DESIGN QUALITY CONTROL

SAME – MEET THE CORPS DAY
MARCH 3RD & 4TH, 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

Military

Multipurpose Reservoirs

Hydropower

Interagency and International Support

MKARNS

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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.

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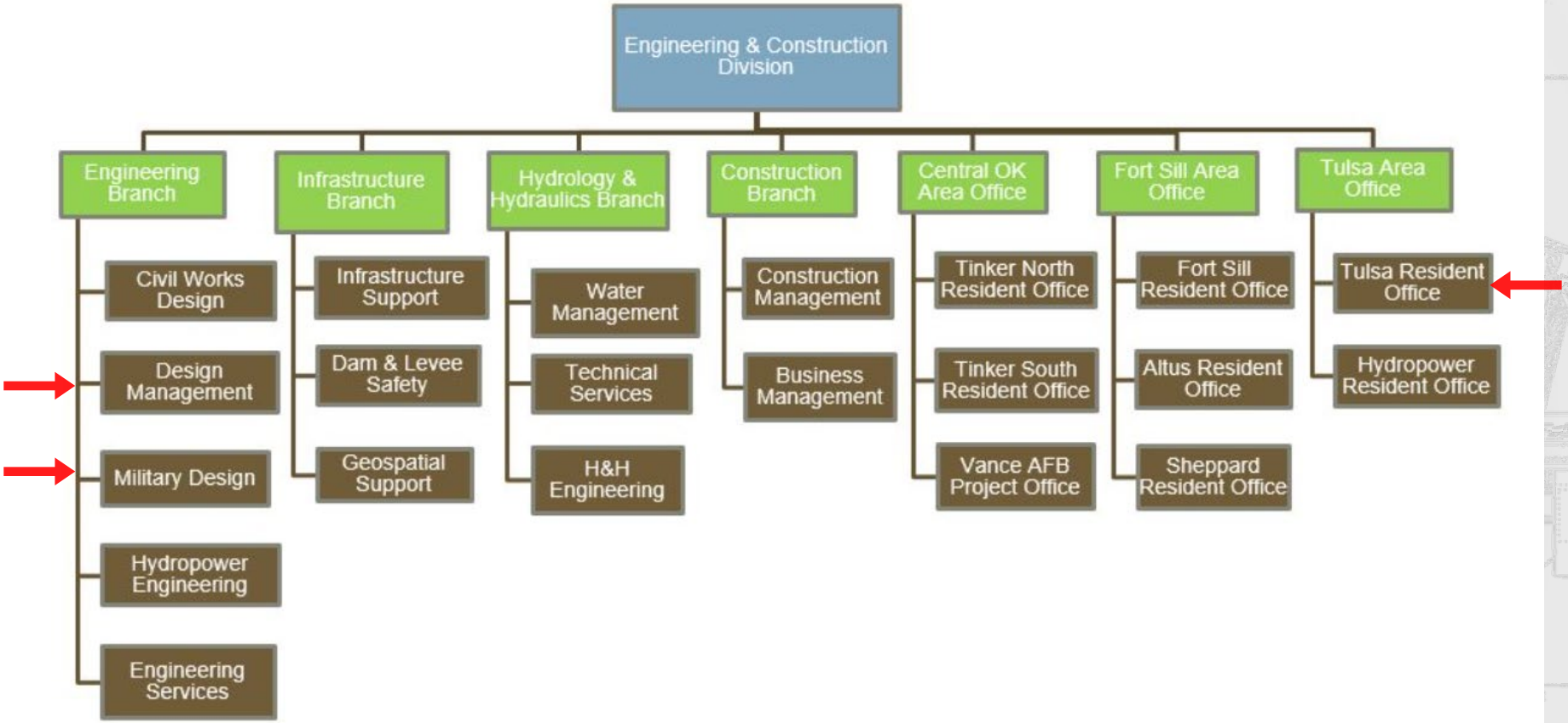
Agenda

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.

Organization



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Organization

Engineering Branch
1 Branch Chief
GS 14 – 1/1
1:5

Civil Design
Chief, Jamie Watts, PE

Oversees Civil Works Design: 70% In-house and 30% Contracted (goal)

Staff:
Civil Engineers
Electrical Engineers
Mechanical Engineers
Structural Engineers
Engineer Techs
(Drafting)

Military & IIS Design
Chief, Christopher Strunk, PE, SE

Oversees Military & IIS Design: 30% In-house and 70% Contracted

Staff:
Architects
Electrical Engineers
Mechanical Engineers
Structural Engineers
Engineer Techs
(Drafting)

Design Management
Chief, Laura Shoopman, PE

Manages Tech. coordination and PDT reviews, A/E contract administration

Staff:
Design Managers
Technical Managers
Writer/Editor

Hydropower Design
Chief, Jay Surman, PE

Oversees Hydropower Design in coordination with HDC

Staff:
Electrical Engineers
Mechanical Engineer
Structural Engineer
Design Managers
Specification Writer

Engineering Services
Chief, Vacant

Oversees Design Quality Control across Business Lines, ATRs, VE's, Sr. Level Tech. Reviews

Staff:
SME – Electrical Eng.
SME – Fire Protection Eng.
SME – Mechanical Eng.
SME – Paving Eng.
SME – Structural Eng.
Specifications Writers

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References

Management & Process:

1. Federal Acquisition Regulation (FAR Part 36 Construction and Architect – Engineer Contracts, 36.601-4, 14 Oct 2014
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

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References

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.

https://www.wbdg.org/

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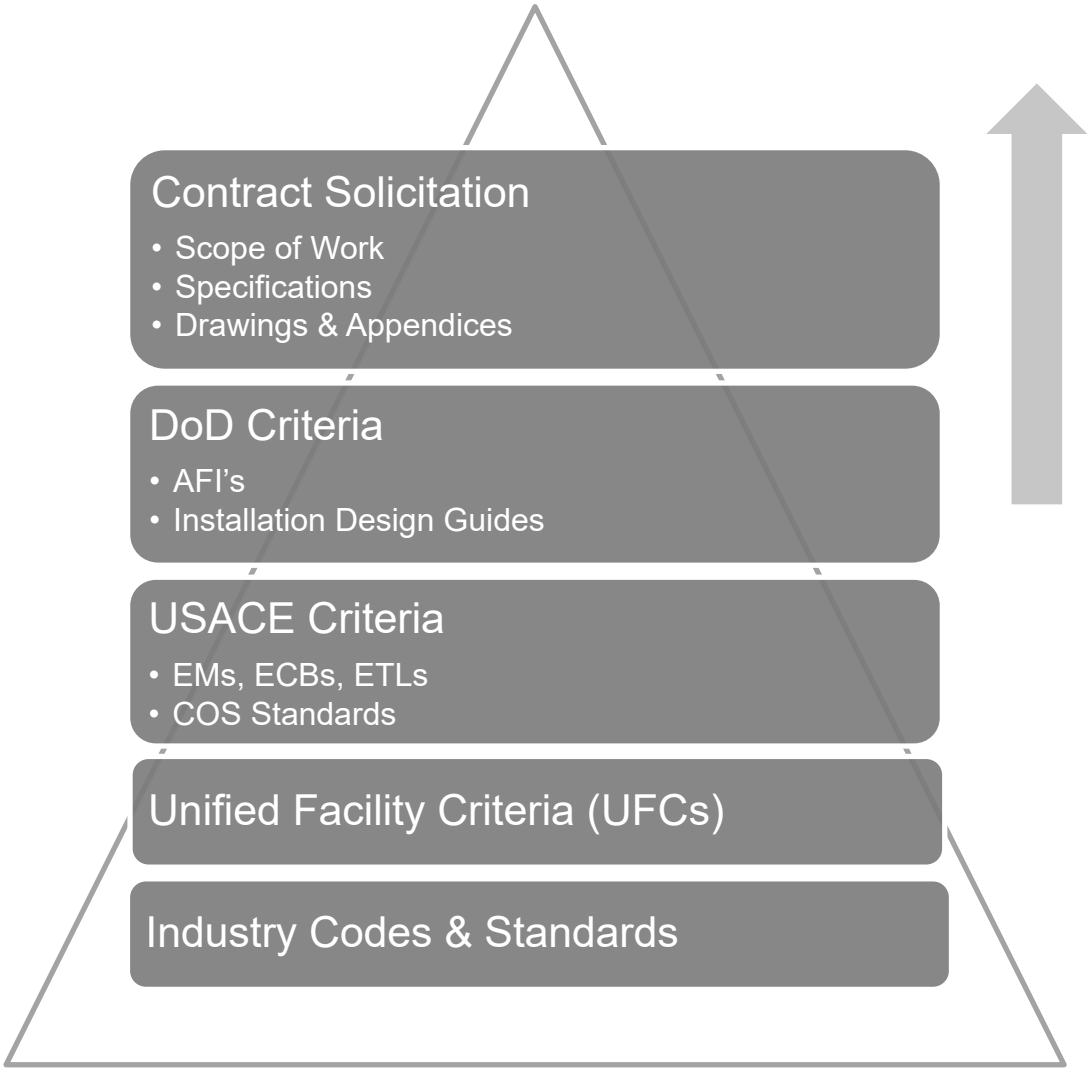
References – Order of Precedence



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

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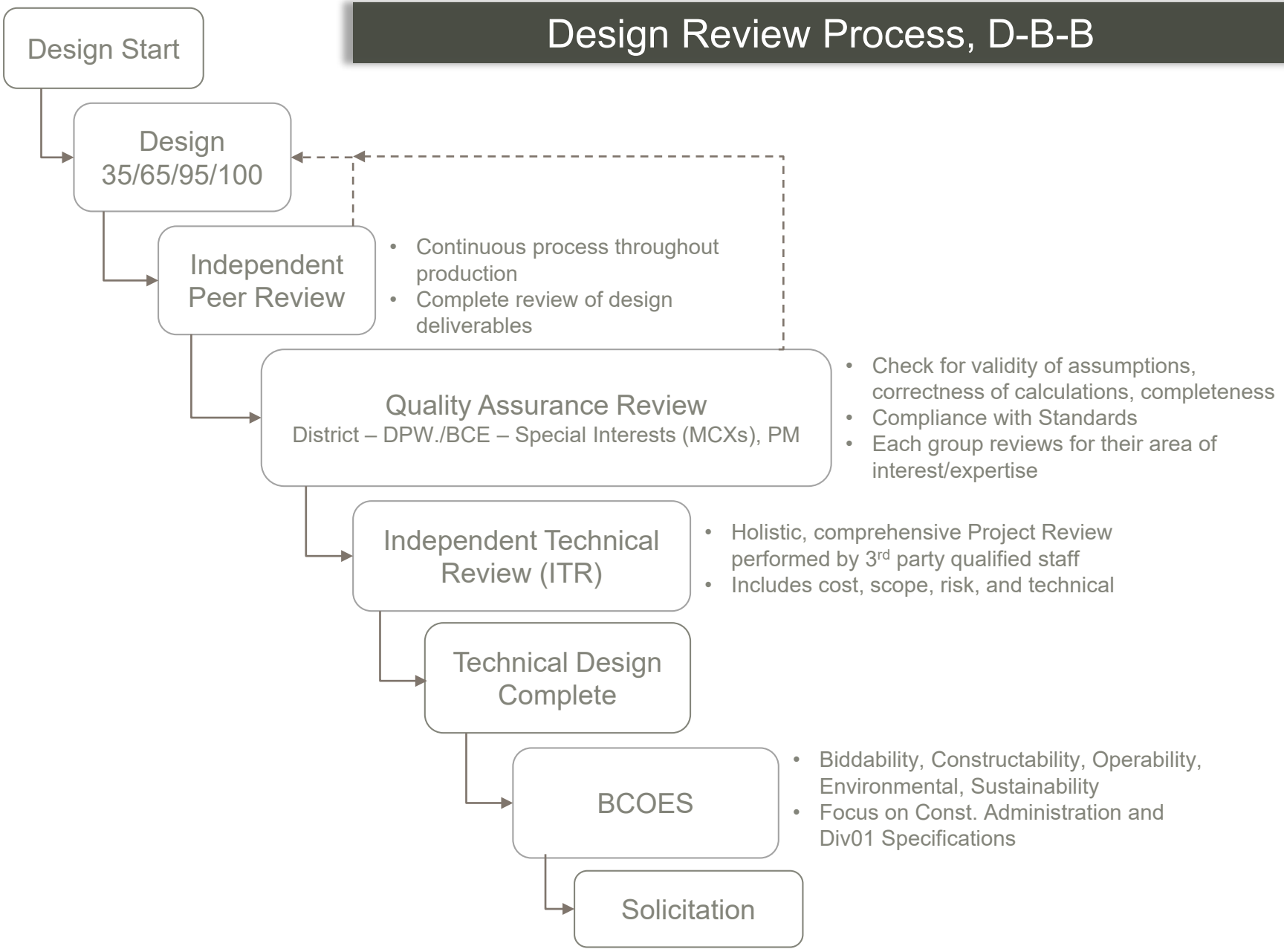
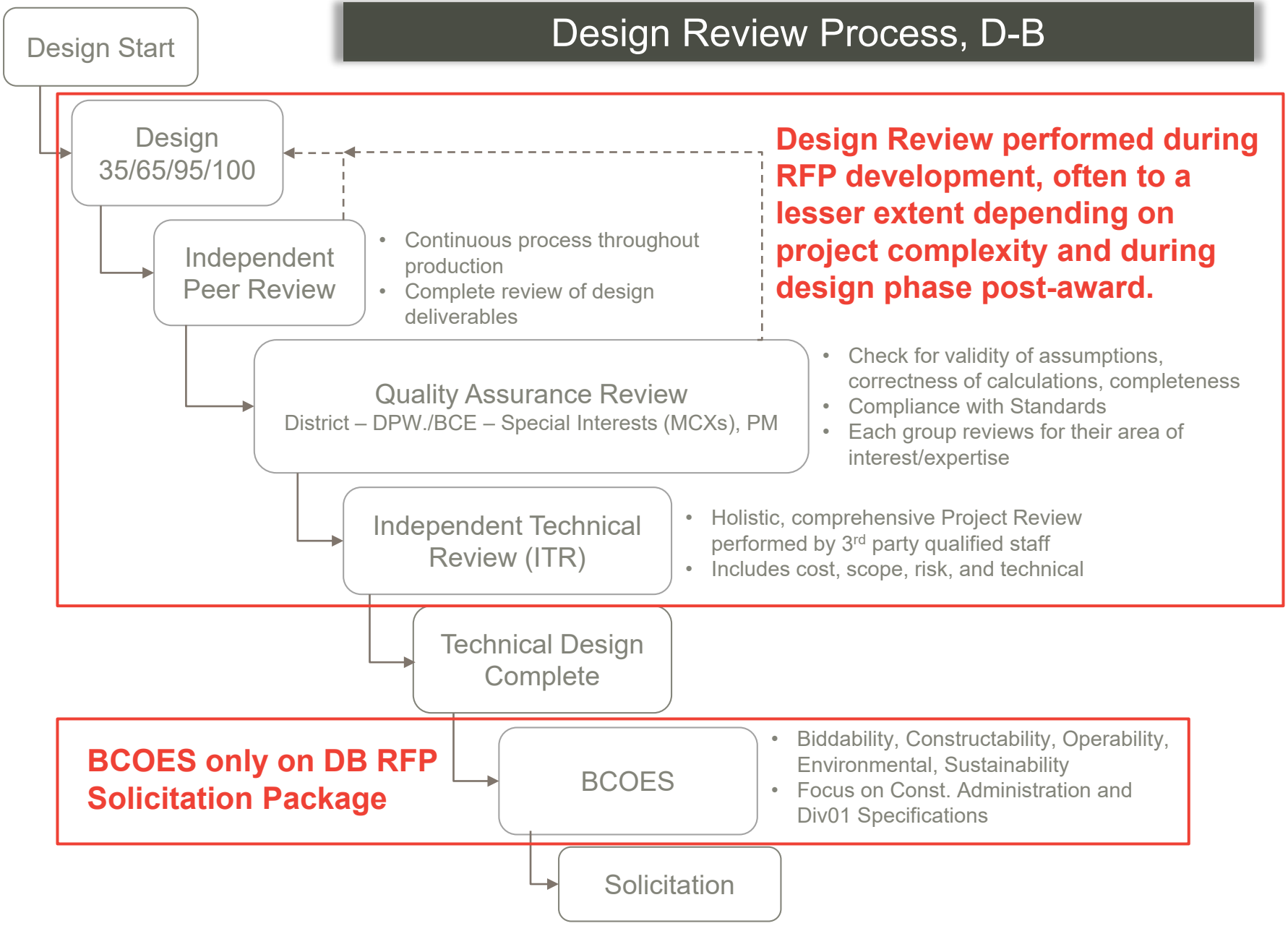
Design Review Process, D-B-B



Design Review Process, D-B



AEIM

CHAPTER XI

DESIGN SUBMISSION REQUIREMENTS

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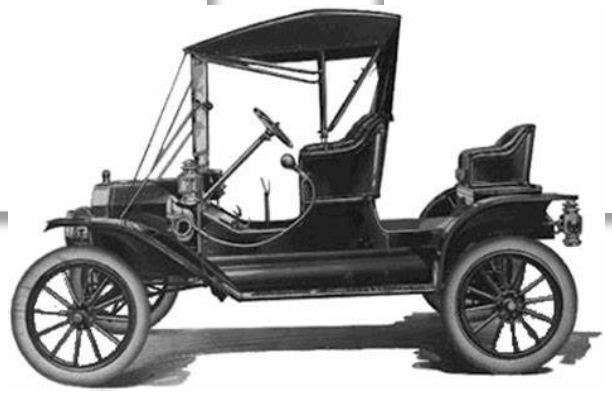
US Army Corps of Engineers®

Southwestern Division

Architectural and Engineering Instructions Manual (AEIM)

January 2003



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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.

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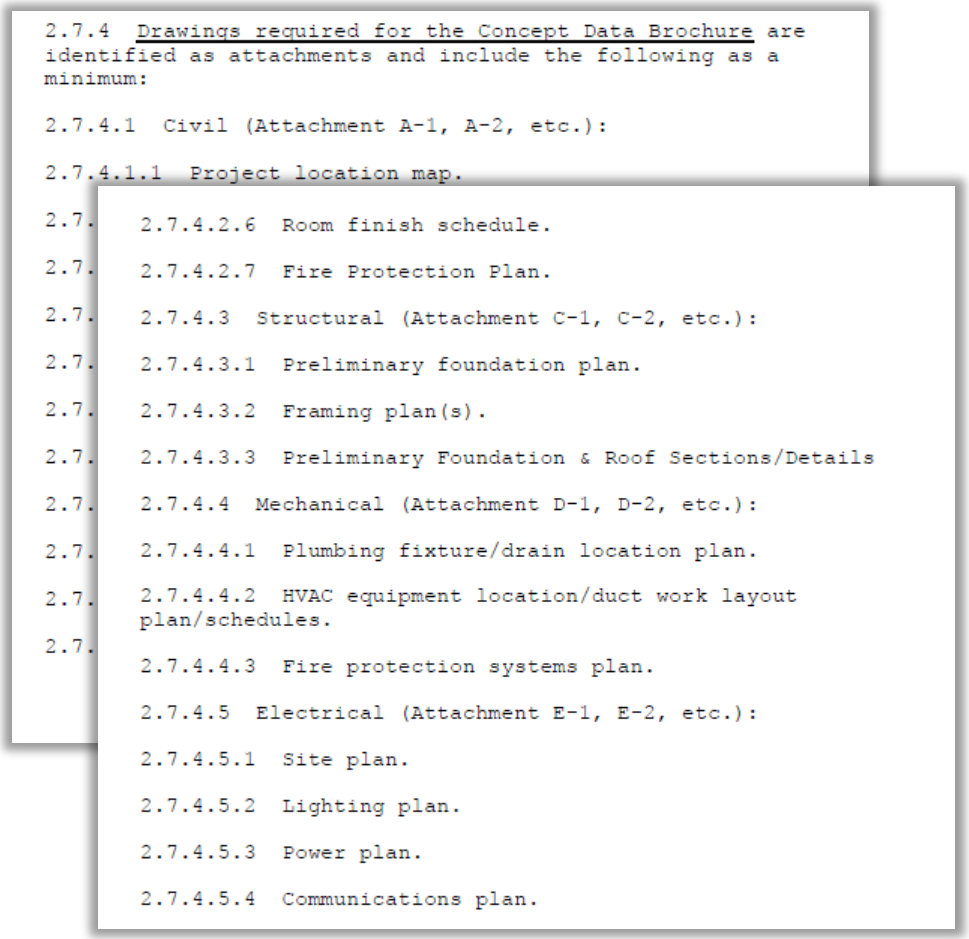
AEIM

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.

2.7.4.2.6 Room finish schedule.

2.7.4.2.7 Fire Protection Plan.

2.7.4.3 Structural (Attachment C-1, C-2, etc.):

2.7.4.3.1 Preliminary foundation plan.

2.7.4.3.2 Framing plan(s).

2.7.4.3.3 Preliminary Foundation & Roof Sections/Details

2.7.4.4 Mechanical (Attachment D-1, D-2, etc.):

2.7.4.4.1 Plumbing fixture/drain location plan.

2.7.4.4.2 HVAC equipment location/duct work layout plan/schedules.

2.7.4.4.3 Fire protection systems plan.

2.7.4.5 Electrical (Attachment E-1, E-2, etc.):

2.7.4.5.1 Site plan.

2.7.4.5.2 Lighting plan.

2.7.4.5.3 Power plan.

2.7.4.5.4 Communications plan.

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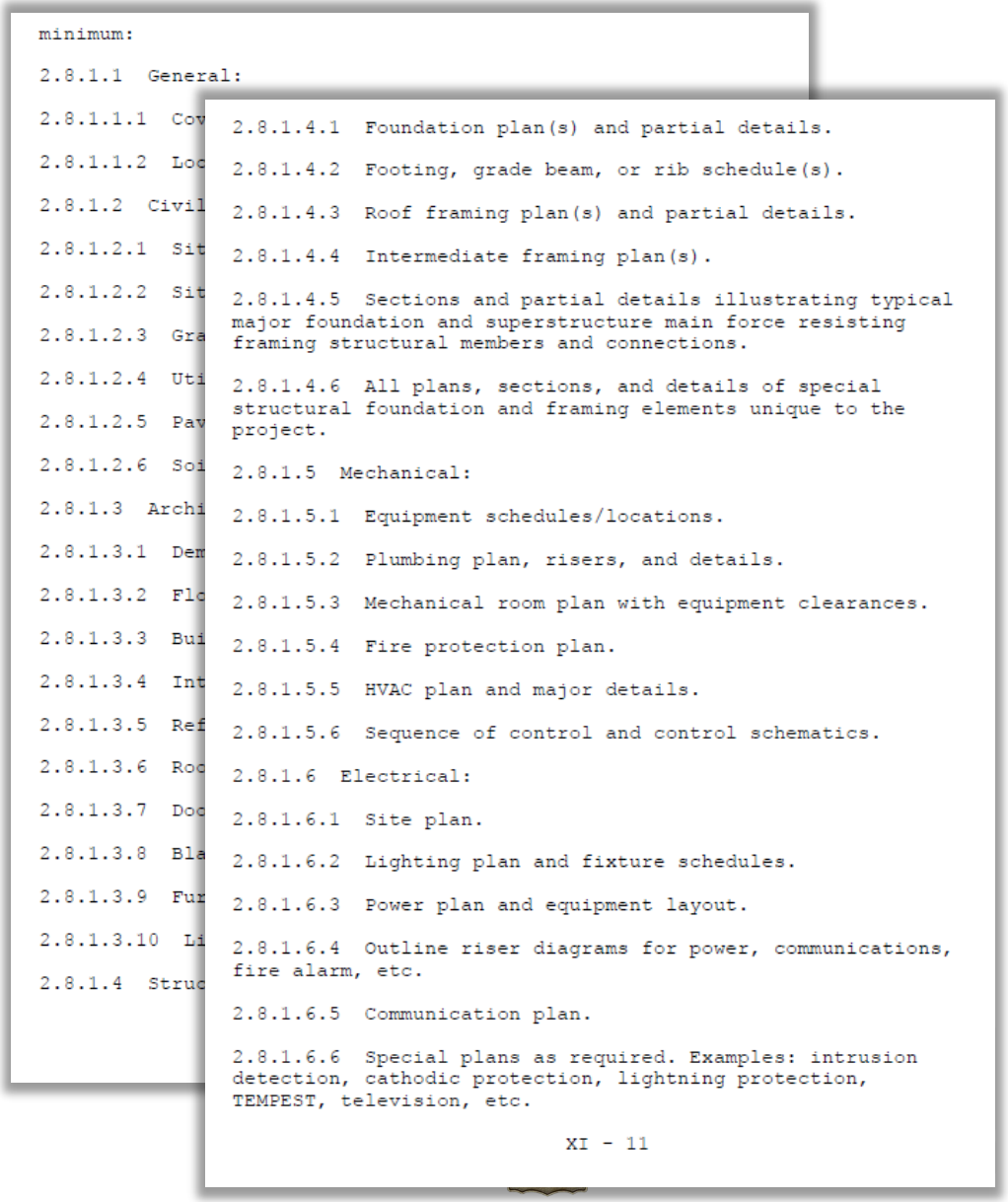
Concept (60%) Army

(Section 2.8, XI – 9):

- 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)



minimum:

2.8.1.1 General:

2.8.1.1.1 Cov

2.8.1.1.2 Loc

2.8.1.2 Civil

2.8.1.2.1 Sit

2.8.1.2.2 Sit

2.8.1.2.3 Gra

2.8.1.2.4 Uti

2.8.1.2.5 Pav

2.8.1.2.6 Soi

2.8.1.3 Archi

2.8.1.3.1 Dem

2.8.1.3.2 Flo

2.8.1.3.3 Bui

2.8.1.3.4 Int

2.8.1.3.5 Ref

2.8.1.3.6 Roo

2.8.1.3.7 Doo

2.8.1.3.8 Bla

2.8.1.3.9 Fur

2.8.1.3.10 Li

2.8.1.4 Struc

2.8.1.4.1 Foundation plan(s) and partial details.

2.8.1.4.2 Footing, grade beam, or rib schedule(s).

2.8.1.4.3 Roof framing plan(s) and partial details.

2.8.1.4.4 Intermediate framing plan(s).

2.8.1.4.5 Sections and partial details illustrating typical major foundation and superstructure main force resisting framing structural members and connections.

2.8.1.4.6 All plans, sections, and details of special structural foundation and framing elements unique to the project.

2.8.1.5 Mechanical:

2.8.1.5.1 Equipment schedules/locations.

2.8.1.5.2 Plumbing plan, risers, and details.

2.8.1.5.3 Mechanical room plan with equipment clearances.

2.8.1.5.4 Fire protection plan.

2.8.1.5.5 HVAC plan and major details.

2.8.1.5.6 Sequence of control and control schematics.

2.8.1.6 Electrical:

2.8.1.6.1 Site plan.

2.8.1.6.2 Lighting plan and fixture schedules.

2.8.1.6.3 Power plan and equipment layout.

2.8.1.6.4 Outline riser diagrams for power, communications, fire alarm, etc.

2.8.1.6.5 Communication plan.

2.8.1.6.6 Special plans as required. Examples: intrusion detection, cathodic protection, lightning protection, TEMPEST, television, etc.

XI - 11

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.

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Examples

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.

  New – ECB "Life Cycle Cost Analysis," coming soon (est. FY20)

- 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.

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