS**

Determine the construction of security windows by evaluating the project program security requirements, using the Military Handbook (MIL-HDBK) 1013/1A, *Design Guidance for Physical Security of Facilities*, to define window requirements.

Provide [aluminum] [ plastic, or wood] [operable] [fixed] windows.

[Provide integral insect screens for all operable windows.]

[Provide a mockup of one combination window unit for the project [to be used for a field mockup test of compliance with American Architectural Manufacturers Association (AAMA) 502 Method A and Method B].]

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NOTE: UFC 4-024-10, *Security Engineering to Resist Forced Entry*, is in preparation to replace MIL-HDBK 1013/A.
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 **B202002 STOREFRONTS**

Provide [aluminum] [steel] [wood] storefronts.

 **B202003 CURTAIN WALLS**

A curtain wall is a reinforced window wall that spans more than one story in height.

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NOTE: Test method ASTM E 331 is a dynamic test for determining resistance of the curtain wall to water penetration under uniform static air pressure difference, in a closed chamber. The availability of facilities for conducting dynamic testing is very limited and should be checked before specifying this type of test.

When testing under field conditions is required, the AAMA Specification test method should be referenced. Specify the precise number of field tests that will be required.
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[Provide a multi-story glazed curtain wall system.

Provide a standard architectural type [Stick] [Unit] [Unit and Mullion] system, with mullions, horizontal rails, [and] or non-integral spandrel panels. Fully coordinate system accessories directly incorporated and adjacent to contiguous related work and insure materials compatibility, deflection limitations, thermal movements, and clearances and tolerances.

Provide a system that is [totally glazed] [or] [a combination of glazed panels and opaque panels]. For design purposes, base provisions for thermal movement on assumed ambient temperature range of from [\_\_\_\_\_] degrees F ([\_\_\_\_\_] degrees C) to [\_\_\_\_\_] degrees F ([\_\_\_\_\_] degrees C). Source of the ambient temperature data is [UFC 3-400-02, *Engineering Weather Data*] [National Oceanic and Atmospheric Administration (NOAA)] [\_\_\_].

[Provide a mockup of one [1] designated Curtain Wall System unit for the project [to be used for a field test of compliance with AAMA 503 Method A and Method B].]

 **B202004 EXTERIOR GLAZING**

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NOTE: Typical colors for exterior glazing are gray, bronze, green or blue.
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Provide glazing with a [\_\_\_] color [matching existing adjacent buildings]. Where bullet resistant glazing is required the materials must be listed by Underwriters Laboratories (UL) as bullet resisting, with a power rating of [Medium--Small Arms] [High--Small Arms] [Super--Small Arms] [High--Rifle] in accordance with Underwriters Laboratories (UL) 752.]

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NOTE: Select fragment retention film when glass may be subject to the effects of explosives or projectiles and when protection of personnel from the resulting glass spalling is required for existing glazing where windows are not to be replaced.
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Provide [clear glass] [heat absorbing glass][wireglass][insulating glass units][laminated glass][tempered glass][bullet resisting glass][patterned glass][spandrel glass][spandrel glass with adhered backing][plastic glazing][bullet resistant plastic sheet][acrylic sheet glazing][polycarbonate sheet glazing][and][or][fragment retention] type glazing.

 **B202090 OTHER EXTERIOR WINDOWS**

[Provide operable tray pass windows at [\_\_\_\_\_\_\_\_\_\_].

 **B2030 EXTERIOR DOORS**

Provide solid door assemblies other than at the main entrance. Exterior doors and frames must be non-corroding [prefinished] [galvanized steel] [prefinished aluminum] [prefinished stainless steel] [prefinished bronze].

[Provide Standard Duty Doors - American National Standards Institute/Steel Door Institute (ANSI/SDI) A250.8, Level 1, physical performance Level C, Model [1] [2]]

[Provide Heavy Duty Doors - American National Standards Institute/Steel Door Institute (ANSI/SDI) A250.8, Level 2, physical performance Level B, Model [1] [2].]

[Provide Extra Heavy Duty Doors -– American National Standards Institute/Steel Door Institute (ANSI/SDI) A250.8, Level 3, physical performance Level A, Model [1] [2] [3].]

[Provide Maximum Duty Doors -– American National Standards Institute/Steel Door Institute (ANSI/SDI) A250.8, Level 4, physical performance Level A, Model [1] [2].]

In residential construction, where the opening is protected by overhangs and other protection from direct rain, wood exterior doors may be used.

[Provide door glazing that matches the window glazing.]

 **B203001 SOLID DOORS**

Provide solid [steel][fiberglass reinforced plastic (FRP)] [wood] door assemblies other than at main storefront/curtainwall entrances including [painted] [prefinished] [zinc coated] [galvanized] heavy-duty, non-corroding, [insulated] doors with [frames] and hardware.

[Provide wood doors with [rotary cut][book matched][random match (only for veneer on painted doors)] hardwood veneers. Edge bands must be wood. Also provide [louvers] [and] [accessories] and wall opening elements such as [lintels] [sills] and [flashings].

 **B203002 GLAZED DOORS**

Glazed Doors - Provide Exterior Glazed Doors and Entrances System. including [factory-finish] [painted] [wood framed] [all glass] [aluminum framed] [steel framed] [stainless steel framed] [bronze framed] door assemblies with [insulated], [tinted] [glazing], frames, and hardware [compatible with other buildings on the base] and wall opening elements such as lintels, sills, through-wall flashings, and joint sealers.

 **B203004 OVERHEAD ROLL-UP AND OVERHEAD SECTIONAL DOORS**

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NOTE: Overhead doors may only be used if they open into an unoccupied space because of ATFP restrictions or if the facility type is exempt from ATFP requirements such as car repair shops. Overhead roll-up doors could possibly be designed to meet ATFP requirements but confirm that blast testing has been accomplished by the door manufactures before requiring these doors to provide entrance or exit from an occupied spaces. No overhead doors have been tested as of the writing of this NOTE. Refer to UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings for ATFP requirements.

Special sliding, exterior folding, or telescoping doors need to be added to RFP Part 3 and RFP Part 4.
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Design doors and opening for [automobile] [\_\_\_] entrance. Provide lockable doors with [manual operation] [automatic operation with protected pushbuttons electric controls].

Accomplish door operation by [lifting handles and pull rope] [hand chain with gear or sprocket reduction] [hand crank with gear or sprocket reduction] [UL Listed electric motor operation with electric controller and an auxiliary hand chain operation.] [Provide [slat] [panel] profile to match existing overhead doors on the [\_\_\_] facility.] Also provide counterbalance, heavy duty springs, wear strips, full perimeter weather-stripping, [continuous button pressure safety operation,] electric or infrared safety edge, galvanized hardware, and manufactured trims and closures pieces. Protect the wall door jamb opening with guards designed to resist abuse from the type of material and vehicles that are transported through the opening.

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NOTE: ANSI/DASMA 102 provides two level of durability for overhead sectional doors, as follows. Choose one in the following paragraph.**

**a. Residential. Intended for use in a residential garage, and normally expected to be operated less than 1,500 cycles per year.

b. Commercial. Intended for vehicular use at entrances of commercial buildings such as loading docks, service stations, parking garages and manufacturing plants, normally expected to be operated but not limited to less than 5,000 cycles per year.**

**NOTE: The standard painted finish for overhead doors is typically two coats of baked-on polyester paint and comes in limited color choices. Choose the powder coat option below if environmental conditions require more weather resistance. Powder coat finish last much longer than the standard paint but does not accept scratch repair or repainting as easily as polyester.

NOTE: Determine if the overhead roll-up doors have to be operational in ASCE 7 ( hurricane) wind loading. Choose the bracketed option below if roll-up doors are required to be operational at all times. Typically the steel slat gauge and width of the roll-up door will be limited if operation during high wind conditions is required. With the minimum insulated steel slat gauge specified in RFP Part 4, you cannot expect a door opening wider than approximately 8'- 0" before the curtain wind locks begin to engage and restrict the door operation at ASCE 7 wind loading. By increasing the slat gauge to a maximum thickness in RFP Part 4, you cannot expect an overhead roll-up door opening wider than approximately 10'-0'' to operate in ASCE 7 wind loading. Overhead sectional doors operate better than overhead roll-up doors in high wind conditions.
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[Provide overhead sectional doors that conform to [Residential] [Commercial] American National Standards Institute/Door & Access Systems Manufacturers Association (ANSI/DASMA) requirements. Provide thermally broken, [galvanized steel] [aluminum] clad insulated door panels with [vision panels] [glazing] to comply with UFC 4-010-01. Provide [[polyester] [powder coat] painted finish with custom colors] [anodized aluminum finish] for the door and accessories to match facility color scheme.] [Design the overhead sectional door to withstanding the design wind loading of American Society of Civil Engineers (ASCE) 7 and operate normally.]]

[Provide insulated overhead roll-up doors. Provide [polyester] [powder coat] painted finish with custom colors for the door and accessories to match facility color scheme. [Design the steel overhead roll-up slats and door width to withstanding the design wind loading of American Society of Civil Engineers (ASCE) 7 and operate normally.]]

 **B203006 BLAST RESISTANT DOORS**

Provide special doors used for blast resistance.

 **B203008 EXTERIOR DOOR HARDWARE**

Provide the services of a certified door hardware consultant to prepare the door hardware schedule.

[Provide hardware keying compatible with the existing base-wide [\_\_\_] keying system.] [Provide replacement interchangeable cores compatible with the Best Lock system.]]

[Existing locks were manufactured by [\_\_\_\_\_] and [do not] have interchangeable cores.]

[Provide a [\_\_\_\_] type card key system. Provide the services of a certified door hardware consultant to prepare the door hardware schedule.

Provide door hardware finish of [chrome-plated brass or bronze, or stainless steel] [brass or bronze].

 **B203090 OTHER EXTERIOR SPECIALTY DOORS**

[Provide automatic [swinging] [sliding] entrance doors at the main entrance to the building.]

--End of Section--