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CEEC

Engineering and Design
Design Analysis, Drawings, Specifications, and Minimum Submittal Requirements

FOR THE COMMANDER:

Digitally signed by DELAROSA.DAMON.ANDREW.1134345566
Date: 2026.01.26 17:34:55 +01'00'

DAMON A. DELAROSA
COL, EN
Chief of Staff

Purpose. This engineer regulation provides U.S. Army Corps of Engineers-wide consistency in criteria and requirements for developing design analysis, drawings, and specifications necessary for facility project design, estimating, approval, contracting, and construction.

Applicability. This regulation applies to all U.S. Army Corps of Engineers elements, major subordinate commands, district commands, technical centers, laboratories, and field operating activities. This regulation applies to all facility design and construction efforts within the Directorate of Military Programs regardless of funding or location. This includes, but is not limited to, Military Construction regardless of service; host nation-funded design and construction in outside the continental United States locations; sustainment, restoration, and modernization regardless of service; and vertical design and construction undertaken according to ER 1140-1-211.

Distribution Statement. Approved for public release; distribution is unlimited.

Proponent and Exception Authority. The proponent of this regulation is the Headquarters, U.S. Army Corps of Engineers, Directorate of Engineering and Construction. The proponent has the authority to approve exceptions or waivers to this regulation that are consistent with controlling law and regulations. Only the proponent of a publication or form may modify it by officially revising or rescinding it.

*This regulation supersedes ER 1110-345-700, dated 30 May 1997.

Summary of Change

ER 1110-345-700
Design Analysis, Drawings, Specifications, and Minimum Submittal Requirements

This revision, dated 4 February 2026:

- Resolves and deconflicts overlapping terms and definitions for Basis of Design, Design Analysis, Owner's Project Requirements, and stakeholder requirements between Department of Defense, U.S. Army Corps of Engineers, and non-governmental commissioning and sustainability authority documents.
- Identifies the multiple purposes and functions of the design analysis and its component parts.
- Outlines the design analysis development process and clarifies the format, content, and use of its components.
- Prescribes the requirements for the preparation and approval of drawings.
- Prescribes the requirements for the preparation of specifications.
- Provides recommended minimum submittal requirements for facility design.
- Incorporates policy related to signature on design documents that was previously included in ER 1110-1-8152.
- Incorporates all policy from ER 1110-1-8155.
- Updates the list of references.
- Adds reference to Whole Building Design Guide for design analysis sample content and templates.
- Adds the Glossary of Terms.

Contents

Table List

Chapter 1
Introduction

1–1. Purpose

This engineer regulation provides U.S. Army Corps of Engineers-wide consistency in criteria and requirements for developing design analysis, drawings, and specifications necessary for facility project design, estimating, approval, contracting, and construction.

1–2. Distribution statement

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1–3. References

See Appendix A.

1–4. Records management (recordkeeping) requirements

The records management requirement for all record numbers, associated forms, and reports required by this publication are addressed in the Army Records Retention Schedule. Detailed information for all related record numbers is located on the U.S. Army Corps of Engineers (USACE) Records Management Site https://usace.dps.mil/sites/INTRA-CIOG6/SitePages/Records-Management.aspx. If any record numbers, forms, and reports are not current, addressed, and/or published correctly, see DA Pam 25-403 for guidance.

1–5. Associated publications

This section contains no entries.

1–6. Design analysis

A design analysis (DA) is a written document developed by the designer of record (DOR) that describes the project at initiation and is updated at each subsequent phase. It presents facts to demonstrate that the concept of the project is understood and that the design is based on sound engineering principles and judgement. It documents the history and criteria for the project, including any criteria designated by the stakeholder, correspondence, codes, references, meeting minutes, and research. The DA addresses the entire facility and site design. The justification for each major design decision must be clearly stated. The DA documents must conform to the stakeholder requirements in EM 5-1-11. Coordinate the DA with the development of the Project Management Plan (PMP). Refer to Chapter 2 for detailed DA requirements.

a. Sequence of development. Initial preparation of the DA follows the development of the PMP and is updated at each project phase. It is prepared according to AR 420-1 and applicable Unified Facilities Criteria (UFC). The initial preparation of the DA may be

referred to as the basis of design (BOD) as it establishes the design requirements for the project. Subsequent submittals will build on these design requirements to document how the design complies with the established criteria. The DA is a living document during project design and construction. It must be updated as appropriate to reflect design progress or changes in project status, conditions, or requirements.

b. Contract document status. The DA informs and documents the work of the DOR. The DA is not considered a contract document for solicitation of construction services; however, it may be included as an informational attachment when appropriate. The DA, if completed, may be used as part of contract documents in solicitations for Architect-Engineer (A-E) services.

c. Proprietary product or brand-specific information. Proprietary product or brand-specific information is prohibited in all documents included in a solicitation unless a justification and approval (J&A) has been prepared and authorized. If any portions of the DA are included in the solicitation, then all proprietary or brand-specific information that is not covered by a J&A must be removed prior to its inclusion in the solicitation. Proprietary information may be included in updates to the DA provided to the contractor after contract award.

1–7. Drawings

A drawing is a static graphic representation of design content formatted as a two-dimensional sheet. Refer to Chapter 3 for detailed drawing requirements.

a. Preparation. Prepare drawings according to the latest version of the Architecture/Engineering/Construction (A/E/C) Graphics Standards (ERDC/ITL SR-23-1) and A/E/C Computer-Aided Design (CAD) Standard (ERDC/ITL TR-19-7).

b. Standard drawings. Standard drawings are drawings that are not created for a specific project and are available to be adapted with project-specific information. They are not contract documents or project drawings in terms of this regulation. They include the following drawing types:

(1) Adapt-build drawings provided by a Center of Standardization (COS).

(2) Non-government standard drawings.

c. Drawing types. Project drawings include the following drawing types:

(1) Parametric drawings and sketches (see AR 420-1).

(2) Concept drawings (see AR 420-1).

(3) Design drawings.

(4) Construction drawings, also known as solicitation or contract documents.

(5) Amendment drawings.

(6) Conformed drawings.

(7) Modification drawings.

(8) Shop drawings.

(9) Record and as-built drawings.

d. Drawings prepared by the contractor. This regulation does not govern drawings prepared by the contractor in fulfillment of construction responsibilities such as shop drawings, record drawings, or as-built drawings.

1–8. Specifications

A specification is a written document describing in detail the scope of work, materials to be used, and quality of workmanship for work to be placed under contract. Refer to Chapter 4 for detailed specification requirements.

a. Preparation. Prepare specifications according to Unified Facilities Supplements (UFS) 1-300-02 and Chapter 4.

b. SpecsIntact. The use of SpecsIntact and the Unified Facilities Guide Specifications (UFGS) database is mandatory for production of all project specifications, except for overseas projects designed to host nation standards.

1–9. Minimum submittal requirements by phase

Refer to Chapter 5 for minimum submittal requirements by phases. Project teams may modify the minimum submittal requirements to align with project scopes. Project teams must record the minimum submittal requirements by phase in the Quality Management Plan (QMP) as part of the PMP, per EM 5-1-11.

Chapter 2
Design Analysis Requirements

2–1. General

This chapter prescribes the requirements for the preparation and approval of the DA. It applies to DAs prepared at all phases of design. For detailed requirements related to quality control reviews of the DA, refer to ER 1110-3-12.

a. For design-bid-build (D-B-B) projects, prepare a DA for the following submittals for all applicable projects: parametric design (5% to 15%), concept design (35%), interim design (65%), final design (95%), corrected final (100%), and ready to advertise (RTA).

b. For design-build (D-B) request for proposals (RFP) prepare a DA for the following submittals for all applicable projects: draft RFP, final RFP, corrected final RFP, and RTA RFP.

c. This regulation does not describe submittals by the D-B construction contractor.

d. Refer to AR 420-1 for more information on design codes.

e. Develop the DA in coordination with the installation and stakeholders.

f. Prepare the DA in a format appropriate for:

(1) Review, approval, and recordkeeping purposes.

(2) Coordination of design modifications during construction.

(3) Incorporation of stakeholder requirements documentation from the PMP.

(4) Use of Owner’s Project Requirements (OPR) documentation for commissioning and sustainability purposes.

(5) Operations and maintenance (O&M) purposes.

(6) Post-occupancy evaluation.

g. The information provided in this chapter is geared toward typical military construction (MILCON) projects and can be adapted for all other project types, or as needed by project teams to align with project scopes.

2–2. Organization and content

The DA is organized into three parts: Part 1 – General Description,
Part 2 – Design Requirements and Provisions, and Part 3 – O&M Provisions.

a. Part 1: General description. Organize Part 1 to facilitate coordination with stakeholder requirements documentation in the PMP and with OPR for commissioning. Include the Table 2-1**.** components in Part 1 of the DA as well.

Table 2-1
General description design analysis components

Component	Description
Purpose	State the functional purpose.
Authorization and directives	Include applicable design directives. Describe the ownership of the facility, site, and installation, and describe the stakeholder structure identifying decision-making responsibilities and the authority having jurisdiction.
Scope of work	Include the Department of Defense “DD” Form 1391, current working estimate (CWE), planning charrette documents, and other governing scoping documents, when available, as attachments in the appendices. Include the record of decision or other decision document for hazardous, toxic, and radioactive waste (HTRW) projects.
General criteria	List of overarching criteria that apply to the facility and site design. Refer to UFC 1-200-01 for applicability of the latest UFCs. Refer to the appropriate UFCs for applicable standard/code versions.
Project description	Include the functional objective, performance requirements, personnel and equipment, facility operational requirements, constructability, master plan compliance, economic summary, and accessibility.

b. Part 2: Design requirements and provisions. Include subparts for each major design discipline and basic project design requirements with justifications for the design decisions, assumptions, feature and system narratives, and calculations applicable to the project.

(1) *Environmental*. Include the Table 2-2 components in the Environmental DA as applicable to the scope of work.

Table 2-2
Environmental design analysis components

Component	Description
Environmental impact assessment	Include an environmental impact assessment checklist covering air, water, and noise effects from the project and construction.
Health and Safety	Describe requirements for worker health and safety specific to a project or location.
Hazardous, toxic, and radioactive waste (HTRW)	Provide HTRW assessment, remediation cleanup, and action levels. Include all applicable regulatory, chemical sampling/analytical, safety and occupational health, geotechnical, cost engineering, and process engineering provisions and criteria required by EM 200-1-2.
Transportation and disposal	Provide transportation and disposal regulation requirements.
Chemical sampling/analysis	Describe quality control for chemical sampling/analysis.

Component	Description
Wetlands	Provide wetlands determination (tidal and non-tidal), special wildlife, plant, and endangered species considerations.
Water protection	Provide groundwater, waterway, and floodplain protection assessment.
Pollution prevention	Provide pollution prevention control requirements and design measures to be implemented (such as construction site sediment and erosion control requirements by federal, state, and local governments).
Permits	Describe required hazardous material management, natural and cultural resources, and environmental permits.

(2) *Geotechnical*. Include the geotechnical data report, regional and site-specific geology, groundwater elevations, geotechnical data, seismic design parameters, geotechnical design considerations, foundation and earthwork recommendations, soil infiltration rates, pavement design, soil corrosivity and conductivity, geotechnical engineering analysis, and special site considerations.

(3) *Civil*. Include survey data, site design, antiterrorism site requirements, site improvements, pavement design, grading and drainage, low-impact development, water, wastewater, permits, contaminant containment, utilities systems analysis and design, and provisions for airfields, ports, and railroads, if required.

(4) *Landscape*. Include planting and landscaping, hardscape, irrigation systems, site furnishings, natural resource mitigation, and recreational site features.

(5) *Structural*. Include overall discussion on applicable codes and standards, building structure, structural materials, structural load path, loading criteria (gravity loads, lateral loads, and environmental loads), risk category, foundation design criteria, retaining walls, identification of any deferred design elements, and any special design requirements such as seismic, tornado, hardened structure design, vibration, progressive collapse, and conveying equipment. Include analysis of all code-compliant major structural materials, including at least one option where mass timber is a substantial structural component, and a justification for the structural system selected.

(6) *Architectural*. Include the Table 2-3 components in the Architectural DA.

Table 2-3
Architectural design analysis components

Component	Description
General Criteria	List all criteria that apply to architectural design. Refer to UFC 1-200-01 for applicability of the latest UFCs. Refer to the appropriate UFCs for applicable standard/code versions.
Scope of work	Summarize the architectural program or scope of work, listing the overall square footage, the functional requirements of the facility, and a tabulation of rooms with square footages of each space.
Type of construction	Describe the type of construction selected and justify its use relative to building permanency, life cycle cost, functionality, and fire resistance.

Component	Description
Gross floor area calculations	Provide a tabulated breakdown of the net and gross programmed areas to confirm project scope and statutory criteria compliance. Provide a supplemental drawing keyed to the area tabulation.
Accessibility	Describe accessibility features included in the project. If a partial or full exclusion to accessibility requirements has been or is being pursued, indicate proper documentation and the status of the exclusion.
Architectural compatibility	Identify the design guidelines that pertain to this project and describe how the proposed design incorporates these guidelines. Discuss the approach to achieving architectural compatibility with other surrounding architecture according to the installation exterior architectural guidelines. Exterior color boards are required for all projects. For all other service projects, refer to service-specific facilities standards and applicable installation facilities standards.
Roof system selection	Indicate the construction of the roof, roof membrane selection, substrate, roof slope, and roof drainage system.
Energy conservation	Identify the American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE) Standard 90.1 climate zone and describe the types of insulation to be provided including specific “U” values for the wall, roof, and floor construction. Provide a description of all architectural energy conserving and generating features, including any passive solar systems. Discuss air barrier components and testing requirements. Provide a moisture vapor analysis.
Security requirements	Describe the physical security or hardening requirements such as controlled access, sensitive compartmented information facility (SCIF), and secure room requirements that will be used in the design.
Antiterrorism	Describe the occupancy of the facility, if the facility is within a controlled perimeter, and what the standoff distances will be. Include sketches as required to depict the site of the project and standoff distances. Include a summary of how the facility meets each of the applicable Standards in UFC 4-010-01 and geographic combatant commander antiterrorism construction standards. Outline any special requirements, including any requirement for hardening of the facility.
Architectural acoustics	Identify design team members responsible for the acoustical engineering. Provide a detailed identification of conditions, materials, or features that will impact the acoustic design of the project. Describe testing, mock-up, commissioning, and quality control processes.
Sustainable design	Include the architectural narrative related to sustainable design features in the “Sustainable Design” chapter. Describe the overall sustainability and energy performance of the project, with the architectural portion leading the process of compliance.
Doors and windows	Indicate the types of doors and windows selected for the project and explain the basis for their selection. Indicate special door requirements such as sound transmission class (STC) ratings, cipher locks, and special window requirements such as outdoor-indoor transmission class ratings.
Demolition or deconstruction	Describe the extent of any architectural demolition or deconstruction and items to be salvaged.

Component	Description
Special construction features	Describe the special construction features built into the facility.
Commissioning	Identify architectural systems scheduled for commissioning as required by the commissioning plan.

(7) *Interior design*. Include the Table 2-4 components in the Interior Design DA.

Table 2-4
Interior design analysis components

Component	Description
General criteria	List all criteria that apply to interior design. Refer to UFC 1-200-01 for applicability of the latest UFCs. Refer to the appropriate UFCs for applicable standard/code versions.
Space utilization	Describe the BOD as it relates to the user's requirements and building design.
Wayfinding	Describe the BOD and wayfinding elements used as it relates to the user's requirements and building design. Describe architectural, building-related finish, and signage strategies used in the overall wayfinding plan.
Structural interior design (SID)	Describe the BOD, building-related finishes, and furniture floor plan development and features as it relates to the user's requirements and building design. Include topics that relate to installation standards, life safety, aesthetics, durability, and maintenance. A SID binder must be provided as an appendix. Reference 2–2.d(6) for detailed SID binder requirements.
Furniture, fixtures, and equipment (FF&E)	Describe the design objectives as they relate to the selection of furniture, finishes, and colors; the furniture plan development and features; and how project-specific requirements are met. Identify the procurement method and format of FF&E package government furnished government installed (GFGI), contractor furnished contractor installated (CFCI), government furnished contractor installed (GFCI) or a combination. Include design decisions made to fully coordinate the SID and the FF&E design, including function, safety and ergonomic considerations, durability, sustainability, and aesthetics. As required, the FF&E package must be provided as an appendix. Reference 2–2.d(7) for detailed FF&E package requirements.

(8) *Fire protection and life safety*. Projects requiring the services of a qualified fire protection engineer (QFPE) must have a fire protection DA that includes the components listed in Table 2-5. Provide both the code requirement and the proposed design as part of any building code or life safety analysis.

Table 2-5
Fire protection design analysis components

Component	Description
General criteria	List all criteria that apply to fire protection. Refer to UFC 1-200-01 for applicability of the latest UFCs. Refer to the appropriate UFCs for applicable standard/code versions.
Specific hazards	Identify hazardous areas (such as chemicals, fuels, and ordnance) with maximum allowable quantities allowed and quantities that will be stored, processes, and special hazards or features requiring special fire protection considerations, such as radio frequency shielded rooms, secured rooms, computer rooms, and commercial kitchen appliances. Provide relevant information pertaining to the hazards and how they are protected.
Summary of fire protection features	Provide a summary of the active and passive features of fire protection. Provide a description and identify the location of new and existing fire extinguishing systems, detection systems, fire alarm systems, or fire pumps to be provided or existing systems to remain or be modified.
Summary of existing conditions	Provide a summary of existing conditions impacting the project, such as existing detection/suppression systems or existing building construction features.
Summary of design enhancements	Identify items in excess of the contract, criteria, or code requirements.
Building code analysis	Include the following information on occupancy classification; mixed use and occupancy separation, height and area calculations (area per floor and total); type of construction; required building separation or exposure protection; rating of structural components; description of construction; whether rated floor and roof assemblies are restrained or unrestrained; and interior fire or smoke rated wall/partition requirements, fire rating of each floor, ceiling system, and roofing system when applicable. Discuss if and how the proximity to, and classification of, adjacent structures factors into the analysis. A summary fire protection and Life Safety Code ® review must be provided as an appendix. Reference 2–2.d(9) for detailed requirements.
Life safety code analysis	Identify occupancy classification; total occupant load; capacity of mean of egress, number of exits; type of exits; exit travel distance; total exit width; common path of travel; illumination of means of egress, emergency lighting, marking of means of egress classification of interior finishes; location of fire-rated walls and partitions; and opening protection, special hazard protection, and other applicable provisions of National Fire Protection Association (NFPA) 101. A summary fire protection and life safety code review must be provided as an appendix. Reference 2–2.d(9) for detailed requirements.
Water supply analysis	Provide a summary of the data obtained from the water flow test and provide a determination of the adequacy of the water supply (even for facilities without sprinkler protection), along with sketches of the water distribution system. If fire flow demands cannot be met, cite the deficiencies and recommend design alternatives/solutions to correct the problem of an insufficient water supply (such as fire pump(s) or water storage tank(s)).

Component	Description
Fire pump(s)	Provide information regarding project site reliable power. Provide fire pump(s) flow and pressure requirements, locations, construction enclosure, fire pump, and fire pump controller maintenance access.
Water storage tank	Indicate water storage requirements including capacity, type of storage tank, and storage tank monitoring.
Adequacy of water supply for fire protection	• Pre-award design services: If the water supply analysis determines that the water supply cannot support the anticipated hydraulic fire flow or fire sprinkler demand, contact the District Fire Protection Engineer (DFPE), as defined in UFC 3-600-01 as soon as possible. Provide appropriate supporting calculations and propose design options or alternatives for consideration. • Post-award design/construction services: Design assumptions must be based on the water supply data cited in the solicitation. This data must be used as the basis for fire flow and sprinkler design even if flow testing performed by the QFPE or sprinkler subcontractor reveals more favorable results. If flow testing performed by the QFPE or sprinkler contractor reveals flow/pressure less than that specified, immediately submit a request for information (RFI) citing the concern. Provide supporting information and calculations to substantiate the claim and request clarification or direction.
Fire suppression system	Describe the area(s) that will be protected, the hazard classification of these area(s), and the type of system protecting these area(s). For sprinkler systems, describe the design density, demand area, and hose stream allowance to be specified for each different area. Describe the method for connecting the suppression system to the fire alarm system, as well as the method of annunciating the systems, and a description of power disconnects or pre-alarms, that are required. Where appropriate, provide sketches representing the water distribution system, sprinkler demand areas, and show hydraulic reference points for the hydraulic sprinkler calculations.
Fire alarm/mass notification system(s)	Describe what type of initiation devices and notification appliances will be provided for all areas. Identify areas that may have challenging features that will make it difficult to achieve intelligibility requirements. Provide information for connecting to the base-wide fire reporting system and the base-wide mass notification system. Provide drawings or sketches. Provide detailed information on existing fire detection and suppression systems for existing buildings (examples: type of systems; area of coverage; make and model of equipment; and why system is or is not being replaced). For fire alarm systems, provide the following information (at a minimum): number of spare zones and spare spaces for modules, capacity of control panel(s), list of existing fire alarm zones, list of outputs, number of audio/visual (AV) circuits, and standby battery capacity. Indicate the working order of each system (condition or status).

(9) *Mechanical*. Include heating, ventilation, and air conditioning (HVAC) systems; dehumidification and humidification systems; special ventilation or exhaust systems; plumbing systems; interior roof drainage; special piping systems (such as acid waste, chemical, compressed air, vacuum, medical gases, and lubrication); gas distribution; exterior mechanical utilities (such as chilled water, hot water, and steam); design temperatures; utility rates; refrigeration; air pollution control; noise and vibration control; fuel storage and dispensing; radon mitigation; controls; utilities monitoring and control system (UMCS); mechanical utility metering; and process systems design. System descriptions must include rationale and justification for equipment and system selection and information about materials and sizes. Include the Table 2-6**.** components in the Mechanical DA as well.

Table 2-6
Mechanical design analysis requirements

Component	Description
General criteria	List all criteria that apply to mechanical design. Refer to UFC 1-200-01 for applicability of the latest UFCs. Refer to the appropriate UFCs for applicable standard/code versions.
Exterior mechanical utilities	Describe exterior mechanical utilities such as hot and chilled water distribution, steam distribution, condensate recovery, and gas and fuel distribution and storage including capacities.
Existing conditions	Describe existing conditions for renovation or rehabilitation projects.
Climatic design conditions	Provide climatic design conditions including, but not limited to, design temperatures and humidities, degree days, and climate zone.
Interior design conditions	Provide interior design conditions including, but not limited to, building population including male to female ratio; design temperatures and humidities; ventilation and exhaust; hazardous pollutant sources and target concentrations; personnel occupant capacity and operating schedule information; and internal heat gain information such as from lighting, equipment, and personnel heat release.
Heat transmission values	Provide heat transmission values for building envelope components.
Alternative systems	Describe alternative mechanical system and energy-conserving and recovery features analyzed. Describe considerations for fuel sources, energy performance, life cycle cost analyses, passive design, sustainability, and environmental impact considered during life cycle cost analyses (LCCA). Provide a final energy optimization and LCCA report as an appendix. Reference 2–2.d(15) for detailed requirements.
Mechanical systems	Describe design mechanical systems including all major features and equipment, how the systems will work, capacities, connection to utilities, antiterrorism measures, seismic design measures, redundance and standby systems, vibration and noise control, system expandability and flexibility, enhancements to support operations and maintenance, and associated control systems.
Special provisions	Provide special provisions for balancing HVAC systems.

Component	Description
Control systems	Describe integration of mechanical control systems with building control systems and UMCSs.

(10) *Electrical*. Include power generation, backup power system, generators, transmission and distribution systems, lighting (interior and exterior), wiring methods, intrusion detection, cathodic protection, grounding, lightning and static electricity protection systems analysis and design, aviation lighting, metering, and electromagnetic protection.

(11) *Telecommunications*. Include overall discussion on interior and exterior telecommunication systems and services, to include telecommunication rooms, network and voice equipment, cabling and cabling infrastructure, network classifications, audio communications, video communications, outlets and terminations, pathways, grounding and bonding, cable television system, and calculations.

(12) *Conveying equipment*. Include the Table 2-7 components in the Conveying Equipment DA.

Table 2-7
Conveying equipment design analysis requirements

Component	Description
General criteria	List all criteria that apply to conveying equipment design. Refer to UFC 1-200-01 for applicability of the latest UFCs. Refer to the appropriate UFCs for applicable standard/code versions.
Type of conveying equipment	Describe type of conveying equipment provided in facility design including elevators, lifts, crane, hoists, etc. Describe the functional requirements resulting in the selection of the type of equipment, required capacity, rated speed, etc.

(13) *Physical security*. Include access control systems, fencing, vaults, protective lighting, security systems, locks, arms rooms, entrances, guard facilities, classified material storage requirements per AR 380-5, patrol roads, clear zones, restricted areas, surveillance, and penetration resistance.

(14) *Cybersecurity*.

(a) The design and installation of the following systems must be in accordance with UFC 4-010-06, UFS 4-010-06, and use UFGS 25 05 11 as the basis for project specifications:

1. Networked Facility Related Control System (FRCS) Control Systems
2. Networked non-FRCS Control Systems
3. Networked low-voltage systems that will integrate to a control system

(b) Additional cybersecurity requirements may be added to meet specific project needs provided those requirements align with the “designer” categorization defined in UFS 4-010-06. Implementation of cybersecurity controls or requirements beyond those that create a functional or documentation requirement for the system are not the responsibility of the designer or construction contractor.

(c) Include scope of design, control systems, system owner (SO) information, authorizing official, communication transport, known authority to operate (ATO) status if any, how the confidentiality, integrity, and availability (C-I-A) was derived, the level of control system work, and connection to base wide platforms. Include a high-level/notional diagram showing major components and connectivity. Cybersecurity design documentation must meet the requirements of UFC 4-010-06 and other applicable supplements or manuals.

(15) *Sustainability*. Include project sustainability requirements according to UFC 1-200-02 and a narrative for how the project is meeting all requirements. Include the Table 2-8 components in the Sustainability DA as well.

Table 2-8
Sustainability design analysis components

Component	Description
General criteria	List all criteria that apply to sustainability. Refer to UFC 1-200-01 for applicability of the latest UFCs. Refer to the appropriate UFCs for applicable standard/code versions.
High Performance Sustainable Buildings (HPSB) Guiding Principles	If the project meets the threshold established in UFC 1-200-02 for HPSB Guiding Principles compliance tracking and reporting, include the checklist and a detailed narrative for how the project is achieving HPSB Guiding Principles.
Third-party certification (TPC)	If the project meets the threshold established in UFC 1-200-02 for third-party certification, include the checklist and a detailed narrative for how the project is achieving the required TPC.
Sustainable design elements	Provide narrative related to federal building performance standards, decarbonization approaches, use of sustainable materials, and all supporting energy models and LCCA.

(16) *Commissioning*. Include project commissioning requirements to meet requirements of UFC 1-200-02 and ER 1110-345-723. Include the Table 2-9 components in the Commissioning DA as well.

Table 2-9
Commissioning design analysis components

Component	Description
General criteria	List all criteria that apply to Commissioning. Refer to UFC 1-200-01 for applicability of the latest UFCs. Refer to the appropriate UFCs for applicable standard/code versions.

Component	Description
Third-party certification	Describe the third-party certification requirements related to commissioning.
List of systems	Provide a list of systems to be commissioned.
Commissioning leadership structure	Identify the Government Commissioning Specialist (CxG) and Design Phase Commissioning Specialist (CxD). Indicate whether a third-party contract will be used to hire or supplement the CxG role. Identify the commissioning authority for leadership in energy and environmental design Leadership in Energy and Environmental Design (LEED) purposes.

(17) *Cost and economic analysis*. Include CWE, program budget limitations, analysis of potential economic impacts and risks, and cost schedule risk analysis (CSRA).

c. Part 3: Operations and maintenance provisions. Describe the design provisions made to enhance and to reduce the cost of operating and maintaining the facility. This section may be omitted if not applicable to the DOR's scope during design. During construction, the construction contractor will include this as applicable and per UFGS 01 33 16.00 10, which is outside the scope of this regulation.

(1) Include the O&M design intentions for the major design disciplines covered in Part 2.

(2) Format this part of the DA so that it can be used separately to supplement required project closeout records, or to form the basis for assembling a facility user's manual.

d. Appendices. Include appendices as appropriate for design calculations, data, analysis, reports, meeting minutes, supplemental information, and the engineering considerations and instructions for field personnel (ECIFP). All calculations must be legible, orderly and easily understood. For computer generated calculations, provide the software program name, version and source used to produce each computer output or report. The following items must be included as appendices to the DA.

(1) DD Form 1391 and design directives.

(2) Cost estimate and risk register.

(3) Geotechnical and environmental data reports.

(4) Civil calculations.

(5) Architectural BOD cutsheets and calculations. Include cut sheets of pertinent items specific to the project used as a BOD for coordination purposes. Provide the architectural calculations outlined in Table 2-10.

Table 2-10
Architectural calculation and documentation requirements

Calculation	Description
Net and gross area	Provide net and gross area calculations in line with UFC 3-101-01.
Scupper, gutter and downspout sizing	Provide calculations indicating size, type, and number of scuppers, gutters, and downspouts for adequate roof drainage in line with UFC 3-110-03.
Cutsheets	Provide BOD cut sheets for all architectural features that have a significant impact to the overall building design.

(6) Structural interior design (SID) binder. Provide a physical and digital SID binder. The physical binder must display actual interior finish color samples proposed for the project; the digital binder must include high resolution images of finish samples. Include the Table 2-11**.** components in the SID binder as well.

Table 2-11
Structural interior design requirements

Component	Description
Cover sheet	Include the following information on the cover page: • Structural interior design • Design stage • Date • Design firm • Project title • Project number • Project location • Volume number
Table of contents	Provide a table of contents.
Color boards	Provide physical and digital interior and exterior finish samples proposed for the project. Samples should be identified and keyed to the item numbers included in the finish legend on the contract documents.

(7) Furniture, fixtures, and equipment (FF&E) package.

(a) USACE standard FF&E nomenclature. Utilize the Standard FF&E Nomenclature document when tagging and cataloging FF&E items regardless of procurement method.

(b) Government furnished; government installed (GFGI) furniture packages. FF&E is procured outside of the construction contract by the government.

1. *Huntsville Center Furnishings Program*. All Army MILCON, Sustainment Restoration and Modernization (SRM), Initial Issue and Replacement Unaccompanied Housing (UH) FF&E procurements are centrally administered through the Huntsville Center (HNC), per Installation Management Command

(IMCOM) narrative funding guidance. The HNC Furnishings Program supports all Department of Defense (DoD) components. Refer to the HNC Furnishings Program MRSI Website for furniture construction standards, additional information, and contacts. For a list of approved items for procurement through HNC, refer to HNC Centralized Furnishings Program – Ancillary Items Authorized for Procurement Matrix.

2. *Agency specific GFGI FF&E package*. Refer to agency specific guidance for FF&E package requirements.

3. *Format.* Provide a physical and digital copy of the FF&E binder. The physical binder must display actual FF&E samples proposed for the project; the digital binder must include high resolution images of finish samples. Include the Table 2-12 components in the FF&E package as well.

Table 2-12
Furniture, fixtures, and equipment package requirements

Component	Description
Cover sheet	Include the following information on the cover page: • Furniture, fixtures, and equipment • Design stage • Date • Design firm • Project title • Project number • Project location • Volume number
Table of contents	Provide a table of contents.
Point of contact list	Provide a points of contacts (POC) list to include appropriate project team members, user contacts, interior design representatives, contractors and installers involved in the project. Include each contact's name, address, phone number, email, and job description.
Itemized furniture cost estimate	Provide an itemized cost estimate of furniture keyed to the plans and the data sheets. Organize the estimate by furniture item code and item name so the estimate can also be used as the item code legend. Base the estimate on applicable pricing. The estimate must include percentage allowances for general contingency, shipping, inflation, and installation costs, listed as separate line items. Consult with the government interior designer for any additional costs to be included. Installation and freight quotes from vendors should be used in lieu of a percentage allowance when available.
Item code legend	Provide a consolidated list of all FF&E items in the package with the item code and name of each item. Organize item codes by product category such as workstations, seating, and tables.

Component	Description
Item installation list	The item code legend may be expanded for use as an item installation list. Indicate quantity per room, model number, and manufacturer of each furniture item.
Data sheets	Prepare one data sheet for each item specified in the design. The data sheet identifies all information required to order each item. Ideally, information is presented on one page; however, a second page may be used for additional detailed specifications. Indicate open market justifications and any other critical procurement information. Organize data sheets by product category and key to the item code legend. Include the following on the data sheet: • Item code and name • General Services Administration (GSA) Schedule Information: Federal Supply Category (FSC) group and part number and special item number (SIN); GSA contract number and expiration date; and GSA contractor name, ordering address, phone number, and email or website • Federal Stock information (if applicable) • Product specification information including manufacturer's item name, series, model number, dimensions, and description including minimum quality standards, construction materials and methods, configuration, features, options, warranty, and critical dimensions • Finish and fabric information coded to the finish samples • Illustration that is close to the actual item specified or it must be noted as representative or similar • Quantity by room number and name • Total quantity of items • Special instructions for ordering such as packaging information, mounting height, and installation coordination notes • Interior design source contact, whether it be the A-E interior designer or the government interior designer • Two alternates for each item to ensure multiple manufacturers can meet the BOD
Furniture and finishes material samples	Provide finish and fabric samples keyed to the item codes and names used on the data sheets and the furniture plans. Use photographs or color photocopies of materials or fabrics to show large overall patterns in conjunction with samples to show the true colors. Samples must be large enough to show a complete pattern or design where practical.
Drawings	Include furniture plans, systems furniture plans, and artwork placements plans in the FF&E package. Reference paragraph 3–12 for detailed interior design drawing requirements.

(c) Contractor furnished; contractor installed (CFCI) furniture packages. FF&E is provided as a part of the construction contract within performance specifications.

1. *FF&E criteria*. Provide non-proprietary, project-specific salient characteristics for all items specified in the FF&E package.

2. *Format.* Provide a physical copy of the FF&E finish samples only. The physical samples must display actual FF&E samples proposed for the project. Samples may be provided in a binder or as loose samples. Refer to Table 2-12 for coversheet and furniture and finish sample requirements.

(8) Structural calculations.

(9) Fire protection and life safety. Provide the life safety and fire protection calculations and code analysis outlined in Table 2-13**.** and in line with UFC 3-600-01.

Table 2-13
Fire protection and life safety calculation and documentation requirements

Component	Description
Fire flow data	Provide fire flow test results in line with UFC 3-600-01.
Hydraulic demand analysis	Using computer program-generated hydraulic calculations, calculate the "anticipated" demand of a facility to validate the adequacy of the available water supply or to establish the minimum water supply required. Refer to UFC 3-600-01 for hazard classifications and design criteria determination. The proposed piping layout must accompany the hydraulic sprinkler calculations included with the fire protection calculations submittals. Plot the available water supply versus the hydraulic demand on the Q1.85 hydraulic graph paper.
Summary fire protection and life safety code review	The summary fire protection and life safety code review includes both the building code analysis and life safety code analysis. Reference UFC 3-600-01 for all requirements of summary fire protection and life safety code review. Utilize the fire protection and life safety code review template in the Whole Building Design Guide (WBDG) resource library (https://wbdg.org/ffc/army-coe/resource-library) for compliance with UFC requirements. The summary fire protection and life safety code review must also appear on the fire protection and life safety drawings. Reference paragraph 3–13 for detailed requirements.

(10) Mechanical and plumbing. Methodology, assumptions, conditions, and data sources must be apparent or explicitly stated for all calculations outlined in Table 2-14.

Table 2-14
Mechanical and plumbing calculation and documentation requirements

Component	Description
Calculations	Include calculations for sizing for all equipment items and distribution systems, distribution system pressure drop calculations, building envelope heat transmission values, pipe stress, liquid and piping material expansion, ventilation and exhaust, building air balance and pressurization, and noise and vibration analyses.
Plumbing fixture calculations	Provide calculations that indicate the required number of plumbing fixtures for the facility for all people in line with UFC 3-420-01. The number of fixtures must be based on occupancy type and number of building occupants as calculated for NFPA 101.

Component	Description
Computerized heating and cooling load calculations	Provide computerized heating and cooling load calculations with input and outputs organized so that each space, zone, system, item of equipment, and building component is correlated with identifiers on plans and easily identifiable. Bookmark each input and output report.
Psychrometric calculations	Proved psychrometric calculations for each air-conditioning process showing all process points on psychrometric charts. Provide system schematics indicating state point dry-bulb and wet-bulb temperatures (or humidity ratios) for the outdoor, mixed, supply, and return airflow streams. Also demonstrate capability to condition ventilation air and maintain space relative humidity design conditions over the full range of cooling loads including part-load.
Floor plan diagram	Provide a floor plan diagram showing and identifying HVAC zones.
Air flow diagrams	Provide air flow diagrams showing supply, return, relief, exhaust, ventilation, and transfer flow throughout the system including air flow volumes, flow direction, and equipment labels.
Cutsheets	Provide BOD cut sheets for all mechanical and plumbing equipment to support calculations.

(11) Electrical BOD cutsheets and calculations.

(12) Telecommunication calculations.

(13) Cybersecurity.

(14) Sustainability. Provide third-party certification checklists and high performance and sustainable building (HPSB) tracking and reporting checklists in line with UFC 1-200-02. USACE-specific HPSB compliance tracking checklists can be found on WBDG at https://www.wbdg.org/dod/sustainability/tracking-reporting.

(15) Energy optimization and LCCA. Provide energy and water optimization and LCCA reports and energy compliance analyses in line with UFC 1-200-02 and ER 1110-1-8173.

(16) Commissioning OPR and BOD. Provide OPR and BOD Commissioning (Cx) in line with ER 1110-345-723.

(17) Design phase commissioning plan.

(18) Value engineering (VE) study. Include a record copy of any VE studies conducted as part of the design process. This documentation should include a summary of all proposal items and if proposals were accepted and incorporated in the final design.

(19) Project correspondence. Include digital copies of all significant project correspondence, which would include design directions, decisions and approval of the design directions and design; correspondence associated with scope, schedule, or

budget changes; and critical information from project stakeholders that influence the design.

(20) Engineering considerations and instructions for field personnel. The DOR must prepare an ECIFP as a transition document from engineering to construction. The document must provide insight and background necessary for construction personnel to conduct quality assurance (QA) oversight, review submittals, and resolve minor construction problems without compromising the design intent. The document should not duplicate extensive information included in the DA. The document will be augmented by briefings and instructional sessions as required. A sample ECIFP is available in the WBDG Resource Library. The ECIFP must outline the following:

(a) Engineering considerations used to make design decisions.

(b) Communicating unique, critical, and/or atypical aspects of the design and contract documents.

(c) Discussions on the intent and why specific design decisions were made.

(d) Why certain systems or materials were selected.

(e) Any features requiring special attention (such as long lead items, extensions of design, extraordinary quality specifications, unique testing, and permits).

(f) Critical submittals for review and identification of reviewer.

(g) Document milestones for subject matter expert or DOR participation in field oversight.

(21) Advanced modeling project execution plan (PxP). The DOR must prepare an advanced modeling PxP. Download the latest template from the USACE CAD/BIM Technology Center website.

2–3. Preparation

a. Format. All DA deliverables must be in portable document format (PDF) unless otherwise specified. PDF files must be text searchable, and documents must include a table of contents with page numbers. Include bookmarks for all major sections in the table of contents, at minimum.

b. Classified material. Prepare the DA as an unclassified document with proper references to sources of classified material.

c. Design calculations. Design calculations will be computed following all code and criteria requirements and checked for accuracy following the QMP per ER 1110-3-12.

d. Use of existing DA. If a standard design or other design is being site adapted, the DA for the new project will include appropriate material from the existing DA modified to incorporate site adaptations and other essential requirements.

2–4. Review and approval

Review and approval of DA will coincide with the review and approval of the project drawings and specifications. For detailed requirements, refer to ER 1110-3-12.

a. For D-B-B projects, review and approval steps will include:

(1) Parametric design phase (5% to 15%). The general summary statement will comply with AR 420-1.

(2) Concept design phase (35%). The DA will cover the progress of all the design disciplines (refer to Part 2).

(3) Interim design phase (65%). All parts of the DA will continue to be developed from the concept design phase.

(4) Final design phase (95%). All parts of the DA will be complete. Approval of final design drawings and specifications will be done concurrently with the review and approval of the final DA.

(5) Corrected final design phase (100%). Back check all comments from the final design and incorporate revisions as necessary to address all previous review comments.

(6) RTA. All review comments will be resolved and incorporated into the RTA DA and kept for recordkeeping purposes.

(7) Drawing modifications. When modifications of project drawings are authorized, the changed conditions may be added to the DA and the revision date or dates noted.

b. For D-B RFP (based on parametric or concept design), the review and approve process will include the following documents:

(1) Draft RFP. Initial DA covering the progress of all the design disciplines (refer to Part 2).

(2) Final RFP. All parts of the DA will be complete. Approval of final RFP concept design drawings (Division 00 and Division 01 specifications) will be done concurrently with the review and approval of the final DA.

(3) Corrected final RFP. Back check all comments from the final RFP and incorporate revisions as necessary to address all previous review comments.

(4) RTA RFP. All review comments will be resolved and incorporated into the RTA DA and kept for recordkeeping purposes.

2–5. Disposition and reference copy

The final DA with revisions and the as-awarded drawings will be transferred to the using service after contract award. A reference copy of the DA will be retained by the executing District and by the design agency, if different, for use in adapting the project design to another site or in evaluating lessons learned.

Chapter 3
Drawing Requirements

3–1. General

This chapter prescribes the requirements for the preparation and approval of drawings. It applies to design drawings prepared at all phases of design and construction, other than drawings prepared by the contractor during construction, such as shop drawings, record drawings, or as-built drawings, which are outside the scope of this regulation. For detailed requirements related to quality control (QC) reviews of drawings, refer to ER 1110-3-12.

3–2. Project drawings

a. Project acquisition and delivery method. The following guidance follows design phases for D-B-B execution. For D-B RFP preparation, the final RFP documents are based on approved concept or parametric designs; therefore, the project drawings should follow the guidance for parametric or concept design outlined below to the level appropriate for D-B. Concept drawings will be attached to UFGS 01 11 00 for D-B RFPs.

b. Parametric design – 5% to 15%. Parametric design incorporates the following information:

(1) Preliminary sketches of the site plan showing project features such as proposed buildings, roads, and parking.

(2) Predesign level functional relationship diagrams showing the functional space arrangements and required program.

(3) Review of existing geotechnical and survey data to identify probable utility connection points and identification of unusual requirements that will significantly influence the cost.

(4) Permanent stormwater management best management practices.

(5) Site inventory and analysis.

c. Concept design drawings – 35%. Concept designs are used to define the functional, technical, architectural, and engineering aspects of a project and to help verify project costs to provide a firm basis on which to initiate the final project design. Concept design drawings typically include the following information:

(1) Fire protection plan.

(a) Provide code compliance summary sheets.

(b) Provide building site code compliance plans.

(c) Life safety floor plan. At a minimum, identify building areas having different occupancy and hazard classifications and identify egress travel requirements.

(d) Fire suppression plans. At a minimum, provide floor plans and identify hazard classifications. Where a facility has multiple hazard classifications, differentiate each classification area by border or hatching. Identify areas to be protected with special fire suppression systems.

(e) Fire alarm and mass notification plans. At minimum, provide plans that include notification and detection areas of protection to indicate required coverage.

(2) Geotechnical investigation results, boring data, subsurface soil classification and profiles, allowable soil bearing capacity, groundwater elevations, etc.

(3) Project site plans showing existing and proposed buildings, roads, parking, landscape planting masses, contours, the utilities in the immediate vicinity of the project, and applicable removal and demolition.

(4) Foundation plans and preliminary framing plans.

(5) Diagrammatic air barrier plans and sections indicating the location of the air barrier envelope on all building surfaces.

(6) Preliminary building floor plans, reflected ceiling plans, roof plans, building sections, wall sections, and exterior elevations showing the overall building dimensions and heights, functional layout, space configuration and form, and exterior materials, including walls, glazing, soffits, and roofs.

(7) Enlarged floor plans of specific areas where more detail is required to explain design relationships or function.

(8) Preliminary schedules of windows, doors, and interior and exterior finishes.

(9) Perspective/isometric renderings to convey campus relations and clearly depict the massing of individual buildings.

(10) Preliminary FF&E floor plans indicating basic furniture arrangements and primary equipment items to convey basic requirements and confirm room geometry is compatible with FF&E requirements.

(11) Schematic systems plans for fire protection, fire alarms, security systems, plumbing, mechanical, electrical, and telecommunications, showing the proposed locations of all equipment and distribution systems and proposed riser diagrams.

(12) Preliminary electrical and telecommunications site plans depicting exterior electrical and telecom services (existing and new), site-related systems, exterior lighting, major equipment items and electrical pathways to/from the building(s),

electronic security systems, intrusion detection systems, antennas, grounding, and lightning protection.

d. Interim design drawings – 65%. Interim design drawings will continue to develop and refine the approved drawings from concept design and add all necessary drawings for a complete construction contract. In addition to the above drawings, the interim design will include the following:

(1) Site details as required for pavement, reinforcement, water, sanitary sewer, stormwater, and signage.

(2) Framing elevations, sections, details, diagrams, and schedules as applicable for foundations, roof framing, walls, and floor framing with sizing of members indicated. Include typical sections showing the methods of framing, typical structural details, and general structural notes including applicable codes used for design. Design loads, including wind component and cladding pressures, identification of delegated design components, and other pertinent information required by International Building Code (IBC) must be noted on the drawings and specified for each facility. Indicate the locations of any expansion/contraction joints in the structure and slabs and provide details.

(3) Building details for continuous air barrier, fire ratings, penetrations, exterior and interior elements, assemblies, detailed wall sections and casework sections.

(4) Provide additional enlarged plans and sections as required.

(5) Room finish plans, interior finish schedules, and interior elevations.

(6) Developed systems plans, diagrams, details, and schedules for fire protection, fire alarm, security systems, plumbing, mechanical, electrical, and telecommunications. Include power calculations.

(7) Fire protection plans (update from Concept Design Submittal). Refer to paragraph 3–13).

e. Final design drawings – 95%.

(1) Final design drawings will be prepared from the approved interim design and will fully develop and expand on all previous drawings for a complete design. Include details for construction of fire protection, firm alarm, security systems, plumbing, mechanical, electrical, structural, and telecommunications, and seismic control for nonstructural components. Include isometric views, sequences of operation, control drawings, and point schedules. When standard design drawings are used, additional sheets will be incorporated as appropriate.

(2) Final design drawings, together with a complete DA, construction specifications, and a CWE covering all technical, architectural, and engineering details are the basis for construction contracting. The drawings will be sufficient in detail, in

combination with the construction specifications, to provide for fair and competitive bids from contractors, and to provide for the construction of the project without additional drawings, except for shop drawings or as may be required to deal with unforeseen conditions encountered during construction.

f. Corrected final design drawings – 100%. Corrected final design drawings will be prepared from the final design drawings and will incorporate all necessary revisions to back check all review comments.

g. Ready to advertise. RTA drawings will be prepared from the corrected final design drawings (100%). This is the final set of drawings that will be used by the contracting officer to advertise the project.

h. As-awarded drawings. Sometimes referred to as “conformed set.” During the solicitation process, a requirement to issue an amended drawing may be identified. At the time of contract award, a conformed set will be prepared and issued by contracting that reflects the scope of work agreed on by the contractor and the government in the executed contract. The as-awarded drawings may reflect additions or deletions realized through scope changes negotiated prior to contract award. These are the official drawings used in the final contract and will be digitally signed.

i. Consolidated set for construction. Depending on the complexity of the bid options executed, there may be a need for the DOR to develop a consolidated set for construction, issued for information only, to provide clarity to the construction contractor. This set of drawings will consolidate the base bid and executed options to avoid confusion during construction. This may involve removing sheets or other partial content to reflect bid options not exercised or combining information from the base bid and option sheets to create a concise and clear plan for construction. There will be no scope changes, modifications, or deviations from the as-awarded drawings.

j. Modifications. Modifications to construction contracts may require modifications to the contract drawings in a clear and concise manner following the A/E/C Graphics Standard (ERDC/ITL SR-23-1).

k. Shop drawings. These are drawings submitted by a contractor, manufacturer, vendor, or others that show in detail the proposed fabrication and assembly of specific building components, or that show the installation details (such as form, fit, and attachment) of materials or equipment. Preparation, approval, and transmittal of shop drawings are outside the scope of this regulation.

l. As-built drawings. These are drawings submitted by a contractor as part of the completion records transferred to the using service on completion of the project. Preparation, approval, and transmittal of as-built drawings are outside the scope of this regulation.

3–3. Drawing preparation

a. Required work. Drawings will delineate the required work clearly and adequately to the level appropriate for the submittal phase as described in paragraph 3–2.

b. Drafting standards and practices. Format and organization, control data blocks, title blocks, drawing conventions, schedules, and standard details must conform to the most recent version of the A/E/C CAD Standard (ERDC/ITL TR-19-7), A/E/C Graphics Standard (ERDC/ITL SR-23-1), and USACE Advanced Modeling Building Information Modeling (BIM)/Civil Information Modeling (CIM) Object Standard (ERDC/LAB TR-21-4).

3–4. General sheets

Cover sheets must comply with the requirements in Chapter 6 concerning signatures of design documents by registered USACE and contractor professionals. General drawing requirements are outlined in Table 3-1.

Table 3-1
General drawing requirements

Drawing	Description
Cover sheet	Project drawings will have a cover sheet with the project name, project location, vicinity map, project rendering, design agency logo and identification, contract information, project number, fiscal year, and signature block area.
Sheet index	All drawing sets will have a sheet index. For small projects, the sheet index may go on the cover sheet. For larger projects, the sheet index should be moved to a separate sheet.
Abbreviations, general notes, and legends	A sheet or sheets with abbreviations, general notes, and legends should follow the index sheet or may be combined with the index sheet. Include definitions of abbreviations used; legends for materials, mechanical, and electrical symbols; a graphic illustration of details and cross-section reference indicators; and other information as required for that set of drawings. For larger projects, it may be appropriate to have discipline-specific abbreviations, general notes, and legends included at the beginning of discipline drawing sheets.
Code compliance summary sheet	The code compliance summary sheet(s) must be prepared by the QFPE and must be included as “general sheets” immediately following the title sheets. At a minimum, include the following information: 1. Building code summary. Identify each of the following elements in the building code summary: • Classification of occupancy • Allowed vs. provided type of construction • Basic allowable heights and areas vs. actual heights and areas

Drawing	Description
	• Allowable vs. provided height or area increases per floor and total • Calculations supporting height and area modifications/increases • Required vs. provided exterior exposure protection • Required vs. provided interior fire-rated occupancy separations • Required vs. provided internal fire area separations • United States required vs. host nation required vs. provided for projects (outside of the continental United Stats) only 2. Life Safety Code summary. Identify the following elements in the Life Safety Code summary: • Classification of occupancy of each room, area, or compartment (on the drawings or in tabular form) • Occupant load factor(s) and total calculated load • Required vs. provided number of exits • Required vs. provided capacity of means of egress • Required vs. provided arrangement of means of egress including remoteness of exits, horizontal exits, travel distance, common path of travel, and dead-end corridor lengths; when suites are used, indicate type, location, area, and arrangement • Required vs. provided accessible means of egress • Required vs. provided discharge from exits
Code compliance site plan	The building code site plan must be included as “general sheets” immediately following the title sheets co-located with the code compliance summary sheet. Identify the following elements on the building code site plan: • Line of encroachment identifying minimum separation distances from adjacent buildings and assumed property lines of the new construction and of the adjacent structures • Building perimeter used for frontage increases • Exit discharge paths • Fire department vehicle access to building • Fire lane width, marking and locations, approach roads and turn radius, and location • Intended fire department main entrance to building • Location of fire department connections • Fire hydrants, post indicator valve or valves, and their connected water distribution mains serving the building • Fire pump room • Water storage tanks • Hazardous material spill containment tanks • Backflow prevention assembly or assemblies serving water-based fire protection systems (if located outside of building)
Life safety plans	The life safety plans must be prepared by the QFPE and must be included as “general sheets” immediately following the title sheets and code compliance summary sheets. Scale the floor plans so the entire footprint fits on a single sheet if information is clearly legible, and the scale is no

Drawing	Description
	smaller than 1/16-inch (1:200). At a minimum, include the following information: • Location and rating of fire walls, fire barriers, fire partitions, smoke barriers, and smoke partitions (both horizontal and vertical). Barriers requiring fire resistance rated supporting construction must be specifically identified for coordination with the structural design partition locations with fire-rated partitions and horizontal exits identified. • Building areas having different occupancy and hazard classifications. • Room numbers, corresponding occupancy classification, and calculated occupant load. Include the occupant load of each room, area, or compartment (on the drawings or in tabular form). Similar occupancies can be grouped together for occupant load calculations. • Capacity and number of occupants using each major means of egress component (such as stairs, stair doors, exterior doors, and assembly exit doors). • Rooms or areas requiring special life safety or fire protection features. • Location of hazardous materials storage, handling and use that exceed the maximum allowable quantities. • Egress travel requirements (such as travel distances, common paths of travel, and dead-end corridors). • Structural fireproofing locations and associated ratings. • When required, fire extinguisher cabinet and surface-mounted fire extinguisher locations. • When required, fire extinguisher type/quantity table identifying the total number and type of extinguishers required. • Location of primary fire alarm/mass notification control panel.

3–5. Discipline drawing sheets

Discipline drawing sheets follow the general sheets in the order and with the naming and numbering sequences in the A/E/C CAD Standard and must include:

a. General notes. Individual discipline drawing sheets will include general notes, keynotes, legends, north arrow, and key plans as applicable for a clear and concise set of drawings.

b. Demolition drawings. For projects that include removal and demolition, all disciplines will include applicable demolition drawings clearly defining the scope of demolition and removal.

c. Room numbering. Every room will be assigned a unique number according to the A/E/C CAD Standard. Room numbering must be consistent throughout all discipline drawings.

3–6. Survey/mapping drawings

Survey/mapping drawing requirements are outlined in Table 3-2.

Table 3-2
Survey/Mapping drawing requirements

Drawing	Description
Abbreviations, general notes, and legends	Include definitions of abbreviations used, legends showing graphic illustration symbols used, general survey/mapping notes, and other information as required.
Topographic survey	Provide a topographic survey including all planimetric features within the survey limits including, but not limited to, buildings, sidewalks, roadways, parking areas, trees, ground covers, road culverts, fences, drainage structures, fire hydrants, water valves, visible utility lines, boxes, and signs including electric, phone, cable, gas, and water. The survey should also show the property boundary.

3–7. Geotechnical drawings

Geotechnical drawing requirements are outlined in Table 3-3.

Table 3-3
Geotechnical drawing requirements

Drawing	Description
Abbreviations, general notes, and legends	Include definitions of abbreviations used, legends showing graphic illustration symbols used, general geotechnical notes, and other information as required. Include a note that references the specification section for any foundation or subgrade areas that require special treatment.
Geotechnical boring plan and logs	Include a general site plan showing the locations of the geotechnical explorations like boreholes or test pits. Place the exploration logs, including all relevant data, onto sheets. Provide all relevant information from the geotechnical report on the drawings (for example, geophysics results if appropriate).

3–8. Civil drawings

Civil drawing requirements are outlined in Table 3-4.

Table 3-4
Civil drawing requirements

Drawing	Description
Abbreviations, general notes, and legends	Include definitions of abbreviations used, legends showing graphic illustration symbols used, general civil notes, and other information as required.
Access and haul route	Include an aerial image or location plan showing the haul route(s), project site, and staging areas.

Drawing	Description
General site plan	Show the new proposed features such as building(s), paved areas, utilities with sizes, demarcations for privatized utilities, hydrants, valves, fences, security systems, stormwater management features, accessible path of travel, setbacks, and antiterrorism standoff distances, as applicable.
Third-party certification site plan	Show the site boundary to comply with TPC requirements (this may be different from the construction limits boundary), total site area, square footages for hardscape and site vegetation, location of recycling, bicycle storage, location of building entry, etc.
Existing conditions site plan	Show the existing site conditions and identify the sources for the base survey data. Include existing site features, utilities, and topography.
Enlarged plans	Include enlarged plans to show areas in more detail where appropriate and include a key plan.
Demolition plans	Include plans showing the demolition and removal of site features, utilities, and roadways, as applicable.
Roadway plans	For projects with roadways, include roadway plans in coordination with the installation. Include enlarged plans and sections showing the roadway profiles.
Grading plans	Show all existing and new grading.
Storm drainage plans	Show all storm drainage features.
Utility plans	Show all existing and new utilities with profiles and inverts.
Sediment and erosion control plans	Provide sediment and erosion control plans as needed.
Pavement plans	Provide pavement plans in coordination with the geotechnical engineer showing the pavement types, joint layouts, striping, and signage.
Profiles	Provide sanitary sewer and storm drain profiles.
Details	Provide details that include the following: • Pavement sections, joint details, and pavement reinforcement details • Utility details • Special site feature details like retaining walls, exterior stairways, sport courts, fences, etc. • Exterior site signage details like sign mounting details, accessible parking space signs, roadway signage, etc. • Roadway cross sections

3–9. Landscape drawings

Landscape drawing requirements are outlined in Table 3-5.

Table 3-5
Landscape drawing requirements

Drawing	Description
Abbreviations, general notes, and legends	Include definitions of abbreviations used, legends showing graphic illustration symbols used, general landscape notes, and other information as required.
Landscape plan schedule	Indicate the planting types, to include the container size, quantity, and spacing. Indicate types of ground treatment with square footage areas, as applicable.
Landscape site plans	Provide landscape site plans that include the following: • General site plan • Ground treatment plan • Planting plan to include the locations of trees and shrubs • Tree preservation/removal plan
Enlarged plans	Include enlarged plans to show areas in more detail where appropriate.
Details	Include necessary planting details for trees, shrubs, ground cover, and planting soil preparation. Include details of unique site features such as seat walls, landscape edging, material transition details, and site furnishings.

3–10. Structural drawings

Structural drawing requirements are outlined in Table 3-6.

Table 3-6
Structural drawing requirements

Drawing	Description
Abbreviations, general notes, and legends	Include definitions of abbreviations used, legends showing graphic illustration symbols used, general structural notes, and other information as required. Include standard general structural notes sheets, to include the minimum requirements found in the IBC and UFCs. These note sheets must include all required building design loads and structural system information as required by the IBC. Include a list of delegated design submittal items that will be designed and coordinated during construction, such as roofing and siding attachments, seismic bracing or equipment, and other items not designed by the structural DOR. Include information on special inspections and testing.
Overall plans and loading plans	Include overall plans showing the structure at each level with overall dimensions and include loading plans showing applied loads used in design (for example, live loads, unbalanced snow loading, wind load diagrams, and any special load considerations). Additional loading diagrams are required for all delegated engineered systems (for example, contractor-designed components and cladding, loading diagrams, and snowdrift loading).
Foundation plans	Include all necessary foundation information, including general plan notes, symbols, schedules, section callouts, foundation tags, grids, dimensions, and key plans.

Drawing	Description
Floor and roof plans	Include framing information, callouts, span directions, bearing elevations, lateral force-resisting system locations, general plan notes, symbols, tags and schedules, section callouts, grids, dimensions, and key plans.
Framing elevations	Provide specific elevations to show unique and typical conditions for framing (such as braced frame elevations, moment frame elevations, and multistory framing considerations). Include elevations, dimensions, framing sizes, opening sizes where applicable, detailing requirements, section callouts, notes, schedules, and information that has not been previously relayed.
Framing and roof framing sections	Include overall or isolated sections to relay information not previously shown or required to illustrate framing complexities or unique conditions. Include elevations, dimensions, framing sizes, detailing requirements, section callouts, notes, schedules, and information that has not been previously relayed.
Enlarged plans	Include enlarged plan views where required due to plan view constraints, amount of information to be relayed, and complexity of construction in the area in detail.
Foundation, framing, and roof framing details	Provide standard construction details based on material type (typical details) and specific details from referenced plan views, elevation views, and section views. Include the following as applicable: • Details of ancillary architectural features and associated reinforcing requirements including, but not limited to, canopies, facades, overhangs, openings, non-load bearing walls, retaining walls, and all connections to structure • Details of compatible connections for delegated design features including, but not limited to, railings, curtainwalls, and pre-engineered components • Details of attachments and supports for large mechanical and electrical units; coordinate with mechanical and electrical for attachment details for light units and equipment
Schedules	Provide structural schedules when required based on type of construction, number of scheduled structural components, and applicability of providing schedules on plan views or other drawing sheets. Examples could include column schedules, beam schedules, and reinforcing schedules.

3–11. Architectural drawings

Architectural drawing requirements are outlined in Table 3-7.

Table 3-7
Architectural drawing requirements

Drawing	Description
Abbreviations, general notes, and legends	Include definitions of abbreviations used, legends showing graphic illustration symbols used, general architectural notes, and other information as required.

Drawing	Description
Air barrier diagrams and calculations	Provide schematic air barrier plans and building sections indicating the volume enclosed by the air barrier and any building areas excluded from the air barrier. Schematic details or notes will clearly indicate the location of the air barrier within the building wall and roof assemblies. Provide calculations for the surface area of the air barrier enclosure.
Floor plans	Include floor plans that show overall building dimensions in two directions as well as dimensions for all building offsets and openings. Overall dimensions will be coordinated with civil and structural drawings so that each discipline shows the same overall building dimensions. Indicate wall type locations on floor plans.
Reflected ceiling plans	Provide reflected ceiling plans matching the floor plans. Indicate ceiling heights above the finish floor, soffits, lighting fixtures, suspended equipment, mechanical features, and other items as necessary for coordination of disciplines. Indicate the starting points of suspended ceiling grids or patterns.
Roof plans	Roof plans will show ridges, valleys, slopes, drainage elements (such as gutters and downspouts), parapets, crickets, roof penetrations in coordination with disciplines (such as mechanical and plumbing), applicable roof elements (such as roof hatches), rooftop fall arrest systems, snow guards, and any roof-mounted equipment.
Building exterior elevations	Exterior elevations will show actual finished grade lines coordinated with civil grades. Building heights according to code requirements will be shown. Exterior finish materials and elements will be called out with keynotes and indicate the location of control joints and expansion joints. Exterior doors, louvers, and windows will be tagged.
Building sections	Building sections will show finished floor elevations, parapet coping and soffit elevations, high slope roof peaks or roof heights according to applicable code provisions, lowest adjacent grade elevations according to applicable code provisions, interior roof, and floor structure in sufficient detail to verify interior and interstitial clearances and grid lines. Show major mechanical, plumbing, electrical, telecommunications, fire protection, and structural systems.
Exterior wall sections	Exterior wall sections will be drawn at large enough scale and in sufficient detail to indicate floor-to-floor heights, soffits, fenestrations, material changes, and interior finish elements. Assemblies will be tagged, and detail callouts will be added at typical and unique conditions such as footings, wall-to-roof transitions, opening heads and sills, and material transitions.
Enlarged plans	Provide enlarged plans of toilet rooms, pantries and kitchen areas, typical units, and areas with significant casework as required to fully describe the design intent and to key relevant interior elevations or details. Each enlarged plan must indicate dimensions to the nearest grid line, existing building elements, or face of structure, in two directions.
Stairs and vertical circulation	Provide enlarged floor plans and sections for stair and vertical circulation drawn at large enough scale to show sufficient detail.
Interior elevations	Provide elevations of interior elements sufficient to define the design intent fully and adequately. Coordinate with interior drawings to avoid duplication of information.

Drawing	Description
Details	Interior and exterior building elements must be adequately detailed. Place exterior details and interior details on separate sheets if possible. Exterior details can include footings; material transitions and terminations; interior and exterior corners; penetrations; expansion joints; drainage; roof and canopy details; and opening head, jamb, and sill details. Exterior details will sufficiently show the building envelope systems and transition details that clearly note the moisture barrier, continuous air barrier, and flashings. Interior details can include vertical circulation details, ceiling details, continuity of fire-rated partitions or shafts, and floor transitions.
Assembly types	Interior and exterior assembly types will be shown as a wall section at adequate scale to indicate all elements of construction. Each unique assembly, including distinctions in fire resistance, will have a unique assembly type indicator. Assemblies include interior and exterior walls, floors, ceilings, and roof assemblies. Each partition section will show a partition thickness dimension. Indicate any required ratings such as fire or smoke resistance and STC ratings. Include references to testing sources for any required ratings.
Schedules	Provide schedules when required based on applicability of providing schedules on plan views or other drawing sheets. Schedules and item or element numbers and identifiers will follow the requirements of the A/E/C Graphics Standard. Include schedules for the following items: • Window schedules. A tabular schedule of windows will be included on the drawings. • Door and louver schedules. A tabular schedule of doors and louvers will be included on the drawings. • Exterior finish and material schedules. Provide a comprehensive exterior finish and color schedule, indicating selections for all exterior materials. Locate this schedule on the finish schedule sheet or on the sheet with the exterior building elevations. • Interior finish and material schedules. For projects without separate interior drawings, this schedule may go in the architectural sheets. See requirements in paragraph 3–12.

3–12. Interior design drawings

Interior design drawing requirements are outlined in Table 3-8.

Table 3-8
Interior design drawing requirements

Drawing	Description
Abbreviations, general notes, and legends	Include definitions of abbreviations used, legends showing graphic illustration symbols used, general interior design notes, and other information as required.

Drawing	Description
FF&E plans	Provide FF&E plans to indicate the locations of all furniture, equipment, and accessories. FF&E plans must include composite and enlarged area plans; area plans must have key plans. Identify these items with an item code that is keyed to the FF&E package and the finish color boards. Each drawing sheet must include a legend listing all furniture item codes and names. Provide to scale as required by scope of work. Typically, FF&E plans will be the same scale as the architectural drawings. Some projects may require furniture plans for individual rooms or areas to show furniture in sufficient detail for installation. Examples of this include enlarged plans for systems furniture or individual room drawings where typical room configurations are repeated throughout a project.
Systems furniture	Provide large-scale plans, elevations, and isometrics showing typical workstation configurations that clearly identify major workstation components to include, but not limited to, panels, storage, worksurfaces, accessories (such as monitor arms and keyboard trays), and task lighting. Include the location of all power, voice, and data outlets and indicate the height on panels by note or symbol.
Artwork placement plans	If the artwork locations and item codes cannot be clearly shown on the FF&E plans, provide separate artwork placement plans. Ensure that mounting heights and special installation instructions are indicated on the plans and on the data sheets.
Element plans	Include floor plans indicating interior elements to be procured and installed by the construction contract including corner guards, wall guards, markerboards, tackboards, window blinds, mop rack and shelf, mailboxes, permanently fixed kitchen equipment, etc. Include an interior elements schedule on the elements plan sheet(s) indicating the type, description, and specification section. Coordinate with the architectural enlarged plans to avoid duplication of information.
Room finish plans	Include floor plans indicating the finishes, to include floor finishes, material transitions, floor patterns, and a finish legend.
Enlarged floor plans	Provide enlarged plans of toilet rooms, pantries and kitchen areas, typical units, and areas with significant casework as required to fully describe the design intent and for key relevant interior elevations or details. Coordinate with the architectural enlarged plans to avoid duplication of information. Include schedules as appropriate for interior elements and accessories tagged on these enlarged plans.
Interior elevations	Provide interior elevations of walls and rooms with built-in features, casework, special equipment, visual display components, finishes/trim or walls with multiple finishes, or complex finishes and trim details.
Signage plans	Include floor plans showing the locations of building signage. Include a schedule indicating the sign type, copy, room number, and location.
Details	Interior elements should be adequately detailed, to include the following: mounting heights, restroom details, interior element details, furniture details, casework details, building signage details, and finish details.

Drawing	Description
Schedules	Provide schedules when required based on applicability of providing schedules on plan views or other drawing sheets as referenced above. Include schedules for the following items: • Finish and material schedules. A tabular schedule of interior finishes and materials will be included on the drawings. Finish and material schedules should identify by room number the finish and material to be used for the floor, to include the base, the walls (including wainscoting and trim), and the ceiling. • Finish materials legend. Describe all finishes and materials listed in the schedules, to include the specification section, item code, description, sustainability features or TPC credits it contributes to, and remarks. If a J&A is in place for interior finishes, then the name of the manufacturer and color used as the BOD may be listed in coordination with the contracting officer.

3–13. Fire protection drawings

Fire protection drawing requirements are outlined in Table 3-9.

Table 3-9
Fire protection drawing requirements

Drawing	Description
Abbreviations, general notes, and legends	Include definitions of abbreviations used, legends showing graphic illustration symbols used, general fire protection notes, and other information as required.
Fire protection plans	Include floor plans showing the following information. Scale the floor plan so the entire footprint fits on a single sheet if information is clearly legible, and the scale is no smaller than 1:200 or 1/16-inch. Where a building has multiple hazard classifications or areas protected with special fire suppression systems, differentiate each area by border or hatching. Information pertaining to electronic control/release systems may be shown on the fire alarm/mass notification systems drawings specified below. 1. Fire sprinkler systems. Include the following information: • Locations of sprinkler riser room • Fire department connections • Post indicator valves • Isolation control valves • Sprinkler branch lines or feed main piping if a specific routing is required, such as single feed to computer room or elevator equipment room and hoistway • Location of control panels used for release of pre-action or deluge systems • Fire pump and associated equipment 2. Gaseous fire extinguishing systems. Include the following information: • Outline of area/hazard to be protected • Location of storage cylinders and releasing panel

Drawing	Description
	• System initiating devices (such as manual releases and automatic detection devices) • Notification appliances • Main/reserve transfer switches • Control devices (such as dampers, shunt trip breakers for computer equipment shutdown, and air-conditioning units to be shut down) and electromagnetic door hold-open devices
Fire suppression details	Provide fire suppression detail sheets that include the following information: 1. Fire sprinkler systems. • Enlarged plan view of sprinkler riser room showing sprinkler risers, control valves, backflow prevention device, and service entrance (supply) manifold drawn to scale. • Cross-sectional elevations of sprinkler and standpipe risers. • Enlarged plan view of fire pumps and piping arrangement, jockey pump, and associated controllers and equipment drawn to scale. • Cross-sectional elevations of fire pump supply and discharge piping arrangement. • Releasing system riser diagram for pre-action or deluge sprinkler systems. Identify zones, circuit inputs, and circuit outputs necessary for controls, including interconnection with building fire alarm control panel. 2. Gaseous fire extinguishing systems. • Releasing system riser diagram identifying zones, circuit inputs and circuit outputs necessary for controls, including interconnection with building fire alarm control panel. • Elevation view of storage cylinders and manifold. • Isometric detail drawing of agent distribution piping including storage cylinder manifold and discharge nozzles. • Sequence of operation matrix. See NFPA 72 for a sample.
Fire alarm/mass notification (FAMN) system plans	Include floor plans identifying the location of field-installed components and interconnected devices. Plans may identify fire suppression control/release system information identified above. At a minimum, identify the location of the following information: 1. Control panel(s). 2. Notification appliance circuit extender panels. 3. Radio transmitter or master box. 4. Line and low voltage surge arrestors. 5. Initiating devices (including duct smoke detectors). In lieu of locating devices on the plans, and as authorized by the DFPE, provide the following information on the plans: • Ambient sound pressure levels and audible design sound pressure levels • Area boarders or other means to identify differing acoustically distinguishable spaces

Drawing	Description
	• Area borders to indicate the type of detection system, initiating devices, notification appliances, and releasing service or area borders for detection and notification zones • Rooms and spaces that will have visible notification and those where visible notification will not be provided • Rooms and spaces that will have initiating devices and the design performance requirements for those devices 6. Supplemental equipment interfaced with the fire alarm system such as voice evacuation panels, electromagnetic door holders, delayed-egress or access-controlled doors, and elevator system components. 7. Supplemental fire suppression equipment control panels such as fire pump controllers and fire suppression control/release panels.
FAMN details	Detail sheets may identify fire suppression control/release system information identified above.
Riser diagram	Provide a riser diagram showing hierarchy, arrangement, and zoning of the system. Identify typical circuits, interconnections, and interlocks necessary for associated controls. Do not identify every field device individually, such as smoke and heat detectors. Identify required line and low voltage surge arrestors. Interface with security systems for required delayed-egress or access-controlled doors. Identify interface with fire suppression control/release panels.
Sequence of operation matrix	Provide a sequence of operation matrix. See NFPA 72 for sample figure A.14.6.1.

3–14. Plumbing drawings

Plumbing drawing requirements are outlined in Table 3-10.

Table 3-10
Plumbing drawing requirements

Drawing	Description
Abbreviations, general notes, and legends	Include definitions of abbreviations used, legends showing graphic illustration symbols used, general plumbing notes, and other information as required. Include general notes relating to compliance with manufacturer recommendations and requirements, applicable codes and standards, permit responsibility, and coordination between trades. Include notes that relate to installation requirements that generally apply throughout the drawings, such as sealing penetrations, general elevation of pipes, or diagrammatic nature of the drawings.
Site plans	Provide site plans for exterior equipment and distribution systems coordinated with civil site plans. Show connection points to existing systems and locations of tanks.

Drawing	Description
Floor plans	Include floor plans indicating the location of all equipment and fixtures, schematic pipe layout for domestic water, sanitary waste, vent, and natural gas indicating the pipe sizes and locations of access panels for isolation valves and cleanouts. In addition, floor plans should include the following: • Routing of all piping distribution systems • Unique identifiers for each item of equipment • Separate water system drawings from sanitary and vent drawings • Other piping systems such as fuel, gas, lubricant, or compressed air on separate drawings where necessary to clearly demonstrate the layout and sizes • Anticipated grading of piping systems for drainage for systems requiring the ability to drain • Means of access, including ceiling or wall panels, catwalks, ladders, platforms, or access doors • Locations of valves, service taps, and pits • Invert elevations for connection to exterior utilities
Sections and elevations	Include building sections and elevations as necessary to indicate the routing of pipes in coordination with other disciplines to avoid conflicts in congested spaces such as mechanical rooms, laundry rooms, areas above ceilings, and typical units. Demonstrate adequate clearance and maintenance access between plumbing systems and other building components. The number and location of elevations and sections must be sufficient for constructability without further design work by the DOR or construction contractor. Label all equipment, devices, and distribution systems and show sizes for all piping.
Enlarged plans	Include enlarged plan views where required due to plan view constraints, amount of information to be relayed, and complexity of the area in detail. Include enlarged mechanical room plans. Label all equipment, devices, and distributions systems. Provide enlarged plans for restroom or shower areas, at a minimum, with separate plans for water and sanitary and vent systems.
Details	Provide standard details based on design (typical details) and specific details from referenced plan views and sections. The number and types of details must be sufficient for constructability and installation without further design by the DOR or construction contractor. At a minimum, show the following: structural supports for equipment; roof mounting details to avoid water leakage and limit air intrusion; pits; drain terminations; vent stacks through roofs; water hammer arrestors; equipment connection details; sinks and drains; building entrance piping and penetrations; cleanouts; water heating system schematics showing all equipment and devices; pumps and appurtenances; lift station and force mains; meters; and exterior tanks.

Drawing	Description
Schedules	Provide equipment schedules with all necessary performance characteristics and features for equipment selection by the construction contractor. Include efficiency and electrical information. Performance characteristics must be minimums or maximums for proper system operation. Include a plumbing fixture schedule indicating cold water, hot water, vent, and sanitary connection sizes. Include additional schedules as applicable, such as pumps (such as ejector, booster, or sump pumps), interceptors, water treatment equipment, backflow preventer schedule, hot water heat pump schedule, recirculation pump for domestic hot water, water heaters, hot water generator (heat exchanger), storage tank schedule, chilled water control valve, thermostatic mixing valve, control valves, expansion tank schedule, compressed air equipment, and water heater point schedule.
Control diagrams	Provide plumbing controls drawings as described in mechanical drawings, to include water heating systems or other systems, equipment, and meters that integrate with the building control systems, meter data management systems, or utility monitoring and controls systems. Plumbing control drawings may be collocated with mechanical controls drawings. Include a schematic diagram showing the hot water controls with information about the sequence of operations in coordination with the requirements of the installation. Include the required interface with control systems, meter data management system.
Isometric diagrams	Provide isometric riser diagrams showing plumbing system piping without other building components, to include domestic system, sanitary system, vents, and natural gas. Show the location of shutoff valves, water hammer arrestors, vent through roof penetrations, building entrance, plumbing system equipment, and cleanouts. Label all equipment and piping and show sizes for all piping.

3–15. Mechanical drawings

Mechanical drawing requirements are outlined in Table 3-11.

Table 3-11
Mechanical drawing requirements

Drawing	Description
Abbreviations, general notes, and legends	Include definitions of abbreviations used, legends showing graphic illustration symbols used, general mechanical notes, and other information as required. Include general notes relating to compliance with manufacturer recommendations and requirements, applicable codes and standards, permit responsibility, and coordination between trades. Include notes that relate to installation requirements that generally apply throughout the drawings, such as sealing penetrations, general elevation of pipes, or diagrammatic nature of the drawings.
Site plans	Provide site plans for exterior equipment and distribution systems coordinated with civil site plans including below and above grade steam, condensate, chilled water, and hot water systems. Include profile drawings.

Drawing	Description
HVAC Floor plans	Include floor plans that show HVAC distribution layout as well as supply/return air distribution device layout and identify or outline individual HVAC zones. Indicate primary equipment such as chillers or refrigeration compressors, boilers, pumps, condensers cooling towers, air handling units, fans, hoods, terminal devices, unitary equipment, access panels for equipment maintenance, required clearances, and other items of major equipment required for the facility. Provide ductwork plans on separate drawings from hydronic system plans. In addition, floor plans must include the following: • Routing and size of all duct work, hydronic lines, and condensate lines for HVAC systems. Separate ductwork and piping plans. • Unique identifiers for each item of equipment and label all devices. • Pressure classification of ductwork. • Anticipated grading of piping systems, as applicable. • Locations of expansion loops, expansion joints, joints, guides, and anchors. • Locations for control devices such as thermostats and humidistats, temperature and humidity sensors, building differential pressure sensors, emergency shutdown switch, and duct pressure sensors. Indicate the terminal equipment each thermostat or humidistat is associated with. • Means of access, including ceiling panels, catwalks, ladders, platforms, and access doors. Show the location and size of access panels in floors, walls, and ceilings. When mechanical rooms have interior access in lieu of exterior access, show the route for replacement of the largest item of equipment including space for a dolly, lift, crane, or similar transport aids. • Locations of isolation valves, manual volume dampers, fire and smoke dampers, door louvers, and turning vanes.
Roof plans	Provide a roof plan showing mechanical penetrations and equipment and distribution systems on the roof.
Sections and elevations	Include building sections and elevations as necessary to indicate the routing of pipes and ducts in coordination with other disciplines to avoid conflicts in congested spaces such as mechanical rooms, laundry rooms, areas above ceilings, typical units, etc. Demonstrate adequate clearance and maintenance access between mechanical systems and other building components. Provide at least one section in the mechanical room. The number and location of elevations and sections must be sufficient for constructability without further design work by the DOR or construction contractor. Label all equipment, devices, and distribution systems and show sizes for all ductwork and piping.
Enlarged plans	Include enlarged plan views where required due to plan view constraints, amount of information to be relayed, and complexity of the area in detail. Include an enlarged plan of the mechanical room showing all equipment, including HVAC, plumbing, and fire suppression system equipment to demonstrate sufficient clearance between equipment and distribution systems. Show the location of control panels and variable frequency drives. Show maintenance clearances around equipment and label all equipment, devices, and distribution systems.

Drawing	Description
Details	Provide standard details based on design (typical details), and specific details from referenced plan views and sections. The number and types of details must be sufficient for constructability and installation without further design by the DOR or construction contractor. At a minimum, show the following: structural supports for equipment (including connection to building structure), penetrations, fire dampers, roof mounting details to avoid water leakage and limit air intrusion, pits, condensate drain details (including depth of water traps and slope from drain pan), air vent and drain details, expansion loops, expansion joins, anchors, make-up water to hydronic systems (including all associated devices), equipment connection details, and hydronic system schematics (including flow direction arrows) showing all equipment and devices. Include an air balance diagram for kitchens and a capture hood design showing capture velocities and distances.
Schedules	Provide equipment schedules with all necessary performance characteristics and features for equipment selection by the construction contractor and to demonstrate compliance with project requirements. Such equipment includes, but is not limited to, dedicated outside air systems, fan coil units, exhaust fans, louvers, air separators, expansion tanks, unit heaters, terminal devices, air distribution devices, plate heat exchangers, split-system indoor units, split-system outdoor units, air-cooled chillers, boilers, hydronic control valves, and pumps. Include efficiency and electrical information. Performance characteristics must be minimums or maximums for proper system operation, as calculated, and not based solely on a specific manufacturer's products. Include a design condition schedule, ventilation schedule, vibration isolator schedule, and duct construction and leak testing table showing duct pressure classes, seal classes, leakage classes, and leak test pressures.
Isometric view	Provide isometric views (three dimensional) of the mechanical systems in mechanical rooms showing ductwork, piping, and equipment for designs that use BIM and three-dimensional modeling.

Drawing	Description
HVAC Control System	Provide control drawings that include every mode of operation, sequence of operation interlock, safety, and control devices required to fully describe system operation for all equipment and systems. HVAC control system drawings must comply with UFC 3-410-02 and all applicable supplements or manuals. • Include a legend for all symbology • Provide a schematic for each unique item of equipment or system showing all associated devices with all devices labeled • Show failure positions of dampers and valves • Include written sequences of operation for each unique item of equipment or system • Provide points schedules indicating points names; network information; setpoints; control and operating ranges; overrides; alarms; and trending, monitoring, and control capabilities • Include a diagram of the system architecture and provide alarm handling, system scheduling, and system integration requirements, including integration with other building control systems (such as lighting and metering) and UMCSs • Provide ladder diagrams where necessary to detail equipment interlocks and interfaces • Provide control valve, control damper, zone sensor, and occupancy schedules

3–16. Electrical drawings

a. Provide adequate plans including demolition; existing conditions; and new work, legends, details, and diagrams to clearly define the work to be accomplished. Coordinate construction drawings and specifications; show information only once to avoid conflicts.

(1) Reference DoD supplemental technical documents located at https://www.wbdg.org/dod/supp-tech-documents for background information (supplemental documentation, best practices, sample calculations, etc.).

(2) Provide a general note at the beginning of the electrical drawings clarifying the work to be accomplished. The following note is required unless directed or approved by the government: “ELECTRICAL WORK AND MATERIAL IS NEW AND PROVIDED BY THE CONTRACTOR UNLESS INDICATED OTHERWISE.”

(3) Follow the NFPA 70 metric designations (mm) and trade sizes (in) for conduit size designations.

(4) Indicate the quantity and size of all conduits and cables required in multiple conduit and cable runs.

b. Electrical drawing requirements are outlined in Table 3-12.

Table 3-12
Electrical drawing requirements

Drawing	Description
Abbreviations, general notes, and legends	Include definitions of abbreviations used, legends showing graphic illustration symbols used, general mechanical notes, and other information as required.
Electrical site plans	Show utility point of common coupling to the installation power and telecommunications systems on the site plan. Provide explicit direction on the method of entering existing manholes. Provide all details including composition of duct banks and depth and configurations of the duct banks. Depict the existing and new exterior electrical service, site-related systems, major equipment items, and electrical pathways to and from the building(s). Locate exterior lighting on the plans. Provide schematic diagrams of exterior systems such as cathodic protection, grounding, and lightning protection. Coordinate with other utilities. 1. Electrical site plans must be separate and distinct from other utility site plans. Electrical and civil site plans may be combined when a project requires minor utility work. 2. Provide the orientation of electrical site drawings consistently with the civil drawings. In addition, provide the orientation of partial building or site plans identical to the orientation of the larger plan from which the partial was taken. Indicate the exact title of each detail, partial plan, or elevation as identified on the cross-referenced sheet.

Drawing	Description
	3. For overhead distribution, use a separate symbol for each individual circuit; define each circuit by voltage level as well as number, size, and type of conductors. Coordinate guying and conductor sag information shown on the drawings with that shown in the specifications. 4. Indicate overhead distribution pole details on the drawings. Identify the pole number assignment consistent with installation standards on the site plan and require a pole identifier number to be installed on the pole matching the installation standard.
Pole details	Indicate overhead distribution pole details on the drawings. 1. Format. • Naval Facilities Engineering Systems Command (NAVFAC) pole details are available in PDF format and in CAD format on the WBDG website at https://www.wbdg.org/dod/ufgs/ufgs-33-71-01. • Provide details in situations where an applicable pole detail has not been developed. Designer developed details must contain the same level of detail equivalent to the NAVFAC pole details and include material requirements. • Review the information contained in the NAVFAC pole details OH-1.1 through OH-1.5a for examples of how to show overhead distribution work. Do not describe proposed work by referencing sketch numbers instead of pole detail designation symbols. Do not use pole detail designation symbols to describe existing facilities to be removed. To maintain the integrity of the pole details, do not modify pole details; include any required exceptions or modifications as supplemental information with the pole detail designation symbols. When using pole details, place a note referencing the pole detail designation symbols (like the following) on the drawings: “XFB, 15FR3-N are pole detail designation symbols. Refer to Sketches OH-1.1 through OH-41 on Sheets [TBD] for an explanation of the use and description of equipment provided by these symbols.” 2. Conductor sag. Indicate conductor initial sag values. Provide initial sag values at ambient temperatures in 18 degrees F (10 degrees C) increments for a temperature range, which includes the outside summer and winter design temperature values. Clearly indicate each different calculated ruling span on the plans and provide initial sag for one span in the calculated ruling span. 3. Fusing. Provide the appropriate symbol and detail indicating the use of backup current-limiting fuses with the device being protected. Indicate the fuse type and ampere rating as well as the voltage rating and current designation of the backup current-limiting fuse.

Drawing	Description
Transformer details	Indicate transformer details on the drawings. Transformer details are available in a PDF format and an CAD format on the WBDG website at https://www.wbdg.org/dod/ufgs/ufgs-26-12-19. Provide the following transformer descriptive information: • Transformer type (such as pad-mounted, pole mounted, station type, or unit-sub) • Kilovolt-Ampere (kVA), single or three phase • Voltage ratings per Institute of Electrical and Electronics Engineers (IEEE) C57.12.00 (such as 11.5kV – 208Y/120 volts) • Primary and secondary connection (when using single-phase units for three-phase service, specifically indicate how the units will be connected such as connect delta-wye grounded for 208Y/120-volt secondary service) Include the following information for surge arresters and fused cutouts: • Surge arrester kV rating • Cutout kV, continuous ampere, and interrupting ampere rating • Fuse link type and ampere rating
Underground distribution	Profiles may be required for duct bank runs. Discuss profile requirements with the electrical reviewer. Indicate structure (manhole and handhole) tops, duct bank elevations, slopes, and diameters. Coordinate structure numbers with plan sheets. Show and label all crossing utility lines, both existing and new. If depths of existing utilities are unknown, indicate the horizontal location of the utility and indicate the vertical location with a line representing the anticipated range of elevations where the utility will be found in the field. Indicate the method of new utility installation routing above or below conflicts. Notes can be used to identify parts. Provide cable/duct bank information indicating cable identification, description, conduit size, and remarks for any special instructions. Where four or more conduits will be installed, provide in schedule format. For smaller applications, schedule or notational conveyance is acceptable. Provide manhole foldout details or exploded views for all multiple-circuit primary systems and all primary systems requiring splices. Indicate the entrance of all conduits and the routing of all conductors in the manholes. Manhole details are available in PDF format and in CAD format on the WBDG website at https://www.wbdg.org/dod/ufgs/ufgs-33-71-02.
Demolition plans	Provide demolition plans separate and distinct from new work plans, except where only minor demolition work is required. Clearly show what will be demolished, at an appropriate scale. Indicate the beginning and ending points of circuit removals. For modifications or additions to existing equipment, provide the manufacturer's name and other pertinent manufacturer's identification (such as serial number, model number, style, and any other manufacturer's identifying markings). Provide a sequence of demolition as required. Include known requirements for continuous operation and/or limited shutdowns. Identify these in the special scheduling paragraphs of the specifications. Indicate the quantity of lighting ballasts that contain polychlorinated biphenyls and the quantity of lamps that contain mercury.

Drawing	Description
Lighting plans and details	Do not show lighting and power on the same floor plan, unless the scale of the plan is 1:50 (1/4 in = 1 ft – 0 in) or larger. Provide a photometric layout plan as an appendix to the BOD. The photometric layout plan may also be a “for information only” drawing but may not be a contract drawing. Provide luminaire (lighting fixture) details, a separate luminaire schedule, controls, and control strategies for each space. Details and a luminaire schedule are available in PDF format and in CAD format on the WBDG website at https://www.wbdg.org/dod/ufgs/ufgs-26-51-00. To maintain the integrity of the details, do not modify details; make any required exceptions or modifications in the remark’s column of the luminaires schedule and not on the details themselves. Provide applicable luminaires type symbol(s) with each luminaire sketch/detail. When using luminaire(s) not included in the database, detail the luminaire(s) on the drawings providing the following minimum information: luminaire type (such as high bay, fluorescent, industrial, downlight, roadway type, or floodlight); physical construction including housing material and fabrication method, description of lens, reflector, refractor; electrical data including number of lamps, lamp type, ballast data, operating voltage; mounting (surface, suspended, flush) and mounting height; and special characteristics such as wet label, specific hazardous classification, or air handling.
Power plans	Show all power requirements and points of connections. Indicate the connection between the exterior electrical systems with the building systems, including indication of electrical characteristics, voltage, phase, conductor size, etc. Indicate the locations of electrical rooms and primary pathways inside facilities. Specifically identify each piece of equipment such as transformers, switchgear, motor control centers, and panelboards including HVAC and mechanical equipment (such as unit heater No. 1, unit heater No. 2). Include required clearances for maintenance in line with applicable codes. Identify physical areas that may be subject to damage as defined in UFC 3-501-01 and indicate the appropriate raceway type for each one.
Grounding plan	Provide grounding plans and details at an appropriate scale.
Roof plan	When roof mounted equipment, including HVAC equipment, cannot be adequately shown on the power plan, provide an appropriately scaled roof plan.
Lightning protection plan	Provide a lightning protection plan and details at an appropriate scale. Indicate the locations and number of system components required. Show air terminal installation details, roof and wall penetration details, and details to show concealed components of the system. Coordinate roof and wall penetrations with other disciplines to ensure that the integrity of the facility envelope is not compromised.
Hazardous location plan	Provide on the drawings the boundaries and classifications of all hazardous locations in line with NFPA 70.

Power one-line/riser diagrams	Provide a power one-line (single-line) diagram for: • Medium-voltage distribution systems, including substations and switching stations • Systems involving generation, either low voltage or medium voltage • Facility switchgear, switchboards, motor control centers, and main distribution panels (MDPs) The one-line diagram must show all components (including metering and protective relaying). Indicate sizes of bus, feeders, and conduits. Show connections of transformers, current transformers, potential transformers, and capacitors on the one-line diagram using the proper symbol. Show potential and current transformer ratios. Indicate relay quantity and function (overcurrent, voltage, differential) using the American National Standards Institute (ANSI) designation numbers. On most facility-related projects, it is acceptable to combine the one-line diagram with a riser diagram. The one-line diagram would begin with the medium voltage system and continue through the transformer up to and including the main breaker and feeder breakers within the MDP. Sub-panels beyond the MDP may be shown in the riser diagram format. Include the following on one-line diagrams: • Indicate kV ratings for surge arresters, and kV and ampere ratings for cutouts. Indicate the fuse link type and ampere rating. For capacitors, indicate Kilovolt-Ampere Reactive Power (kVAR) per unit, number of units per bank, voltage (voltage rating of units, not the system voltage), phase (for example, three-phase or single-phase units), fuse size, and fuse type. • Show the following on the one-line diagram when a transformer is indicated, as applicable: primary switches, wye or delta connection, loadbreak elbows, lightning arresters, kVA rating, rated voltage (primary and secondary), transformer identification number, industry standard impedance, meter type, current transformer and potential transformer sizes, and fuse sizes. Show all pertinent transformer information on the one-line diagram as opposed to the specifications. Items that are common to all transformers can be indicated by notes on the one-line diagram if a typical detail drawing is provided. • Show the following on the one-line diagram when pad-mounted switchgear is indicated: spare ways (cubicles), protective devices, loadbreak elbows, and switch identification number. • Show the following on the one-line diagram when a new primary is indicated: in-line splices in manholes, normally open points, number and sizes of phase, neutral and ground cables, and conduit sizes. • If there is demolition involved or work is to be done to existing equipment, provide an existing one-line diagram showing the current arrangement of the gear and then show a new one-line diagram indicating by line weights what is existing or new. Ensure that information shown on the one-line diagram is not duplicated elsewhere in the construction package, as this will likely cause conflicts if changes are necessary. Indicate on the electrical legend the exact nomenclature used to indicate conductor and conduit sizing. Provide a schedule for feeder runs. Provide medium voltage one-line diagrams for stations and distribution systems that have a geographic affiliation to the actual constructed distribution system.

Drawing	Description
Fire alarm riser diagram	If required, fire alarm riser diagrams, including a mass notification system, will be provided by the fire protection engineer.
Special systems riser diagrams	Provide riser diagrams for other support systems, which may include electronic security, intrusion detection, access control, video surveillance, and lighting.
Enlarged plans	Include enlarged plan views where required due to plan view constraints, amount of information to be relayed, and complexity of the area in detail. Include enlarged electrical room plans.
Schematics and diagrams	Diagrams of high- and low-voltage interior electrical distribution will show features such as auto-transfer switches, emergency generators, emergency systems, and major subpanels. Provide control schematics, including motor and lighting controls and specialized controls.
Details	Include details for all electrical equipment, lighting calculations, light fixtures, exit signs, mounting details, occupancy sensors, exterior lighting control connection detail, daylighting and occupancy sensor diagram, system ground detail, main electrical grounding bar, panel details, arc flash warning label, ground rod test well details, duct bank details, power trench details, hand hole, etc.
Schedules and elevations	Provide elevations, sections, and details to clearly identify space constraints, unique conditions, design intent, or to ensure a specific method is implemented. Include schedules as applicable, such as lighting fixtures, lighting control scenarios and strategies, wire, cable and raceway, switchboard, motor control center, and panelboard schedules. 1. Panelboards. Provide schedules for all panelboards. Provide the panelboard schedule reflecting the actual circuit breaker and bus arrangement. Include the following: • Panelboard designation and location (such as room number). • Voltage, phase, frequency, number of poles, and minimum interrupting rating. • Main amperes indicating main breakers or lugs only. • Surface or flush mounting. • Circuit number, wire size, breaker trip, connected load, and identification of load associated with each branch or feeder (for example, do not merely indicate “Lighting,” but rather “Lighting, Room 102” for the directory marking). • Total connected load (calculated load) including demand factors of all circuits. • Any special breaker requirements such as ground fault circuit interrupter, arc fault circuit interrupter, switch duty, adjustable trip, and 100% rated. *Note*: Many manufacturers require minimum 400A panel frames for 100% breakers to be used. • Neutral bus size (100% or 200%). Additionally, consider other conductor sizing factors specific to a given circuit such as anticipated ambient temperature on the assumed routing path, whether the load is nonlinear, and the number of current-carrying conductors for purposes of re-sizing should circuits be consolidated into a common raceway during construction.

Drawing	Description
	Show all circuiting (identifying conduit and wiring back to specific panels but not identifying the exact routing required during construction) on the design drawings exactly as they will be installed. 2. Switchboards and switchgear. Provide plan and elevation or isometric drawings for switchboards and switchgear, showing compartments, their intended use, and instruments, relays, and controls. Clearly show contents of all sections including whether breakers are individually or group mounted. Indicate that switchboards and switchgear are mounted on 4 in (100 mm) elevated concrete pads. Coordinate design of pad with a structural engineer. 3. Motor control centers (MCCs). Provide plan and elevation or isometric drawings for MCCs identifying compartments. Provide a schedule listing each compartment. Include on the schedule (for each compartment) the description of load, load in amperes, load in horsepower, National Electric Manufacturers Association (NEMA) size and type of starter, breaker size, conductor and conduit size, control devices, and other special requirements. • Indicate, on plans or in specifications, the enclosure type, bus rating, bus material, bus bracing, NEMA class and wiring type, service voltage, control voltage and source, and top or bottom feed. • Indicate on the drawings that MCCs are mounted on 4 in (100 mm) elevated concrete pads. Coordinate design of pad with a structural engineer. • Provide elevation of control panels, indicating front panel devices such as indicator lights, pushbuttons, gauges, and switches.

3–17. Telecommunications drawings

Telecommunications drawing requirements are outlined in Table 3-13.

Table 3-13
Telecommunications drawing requirements

Drawing	Description
Abbreviations, general notes, and legends	Include definitions of abbreviations used, legends showing graphic illustration symbols used, general telecommunications notes, and other information as required.
Site plans	Depict the existing and new exterior telecommunication services, site-related systems, major equipment items, and pathways to and from the building(s). Indicate the telecommunications pathway improvements required from the installation-identified connection point to the site. Provide schematic diagrams of exterior systems such as grounding, electronic security systems, intrusion detection systems, and ground- or building-mounted antennas.

Drawing	Description
Floor plans	Provide a plan for the interior distribution systems, including access control, closed circuit television and cable television systems, AV systems, proposed location of all major items of telecommunications equipment, telecommunication connections, and cable raceways. Include required clearances for maintenance. Indicate pathways for cables, conduit, and equipment installed by the government or others (for example, antenna systems).
Enlarged plans	Include enlarged plan views where required due to plan view constraints, amount of information to be relayed, and complexity of the area in detail. Include enlarged telecommunication room plans and operating equipment spaces for control of secure areas within the facility, including exterior sally ports.
Diagrams	Include interior distribution control system diagrams, outside plant telecommunications one-line diagrams, telecommunication riser diagrams, and cable television diagrams.
Details	Include details for all telecommunication equipment and outlets, security equipment, cable trays, duct banks, penetrations, conduit entry into building, vaults, support details, and grounding.
Schedules	Include schedules as applicable, such as cables and cable trays, either on the floor plans or separate sheets as appropriate.
Control drawings	Include the interactive control and operations of all systems.

3–18. Utility monitoring and control system drawings

UMCS drawings for all UMCS Front Ends and for integration of building control systems with a UMCS must comply with UFC 3-470-01 and all applicable supplements or manuals.

3–19. Review and approval of project drawings

All reviews must be conducted in line with ER 1110-3-12. District and Center Chiefs of Engineering or their deputies will approve all appropriate in-house design drawings per Chapter 6.

Chapter 4
Specifications Requirements

4–1. General

This chapter prescribes the requirements for preparing specifications. It applies to specifications prepared at all phases of the design and construction process, and by both in-house teams and A-E contractors. Refer to UFS 1-300-02 for specifications formatting requirements.

4–2. Unified Facilities Guide Specifications

UFGS are a set of standardized, comprehensive specifications used for DoD design and construction. These specifications provide common requirements across DoD for safety, sustainability, durability, and functionality and refer to the applicable consensus building codes, DoD-defined requirements, and statutory and regulatory requirements. UFGS promotes consistency, quality, and efficiency across various projects by providing a standardized framework for a project team to use and edit for their project.

a. UFGS contain designer notes providing guidance on use of the specifications and the coordination required with the other project specification sections and the project drawings. Many UFGS contain “tailoring options” that allow SpecsIntact to globally delete products or requirements with minimal effort. Additionally, the guide specifications use brackets to identify alternative text and fill-in blanks for selection by designers.

b. The UFGS, combined with the use of SpecsIntact automated processing, improve project specification production, uniformity, consistency, and overall quality according to DoD policy. Uniformity and consistency of project specifications aid contractors in preparing their bids, improve quality of construction, and reduce cost to DoD stakeholders.

c. Use of UFGS is mandatory for developing project specifications. Use the latest version of UFGS per UFC 1-200-01.

d. UFGS are developed and maintained per MIL-STD-3007.

(1) Proposals for new criteria and UFGS with potential DoD-wide application are encouraged for submission. Proposals for technical or editorial changes to existing criteria and UFGS that are necessary or desirable for general application or to reflect local availability of materials and construction practice are also encouraged. Submit such proposals to DoD electronically as a criteria change request (CCR) in the WBDG website.

(2) UFGS are revised and reissued periodically to incorporate CCR, lessons learned, and technological advances. UFGS are published quarterly in February, May, August, and November.

4–3. SpecsIntact

SpecsIntact is a software program developed in partnership between the National Aeronautics and Space Administration (NASA) and the DoD, for use in producing USACE project specifications and maintaining guide specifications. The software provides specification automation to users and incorporates a wide range of quality control features.

a. Using SpecsIntact is mandatory for production of all project specifications, except for overseas projects that are designed to host nation standards. Maximum efficiency and quality are obtained when project specifications are prepared using SpecsIntact and the latest UFGS edited to suit the specific requirements of projects.

b. Refer to the eLearning modules and Web-based Help on the SpecsIntact website for instructions on its use.

4–4. Project specifications

a. General requirements. Ensure that high-quality and concise specifications are prepared, that the preparation of project specifications is fully coordinated with agency construction and contracting representatives, and that the project specifications comply with format and content requirements according to UFS 1-300-02. As needed, designate a lead specification engineer to oversee and coordinate the preparation of project specifications and to ensure compliance with these requirements. A specifications engineer has knowledge and experience in developing construction contract documents and project specifications.

b. Use of existing project specifications. To ensure that the latest UFGS is used, using sections from previous design project specifications is prohibited.

c. Tailor and edit the UFGS to fit specific project requirements. Preserve the intent of and wording of UFGS to the extent practicable as they incorporate public laws, federal mandates, DoD policy, industry coordination, and lessons learned.

d. Specifications development during project phases.

(1) Project specifications, when combined with the project drawings, must provide a comprehensive set of construction documents that can be bid fairly, competitively, and executed without change, except as necessary to resolve unforeseen conditions or changes made during construction. See ER 415-1-11 for guidance on biddability, constructability, operability, environmental, and sustainability (BCOES) reviews. Identify and resolve unusual design or contract administration problems and assure that project specifications comply with technical policy established by Headquarters, U.S. Army Corps of Engineers (HQUSACE).

(2) Close coordination between the specifications engineer, specifiers, and the designers is important throughout all design phases to produce complete and accurate project specifications. Specifications engineering and designing are distinct professional

functions that must be performed during specifications development. A person responsible for the specifications engineering function on a project may also handle some design tasks. However, one person may focus solely on specifications engineering while others handle the design functions. The specifications engineer is responsible for establishing local processes for developing and tracking project specifications.

(3) Specifiers should assist designers in identifying UFGS sections to use in the project, operating the SpecsIntact software, and incorporating a designer's technical requirements into the project specifications.

(4) Designers are responsible for designing the technical project features and for the technical content of the project specifications for those features. Specifiers are responsible for formatting all project specification sections and for ensuring that proper and non-contradictory contract language is used throughout. Additionally, specifiers determine the project-specific information that must be inserted into the non-technical provisions and the Division 01 general requirements sections.

(5) Designers will prepare technical specification sections for which no UFGS exists. When a new specification section must be developed for a particular project, the designer will provide the technical information and technical requirements to be included in the specification section. The specifier will work with the designer to ensure that the section contains proper language and is properly formatted per UFS 1-300-02.

(6) Project bid schedules (also known as pricing schedules) will be prepared in close coordination with contracting, Counsel, project management, design, cost engineering, and construction. For Civil Works projects, the lump sum and unit-priced items defined for incorporation in the bid schedule must be consistent with the work breakdown structure. Conform bid schedules to USACE guidance and all aspects of Federal Acquisition Regulation (FAR) Subpart 36.207. Contracting is responsible for incorporating the bid schedule into the contract documents.

(7) As part of the routine QA/QC process, Specifiers should perform quality checks (for example, SpecsIntact reports, visual scan of pages for errors, verification of specification inserts such as the submittal register, test requirement list) on project specifications prior to advertisement.

(8) Appropriate design staff should make field trips during the construction phase of projects to identify specifications and contract administration problems to be avoided in future project specifications. Implement corrective action to resolve problems identified during all project phases that could have been prevented by improved specifications, such as recommend changes in UFGS.

(9) Contact the Resident and Area Engineers during the design process and solicit their input, particularly for Division 01 sections.

e. Specifications prepared by architect-engineer firms. Include the requirement to use SpecsIntact for production of project specifications in all procurement of A-E design services. Give preference to A-E firms that utilize Construction Specifications Institute (CSI) certified construction specifiers.

(1) Provide the A-E copies of regulations, manuals, engineer technical letters, and other information not available on TECHINFO and the WBDG website.

(2) Clearly specify in the A-E scope of work who will prepare the Division 01 sections. If the A-E is responsible, provide guidance and agency-unique information to A-E firms for incorporation into Division 01 sections.

f. Construction documents format. Format project specifications per UFS 1-300-02.

(1) Specification section numbering will follow CSI MasterFormat® (latest edition). If CSI MasterFormat lists a section number and title, that is the number and title to use. If either the section number or title changes, update both to maintain a unique and consistent set.

(2) CSI MasterFormat classifies the fifth-level numbering as user-defined for internal agency use only. The UFGS uses a fifth-level section numbering scheme to designate agency-specific sections; fifth-level 10 indicates a USACE-specific section. Refer to Table 4–1 for fifth-level numbers assigned to USACE Districts for local masters.

Table 4–1
U.S. Army Corps of Engineers District fifth levels

District	5th Level	District	5th Level
CEHNC (Huntsville)	01	CENWP (Portland)	25
CELRB (Buffalo)	02	CENWS (Seattle)	27
CELRC (Chicago)	03	CENWW (Walla Walla)	28
CELRE (Detroit)	04	CEPOA (Alaska)	29
CELRH (Huntington)	05	CEPOF (Far East)	31
CELRL (Louisville)	06	CEPOH (Honolulu)	32
CELRL-PM-R (Army Reserve)	48	CEPOJ (Japan)	33
CELRN (Nashville)	07	CESAA (Caribbean)	51
CELRP (Pittsburgh)	08	CESAC (Charleston)	34
CEMVK (Vicksburg)	09	CESAJ (Jacksonville)	35
CEMVM (Memphis)	11	CESAM (Mobile)	36
CEMVN (New Orleans)	12	CESAS (Savannah)	37
CEMVP (St. Paul)	13	CESAW (Wilmington)	38
CEMVR (Rock Island)	14	CESPA (Albuquerque)	39

District	5th Level
CEMVS (St. Louis)	15
CENAB (Baltimore)	16
CENAE (New England)	17
CENAN (New York)	18
CENAO (Norfolk)	19
CENAP (Philadelphia)	21
CENAU (Europe)	22
CENWK (Kansas City)	23
CENWO (Omaha)	24

District	5th Level
CESPK (Sacramento)	41
CESPL (Los Angeles)	42
CESPN (San Francisco)	43
CESWE (Expeditionary)	52
CESWF (Fort Worth)	44
CESWG (Galveston)	45
CESWL (Little Rock)	46
CESWT (Tulsa)	47
CESWM (Middle East)	49

g. Reference publications.

(1) Describe materials, workmanship, and equipment, where possible, by referring to industry and government standards generally known to the construction community, citing the type, class, or other designation necessary to identify fully the item required. The reference approval date and the dates of any applicable amendment and revisions must be included in the solicitation (FAR Subpart 11.201a). Reference standards should not be used to describe minor, non-critical items (such as incidental fasteners) when any commercially available product of that nature may be adequate. To the maximum extent practicable, references will be to nationally recognized industry and technical society specifications and standards. If industry documents are unavailable or unsuitable, refer to the applicable commercial item descriptions.

(2) Publications referenced in project specifications need to be no later than the editions cited in the current notice for the corresponding UFGS. Publications not readily available to bidders, such as locally developed policy or guidance, should not be referenced, but if referenced, will be furnished with the solicitation (FAR Subpart 11.201b). Per DoD direction, do not use federal specifications (FED-SPEC), federal standards (FED-STD), military specifications (MIL-SPEC), and military standards (MIL-STD) in contracts unless exempted by HQUSACE. These publications, when cited in UFGS, are approved for use. FED-SPEC, FED-STD, and commercial item descriptions are available on the GSA website. MIL-SPEC and MIL-STD can be located through the Defense Standardization Program website.

h. Submittals. Construction submittals such as shop drawings, samples, test reports, certificates, and manufacturer's instructions are not required for non-critical items of relatively low value when the cost of making the submittal exceeds the benefit to the project (see ER 415-1-10). Avoid such submittal requirements for small projects. Keep submittals requiring government approval to a minimum.

i. Testing. Ordinarily, testing is the contractor's responsibility under the Contractor Quality Control (CQC) provisions of the specifications (see ER 1180-1-6). Specifications that designate testing as the contractor's responsibility will not override the Contracting

Officer's right to conduct confirmation testing, QA testing, or to observe the contractor's testing. Keep government testing at government expense (outside of the tests performed by the contractor under the CQC procedures) to a minimum and specify it only when necessary to assure the quality of critical construction. SpecsIntact produces a test/requirements list that includes all the test requirements cited in the text, along with the sections and subparts. Provide this report to the Resident Engineer when required.

j. Warranties. Warranty requirements extending beyond the normal one-year construction warranty period, or such other period required by UFGS will be specified only for materials, equipment, or systems for which longer warranties are normally provided in the industry. Evaluate the increased cost of the extended warranties and the costs of administering and enforcing such warranties prior to their specification.

k. New materials and methods. Designers are encouraged to consider using new or innovative materials, equipment, systems, or methods in designs when evidence shows that their use is in the best interest of the government in terms of value, lower life cycle costs, and quality of construction. Manufacturers are to prove the merits of their product by certified, independent laboratory results, evidence of satisfactory installation under conditions like those anticipated for the proposed construction, and compliance with appropriate industry standards, if they exist. Refer to UFS 1-300-02 for specifying new items. Consider submitting new and innovative items to the DoD as a CCR on the WBDG website. The CCR will inform the DoD about the innovation, enabling the evaluation and implementation of change to the criteria.

l. Brand names and proprietary items. Specifying items peculiar to one manufacturer (closed proprietary), either by brand name or by peculiar characteristic, is prohibited unless specially justified and approved (FAR, Subpart 11.105). The use of brand name or equal (open proprietary) descriptions also requires J&A (DFAR 206.302-1(c)). When such descriptions are used, include the salient features of the item specified on which equality can be determined (FAR, Subpart 11.104, Subpart 11.107, and Subpart 36.202(c)).

m. Discipline-specific specification requirements.

(1) *Facility-related control system cybersecurity specifications*. Provide separate specifications for each FRCS and cybersecurity impact level. Begin all FRCS cybersecurity specification with "25 05 11" for the first three levels of numbers and use fourth-level numbering to differentiate specifications as described in UFC 4-010-06 and UFS 4-010-06.

(2) *Contractor furnished contractor installed furniture*. Include specification UFGS 12 50 00.13 10 or a comparable specification in the contract documents when the FF&E is contractor furnished contractor installed. Specifications must include non-proprietary, project-specific, salient characteristics for furniture items. An FF&E package is required as an attachment to UFGS 12 50 00.13 10 but may not be required for other comparable specifications. Reference 2–2.d(7) for detailed FF&E package

requirements. When including an FF&E attachment, omit unit, extended, or shipping costs on data sheets.

Chapter 5
Recommended Minimum Submittal Requirements for Military Vertical Design

5–1. General

This list of requirements represents typical minimum submittal content for MILCON projects but can be adapted for all other project types. Project teams are to review this information and validate this list against the specific scope and project requirements to generate project-specific submittal requirements. Coordinate the lists with project requirements, AR 420-1, all relevant ERs, UFCs, and other applicable criteria. The submittal phases outline requirements for D-B-B execution. Notations are added to help adapt the list for D-B RFP preparation.

5–2. Parametric design – 5% to 15% submittal

a. Drawings. Refer to Chapter 3 for detailed drawing requirements.

b. Specifications. Not required at this phase.

c. Design analysis. Refer to Chapter 2 for detailed DA requirements and for the OPR that corresponds to “Stakeholder Requirements” in the PMP.

5–3. Concept design – 35% submittal

AR 420-1, paragraph 4-40 concept design (code 2) states: “The design will establish all basic features, materials, construction methods, facility systems, fire plans, and related costs of the facility.” The 35% design effort establishes that the facility can be constructed according to applicable codes and criteria, the user program, and the DD Form 1391 requirements. The overall size, shape, and configuration of the building(s) are defined. The requirements for a concept or 35% submittal include, but are not limited to:

a. Drawings. Refer to Chapter 3 for detailed drawing requirements. A project delivery team must tailor minimum content to match the project scope.

b. Advanced modeling. Include the following documents and files and the USACE Advanced Modeling submittal checklist for the advanced modeling submittal. Refer to EM 1110-1-2909.

(1) *Advanced modeling project execution plan.* An electronic copy of the most current approved version of the project advanced modeling PxP. For in-house design projects, this will be included as an appendix to the DA. For projects designed by A-Es, this will be a required submittal.

(2) *Electronic files.* An electronic list (.txt file or similar) of all submitted electronic files, including a description, directory, and file name for each file submitted. Identify which files were produced from the model and facility data. For all sheet files, include a list of the sheet titles and sheet numbers.

(3) *Advanced modeling submittal checklist.* Complete the USACE BIM/CIM advanced modeling submittal checklist and include it with each submittal. Download the latest checklist from the USACE CAD/BIM Technology Center website (https://cadbimcenter.erdc.dren.mil/).

(4) *Advanced modeling files.* Provide all native advanced modeling files associated with the production of the contract drawings and associated as-modeled drawings.

(5) *Quality control reports.* Provide electronic PDFs of all QC reports and checklists used to verify full compliance with the contract requirements and standards.

(6) *Computer-aided design exports of building information modeling, generated sheets, and drawings.* Provide supplemental two-dimensional CAD exports from the project BIM model as needed to demonstrate compliance with contract requirements.

c. Specifications. Edited table of contents. (For draft D-B RFP submittal requirements, refer to 65% submittal for specification requirements).

d. Design analysis. Refer to Chapter 2 for detailed DA requirements.

(1) Initial acquisition strategy.

(2) (For D-B-B) Updated CWE (class 3 or better), CSRA (if applicable), ENG Form 6196, and ENG Form 3086.

(3) BOD Cx format covering commissioned systems.

(4) OPR format covering commissioned systems.

(5) Geotechnical data report.

(6) Initial site survey including identification of all major site utilities.

5–4. Interim design – 65% submittal

a. Drawings. Update and develop the drawings from the 35% submittal and add new 65% drawings as required by each discipline. Incorporate revisions as necessary to address previous review comments. Refer to Chapter 3 for detailed drawing requirements.

b. Advanced modeling. See paragraph 5–3.b for detailed requirements.

(1) Advanced modeling PxP.

(2) Electronic files.

(3) Advanced modeling submittal checklist.

(4) Advanced modeling files.

(5) QC reports.

(6) CAD exports of BIM-generated sheets and drawings.

c. Specifications. Refer to Chapter 4.

(1) Updated table of contents.

(2) Edit specification sections and include any necessary attachments. Leave edits visible for review. For Draft D-B RFP, include all Division 01 specifications and attachments. Example of attachments to the UFGS 01 11 00 include: scope of work, concept drawings, FF&E, communication information, environmental information, fire flow test results, photos of existing conditions, and as-built drawings. Level of development may vary between disciplines.

(3) Bid schedule indicating bid items, units of measure, and estimated quantities.

d. Design analysis. Updated from 35% submittal. Refer to Chapter 2 for detailed DA requirements.

(1) Final acquisition strategy.

(2) Updated CWE (class 2 or better).

(3) VE study.

(4) Outline of ECIFP.

(5) Final geotechnical data report.

5–5. Final design – 95% submittal

a. Drawings. Complete the drawings from the previous submittal. Incorporate revisions as necessary to address all previous review comments. Refer to Chapter 3 for detailed drawing requirements.

b. Advanced modeling. See paragraph 5–3.b for detailed requirements.

(1) Advanced modeling PxP.

(2) Electronic files.

(3) Advanced modeling submittal checklist.

(4) Advanced modeling files.

(5) QC reports.

(6) CAD exports of BIM-generated sheets and drawings.

c. Specifications. Final edited specifications, including all required attachments. Refer to Chapter 4.

(1) Coordinate with contracting to prepare the Division 00 specifications to be included in this submittal. Contract clauses, instructions to bidders, and selection criteria are established.

(2) All final specifications will incorporate necessary revisions to address review comments. Edits no longer need to be visible for final review.

(3) All errors have been resolved, and all brackets have been edited.

(4) Updated bid schedule.

d. Design analysis. Updated from the 65% submittal. Refer to Chapter 2 for detailed DA requirements.

(1) Updated acquisition strategy if it has changed.

(2) Updated CWE (Class 1).

(3) VE study documentation, if applicable, complete and certified.

(4) Final ECIFP.

5–6. Corrected final – 100% submittal

a. Drawings. Corrected final drawings incorporating any required revisions from the 95% (or Final D-B RFP) submittal to allow all reviewers to back check and close remaining comments. Refer to Chapter 3 for detailed drawing requirements.

b. Advanced modeling. See paragraph 5–3.b.

(1) Advanced modeling PxP.

(2) Electronic files.

(3) Advanced modeling submittal checklist.

(4) Advanced modeling files.

(5) QC reports.

(6) CAD exports of BIM-generated sheets and drawings.

c. Specifications. Corrected final specifications with all comments addressed. Refer to Chapter 4.

(1) Final division 00 Specifications.

(2) Final bid schedule.

d. Design analysis. Corrected final DA updated to document any revisions made to the final design, including any final updates to the acquisition strategy, CWE, VE Study, or ECIFP. Refer to Chapter 2 for detailed DA requirements.

5–7. Ready to advertise (Ready to advertise/Ready to advertise design-build request for proposal)

a. Drawings. Final drawings that resolve all previous review comments, including all appropriate signatures. Refer to Chapter 3 for detailed drawing requirements.

b. Advanced modeling. See paragraph 5–3.b for detailed requirements.

(1) Advanced modeling PxP.

(2) Electronic files.

(3) Advanced modeling submittal checklist.

(4) Advanced modeling files.

(5) QC Reports.

(6) CAD exports of BIM-generated sheets and drawings.

c. Specifications. Final edited specifications. Coordinate with the project Specifications Engineer on additional documents required for the RTA submittal, such as:

(1) Signed ENG Form 6055 or waiver.

(2) Signed liquidated damages/construction memo.

(3) (D-B-B only) Signed district quality control/A-E quality control certifications from each discipline.

(4) DrChecks screenshot showing all review comments as closed.

(5) Report with DrChecks BCOES review comments.

(6) Report with DrChecks DQC review comments.

(7) Final bid schedule.

(8) (D-B-B Only) Attachment 00 72 00-A index of drawings.

(9) BCOES certification form.

(10) (D-B-B in-house only) Design authentication form.

(11) Certification needed prior to advertisement, if applicable (for example, see BCOES Certification per ER 415-1-11, Appendix 1).

(12) Real estate certification form.

(13) Scope certification form.

(14) Other documents on request (for example, J&As).

d. Design analysis. Final DA that resolves all previous review comments. Refer to Chapter 2 for detailed DA requirements.

Chapter 6
Signatures on design documents

6–1. Signature of design documents by registered U.S. Army Corps of Engineers and contractor professionals

a. USACE District and Center Chiefs of Engineering, District Chiefs of Construction, or their equivalent will sign and indicate their professional registration on appropriate design documents, permit applications, and certifications. When administratively requested by state or local authorities, although not legally required to do so, a currently registered USACE professional at a USACE Center or District may also stamp or seal documents, or portions of documents, prepared by in-house USACE personnel.

b. A-E contractors will prepare or review and approve design documents, permit applications, or certifications as required by the A-E contract. If the work requirements and the A-E contract necessitate signature and a stamp or seal for specific document sections for specific engineering disciplines such as structural, mechanical, electrical, or fire protection designs, then the currently registered A-E professional(s) overseeing the production of those documents will sign and stamp or seal the documents associated with that specialty. The complete set of design documents will be signed and stamped or sealed by the currently registered designer(s) of record.

c. The D-B contractor's designer(s) of record will prepare or review and approve their work by affixing their signature and stamp or seal on design documents, permit applications, or certifications as required by the construction contract and applicable state laws or regulations.

6–2. Review, approval, and signature on design documents and indication of registration

a. District and Center Chiefs of Engineering or their deputies will review and approve all appropriate design documents and associated certifications, as well as all appropriate permit applications prepared by in-house USACE personnel. Their approval and professional registration will be indicated by their signature or stamp and date on appropriate design documents and permit applications. District and Center Chiefs of Construction (or their equivalent) or their deputies will sign and date USACE certifications required during or after construction. Districts and Centers are encouraged to contact HQUSACE for guidance concerning unusual situations.

b. The responsible registered professional's signature must be followed by "P.E." (Professional Engineer), "R.A." (Registered Architect), or other appropriate designation indicating that the signer is a currently registered professional. At the discretion of the District or Center engineering and construction leadership, all documents may be sealed or stamped rather than using the P.E. or R.A. designation.

c. Individuals signing per paragraph 6–1 of this regulation are required to do so within the scope of their employment. Documents to be submitted to federal, state, or local authorities that contain initials, signatures, or seals (or other indication of registration such as P.E.) will contain a statement that the documents are executed according to this regulation. For example, the cover sheet for the project plans and specifications will include a statement such as the following: “This project was designed by the (name of District) District of the U.S. Army Corps of Engineers. The initials or signatures and registration designations of individuals appear on these project documents within the scope of their employment as required by ER 1110-345-700.”

d. The purpose of this requirement is to establish a clear, written record to be used in case of litigation, indicating that USACE employees who sign documents are doing so within the scope of their employment and specific, written authority and thus are not personally liable.

6–3. Signing and sealing or stamping of Architect-Engineer or design-build contract deliverables

A-E and D-B contracts will require the A-E or D-B contractor to sign and stamp or seal and date at least one set of electronic design documents (including DA, drawings, and specifications), permit applications, or certifications.

6–4. Changing in-house Architect-Engineer or design-build contract designs

a. In-house designs.

(1) If a design document, permit application, or certification created by USACE in-house designers is changed by someone other than the original professional, a clear record of internal responsibility for the change must be maintained. Accordingly, when a change is prepared by someone other than the original professional, before the change is implemented, a written record will be made describing the change and the reason for making the change, showing the date, signature, and title of the individual making the change.

(2) Significant changes, such as changes impacting the design intent or details of implementation, will be made only in consultation with the original designer and with the written concurrence of the original designer. If the original designer is no longer employed by USACE, then the professional who is duly designated to succeed or assume the original designer’s role must be consulted appropriately, and this professional will provide the necessary review and written concurrence of the significant change to the original design.

(3) In the event of a conflict between the original professional and acceptance of a management-directed change, the resolution must be made by the supervising technical professionals and documented to establish clear internal responsibility for the change.

b. Architect-engineer contractor designs.

(1) Changes to A-E contractor-prepared design documents, permit applications, and certifications should not be made by anyone other than the original designers. If a document prepared under an A-E contract is changed by someone other than the original A-E designers, then the A-E may successfully argue that it is relieved of some responsibility for the original design, and the government may have difficulty enforcing A-E liability under FAR Subpart 36.608.

(2) If a document created by an A-E contractor is changed by someone other than the original professional, a clear record of internal responsibility for the change must be maintained. Accordingly, when a change is prepared by someone other than the original professional, before the change is implemented, a written record must be made describing the change and the reason for making the change, showing the date, signature, and title of the individual making the change.

(3) Significant changes, such as changes impacting the design intent or details of implementation, will be made only in consultation with the original designer and with the original designer's written concurrence.

c. Design-bid contractor designs. Changes to D-B contractor-prepared design documents, permit applications, and certifications should not be made by anyone other than the original designers.

Appendix A
References

Section I

Required Publications

Unless otherwise indicated, all Army and USACE publications are available at https://armypubs.army.mil and https://www.publications.usace.army.mil. DoD publications are available on the Executive Services Directorate website at https://www.esd.whs.mil. Federal Acquisition Regulations (FARs) are available at https://www.acquisition.gov/browse/index/far. National Fire Protection Association (NFPA) publications are available at https://www.nfpa.org/for-professionals/codes-and-standards/list-of-codes-and-standards. Unified Facilities Criteria (UFC) and Unified Facilities Supplements (UFS) publications are available on the Whole Building Design Guide website at https://www.wbdg.org/dod/ufc.

AR 380-5
Army Information Security Program

AR 420-1
Facilities Management

ASHRAE Guideline 0
The Commissioning Process

ASHRAE Standard 90.1
Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings

ASHRAE Standard 202
Commissioning Process for Buildings and Systems
(Available at https://www.ashrae.org/**)**

CSI MasterFormat® 2020 Edition
(Available at csiresources.org)

DA Pam 25-403
Army Guide to Recordkeeping

DFAR 206.302-1(c)
Application for brand-name descriptions
(Available at https://www.acquisition.gov/dfars/206.302-1-only-one-responsible-source-and-no-other-supplies-or-services-will-satisfy-agency-requirements.?searchTerms=206.302-1)

EM 5-1-11
Project Delivery Business Process

EM 200-1-2
Environmental Quality Technical Project Planning Process

EM 1110-1-2909
Geospatial Data and Systems

ER 415-1-10
Contractor Submittal Procedures

ER 415-1-11
Biddability, Constructability, Operability, Environmental, and Sustainability (BCOES) Reviews

ER 1110-1-8152
Professional Registration and Signature on Design Documents

ER 1110-1-8155
Specifications

ER 1110-3-12
Quality Management

ER 1110-345-723
Total Building Commissioning Procedures

ER 1140-1-211
Support for Others: Reimbursable Services

ER 1180-1-6
Construction Quality Management

ERDC/ITL SR-23-1
A/E/C Graphic Standards
(Available at https://cadbimcenter.erdc.dren.mil/)

ERDC/ITL TR-19-7
A/E/C Computer-Aided Design (CAD) Standard
(Available at https://cadbimcenter.erdc.dren.mil/)

ERDC/LAB TR 21-4
USACE Advanced Modeling BIM/CIM Object Standard
(Available at https://cadbimcenter.erdc.dren.mil/BIM)

FAR Subpart 11.104
Use of brand name or equal purchase descriptions

FAR Subpart 11.105
Items peculiar to one manufacturer

FAR Subpart 11.107
Solicitation provision

FAR Subpart 11.201 (a and b)
Identification and availability of specifications

FAR Subpart 36.102
Definitions

FAR Subpart 36.202(c)
Specifications

FAR Subpart 36.207
Pricing fixed-price construction contracts

FAR Subpart 36.608
Liability for Government costs resulting from design errors or deficiencies

Federal Specifications, Federal Standards, and Commercial Item Descriptions
(Available at https://fedspecs.gsa.gov/s/)

HNC Furniture Program MRSI Website
(Available at https://mrsi.erdc.dren.mil/furniture/)

IEEE C57.12.00
IEEE Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers(Available at https://standards.ieee.org/ieee/C57.12.00/6962/)

High Performance and Sustainable Building (HPSB) Guiding Principles(Available at https://www.wbdg.org/FFC/FED/hpsb_guidance.pdf)

International Building Code (IBC)
(Available at https://codes.iccsafe.org)

Military Specifications and Military Standards
(Available at https://www.dsp.dla.mil)

MIL-STD-3007
Standard Practice Unified Facilities Criteria, Facilities Criteria and Unified Facilities Guide Specifications
(Available at https://www.wbdg.org/dod/fedmil/mil-std-3007)

NFPA 70
National Electrical Code (NEC)

NFPA 72
National Fire Alarm and Signaling Code

NFPA 101
Life Safety Code®

SpecsIntact
eLearning Modules and Web-Based Help
(Available at https://SpecsIntact.wbdg.org)

UFC 1-200-01
DoD Building Code

UFC 1-200-02
High Performance and Sustainable Building Requirements

UFC 3-101-01
Architecture

UFC 3-410-02
Direct Digital Control for HVAC and Other Building Control Systems

UFC 3-420-01
Plumbing Systems

UFC 3-470-01
Utility Monitoring and Control System (UMCS) Front End and Integration

UFC 3-501-01
Electrical Engineering

UFC 3-600-01
Fire Protection Engineering for Facilities

UFC 4-010-01
DoD Minimum Antiterrorism Standards for Buildings

UFC 4-010-06
Cybersecurity of Facility-Related Control Systems (FRCS)

UFGS 01 11 00
Summary of Work

UFGS 01 33 16.00 10
Design Data (Design After Award)

UFGS 12 50 00.13 10
Furniture and Furniture Installation

UFS 1-300-02
Unified Facilities Guide Specifications (UFGS) Format Standard

USACE Technical Information-Facilities Design Website
(Available at https://www.hnc.usace.army.mil/Missions/Engineering-Directorate/TECHINFO/)

WBDG Resource Library
(Available at https://wbdg.org/ffc/army-coe/resource-library)

Section II

Prescribed Forms

DD Form 1391
FY__ Military Construction Project Data

ENG Form 3086
Current Working Estimate for Budget Purposes

ENG Form 6055
Contract Requirements Package Security Review Cover Sheet

ENG Form 6196
Designated Department of Defense Construction Agent (DCA) Assessment

Glossary of Terms

Section I

Acronym List

Term	Definition
A/E/C	Architecture/Engineering/Construction
A-E	Architect-Engineer
ANSI	American National Standards Institute
AR	Army Regulation
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ATO	Authority to Operate
AV	Audio/Visual
BCOES	Biddability, Constructability, Operability, Environmental and Sustainability
BIM	Building Information Modeling
BOD	Basis of Design
CAD	Computer-Aided Design
CCR	Criteria Change Request
CFCI	Contractor furnished, contractor installed
C-I-A	Confidentiality, Integrity, and Availability
CIM	Civil Information Modeling
CQC	Contractor Quality Control
COS	Center of Standardization
CSI	Construction Specifications Institute
CSRA	Cost Schedule Risk Analysis
CWE	Current Working Estimate
Cx	Commissioning
CxD	Commissioning Specialist for the Design Phase
CxG	Commissioning Specialist for the Government
DA	Design Analysis
D-B	Design-Bid
D-B-B	Design-Bid-Build
DFAR	Defense Federal Acquisition Regulation
DFPE	District Fire Protection Engineer
DoD	Department of Defense
DOR	Designer of Record
ECIFP	Engineering Considerations and Instructions for Field Personnel
EM	Engineer Manual
ER	Engineer Regulation

Term	Definition
ERDC/ITL	Engineer Research and Development Center/Information Technology Laboratory
FAMN	Fire Alarm/Mass Notification
FAR	Federal Acquisition Regulation
FED-SPEC	Federal Specifications
FED-STD	Federal Standards
FF&E	Furniture, Fixtures, and Equipment
FRCS	Facility Related Control System
FSC	Federal Supply Category
GFCI	Government furnished, contractor installed
GFGI	Government furnished, government installed.
GSA	General Services Administration
HNC	Huntsville Engineering and Support Center
HPSB	High Performance and Sustainable Building
HQUSACE	Headquarters, U.S. Army Corps of Engineers
HTRW	Hazardous, Toxic, and Radioactive Waste
HVAC	Heating, Ventilation, and Air Conditioning
IBC	International Building Code
IEEE	Institute of Electrical and Electronics Engineers
IMCOM	Installation Management Command
J&A	Justification and Approval
kVA	Kilovolt-Ampere
kVAR	Kilovolt-Ampere Reactive Power
LCCA	Life Cycle Cost Analysis
LEED	Leadership in Energy and Environmental Design
MCC	Motor Control Center
MDP	Main Distribution Panel
MILCON	Military Construction
MIL-SPEC	Military Specifications
MIL-STD	Military Standards
NASA	National Air and Space Administration
NAVFAC	Naval Facilities Engineering Systems Command
NEMA	National Electric Manufacturers Association
NFPA	National Fire Protection Association
O&M	Operations and Maintenance
OPR	Owner’s Project Requirements
P.E.	Professional Engineer
PDF	Portable Document Format
PMP	Project Management Plan
POC	Point of Contact

Term	Definition
PxP	Project Execution Plan
QA	Quality Assurance
QC	Quality Control
QFPE	Qualified Fire Protection Engineer
QMP	Quality Management Plan
R.A.	Registered Architect
RFI	Request for Information
RFP	Request for Proposal
RTA	Ready to Advertise
SCIF	Sensitive Compartmented Information Facility
SID	Structural Interior Design
SIN	Special Item Number
SO	System Owner
SRM	Sustainment Restoration and Modernization
STC	Sound Transmission Class
TPC	Third-Party Certification
UFC	Unified Facilities Criteria
UFGS	Unified Facilities Guide Specifications
UH	Unaccompanied Housing
UMCS	Utility Monitoring and Control System
USACE	U.S. Army Corps of Engineers
VE	Value Engineering
WBDG	Whole Building Design Guide

Section II

Terms

Advanced Modeling Project Execution Plan
The governing document that establishes how to execute, monitor, and control projects. The plan is the main communication vehicle to ensure that everyone is aware of and knows the project objectives and how they will be accomplished. Project objectives are derived from the mission needs statement, and an integrated project team assists in developing the PxP. The plan is a living document and should be updated to describe current and future processes and procedures such as integrating safety into the design process. Updates are common as a project moves through critical decision phases.

Basis of Design for Commissioning
A stand-alone subset or sections of the design analysis that address commissioned systems and elements. Where ER 1110-345-723, ASHRAE Standard 202, or ASHRAE Guideline 0 use the terms “Basis of Design” or “BOD,” those references will be understood as referring to BOD Cx.

CSI MasterFormat
Industry standard for organizing construction project information to create a consistent, logical format for specifications, costs data and other project details using a hierarchical system of 50 divisions.

Design Analysis
The document that contains written material covering general parameters, functional and technical requirements, design objectives, design assumptions, and provides design calculations applicable to a project’s design.

Design-Bid-Build
Per FAR 36.102, a project acquisition and delivery method where design and construction are sequential, and construction is contracted separately. For USACE in-house D-B-B, the executing District is DOR. For A-E contracted D-B-B, the A-E is DOR.

Design-Build
Per FAR 36.102, a project acquisition and delivery method that combines design and construction in a single contract with one contractor.

Designer of Record
The registered professional responsible for the technical correctness of the design, supervises the design team, and who signs and seals the design documents.

Drawing
A static graphic representation of design content formatted as a two-dimensional sheet.

Engineering Considerations and Instructions for Field Personnel
An information bridge between designers, design-build preparers, and construction personnel for both design-build and design-bid-build projects. The ECIFP conveys risk elements identified during the design, design assumptions of critical project features, and initial project coordination of the project delivery team to USACE construction field personnel.

Justification and Approval
A document required to justify and obtain appropriate level approvals to contract without providing for full and open competition as required by the FAR.

Project Management Plan
Per EM 5-1-11, “A formal, approved, living document used to define requirements and expected outcomes and guide project execution and control.”

Owner's Project Requirements
A stand-alone subset of the DA that addresses commissioned systems and elements. Per ER 1110-345-723, it is a "written document that details the project requirements and the expectations of how the building and its systems must be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information."

Reference Standards
Documents that contain requirements set by authority, custom, or general consensus and are established as accepted criteria. Trade associations, professional societies, standards-writing organizations, governments, and institutional organizations such as the American National Standards Institute (ANSI) and ASTM International publish reference standards. The UFGS and project specifications refer to these documents to define qualitative and performance requirements for materials, equipment, systems, test methods, and workmanship.

Request for Proposal
A request for proposal is the procurement document normally used to procure D-B projects. An RFP for a D-B contract should state project requirements, criteria, and evaluation factors. It provides the information as well as framework necessary for offerors to submit proposals.

Specifications Engineer
An Architect, Engineer or Technician who is assigned primary responsibility for overseeing the collective preparation of project specifications/construction documents on an individual project and has the responsibility for overall coordination of the final RTA package for the individual project.

Specifier
An Architect, Engineer, or Technician who is assigned the preparation of project specifications and coordination of the specifications with the other construction documents. The Specifier works under the direction of a Specifications Engineer or Designer.

SpecsIntact
A software program, developed in partnership between NASA and DoD, mandated for use in producing USACE project specifications and maintaining guide specifications. The software provides specification automation to users and incorporates a wide range of quality control features.

Stakeholder Requirements
Per EM 5-1-11, Stakeholder Requirements "outline project objectives, key deliverables, decision points, and constraints related to the project. Assumptions made during the development of the scope should also be documented."

Submittal

The complete package of documents that is delivered at completion of a design milestone as identified in the PMP, or as required during the design process. Submittals can be for internal or external use.

Third-Party Certification
Per UFC 1-200-02, third-party certification is “the generic term for a third-party product that provides either certification of the third-party’s specific product or a validation program by the third-party.”