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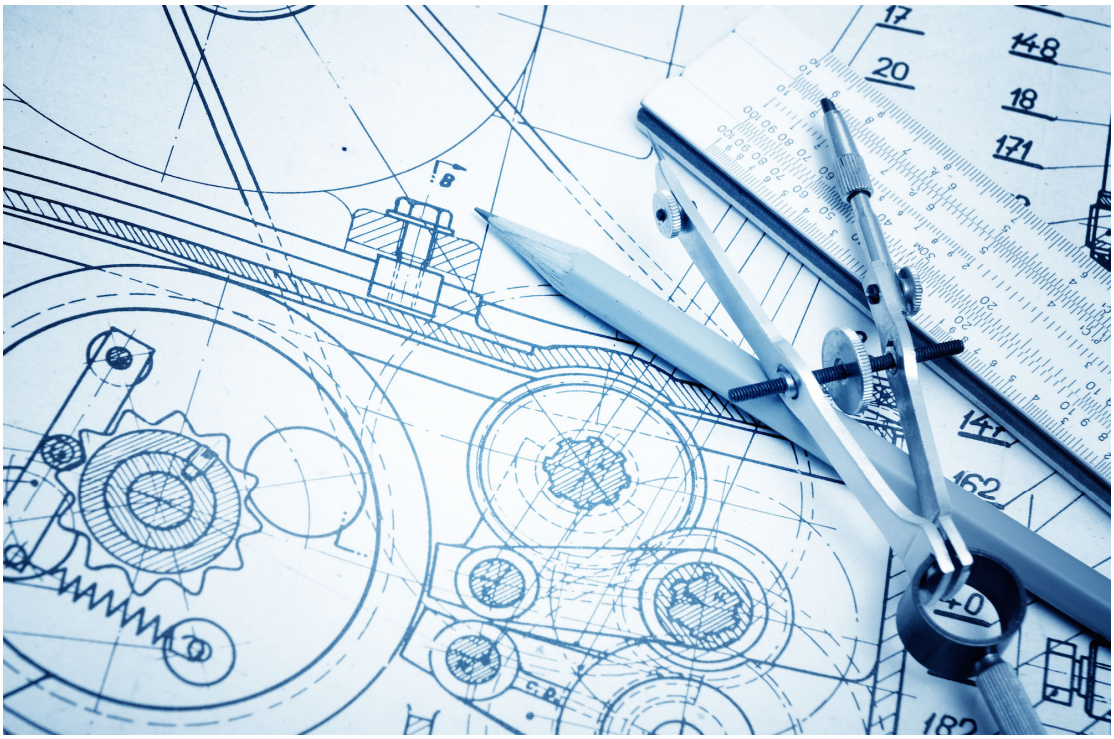
US Army Corps of Engineers®

ARCHITECT-ENGINEER GUIDE 10%

SACRAMENTO DISTRICT

USACE



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Purpose

The purpose of the Architect-Engineer (A-E) Guides are to inform A-E firms of the general administrative and technical requirements for providing professional services and products relative to their contract(s) with the U.S. Army Corps of Engineers, Sacramento District (SPK). These guides provide guidance for what is required at each DBB submittal stage as well as for DB RFP package development. They are meant to supplement the statement of work in the project task order contract and not replace the specific contract requirements and other applicable codes and guidelines.

USACE Point of Contact

The Statement of Work indicates a Technical Lead assigned to the project who will function as the USACE Primary Point of Contact (POC).

Document Update - Point of Contact

The Quality Assurance, Specifications and A-E Services Section (QASAE, CESPK-EDS-Q) is responsible for coordinating updates to these A-E Guides. The QASAE Section is also responsible for ensuring contents reflect actual practices. Contact the QASAE Section if you have any questions, suggestions, or concerns about any part of these documents.

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Architect-Engineer 10% Design Submittals

Table of Contents

Scope

The purpose of this document is to provide the guidance for the content of the Architect-Engineer (A-E) 10% Design Submittals. This is also called the Concept Design Phase.

Distribution (to applicable organizations)

A-E Firm

Chief of Quality Assurance, Specifications and A–E Services (QASAE) Section

Chief of Engineering Division

Assistant Chief of Engineering Division

Chief of Engineering Support Branch

Chief of Military Design Branch

Assistant Chief of Military Design Branch

Chief of Civil Design Branch

Chief of Geotechnical Branch

Chief of Environmental Engineering Branch

Chief of Environmental Resources Branch

Project Management

Safety Office

Ownership

The Quality Assurance, Specifications and A-E Services Section (QASAE, CESPK-EDS-Q) is responsible for the administration and update of this A-E Guide. The QASAE is also responsible for ensuring that this document reflects actual practices. Contact the QASAE if you have issues, questions, suggestions, or concerns about any part of this document.

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References

- *Refer to the individual discipline sections and A-E Statement of Work (SOW) for applicable project specific criteria*
- *UFC (all locations) [http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc]*

Definitions

A-E	Architect-Engineer - Consulting Firms and their Subcontractors - A vendor hired by the District to provide architectural-engineering services requiring professional and/or architectural license, as defined by state regulatory agencies and laws.
A/E/C	Architectural, Engineering, Construction
BIM	Building Information Modeling
CAD	Computer Aided Design
CCD	Customer Concept Documents
COE or Corps	Corps of Engineers a.k.a. USACE
COE COR	Corps of Engineers Contracting Officer's Representative
CWE	Current Working Estimate
DDC	Direct Digital Control. This is a building level control system.
DM	Design Manual
EA	Environmental Analysis
EIS	Environmental Impact Statement
EMCS	Energy Monitoring and Control System. Also known as a Utility Monitoring and Control System (UMCS). This is a base-wide control system.
EOR	Engineer of Record
EPA	Environmental Protection Agency
FF&E	Furniture, Fixtures and Equipment
LEED	Leadership in Energy and Environmental Design
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
PA	Programmed Amount
PDT	Project Delivery Team

PM	Project Manager - The individual in PPMD assigned to manage a project or program from the inception through completion. The PM is the leader of the PDT. The PM has the responsibility for the development of the PMP, which will include the project QCP.
PPMD	Programs and Project Management Division - PPMD consists of five Branches with Project Managers (PM) who are responsible for project execution within cost and schedules limits.
PMP	Project Management Plan
Project	A unique process, consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements, including the constraints of time, cost and resources. It can be any combination of work (products, services, for example) intended to produce a specific expected outcome or solution to a customer problem or need.
Quality	The degree to which a set of inherent characteristics fulfills requirements.
ROM	Rough Order of Magnitude
SID	Structural Interior Design
TM	Technical Manual
UFC	Unified Facilities Criteria. UFC documents provide planning, design, construction, sustainment, restoration, and modernization criteria, and apply to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with DoD Directive 4270.5 (Military Construction) and USD(AT&L) Memorandum dated 29 May 2002. UFC are distributed only in electronic media and are effective upon issuance.
UFGS	Unified Facilities Guide Specifications. Unified Facilities Guide Specifications (UFGS) are a joint effort of the U.S. Army Corps of Engineers (USACE), the Naval Facilities Engineering Systems Command (NAVFAC), and the Air Force Civil Engineer Center (HQ AFCEC). UFGS are for use in specifying construction for the military services. The Unified Facilities Guide Specifications (UFGS) are published only in electronic format and are intended to be used with SpecsIntact software. The UFGS Master complies with *UFC 1-300-02*. SpecsIntact supports the UFGS format. SpecsIntact can still open Masters or Jobs created with older versions of the UFGS format.
VAV	Variable Air Volume
10% Design	This is the Concept Design phase of a project. It is an opportunity for the A-E Firm to demonstrate full understanding of the scope of the project to the customer and that all the customer's requirements are being considered and incorporated into the design. An Air Force MAJCOM may refer to the 10% design in a Customer Concept Document. Concept Design is also an opportunity for the customer to make any adjustments needed to produce what is required. Other agencies might be part of this review stage to support the customer in whatever way needed.

Responsibility

The A-E Firm is responsible for preparing the Customer Concept Documents (CCD) and will communicate its understanding in the shape of CCD and any other pertinent narratives describing the plan for design of the facility. CCD will include, but not be limited to: Drawings, Design Analysis / Calculations, and Outline Specifications. Submittals will include supporting documentations in any area where other data was used in arriving at the concept design solution such as Cost Estimates and Geotechnical Reports.

10% Design Submittal

The 10% Design Submittal must, as a minimum, consist of the following documents:

- Design Analysis (narratives and preliminary calculations as needed)
- Drawings
- Project Safety and Health Requirements
- Cost Estimate and Conceptual Construction Schedule
- Draft of Environmental Permit Matrix (if required by the statement of work)
- Other Items as Required by the statement of work

Objective

The 10% Design data must be presented in sufficient detail to accomplish the following:

- Show the customer how the proposed design satisfies functional, special, technical, and aesthetic needs of the customer.

- Show all reviewing agencies that (1) the designer's approach to solution of technical aspects of the project is sound and (2) the designer intends to utilize appropriate design criteria (such as, Design Manuals (DM), Unified Facilities Criteria (UFC), Unified Facilities Guide Specifications (UFGS)) in developing a final product.

- Report on the budgetary costs of construction from the A-E's Class 4 Budgetary Current Working Estimate (CWE) .Validate that the appropriate and most economical civil, landscape, architectural, interior design, structural, mechanical and electrical systems have been selected for the project.

General Requirements

Design Instruments generated by the A-E will be generated in accordance with the following general requirements:

Means and Methods of the A-E. The Contract Plans & Specifications must not explicitly assign work among the various construction trades to include any subcontractors. The documents must depict the work to be performed and suggest which trade will perform the work.

Proprietary Products. Use of proprietary structural elements and materials are generally avoided. If Proprietary Products are necessary, the A-E will consult with the COE COR (Corps of Engineers Contracting Officer's Representative) and Technical Lead if a Justification and Approval (J&A) is to be recommended.

Design Analysis - General Requirements

Construction Site

Include a synopsis of the construction site conditions, project requirements and conformance with the master plan.

- Function. Describe the basic functional objective and capacities of the proposed facility and the estimated function life. Describe the types of activities involved.

- Personnel and equipment. Describe the range and number of civilian/ military personnel, equipment and vehicles to be accommodated.

- Constructability. Describe the basic construction systems selected, temporary or permanent, and the estimated structural life of the facility. Provide sample design(s) indicating that the type of structural system chosen has been constructed successfully in the recent past.

- Desired image or visual appearance to include design of the exterior of the building.

Economic Summary

Describe the economic factors influencing the choice of basic materials, and the civil, landscape, architectural, interior design, structural, mechanical, electrical and fire safety systems used. The summary must include:

- Results of economic studies, which consider not only the initial construction cost, but costs incurred over the projected life of the facility as determined on the basis of the best information available, and in view of the estimated functional life of the facility.

- Compare Programmed Amount (PA) to CWE with discussion on reasons for relationship to CWE. If CWE exceeds PA, then provide initial suggestions on how to remedy the problem.

- Sustainable Design and Energy Conservation: In consideration of the serious national energy shortage and escalating utility costs, designs must incorporate features that can reduce energy consumption. Systems that are energy intensive must be avoided. State the level of sustainable design required for the project in terms of LEED (Leadership in Energy and Environmental Excellence) points. Identify the strategies being considered to meet the goal.

Hazardous Material Mitigation

Asbestos, lead base paint, and mold removal for all rehabilitation projects when new work ties into existing work, or if demolition must take place before new construction:

If:

- in any earlier correspondence between the A-E and the Corps, the presence of asbestos is stated to be known or suspected; or
- during the A-E's field investigation, the presence of friable asbestos is discovered or suspected; or
- the presence of non-friable asbestos is known to exist in products scheduled for removal,

Then the following becomes a requirement of the project:

- A qualified asbestos abatement professional must prepare an asbestos report and asbestos control plan to meet state and local air quality management regulations in addition to *EPA 340 1-90 018 Asbestos NESHAP Regulated Asbestos-Containing Materials Guidance.*
- Prepare plans and elevations indicating the location and extent of all known asbestos containing products, which will require removal, enclosure, encapsulation or encasement.
- Prepare the Asbestos Specification *UFGS SECTION 02 82 00 ASBESTOS REMEDIATION*, as applicable.
- Prepare the Specification *UFGS SECTION 02 83 00 LEAD REMEDIATION*, as applicable.

Removal of asbestos must always be considered the primary goal. When this is not possible, the A-E must determine the best alternative approach (enclosure, encasement or encapsulation) and must modify the guide specification accordingly.

State if the project does not contain asbestos, lead base paint, mold, or other hazardous materials.

Drawings - General Requirements

All drawings must comply with the most recent Architectural, Engineering, Construction (A/E/C) CAD Standards and A/E/C Graphic Standards at time of award and includes the required fonts, layers, styles, borders, blocks, file naming, for example. Utilize the latest A/E/C workspace and the USACE CAD/ Building Information Modeling (BIM) templates available from the CAD/BIM Center website.

Specifications – General Requirements

Obtain the current SPK quarter Master SpecsIntact files from SPK's Quality Assurance and Specifications Unit (QAS) via the TL, COR or SOW manager, to start a project. Do not re-use older .sec files. Submit the .sec files at each submittal. Use Master Format™ for Section numbering when renaming a Section title or if creating a new Section. Discipline Specific Guidance

The following discipline specific guidance is for general information, to provide an example of what is expected to be produced at the 10% level of design. Design disciplines not needed on a specific project will not be applicable. Every discipline item mentioned is to be determined if it is applicable to a specific project based on the project's scope of work.

Civil Design

Design Analysis - Narrative/Calculations

Siting

Describe site conditions, including existing topographic features and improvements, affecting or relating to the proposed work. Consider any special or unusual conditions such as former refuse dump areas, any potential for flooding, ground stability, rock outcrops, drainage features and unusual soil conditions. Note any contaminated soil or groundwater conditions discovered, note any elevation or grading concerns, existing environmental impacts and mitigation requirements, NEPA compliance and completed EA / EIS. Discuss reasons for facility orientation. Consider such factors as prevailing winds, existing structures, adjacent site conditions, solar loads, clearance restrictions and future development areas. Generally state building placement reasons: discuss the impact of new construction on existing facilities, considerations for future expansion, requirements for flood protection, set-back requirements or specific clearance requirements, or unusual cut or fill requirements.

Water Service and Fire Lines

Determine the static and residual pressure at or near the point of connection to the existing, or new, water distribution system. Hydrant flow test data must be conducted with A-E's representative present per *UFC 3-600-01 Fire Protection Engineering For Facilities*. Historical flow data is not allowable.

Water Supply Line and Distribution System

Develop basic and controlling water demands and show required residual pressure. Include fire, domestic and industrial average and/or peak demands as applicable; include information such as known flow tests. For distribution systems, indicate whether additional fire hydrants are needed, and discuss their spacing. Discuss water storage, transient pressure, pump stations, corrosion and scale control needs, and soil boring requirements.

Water Supply Works

Provide information on type, condition, and adequacy of existing units such as wells, pumps, reservoirs, for example, and current water use. If these items are already described in an existing report, give summary statement and appropriate reference.

Water Treatment

Where water treatment is included in the project, the designer must provide a copy of the water chemical and physical analysis. For water to be accepted for human consumption it must be palatable; additionally, it should not be destructive to the materials used in its transportation and storage; it should also be suitable for the ancillary uses associated with human habitation (such as: personal hygiene, laundering of clothes, dishwashing).

Building Sewer Connection

Gravity type building sewers are preferable, if feasible; duplex pneumatic ejectors or sewage pumps are the alternatives when gravity sewage connections cannot be provided.

Sanitary and Industrial Sewer Systems

Discuss and determine average, peak, infiltration, inflow, and industrial waste flows for building connections, individual sewers, and force mains from population, measurement, or fixture units as applicable. Describe type of proposed system; where lift stations are required, state type of construction and tentative pump type. Indicate controlling elevations and compliance with minimum velocities and sizes. Discuss nature of industrial wastes.

Wastewater Treatment

Analyze wastewater characteristics, degree of treatment required, treatment process, and anticipated effluent quality. Describe anticipated effect of treatment plant effluent. Provide a brief description of units involved including basic data (population, flows, for example.), which will be used in sizing units. Discuss Army and State wastewater discharge regulations, the National Pollutant Discharge Elimination System (NPDES) permit, and pretreatment to discharge to municipal treatment systems. Evaluate and recommend EPA innovative and alternative technologies involving less costly solutions.

Percolation Tests

Percolation tests are to be used to determine the acceptability of the site and for the design of the subsurface disposal systems. Whenever the Architect-Engineer determines that percolation tests are required for the project, the District will make percolation tests at the request of the Corps Project Manager (PM). Discuss the need for percolation tests, and if required, indicate the required depth. Whenever periodic high water conditions are expected, consider another type of absorption field, other than the conventional septic tank-tile field design, such as mounds, fill systems, and under drain systems.

Corrosion Survey

For each new project with utilities systems and/or metallic structures that are buried, submerged, or in contact with either the ground or a substance, which may be corrosive, a preliminary survey will be made by the District or Architect-Engineer (depending on contractual provisions) to determine the need for corrosion protection. If the Architect- Engineer determines further tests are required, this recommendation will be presented to the COE Project Manager. Submit a summary of the conclusions on the need for protection against corrosion. When water utility systems are involved in locations where the soils are known to be very corrosive, it may be desirable to use cathodic protection systems as a supplement to (but not in place of) coal tar or cement mortar coatings.

Surveying

The existing topography is to be shown on the Site Plan; provide the name of the surveyor, the date of the survey or aerial photography, along with all control points with a note on the site plan. The specific surveying and topography drawing requirements are given in *Architect-Engineer 65% Design Submittals*.

Demolition

Describe any required demolition.

Storm Drainage and Grading

Discuss any grading problems, and related system site and tributary area, affecting the drainage requirements. Determine the location, type, size, elevations, and condition of the existing storm drainage system, as well as topography, size and shape of the drainage area, extent and type of development. Acceptable surface drainage systems include, among others, swales, ditches, gutters, channels, underground pipes and conduits, culverts, and detention ponds. The storm drainage plan must be selected with respect to the existing storm drainage system. Consider future expansion and change in land use within the watershed.

Roads, Streets

Discuss traffic volume and composition, as well as design speed, sight distance requirements, intersections or connections to existing roads, streets or parking areas, and traffic routing during construction.

Parking, Open Storage, and Hardstand Areas

Determine the general location of parking, storage and hardstand areas, the type of vehicle to be accommodated, location of ingress and egress, pedestrian access, need of handicapped parking spaces, curbs, and curbs-and-gutters.

Sidewalks, Fencing and Signage

Americans with Disabilities Act of 1990 (ADA) requirements and force protection setbacks. Describe pedestrian and bicycle flow and gathering spaces such as break areas, patios, barbecue

areas, mail box pods, and shelters. The walk requirements are determined on the basis of need, regardless of how built-up or isolated an area may be; the width of the walk will be based on pedestrian traffic volume. Fences define perimeters, and when integrated with lighting and with the fence line cleared of vegetation, can be a very important component of the security system; state the justification and location of gates, and determine if they are to be used for a controlled area or for higher security. Discuss the need for parking, pedestrian, and traffic signal signs.

Pavement Design and Logs of Explorations

The Sacramento District Geotechnical Report includes, among other items, all pavement design. The Geotechnical Report must be referenced and a copy appended to the Design Analysis as an appendix. The pavement design consists of a cross section of the pavement structure including subgrade, subbase, base course, and surface course or concrete pavement as applicable. The geometric layout of all pavements is the responsibility of the Architect-Engineer.

District prepared logs of borings are made available as part of the Geotechnical Report. If the Architect-Engineer determines that additional explorations are necessary, they must be requested through the COE COR.

Additional borings may be required along the route of water supply lines and distribution systems, trunk, branch and lateral sewers, storm drainage systems, and reservoir sites.

Military Airfield Pavements

Airfield pavement design, requiring aircraft operation criteria, is accomplished only by the Corps. The pavement structure is included in the District's Geotechnical Report without any reference to aircraft operation criteria. The width and length of the airfield pavement is to be obtained from the COE Project Manager.

Railroads

State type of service for which railroad track will be provided, the anticipated volume, type of traffic, and the name of the operating agency.

Drawings

Site Plan

Show new and existing building locations, access roads, parking areas, existing topography, survey control points, fences, benchmarks, drainage, sidewalks, landscaping, and demolition requirements. Where drainage facilities are to be provided, indicate direction of flow and points of discharge. Also, show all electrical and mechanical site work that is visible.

Utilities Plan

Show new and existing utility lines; points of connection to existing utilities, and any demolition or rerouting of existing utility lines, and all new and existing electrical and mechanical utility lines.

Landscape Layout Plan

Provide a separate plan showing new and existing landscape architectural features. Include existing building locations, access roads, parking, sidewalks, topography, and bench marks, in a dithered or light pen weight as the base sheet. Over lay existing features with new sidewalk, hardstand areas, parking layout and islands, turf area, planting beds, organic and inorganic mulch areas, water features, shade shelters, barbecue areas, recreations features, interpretive signage locations, pedestrian directional signage locations, point of connection for irrigation, general tree locations and site furniture locations.

Landscape Architectural Design

Design Analysis - Narrative/Calculations

State what general type of vegetation exists both on the Installation and in the immediate vicinity of the project. Although this project should be harmonious with adjacent landscape treatments or vegetative communities, the design need not necessarily be identical. Refer to the Base Design Guide or Installation Master Plan for approved Plant Species, if available. The theme must consider future long range design continuity, and compatibility with customer needs and maintenance constraints. Describe how this design satisfies these requirements and provide rationale for the proposed landscape treatment (e.g., mitigation, enhancement, erosion control). All new Army irrigation projects require specific authorization from Headquarters, Department of the Army. In general, irrigation systems receive consideration only in arid or semi-arid areas where rainfall is less than 25-inches annually. Indicate if an irrigation system is authorized. If an irrigation system is to be included define type, such as, bubbler, spray, and drip. State waterline design pressures, if domestic or reclaimed and possible tap location.

Site Furnishings

Identify, if required, quantities and materials for benches, tables, trash receptacles, ash urns, removable and fixed bollards.

Site Recreation Equipment

Identify, if required, quantities of any volleyball, basketball or tennis courts, running track, PAR course, sports field, for example.

Drawings

Landscape drawings are not required at the 10% Design submittal, but areas to be landscaped must be indicated on the civil site plan.

Structural Design

Refer to the following for the basis of structural design:

- *UFC 3-301-01 Structural Engineering*
- *UFC 4-010-01 DoD Minimum Anti-Terrorism Standards for Buildings*

Design Analysis - Narrative/Calculations

It is extremely important that the A-E, Engineer of Record (EOR), clearly indicate their strategy for an acceptable/appropriate Quality Control of all design effort. As a minimum, it is expected that the project be Peer reviewed by a competent engineer during the development of the design work. Independent Technical Review may be required at some point or may be a strategy that the A-E will consider.

All design analysis, narratives and calculations must clearly indicate that the product has been Peer Reviewed prior to the submittal. The Government will not act as the Peer Reviewer for the A-E and any submittals delivered not meeting these requirements will be returned without any further action. The A-E is fully responsible for any delays in delivering quality product for the government's review. A-E's Peer Reviewer must be identified at this stage of the project and must initial every sheet of submittal. This requirement also applies to other phases of the project submittal.

Risk Category and Seismic Design Category

Select the structure's Risk Category in accordance with the requirements of *UFC 3-301-01 Structural Engineering*. Provide a discussion of the building occupancy which governed selection of the risk category. Determine the Seismic Design Category of the site.

Design Loadings

Provide a discussion of all loadings to be used, to include floor loads (dead load and live load), wind, snow, earthquake, for example, together with data to justify any proposed deviations from established criteria. Design the seismic force resisting system in accordance with the latest International Building Code (IBC) with any exceptions required per *UFC 3-301-01 Structural Engineering*. Indicate the basic ground motions to be used in seismic design of the building. Provide a narrative describing the planned seismic design and expected structural seismic performance of the building. Select Wind, Snow, and Seismic design parameters from the Whole Building Design Guide tool referenced in *UFC 3-301-01*. For Installations with a large geographic footprint use available web-based query tools to the USGS Seismic Design Maps Web Service to find site-specific seismic parameters. Provide justification for use of an exception to the requirement for a site response analysis or ground motion hazard analysis where high tabulated S_1, S_S, and Site Class parameters would normally trigger a site-specific ground motion procedure. Verify correct snow ground loads for sites within a special-study area as designated by the IBC maps. Provide any applicable design parameter per required criteria.

Foundation Design

Provide a statement referencing the Geotechnical Report, which will be attached as an appendix to the Design Analysis. The Geotechnical Report will normally be provided by the COE. Describe the type of foundation proposed, site class, frost depth, need and type of vapor barrier, estimated depth of bearing, allowable bearing values, compaction requirements, and any other measures mentioned in the Geotechnical Report or recommended by the designer. When the Geotechnical Report recommends two foundation types as being an acceptable economic

analysis and comparison between the two methods must be presented and select the most cost-effective method.

Structural System Selection

As much as possible, use a uniform and consistent structural system in design of the structural system. Availability of local labor and materials will be considered in selecting the systems. Each of the systems should be presented on a sketch indicating the sizes of all the framing members for each area of the building with a different framing scheme. Provide calculations used to size members. Investigate various column spacing. For a one-story structure, the cost comparison will be done for the roof structure and the wall system. For a multi-story facility, a cost comparison will be presented for the roof structure, the floor system, and the wall system. Attach the comparison to the Design Analysis as an appendix. Provide a narrative description of all the potential solutions and indicate that the most economical has been selected.

Lateral Force Resisting System

Select preferred lateral-force resisting systems and note the structural height limits imposed by the selected system and Seismic Design Category. Note the use of any allowable height increases provided by the code and include calculations justifying use of those height increases where the weight of the structure is a criteria required for the height increase.

Additions to Existing Buildings

For those cases in which additions to existing building(s) are to be constructed, the addition must be physically separated from the existing building so as to avoid interfering and modifying the seismic performance of the existing building. Create seismic separation by using seismic joints through the height of the building, compatible with the architectural requirements. When the addition and the existing building(s) are to be physically attached and no seismic separation is possible, provide calculations for the “integral structure" (such as, new plus existing). The strength and performance of the existing structure will not be compromised. Where practicable, upgrade the lateral resistance of the existing system to meet current code.

Building Alterations

In the projects involving alterations and/or modifications, the A-E is responsible for the investigation and design necessary to strengthen existing structural members, which are structurally affected by the alterations.

Seismic Evaluation and Rehabilitation for Existing Buildings

ICSSC RP 10 Standards of Seismic Safety for Existing Federally Owned and Leased Buildings identifies trigger situations requiring evaluation seismic evaluation and rehabilitation for existing structures. Refer to:

- *ASCE 41 Seismic Evaluation and Retrofit of Existing Buildings*
- *International Existing Building Code (IEBC)*

Seismic Evaluation Submittal Requirements

The seismic evaluation study, complete with conceptual fix (if required) and associated costs, must be submitted. The seismic evaluation study must be performed concurrent with other design work and coordinated with other design work to the maximum degree possible, (such as, be feasible from a functional/architectural standpoint). The seismic evaluation study and its impact on the project CWE must be approved by the COE prior to incorporation into the project's bid documents.

Future Expansion

Where buildings are to be designed for future expansion, discuss provisions to be taken to ensure the projected construction will proceed in a trouble-free fashion. State that no provisions have been made for future expansion, if this is the case.

Drawings

Scale of drawings to match the Architectural drawings where features are related.

Foundation and Floor Plans

Show type of foundation proposed, depths of footings, relation of walls and ground supported floor slab to foundation system, overall dimensions, column spacing, joint pattern in slab-on-grade, tie beams, grade beams, for example.

Elevated Floor Framing Plan

Show the type and general spacing of framing members, overall depth of floor structure, proposed column spacing, principal framing dimensions and shape of the building. Indicate any significant openings required in the floor to accommodate other trades and disciplines.

Roof Framing Plan

Show locations of framing members, overall shape and dimensions, diaphragm, for example.

Architectural Design

Design Analysis - Narrative/Calculations

State the general type of architectural treatment that exists both on the Installation, and in the immediate vicinity of the project. Although selected design features of this structure should take into consideration the surrounding context, the design must endeavor to be technologically state-of-the-art and rooted in on-going tradition. Emphasis should be made on the design’s strength, commodity and appearance. Consider any special conditions from published Installation design guides and any current programming and planning from staff on site. Describe how the design will satisfy such conditions. Give a description of particular framing and wall systems selected, others considered, and reasons for selection. If setbacks are involved, establish the criteria for setback design provisions.

Type of Construction

Provide statement as to type of construction per *UFC 3-600-01 Fire Protection Engineering For Facilities* and Architectural/Engineering Instructions, such as, Fire-resistive, protected non-combustible, permanent or temporary, for example.

Indicate Programmed and Computed Floor Area (for each space or activity)

Gross and net areas must be calculated as indicated in the IBC version as indicated by *UFC 1-200-01 General Building Requirements*. Indicate occupancy capacities allowed and actual per criteria.

Net Room Areas, Occupant Capacity and Gross Building Areas

Provide gross floor area computations for total building. Provide the net floor area for each room in tabular form in the computation. These areas will not be shown on the drawings. Break down the areas into two categories, those calculated on the basis of full area and those calculated on the basis of one-half area, and then show the grand total. Also, show the programmed area for each room and criteria data used.

Calculate building area calculations in accordance with *UFC 3-101-01*, paragraph 4-2.

Energy and Economic Analysis Calculation Methods:

- "U"-values for each building section
  - Ratio of exterior window and room area, if applicable.
  - Estimated annual unit energy consumption.

Functional and Technical Requirements

Equipment, furniture and furnishings to include all items required. Provide a tabulation of all equipment in the project to show the following: (If none, so state for each subparagraph below.)

- Contractor Furnished-Contractor Installed (CF-CI).
- Government Furnished-Government Installed (GF-GI or not in contract (N.I.C.).
- Energy conservation including solar energy applications and energy budget goals.
- Sound and vibration control.
- Interior parking and service areas.
- Physical security: lock and keying, intrusion detection, alarms, restricted access areas, interior guard/canine support and ties to local authorities. Coordinate with Anti-Terrorism requirements.
- Signage; directional, informational, and motivational.
- Exterior and interior finish materials; textures, colors and resistances.

Design Objectives and Provisions

Adapt the building to the size, shape, and orientation of the site to include benefit from natural warming and cooling effects afforded by the site.

- State how location on the site relative to local climate affects the placement of entries, fenestration, and roof overhangs due to prevailing wind, sun, and noise. Discuss architectural features and relative costs, such as, the use of tinted or thermal glass if required as opposed to glass ordinarily used.
- Organization of functional spaces to establish workable adjacency relationships.
- Building layout to establish convenient circulation flows for materials, equipment, services and people and also to include evacuation during emergencies.
- Consolidation of spaces into sound compatible zones and protective construction zones, e.g., for fire, storm, and fallout.
- Space layout compatible with modular (structural and environmental) support systems.
- Building expandability/changeability. Where buildings are to be designed for further expansion, discuss provisions to be taken to ensure the projected construction will proceed in a trouble-free fashion. If no provisions have been made for future expansion, so state.
- Physical security.
- Barrier-free design.
- Sustainable Design and energy conservation.
- Building wall and roof construction: Provide statement of required type of construction based on occupancy, area and height. State required wall and roof "U" values.
- Acoustical noise attenuation from interior and exterior sound sources.
- Perception of the building details and volumes. (Specific provisions made, such as, an identifiable sequence of viewing positions for experiencing the architectural and interior design).
- Enhancement of materials and systems maintenance and operation.
- Economy of building construction, operation and maintenance: Life cycle cost effectiveness. Provide an economic comparison of the in-place costs of three or more wall systems. The comparison will only consider systems, which meet the required "U" factors, are suitable to the seismic zone, and meet the durability and esthetic requirements for the project. Present the first costs for each component of the wall system, combine these, and arrive at an overall cost per square foot of wall surface. Describe the maintenance requirements for each system that was studied. Provide a section through each wall system and show all components of the wall. Attach the economic comparison to the Design Analysis as an appendix.
- A narrative of the interior design objectives. The narrative must be concise and clearly written and include the following:
- Delineation of the designer's philosophy and intent relative to the interior design scheme before it is integrated into the contract documents. Refer to *UFC 3-120-10 Interior Design*.
- Discuss how this particular interior design scheme will help humanize our military environment by fostering desired behavior and eliminating negative responses; coordinate with Installation or base Design Guide.
- For new buildings, provide a rendering of the exterior of the building, demonstrating compatibility with Installation facility standards and adjacent buildings. If there are

any mission-critical or unique interior spaces, provide renderings or other visualizations to best communicate design intent.

Roof clutter and the trade-off of cost versus acceptable aesthetics must be discussed in the Design Analysis and at the Preliminary Review Conference. Concurrence of the customer regarding acceptability of the roof aesthetics will be obtained and documented at the next Review Conference.

Coordination with Installation or Outside Agencies

- Physical security support.
- Occupation safety and health, as required.
- Government furnished equipment.
- Make up of signage.
- Operations and maintenance support.
- Nursing Mothers Room.

Economy of Building Construction, Operation, and Maintenance

In order to apply life cycle cost effectiveness, an acceptable method of wall and roof construction including roof profiles must be defined as early as possible in the design effort. The narrative description will present a discussion of different systems and alternative methods together with the reason for a particular selection. Coordinate with mechanical designer.

Toilet Room Privacy

Provide a statement defining measures taken in the design to prevent persons outside the toilets from viewing into the toilet area including the mirror and sink areas.

Occupational Safety and Health Act (OSHA)

Designs will be consistent with the standards issued by the Department of Labor under Section 6 of the Williams-Steiger Occupational Safety and Health Act. Basic materials, equipment, and functional requirements must be in accordance with the criteria contained in TM and UFGS. Any conflicts discovered will be brought to the attention of the PM, in writing for resolution.

Disability Data

Design for People with Disability must be IAW *UFC 1-200-01 General Building Requirements*. For purposes of determining handicapped requirements, provide a completed handicapped checklist. If facility is not designed for physically handicapped, cite written permission from the Corps PM for the authority to deviate.

Fire Protection Analysis

Coordinate with the mechanical and electrical designers and provide the following:

- Basic NFPA occupancy classification and hazard (low, ordinary, high) on which analysis is based; type of construction from International Building Code (IBC); area of ground floor and total floor area; building height in feet, and number of stories.

- Building separation distances and access thereto, as stated above, and in *UFC 3-600-01 Fire Protection Engineering For Facilities*.

- Hourly (Fire) ratings (show required and provided) of exterior and interior walls, exit passageways, corridors, stairs, boiler/mechanical rooms, shafts, storage areas, janitor closets, and other hazard areas; fire and smoke floor areas; hourly rating of fire/smoke walls; corridor lengths and dead ends; corridor doors and other rated doors. Provide the UL or other nationally recognized testing laboratory listing for all fire rated walls, floor/ceiling, and roof/ceiling systems.

Extinguishing and/or Fire Sprinkler Systems

Determine the Type (wet or dry system); special systems, such as "Carbon Dioxide," "Deluge," or "Standpipe," **AFFF**, or "Halon" Systems. Coordinate with mechanical designer.

Fire Alarm and Evacuation System

Coordinate with the electrical designer on the Type, extent, and zoning.

Use or Storage of Flammable and Explosive Liquids and Gases, or Accumulation of Dusts

System must be designed to comply with NFPA and IBC as directed by *UFC 3-600-01 Fire Protection Engineering For Facilities*. Provide the flash point for liquids. Describe type of electrical equipment, lighting fixtures, ventilation and other related fire protection features required to minimize hazard(s).

The analysis must list applicable NFPA and IBC number references as well as "required" and "design" conditions.

"Means of egress" sketch must be provided for each floor indicating exit access; door swings in path of egress, required fire separations, stairs and rated exit passageways. In addition, provide a location of exit sign sketch indicating exit lights including direction and locations for which "Not An Exit" signs may be required. Illumination of means of egress and exit markings must comply with NFPA 101 required and provided exit width, maximum distance to nearest exit, common path corridor length, dead-end corridor length, number of exits, and exit capacity. Multi-story facilities may require Areas of Refuge as defined by NFPA 101.

Roof mounted equipment is not acceptable to many users. Roof clutter and the trade-off of cost versus acceptable aesthetics and risk of roof leakage must be discussed in the Design Analysis and at the Concept Design Review Conference.

Asbestos

Refer to paragraph Hazardous Material Mitigation.

Life Safety

Perform a life safety survey to identify existing violations of means of egress and fire separation per NFPA 101, NFPA 220 and the IBC as directed by *UFC 3-600-01 Fire Protection Engineering For Facilities* and describe how new work will impact existing life safety. State the building construction types and occupancy classification. Provide "means of egress" sketches to identify existing violations and recommended corrective actions.

Physical Security/Anti-Terrorism Features

Antiterrorism Threat Protection design considerations must follow DOD criteria, in accordance with the Public Health Security and Bioterrorism Response Act of 2002, PL 107-88 (utility vulnerability assessments), and in accordance with the Public Health Security and Bioterrorism Response Act of 2001 (vulnerability assessments). The DOD criterion is found at the *Protective Design Center*.

Drawings

Floor Plan

For each floor at l/4" = l' scale (except as stated below), showing: (1) overall dimensions, (2) functional arrangement, (3) label all rooms and spaces, (4) interior colors and finishes and exterior colors in tabular form.

On a case-by-case basis, a smaller scale can be used for large, open structures, subject to discussion at the Pre-Negotiation Conference. If a smaller scale is approved and used, congested areas such as toilet rooms, mechanical or electrical equipment rooms, for example, must be enlarged to a minimum scale of ¼" = 1'.

Provide Interior/Exterior Colors and Finishes in Tabular Form

Describe colors by words as well as a standard number designation, so that the customer will have no doubts as to what they will receive.

Indicate all major equipment and show to scale.

Principal Elevations

Provide a minimum of two principal elevations. Coordinate and show exterior mechanical and electrical equipment and penetrations at each elevation. Scale must be not less than 1/8" = 1'.

Building Section

Provide at least one principal section showing floor and roof framing, suspended ceilings, floor-to-floor heights, concealed or open ducts, relations of fenestration to support columns or walls, for example. Due to special needs, other primary transverse or longitudinal sections may be shown. Provide wall section at ½" = 1' minimum scale as required for clarity, and principal section at minimum scale of 1/8" = 1'.

Wall Sections

Provide exterior and interior wall section for each type of typical wall system. These wall sections are to be cut from the floor plan, not the elevation.

Interior Design

Design Analysis – Narrative Structural Interior Design (SID)

If the Installation has an established design guide, it should be followed to develop the interior color/finish scheme. State the general type of exterior and interior finishes and materials that are going to be needed in this facility. Explain the interior design philosophy of the facility. Per the architectural write-up, finishes must be based on existing elements on the Installation and in the immediate vicinity of the project. The exterior and interior finishes need to be coordinated with the architectural design and requirements on the project. Coordinate interior design narrative with the architectural narrative. In some cases, the two disciples' write-ups are combined, especially if the project is only dealing with Structural Interior Design (SID) and not both SID and FF&E.

Furniture, Fixtures & Equipment (FF&E)

If the Installation or agency has an established design guide, it should be followed to develop the furniture, fixtures and equipment space planning. State the general furniture function, philosophy, style, and configurations developed and coordinated with the users' requirements. These requirements are obtained during the interview process with the users. Criteria for furniture selection will include function and ergonomic considerations, maintenance, durability, sustainability, comfort and cost. List the furnishings required for each space within the facility in the design analysis or refer to the drawings. The FF&E package will be developed and coordinated with the architectural design and the structural interior design (SID). Refer to *UFC 3-120-10 Interior Design* for additional information on FF&E packages.

Drawings

SID

Exterior and interior finish schedules must be in tabular form with legends. In the conceptual phase, the finishes can be listed in generic form, so that the customer can get an overall sense of the exterior and interior materials and finishes. Color and more specific finishes can be added in the following phases.

FF&E

The furniture plan is to show the furnishings necessary for the customer's functional requirements and satisfy applicable life safety codes. The furniture plan will show the appropriate size and type of furnishings as well as critical or required clearances. The furniture plan must also include a furniture legend. When the design of the FF&E package is included in the building design contract, the furniture plan must be fully developed, along with the FF&E package. If the FF&E package is not included as part of the building design contract, the

furniture plan must be clearly identified as “Not In Contract”. Furniture plans must be included throughout the design delivery process, from 10% design submittal to final submission, to ensure coordination of architectural components and engineering disciplines (lighting, power, mechanical, window placement, and so forth) with respect to furniture placement.

Mechanical Design

Design Analysis - Narrative/Calculations

Design Conditions

State indoor and outdoor design temperatures for heating and cooling, proposed “U” factors for walls, ceilings, floor, for example, personnel load, equipment heat release (if any), outside air or ventilation requirements and any other special conditions.

Heating, Ventilating, And Air Conditioning (HVAC) System

Indicate type of HVAC system and justification for selection, operating pressure and temperature, and capacity. Briefly discuss temperature control system. Discuss type of system, such as, forced warm air with direct fired furnace or hot water coil, forced hot water or steam with direct radiation or unit heaters. Indicate type of plant distribution outside of buildings - steam or high temperature hot water/chilled water and whether above-ground or underground.

Calculations

Calculations of a limited nature must include heat gain, heat loss, and equipment sizing including the method for handling diversities in the air conditioning load and method for sizing boilers. Show typical air conditioning load calculations; preferably the building peak loads.

Heating Load Calculations

Exclude anticipated internal and solar heat gains from heating load calculations. Increase the calculated size of equipment and distribution system by up to 30 percent where necessary to compensate for morning recovery due to night setback.

Cooling Load Calculations

If necessary, increase the calculated size of equipment and distribution system(s) by up to 10 percent to compensate for morning recovery due to night set forward or by up to 10 percent to compensate for unanticipated loads or changes in space usage. Limit the total combined increase above the size calculated of equipment and distribution system(s) to 15 percent total. List the sensible, latent, and total capacity requirements for each cooling coil specified. For applications where reheat is required for humidity control, the capacity of the reheat will be equal to the total internal sensible heat generated in the area served.

Energy

Refer to *UFC 1-200-02 High Performance and Sustainable building Requirements*.

Energy and Economic Analysis Calculation Methods: All analysis must be performed based on the actual conditions expected over the life of the facility including anticipated occupancies, scheduled hours of operation and process loads. Realistic energy usage and efficiencies, maintenance cost and repairs and renovations must be included.

Energy Calculations

Energy calculations for new conditioned buildings or for comparing alternative building features and energy conservation techniques or equipment will be determined using a professionally recognized and proven computer program or programs that integrate architectural features with air-conditioning, heating, lighting, and other energy producing or consuming systems. These programs will be capable of simulating the features, systems, and thermal loads used in the design. The energy savings and any parasitic energy loads associated with the utilization of recovered energy, solar heat, solar photovoltaic energy and other renewable or waste heat applications must be included. Using *UFC 3-400-02 Design: Engineering Weather Data*, or other established and authoritative weather data files, the program will perform 8760 hourly calculations. Programs that "condense" the weather files and number of calculations into several "typical" or average days per month, follow modified bin calculation procedures or other simplified methods described in the Chapter entitled "Energy Estimating and Modeling Methods" of the ASHRAE Handbook of Fundamentals may be used when the features, size or complexity of the building design and alternatives do not demand more sophisticated energy calculations to give accurate results and support design decisions. In addition, the Department of Energy maintains a list of building energy and water conserving tools for design. A number of the programs may be of benefit in performing energy and water conservation calculations, comparing energy and water system alternatives and evaluating specific conservation measures.

Compliance Path and Project Documentation

In addition to the Mandatory Provisions, the path or method selected to ensure compliance with ASHRAE Standard 90.1 must be clearly indicated in the concept design. The reasons and effects, on the energy usage and life cycle cost of the completed facility, of selecting the particular compliance path or method must be presented. The engineering and economic analysis, including computer simulations and program inputs, outputs and assumptions, used to support the HVAC system selection and other concept design decisions must be fully documented and made a part of the concept design package. The forms from the ASHRAE Standard 90.1 User's Manual may be helpful in developing the project and compliance documentation.

Economic Analysis

Life cycle costing must be in accordance with Title 10 Code of Federal Regulations Part 436, Subpart A. A life cycle costing program in full compliance with the Federal Regulation and updated with the latest economic factors is the Building Life Cycle Costing (BLCC) program available from the *WBDG Energy Tools*. The appropriate cost and savings associated with the utilization of recovered energy, solar heat, solar photovoltaic energy and other renewable or waste heat applications must be included.

Plumbing System

Unless directed otherwise, the design analysis will include the following: *UFC 3-420-01 Plumbing Systems*.

Design Basis

Basis for design will consist of:

- Plumbing fixture determination, listing quantity and types of fixtures
- Fixture units for drainage, venting, cold and hot water piping
- Roof areas used in determining storm drainage pipe sizes
- Capacities of all equipment and tanks.

Calculations

Show calculations clearly so that any changes that become necessary during construction or re-siting are made efficiently. When tables used in the design are taken from publications, indicate the title, source and date of the publication. Provide the model number and manufacturer of each major piece of equipment for which space was allocated.

System Type

Refer to *UFC 3-410-01 Heating, Ventilating, and Air Conditioning Systems*.

Special Criteria for Humid Areas

Use the following criteria in the design of air-conditioned facilities located in areas where:

- the wet bulb temperature is 67 degrees F (19 degrees C) or higher for over 3,000 hours and the outside design relative humidity is 50 percent or higher, or

- The wet bulb temperature is 73 degrees F (23 degrees C) or higher for over 1500 hours and the outside design relative humidity is 50 percent or higher, based on 1.0 percent dry bulb and the corresponding mean coincident wet bulb temperature.

System Selection

HVAC systems will typically consist of a central air-handling unit with chilled water coils or unitary direct expansion-type unit(s) capable of controlling the dew point of the supply air for all load conditions. In addition to life cycle cost considerations, the designer must base system selection on the capability of the air-conditioning system to control the humidity in the conditioned space continuously under full load and part load conditions. System selection will be supported by a psychrometric analysis computer program that will consider the latent-heat gain due to vapor flow through the building structure, to air bypassed through cooling coils, and to the dehumidification performance of the air-conditioning system under varying external and internal load conditions. Peak latent load outdoor design conditions (the design wet bulb temperature and the mean-coincident dry bulb temperature) or low sensible loads and high latent loads (days with low sensible and high latent external loads) will, in some cases, cause inside

relative humidity to be higher than desired. If analysis indicates that this condition will occur for an unacceptable period of time, reheat will be used. Use recovered heat for reheat where possible. Do not use face and bypass dampers for temperature control.

Air Handling Units

Specify draw-through type air-handling units in order to use the fan energy for reheat. Design the air distribution system to prevent infiltration at the highest anticipated sustained prevailing wind.

Variable-Air-Volume (VAV) Units

Use air throttling type VAV terminal units with an integral heating coil and a pressure independent air valve that modulates in response to space temperature.

Ventilating System

Gravity ventilation is rarely adequate as a reliable source for comfort ventilation. It can be used in high-bay areas that are rarely occupied, such as storage buildings, or in areas that are difficult to ventilate, such as hangars. Consider nighttime air flushing of spaces, multi-speed fans, increased insulation, improved shading, and building site to improve the effectiveness of comfort ventilation. If a waiver to provide air conditioning in an area not authorized is submitted an hour-by-hour simulation of indoor conditions using comfort ventilation only will be included in the waiver request.

Evaporative Cooling

Use evaporative cooling where the facility in question is eligible for air conditioning, and evaporative cooling can provide the required indoor design conditions based on the appropriate outdoor design conditions. In many locations where evaporative cooling cannot provide the required indoor conditions year-round, give further consideration to its use as a supplement to the primary cooling system when preliminary life cycle calculations show the supplementary system to be cost effective. For special applications where close temperature or humidity control is required, consider two-stage evaporative cooling or indirect evaporative cooling in the life cycle cost analysis as a supplement to, not in lieu of, the primary cooling system.

Heat Pumps

When considering the use of heat pumps, perform a thorough engineering analysis. The requirement for possible additional power transmission and substation capacity, the added impact of demand charge power consumption, and peak demands must all be evaluated. Select heat pumps on the basis of life cycle cost effectiveness and include the following types, including combinations, where advantageous:

- Ground source heat pumps, using wells or ponds as a heat source or perhaps imbedding a closed-loop heat rejection circuit in a parking lot as a “heat exchanger.”

- where the perimeter spaces of a building must be heated and the interior cooled concurrently, water-to-air heat pumps utilizing a closed-water loop system air source heat pumps

Radiant Heating and Cooling

Radiant heating and cooling systems are gaining wider acceptance among HVAC designers. The designer should carefully review the most current design guidance from both ASHRAE and manufacturers' literature prior to designing these systems, as they have many unique design characteristics.

Cold Storage Projects

Indicate the room holding temperatures and commodities to be held in cold storage. Also, show the approximate equipment sizes.

Service Piping Systems

Include determination and capacity of compressed air, vacuum, or other service piping systems. Refer to *UFC 3-420-02FA Compressed Air*.

Plumbing

Provide plumbing fixture determination listing quantity and types of fixtures. Describe domestic water heating and storage equipment including capacity, materials, piping types, and insulation requirements. Refer to *UFC 3-420-01 Plumbing Systems* and *UFC 3-420-02FA Compressed Air*.

Seismic Considerations

State that design procedure to be used for support and anchorage for mechanical equipment is in accordance with *UFC 3-310-04 Seismic Design of Building*.

Hazardous Waste

Specify only EPA approved materials, equipment and systems for use.

Fuel

State type, source, whether firm, or interruptible gas and metering arrangements. Indicate adequacy of existing gas distribution system and of existing gas supply to carry additional load. Indicate type of standby fuel for interruptible gas.

Energy Monitoring and Control System

Indicate if base-wide system exists, under construction, or planned within five years. For existing system, identify system in operation.

Building system must terminate with the DDC. Individual buildings will be connected to the base-wide system by a separate construction contract at a later date.

Refer to *UFC 3-470-01 Utility Monitoring and Control Systems UMCS Front End and Integration* and *UFC 3-410-01 Heating, Ventilating, and Air Conditioning Systems.*

Fire Protection

Coordinate with the Architect to ensure all aspects of the fire protection plan are addressed.

For sprinkler systems, indicate type (wet or dry) system, provide evidence that the system is in compliance with *UFC 3-600-01 Fire Protection Engineering For Facilities*.

For foam, dry-chemical, and other special extinguishing systems, show information justifying the arrangement, size, and coverage of each system.

Include a fire water flow curve, based on flow test data, and determine if the available water quantities and pressures are adequate to meet project requirements. Conduct water flow tests, in accordance with the procedures contained in NFPA 291, to determine available water supply for the water-based fire extinguishing systems. The preparer of the contract documents (a fire protection engineer or an engineer experienced in water flow testing) must perform or witness the required flow testing prior to the first submission of the project. Advertisement of the project must not be permitted before water flow tests are accepted. Historical water supply information must not be accepted.

Drawings

Floor Plan

Prepare a floor plan showing heating, ventilating, and air conditioning equipment layout; chillers or refrigeration compressors; boilers; pumps; condensers or cooling towers; air handling units; fans; air distribution duct layout (may be single line); hoods; and other items of major equipment required for the facility.

Plumbing

Show the plumbing fixture layout, floor and area drains, and plumbing equipment layout (hot water generator, storage tanks, pumps, air compressors, for example.).

Mechanical Rooms

Present a study of floor space in the mechanical room and roof space on roof plan by selecting the largest and heaviest of three competing makes of each piece of equipment to go into the room and to mount on the roof. The Mechanical designer must inform the Structural designer of the selections in order to properly size the roof structure.

Adequate provisions must be made in the mechanical rooms to allow for the removal of tubes from boilers, chillers, and condensers, and the removal of coils and filters from air handling units for maintenance or replacement. To save room space, full use must be made of knockout panels or doors on outside walls for tube and other equipment removal. Equipment must be located to allow ample room for servicing and replacement. Show service clearance required for

equipment per manufacturers recommendations. Piping and valves must be arranged so that they will not prevent personnel movement within the equipment room and all valves must be located for ready accessibility. Where necessary because of the location of valves and headers, catwalks or ladders must be furnished for operating and servicing the valves. Gages and thermometers must be of such size, scale, and location as to be easily read by operating personnel.

If an outdoor Mechanical Equipment yard is enclosed by a solid CMU fence, adequate air movement must be provided by openings in the wall, wall section overlap with air gap between, removing blocks at certain intervals, and so forth.

Electrical Design

Design Analysis - Narrative/Calculations

General

Provide electrical characteristics (phase, voltage, and number of wires) or circuits.

Electrical Load Analysis

Include estimate of total connected load and demand factors, diversity, and resulting kilowatt demand. Breakdown of the estimated connected and demand load must show: (1) Lighting and convenience outlet load; (2) power load for building equipment such as heating, air conditioning, for example., (3) loads for special operating equipment such as air compressors, generators, pumps, and for power receptacles being provided to energize special equipment, (4) appropriate spare load, for future growth. State required power factor and size of transformers.

Lighting

Describe the proposed standards of design for lighting intensities and type of lighting fixtures for functional areas, including controls, both interior and exterior in accordance with design criteria as required in Architectural and Engineering Instructions. Indicate type of emergency lighting system to be provided. Indicate other energy conservation features such as task lighting. Discuss airfield lighting requirements if applicable.

Miscellaneous

Describe provisions for specialized motor control, cathodic protection, grounding and lightning protection as applicable.

Hazardous Classification

Provide a description of the physical limits of each hazardous area and the class, division, and group of equipment and wiring. Discuss special fixtures for hazardous areas.

Power Supply

Discuss, electrical characteristics of power supply to base, or portion thereof involved, including circuit interrupting requirements and voltage regulations. State the adequacy of the existing

power supply at the point of take-off. If power source is inadequate, state measures proposed to correct the deficiency. If new power source or local/standby generation is required, discuss the various schemes and submit cost comparisons. Indicate voltage drop of service entrance and voltage drop basis for feeders and circuits. Indicate the requirement of short circuit calculation.

Distribution

Discuss basis for selection of primary and secondary distribution voltage, and of overhead or underground construction. Indicate characteristics and standards of design for overhead or underground line. Include a justification for underground line.

Fire Alarm and Mass Notification

Discuss proposed fire alarm and mass notification system and means for transmission of signal (if applicable). Discuss any special systems such as fast-acting smoke detection.

Signal Systems

Discuss signal systems, such as: MATV, Public Address/Paging, Intercom, Audio Visual system, for example. (if applicable).

Electronic Security Systems

Discuss intrusion detection, access control, and CCTV. Discuss if portions of systems are Government provided.

Telecommunications Systems

Discuss the Telephone and Data Systems requirements, such as, telephone instruments/switching equipment, Category of Data system (Cat 6 minimum), list of data networks and classifications (NIPR, SIPR/SECRET, TS, for example), and inside (and outside) wiring, Telecommunications Room details, Server Room details (if applicable) cable tray plan, for example.

System Control

Discuss special control, such as, generator paralleling, switch gear remote control, telemetering, central supervisory control (if applicable).

Grounding

Discuss special grounding, such as, electronic labs, security communications areas, and data processing (if applicable).

Hospital Designs

Discuss hospital criteria per NFPA, and *UFC 4-510-01 Design: Medical Military Facilities* (if applicable).

Seismic Considerations

Statement of support and anchorage design for electrical equipment in seismic areas must be in accordance with *UFC 3-310-04 Seismic Design of Building*.

Raised Floor Systems

When raised floor systems are required, state that all stanchions will be made electrically continuous for computer noise with 1 #l/0 BC brought from one point on the stanchions to a computer ground bar located within the raised floor areas. Bond this computer ground bar with 1 C1/0 BC to the service entrance ground bus.

TEMPEST/EMP Shielding

State the frequency spectrum of the installed equipment to be afforded TEMPEST/EMP protection. Coordinate shielded wall systems with architectural and mechanical designers.

Cybersecurity

Discuss the requirement, such as, fire alarm reporting, EMCS, lighting, security controls, and so forth.

Commissioning

Discuss the commissioning process, such as, operation, installation, maintenance, and so forth.

Metering

Discuss the installation's requirement for metering, such as, smart metering, power consumption, reporting, and so forth.

Sustainable Design

Discuss the features incorporated for compliance with UFC 1-200-02. Provide the LCCA for any renewable energy systems.

LEED

Discuss the certification requirement (if applicable), such as, light pollution reduction, metering, interior lighting, and so forth.

Emergency Power

Discuss generator type requirement or UPS (if applicable).

Renewable Energy Source

Discuss the option (if applicable). Provide LCCA calculation.

Drawings

Electrical Site Plan

Provide electrical site characteristics on a civil site plan (or on separate electrical site plan if more appropriate due to complexity) including power and communication service lines to the building and exterior location of proposed electrical equipment.

Power 1-Line Diagram

Provide A Power 1-Line Diagram must be provided unless the concept is basic such as a single electrical service to a straightforward facility.

Other

Other electrical drawings are normally not provided at this stage but can be on a case-by-case basis as the project dictates.

Cost Engineering

Engineering Regulations (ER) 1110-2-1302 and (ER) 1110-3-1300 provides policy, guidance, and procedures for cost engineering responsibilities for all projects assigned to the U.S. Army Corps of Engineers (USACE). All cost engineering products required to support USACE managed projects must be prepared in accordance with this regulation and all referenced regulations, policy and guidance, including engineering manuals, pamphlets and USACE memoranda.

Cost engineering products developed by architect-engineer (A-E) contractors or by other offices (such as, Area Offices, Resident Offices, for example) must conform to all cost ERs, EMs, and other applicable regulations (shown at Appendix A of ER 1110-2-1302)

The USACE approved estimating software programs, Microcomputer Aided Cost Engineering System (MCACES) and the Cost Engineering Dredge Estimating Program (CEDEP), are the required software programs for the preparation of Civil Works cost estimates throughout USACE. Parametric Cost Engineering System Software (PACES) is acceptable for 10% design for Military projects.

To support the Civil Works missions addressed in ER 1105-2-100, cost estimates are required for all phases of a project. Detailed cost estimates should be considered For Official Use Only (FOUO) and managed in accordance with AR 25-55 and FAR 36.203.

The cost engineer must prepare reasonable construction schedules that reflect the construction estimates.

Estimates produced for Military Construction-funded – Army (MCA) projects at this maturation, must still be in the format of the DD 1391, as the initial ENG 3086 must be produced and entered into the PAX system by the district cost engineer. The AE will work with the district cost engineer so that this initial 3086 can be reviewed by HQUSACE for the ongoing programming effort.