DESIGN QUALITY CONTROL

SAME – MEET THE CORPS DAY
MARCH 3\(^{RD}\) & 4\(^{TH}\), 2020

Christopher Strunk, PE, SE
Chief, Military & IIS Design Section
Engineering Branch / E&C Division

Laura Shoopman, PE
Chief, Design Management Section
Engineering Branch / E&C Division

“The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation.”
DISCLAIMER:

These presentations are opinions of SWT E&C personnel only, and should not be considered as USACE policy or direction. The topics covered here within are to spur conversation and dialogue at this event only.
Agenda

1. District Organization / USACE Roles and Responsibilities

2. Topics of Conversation:
   - References and Criteria
   - Review Process
   - AEIM: 35/65/95 (expectations)
   - Examples: LCCA, Fast Tracking, Geotech, Cybersecurity, Personnel Qualifications, etc.
References

Management & Process:
2. USACE Business Process, ER 5-1-11, 31 Jul 2018
3. ER 1110-1-12, Quality Management, 31 Mar ‘11

Military:
ER 1110-345-100
ER 1110-345-700

Civil:
ER 1110-2-1150
ER 1110-2-1200

Cost Est. (all):
ER 1110-1-1300

Specification:
ER 1110-1-8155

NEPA:
ER 200-2-2

Environmental Operating Princ.
ER 200-1-5

Environmental Operating Princ.
Design Criteria:

- DoD Building Code, UFC 1-200-01, 8 Oct. 2019
- Criteria Format Standard, UFC 1-300-01, 18 July 2018
- Design Build Technical Requirements, UFC 1-300-07A, 1 March 2005
- *Navy and Marine Corps Design Procedures, FC 1-300-09N w/ Change 4, 14 Jun 2018
- Etc.

References

https://www.wbdg.org/
References – Order of Precedence

Criteria is generally intended to become more specific and restrictive as you go up the pyramid.

Contract Solicitation
- Scope of Work
- Specifications
- Drawings & Appendices

DoD Criteria
- AFI’s
- Installation Design Guides

USACE Criteria
- EMs, ECBs, ETLs
- COS Standards

Unified Facility Criteria (UFCs)

Industry Codes & Standards
Design Review Process, D-B-B

Design Start

- Design 35/65/95/100

Independent Peer Review
- Continuous process throughout production
- Complete review of design deliverables

Quality Assurance Review
- District – DPW./BCE – Special Interests (MCXs), PM
  - Check for validity of assumptions, correctness of calculations, completeness
  - Compliance with Standards
  - Each group reviews for their area of interest/expertise

Independent Technical Review (ITR)
- Holistic, comprehensive Project Review performed by 3rd party qualified staff
- Includes cost, scope, risk, and technical

Technical Design Complete
- Biddability, Constructability, Operability, Environmental, Sustainability
- Focus on Const. Administration and Div01 Specifications

BCOES

Solicitation
Design Review Process, D-B

Design Start

Design 35/65/95/100

Independent Peer Review
- Continuous process throughout production
- Complete review of design deliverables

Quality Assurance Review
District – DPW./BCE – Special Interests (MCXs), PM
- Check for validity of assumptions, correctness of calculations, completeness
- Compliance with Standards
- Each group reviews for their area of interest/expertise

Independent Technical Review (ITR)
- Holistic, comprehensive Project Review performed by 3rd party qualified staff
- Includes cost, scope, risk, and technical

Technical Design Complete

BCOES only on DB RFP Solicitation Package
- Biddability, Constructability, Operability, Environmental, Sustainability
- Focus on Const. Administration and Div01 Specifications

Solicitation
# CHAPTER XI
## DESIGN SUBMISSION REQUIREMENTS

### Table of Contents

1. INTRODUCTION
   1.1 Applicable Submission Phases

2. ARMY/AIR FORCE PROJECTS GENERAL SUBMISSION PHASES
   2.1 Requirements & Management Plan (RAMP) (5%) (AIR FORCE)
   2.2 Schematic Submittal (5%) (ARMY)
   2.3 Preconcept Design (10%) (ARMY)
   2.4 Charette Requirements
   2.5 Project Definition (10-30%) (AIR FORCE)
   2.6 Project Engineering/Code 3 (10-15%) (Army)
   2.7 Concept Design (15%) (ARMY)
   2.8 Preliminary Design (60%)
   2.9 Final Design
   2.10 Corrected Final Design (100%)

3. MEDICAL PROJECT REQUIREMENTS (ARMY/AIR FORCE)

4. GENERAL DESIGN DOCUMENT REQUIREMENTS
   4.1 Drawings
   4.2 Specifications
   4.3 Design Analysis
   4.4 Cost Estimate
   4.5 Color Boards
   4.6 Structural Interior Design (SID)
   4.7 Comprehensive Interior Design (CID)
   4.8 Submittal Register (ENG Form 4288)
   4.9 DD Form 1354 "Transfer & Acceptance of Military Real Property"
   4.10 Construction Schedule
   4.11 Architectural Sketches/Renditions
   4.12 Architect-Engineer Design Quality Control Plan (CED)
   4.13 Miscellaneous

---

**Southwestern Division**

**Architectural and Engineering Instructions Manual (AEIM)**

January 2003
General Requirements

(Section 4.x):

- 4.3 – Design Analysis; The design analysis submitted shall include information, narratives, data and computations necessary to support and describe the design developed, with sufficient detail to permit a complete understanding of the project design.

- 4.12 – Architect-Engineer Design Quality Control Plan (QCP); The A-E is required to submit a product QCP with the fee proposal. The minimum requirements are given in ER 1110-1-12 and project SOW.

- 4.13.2 – Standard Designs. Changes to Standard Designs shall be avoided. Any changes require approval by CESWD and HQUSACE.
Concept (35%) and DB Army (Section 2.7, XI – 6):

- Demonstrate Functional and Technical Approach.
- Comprised of Narrative, by discipline, anticipated Guide Specifications, Drawings, & Energy Analysis (is required, per LCCA in Mechanical EM’s), etc.
- Note: “the submittal defining the site work for existing utilities may require a design effort greater than 30-35%...”

2.7.4 Drawings required for the Concept Data Brochure are identified as attachments and include the following as a minimum:

2.7.4.1 Civil (Attachment A-1, A-2, etc.):

- 2.7.4.1.1 Project location map.

2.7.4.2 Plumbing (Attachment C-1, C-2, etc.):

- 2.7.4.2.1 Preliminary foundation plan.
- 2.7.4.2.2 Framing plan(s).
- 2.7.4.2.3 Preliminary Foundation & Roof Sections/Details
- 2.7.4.2.4 Mechanical (Attachment D-1, D-2, etc.):
- 2.7.4.2.5 Plumbing fixture/drain location plan.
- 2.7.4.2.6 HVAC equipment location/duct work layout plan/schedules.
- 2.7.4.2.7 Fire protection systems plan.
- 2.7.4.2.8 Electrical (Attachment E-1, E-2, etc.):

- 2.7.4.3.1 Site plan.
- 2.7.4.3.2 Lighting plan.
- 2.7.4.3.3 Power plan.
- 2.7.4.3.4 Communications plan.
Concept (60%) Army

This submittal typically consists of a design analysis, working drawings, marked-up guide specifications, construction cost estimate, and color boards.

Comments from previous Government review shall be incorporated.

Design Analysis – requires 100% calculations for multiple disciplines (2.8.2)
Final Army D-B

(Section 2.9, XI – 13):

- The project plans and specifications are complete and ready for advertising at this state, except for incorporation of final comments, if any.
- Comments from previous Government review(s) shall be incorporated.
Issues found in DQC:

- LCCA’s – often energy modeling and systems are not properly (per AEIM and EM’s) identified and documented at the 35% or 65% submittal.


- Fast tracking – either formal with intent to begin site-work and foundation package prior to final building design acceptance, OR accelerated design – skipping 35% design and going straight to 65%.

- Geotechnical Report – often submitted later than 35%, site/civil and structural are often based on minimal information provided for bid estimates in RFP w/o confirming existing conditions.

- Cybersecurity – Installation CIAs are not requested for each of the proposed systems; USACE MCX can provide (Army) when requested via RFI process.

- Personnel Qualifications – required years of experience, or certifications are out of date, change due to design team fluidity, etc.