



**US Army Corps  
of Engineers®**

# ENGINEERING AND CONSTRUCTION BULLETIN

**No. 2014-8**

**Issuing Office: CECW-CE**

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**Subject:** HQUSACE Led Design and Construction Evaluations FY 2012 and 13 - Plan for FY 14

**Applicability:** Information

1. Reference:

- a. ER 415-1-13, Design and Construction Evaluation, 29 February 1996
- b. ER 1110-2-1150, Engineering and Design for Civil Works Projects, 31 August 1999  
ECB 2009-10, HQUSACE Led Design and Construction Evaluations
- c. Archived ECB 2010-3 and 2011-7 Results of HQUSACE Led Design and Construction Evaluations FY 09 and FY 10
- d. Archived ECB 2012-2 and ECB 2013-11 Mega Projects Guidance
- e. PMBP Manual Version 1.0 May 2009
- f. CECW-CE Memorandum 2 April 2013: Quality Imperatives for Engineering and Construction Products and Services

2. Purpose: The purpose of this ECB is to summarize the results and lessons learned from FY12 and 13 HQUSACE- led Design and Construction Evaluations (DCE). It also includes Lessons Learned from, and proposed changes to the DCE Process; and a listing of programs, projects, and focus areas for FY 14.

3. In FY 12 and 13, five HQ-led DCEs were conducted. Three were Mega Projects; one was a focused evaluation of a medical facilities project; and one was a programmatic look at several Dam Safety Modification projects. HQ representatives also evaluated several significant safety, structural, and electrical/mechanical issues, and received some very critical Congressional Correspondence, GAO, and IG evaluations of work. This ECB provides summary level results and lessons learned from those DCEs, and from other design and construction issues which were elevated to HQUSACE for consideration.

4. PROGRAM AND PROJECT SELECTION: Programs and projects selected for HQ-led participation in FY 12 and 13 included:

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a. Mega Projects, specifically evaluating if designated projects were complying with the 12 Mega Project Tenets.

b. Dam Safety Modification Projects, with a goal of evaluating program execution across several representative projects, MSCs, Districts, and Centers of Expertise.

c. Individual, focused DCEs, using smaller teams, on shorter notice, and with more limited scope to address urgent needs.

d. Projects with current and high level issues, as identified by senior leaders in the Civil Works and Military Programs Directorates, or as requested by MSCs.

e. Projects with features that required and emphasized quality management in design and construction as determined by the Director, E&C.

5. FINDINGS - The following are summary level findings in 8 categories. Detailed examples of these findings are in Appendix A:

a. MEGA PROJECTS - The 12 basic tenets of Mega Project Management are outlined in archived ECB 2012-2 and ECB 2013-11. Based on DCE results, project briefings, and documents furnished to E&C, we are not implementing, or (at best) are only partially implementing the tenets for Integrated Master Schedule, Earned Value Management, Metrics, Tiered Management, and Facilitated Partnering.

b. PROGRAMMING and BUDGETING - Mega Project Management, Life Cycle Cost Management, and other USACE initiatives are intended to improve our ability to predict and control time and cost growth, while delivering the agreed project scope and quality. While there does seem to be a heightened awareness of these needs, additional improvements are needed in the use of risk-based estimates, scope and contingency management, and in considering the cost and time impacts of acquisition decisions.

c. PROGRAM and PROJECT MANAGEMENT PLANS - The requirements for Program and Project Management Plans are outlined in our PMBP guidance. Many of the activities and documents described within those processes involve E&C. Our recent leadership role in Mega Project planning and execution has added to our responsibilities in the areas of Mega Project Management and Cost and Schedule Risk Analysis. DCE findings indicate that Mega project and program plans do not contain sufficient information regarding quality management, cost and schedule risk analysis, metrics, and other management processes that are essential for proper design and construction management. While the assigned Project Executive is ultimately responsible for the project/program execution, E&C representatives are responsible for key pieces of that execution. Reference 1f above is a clear example of where we need to provide additional efforts.

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d. **QUALITY MANAGEMENT** – By Memorandum dated 2 April 2013, the Chief of E&C directed all MSCs and Centers to increase their focus on the quality of our design and construction products. Among the requirements in the memo:

- (1) Broader application of the “Lead Engineer” concept
- (2) Improved quality management plans, with 20% sampling and review by Chiefs of E&C
- (3) Accountability for quality in PDT member evaluations
- (4) Development of quality metrics
- (5) Development of risk assessment and management plans

While this is a relatively new requirement, we did not see evidence of compliance with these requirements during the DCE evaluations which were conducted after April 2013.

e. **DESIGN** - As our processes and delivery systems become more integrated, our responsibility for ensuring design integrity becomes even more important. DCE findings indicate that design narratives, calculations, drawings, and energy/sustainability features are not fully integrated; stakeholder, centers of expertise, and Designer of Record roles and responsibilities are unclear; and that design processes are not consistent with innovative procurement methods.

f. **ACQUISITION** - The integration of our roles in support of planning, project management, and operations all involve the successful use of contracts and contractors to perform design and construction work. These duties, coupled with innovative delivery systems, require a more uniform, thorough understating and definition of roles, responsibilities, and authorities for all USACE elements, our AEs, and our construction contractors. DCE findings have identified many areas where we are creating complex solicitations and contracts for Design, Design-Build, Construction Phase Services, and Design-Bid-Build procurements where we do not have the technical expertise and/or contractual skills to properly monitor and administer the work.

g. **CONSTRUCTION MANAGEMENT and COMMISSIONING** - USACE and our industry partners are increasingly aware of the important role(s) of construction managers, and of the significance of commissioning the facilities which we design and construct. E&C representatives traditionally have delegated authorities (COR, ACO). Increased knowledge, along with more uniform and strict enforcement of applicable codes, FAR clauses, and other contract provisions, are needed.

h. **COORDINATION AMONG USACE ELEMENTS** - Many of our projects are being scrutinized (by GAO and other review/audit agents) for cost and time growth, systemic defects, and acquisition errors. These evaluations further highlight the importance of fielding and

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maintaining competent project delivery teams. Reduced project funding and lead time are impacting our ability to identify and prevent recurrence of these defects.

**6. LESSONS LEARNED IN THE DCE PROCESS**

Our experiences in FY 2012/13 led us to conclude that the following aspects of the DCE process should be revised or enhanced:

a. **PLANNING and PREPARATION** – Projects selected for DCE visits were based on available funding and current interest, resulting in short notice and preparation times. Lesson Learned: Utilize the yearly Mega Projects guidance update, this periodic summary of DCE findings, and monthly E&C Chiefs conference calls, to plan future DCE visits. Provide sufficient funding for these efforts.

b. **PARTICIPANTS** – DCE Team members are selected based on their expertise and availability. The total commitment required of these individuals, including read-ahead and report writing, have not been considered in making these selections. The result has been that DCE Teams report to the project site without full preparation, and the subsequent report is delayed and/or incomplete. Lesson Learned: Form the team at least 2 months in advance of the DCE. Plan for two weeks of pre-visit reading and post-visit report writing for each one week of DCE visit time. Obtain commitments of time from team members and their supervisors. Provide sufficient funding for these efforts.

c. **READ-AHEAD MATERIAL** – ECB 2009-10 contains a listing of potential documents required to support a DCE Visit. ECB 2012-3 and 2013-11 list additional information which supports Mega Projects. Not all of these documents apply to every DCE, and sufficient information and guidance is not always provided for district representatives to assemble the advance documentation. Lesson Learned: In advance conversations with MSCs, select the documents required in each of the listed categories, then ask for additional data (as the need arises) prior to and during the DCE visit. Appoint an MSC POC to handle all follow-up requests for data, documents, or information.

d. **DELAY IN FINALIZING AND ISSUING REPORTS** – DCE reports are not being finalized and signed in a timely fashion. In addition to the delays caused by the issues listed above (team member non-availability, obtaining additional information after the visit, etc), there have been multiple rounds of drafts, comments, and revision. Lesson Learned: Issue a preliminary report, based on the DCE Out Brief (which is typically done on the last day of the visit) within 4 weeks of the visit. Ensure that senior leaders from the MSC, cognizant MCX, and HQ participate in the out brief and that they receive copies of the preliminary report. Include a schedule for gathering and analyzing additional information (and other follow-up actions) in the preliminary report. Issue final report within 4 weeks of completing those actions.

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7. FY 14 PROGRAMS and FOCUS AREAS – the following are tentative selections for DCE Visits in FY 2014:

a. Medical Facilities – Locations within SWF. Focus on design integrity, commissioning, and turnover.

b. MILCON (Other) – USMA Cadet Barracks . Traditional DCE evaluation of design and construction quality, scheduling, procurement, project and fiscal management.

c. Civil Works (Other) – Hurricane Sandy Recovery Programs. Focus on mega project (programs) integration and the incorporation of current and emerging engineering and scientific standards.

d. Civil Works (Other ) – New Orleans Permanent Canal Pump Stations . Focus on integrity of the DB process.

8. STANDARD REPORT FORMAT:

The DCE Report format has been changed to place summary data in the beginning of the report, and to track the balance of the report to the Charge Memo, as follows:

a. Executive Summary – high level discussion of findings.

b. Background and Status – A brief statement of the project or program being evaluated, the status, and the reason for the DCE.

c. Process– An expanded discussion of what took place prior to, during, and after the DCE visit, and how the Observations were developed.

d. Observations – Detailed discussion and analyses, keyed to the Charge Memo.

e. Items for Further Consideration - Recommendations and Follow-Up Actions Enclosures

Reports are transmitted by cover memo from the Chief of Engineering and Construction at HQ to the MSC Director.

9. Points of contact for this ECB and the DCE program are Robert Rizzieri, 202-761-7423 and Jim Moore, 570-650-3055.

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1. FINDINGS - The following are summary level findings in 8 categories.

a. MEGA PROJECTS

The 12 basic tenets of Mega Project Management are outlined in ECB 2012-2 and 2013-11. Based on DCE results, project briefings, and documents furnished to E&C for other designated Mega Projects and Programs, we are not implementing, or (at best) are only partially implementing:

(1) Integrated Master Schedules are not comprehensively prepared. Generally they did not have logically connected networks depicting or summarizing the entire project. Many were simply graphical depictions or Gantt charts showing only milestones, without embedded logic, resource, or cost loading.

(2) Earned Value is not widely or uniformly understood and implemented.

(3) Although we claim that Mega Project tenets have improving project execution, there are not data or metrics to support those claims.

(4) Tiered management schemes seldom reach beyond the District level.

(5) Facilitated Partnering has not been fully implemented or utilized

b. PROGRAMMING and BUDGETING

Mega Project Management, Life Cycle Cost Management, and other USACE initiatives are intended to improve our ability to predict and control time and cost growth, while delivering the agreed project scope and quality. While there does seem to be a heightened awareness of these needs, additional improvements are needed:

(1) Projects with long durations and/or incremental funding require more current, detailed, risk-based estimates and controls for cost, scope and contingency management.

(2) Many projects are being awarded with partial, mixed, and/or incremental funding. MILCON 1391 and Civil Works Programming Documents are not always sufficiently detailed to precisely determine the scope and funding associated with each funding line item, so customers are expecting full scope for Project Authorized amount, regardless of Congressional or service-wide adjustments and delays in funding; additional requirements for energy/sustainability and commissioning, and market based influences. Well intentioned methods for anticipating and mitigating these influences (bid options, incremental funding, etc.) can actually exacerbate the situation, by creating ambiguity and resulting in delays in award, bid protests, and post-award changes and claims.

#### c. PROGRAM and PROJECT MANAGEMENT PLANS

The requirements for Program and Project Management Plans are outlined in our PMBP guidance. Many of the activities and documents described within those processes involve E&C. Our recent leadership role in Mega Project planning and execution has added to our responsibilities:

(1) Although Mega Project tenets and business processes are emphasizing the need for hierarchical management of projects on a portfolio and regional basis, program and individual project plans are not synchronized. They do not contain sufficient detail about the roles, responsibilities, and funding (amounts and types) for quality management activities, and for CX involvement during design and construction phases.

(2) Cost and schedule risk analyses, including risk registers, are not being developed and updated throughout the project life cycle.

#### d. QUALITY MANAGEMENT

By Memorandum dated 2 April 2013, the Chief of E&C directed all MSCs and Centers to increase their focus on the quality of our design and construction products. Among the requirements in the memo:

- (1) Broader application of the “Lead Engineer” concept
- (2) Improved quality management plans, with 20% sampling and review by Chiefs of E&C
- (3) Accountability for quality in PDT member evaluations
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- (5) Development of risk assessment and management plans

While this is a relatively new requirement, we did not see evidence of compliance with these requirements during the DCE evaluations which were conducted after April 2013.

#### e. DESIGN

As our processes and delivery systems become more integrated, our responsibility for ensuring design integrity becomes even more important:

(1) Design narratives, calculations, and drawings are not fully integrated (sub consultants and modular component designs are not reviewed by prime or other design disciplines), and they do not bear evidence of peer review, and DOR review/approval.

(2) Many innovative energy savings and sustainability concepts (air/vapor barriers, enthalphy wheels, etc.) have been incorporated, but their impact on other systems and building features are not always fully considered and coordinated in design analyses and calculations.

(3) Stakeholder, DQC, ATR, IEPR, and BCOES review comments are being captured in Dr Checks. Unfortunately many comments remain “open” or “non-concur” even after the design has been accepted and construction is underway or completed.

(4) Many of the above listed reviews have become design assistance rather than focusing on the integrity of the data which support the design, or on the biddability, constructability, etc.

(5) Professional Service contracts for Architect-Engineer services are intended to produce a deliverable product, and be managed by registered professionals, within the Engineering elements of Districts. Some of these services are being scoped, solicited, estimated, and negotiated as if they are personal services (based on level of effort instead of deliverables).

(6) ER 1110-345-100 and related guidance documents prescribe the use of centers of design expertise and standardization. Even if these centers do not directly perform the design work, they must be utilized for design review. The DCE teams noted several instances where MCX for project features regarding protective design and intrusion detection were not consulted.

(7) There is a potential for confusion when USACE, customer or mission-specific criteria are combined with standard or commercial criteria. Further confusion and loss of design integrity occurs when changes are made during construction without consulting the Geographic District, MCX, or the DOR. Pursuant to ER 1110-345-100 (MILCON) and ER 1110-2-1150 (Civil Works), the Designer of Record (DOR) and USACE Geographic District engineering staff elements have responsibility for properly interpreting and applying criteria, designing and revising designs, throughout the entire project delivery phases. This includes the review and incorporation of all changes made during construction.

(8) Innovative and integrated procurement methods (such as Early Contractor Involvement and Design Build) are an opportunity for our in-house personnel to expand and update their expertise. Unfortunately, project schedules and budgets do not always provide sufficient time or resources for District EN elements to participate at this level.

(9) More performance-based designs are being demanded and developed. USACE Districts are not always demanding or enforcing all of the required design and/or certification and commissioning information, including:

- design analyses that explain how the proposed arrangements will work
- shop drawing and catalog cut reviews which confirm that the selected components have proven capabilities and meet all contractual specifications
- construction reviews that confirm the assembled components are properly integrated
- commissioning reviews which confirm that system performance parameters are being fully met
- prototypes and mock-ups that are approved as samples for the facility.



#### f. ACQUISITION

The integration of our roles in support of planning, project management, and operations all involve the successful use of contracts and contractors to perform design and construction work:

(1) Our ability to acquire construction contractors using advanced (best value) techniques has increased. However, our best value solicitations are increasingly being protested (some multiple times) based on the number and complexity of evaluation factors, and the lack of documentation for technical vs. price “tradeoff” considerations.

(2) Districts are increasingly advertising and awarding AE and Construction contracts with large geographic and programmatic coverage. The Director of Military Programs has expressed concerns about these, and issued a Directorate Policy Memorandum, dated 20 May 2013, outlining roles and responsibilities when formulating and executing these types of contracts. That directive language is not always being followed.

(3) USACE elements are using AE contracts to support risk assessments, design and shop drawing reviews, and QA efforts, especially in specialty areas (mechanical, electrical engineering, code compliance and regulatory control). ECB 2009-5 requires that these services to be performed under “professional” service contracts. More diligent review of these services is necessary to ensure that the persons performing them are not being mistaken for “Government Employees” and that the services they are performing are not “inherently governmental” (FAR 7.5).

(4) MILCON business process (MBP) principles and the USACE model RFP allowed USACE to meet timelines which would have previously been considered impossible, and to evaluate a wide variety of design/construction solutions. Our intent was to select the best designs and features, create standard models, and adapt-build those in the future. However, most new projects are being developed as unique packages, utilizing a combination of customer and installation-unique requirements to create “bridging documents” negating promised savings to the Army.

(5) ECI, SATOC, MATOC, and other innovative contract mechanisms have led to shorter cycle times for award of some very critical projects. However, the requirements for negotiated procurements and/or incentive contracts, including: USACE PILs and ECBs; Certified Cost or Pricing Data; audits; approved accounting systems (including CAS); and the use of EVMS, are not being consistently addressed.

#### g. CONSTRUCTION MANAGEMENT and COMMISSIONING

USACE and our industry partners are increasingly aware of the important role(s) of construction managers, and of the significance of commissioning the facilities which we design and construct before we turn them over to end users:

(1) Districts are adapting to the downturn in MILCON programs (post BRAC) by relocating or downsizing staff, redrawing geographic and program boundaries, and supporting some very large and complex facilities using construction phase support

contractor employees, term and temporary staff, or TDY support. Additional emphasis is critical to ensure that contractor representatives have government supervision, and that they do not perform inherently governmental functions; and that term, temporary and TDY government employees are sufficiently trained and provided with adequate time to learn, perform, document, and transition their duties throughout project execution.

(2) The use of design build has allowed USACE E&C representatives to become knowledgeable in IBC and other industry codes. However, “Code Compliance” alone does not equate to full satisfaction of project criteria and design requirements. Furthermore, the integration of these criteria must be evident in the design analysis, plans, and specifications.

(3) During construction, FAR 52.236-5, requires that “all work ...be performed in a skillful and workmanlike manner.” Compliance determinations under this clause include properly developed plans and specifications, and the scheduling and execution of the construction work. These determinations, and acceptance of the work are made by authorized representatives of the contracting officer for administrative (schedule) and technical (shop drawings, catalog cuts, etc.) efforts, throughout the life of design, contract, and design-build contracts. Many of our CORs and ACOs are confused on this point, fearing that their actions might assume liability for contractor, designer of record, or subcontractor actions. Authorized representatives of the Contracting Officer are ultimately and solely responsible for acceptance of the work pursuant to FAR 52.246-12. The Quality Assurance activities which they perform in order to ensure contract compliance are necessary and precedent to that acceptance. Their actions do not relieve any of the other parties of their responsibilities.

(4) DB contracts often permit contractors and their design teams to select specifications which are most relevant to their innovative solutions. Many select Tri-service UFGS specifications without full understanding of the requirements contained in those specifications, and without coordinating these specifications with the contract drawings. USACE Geographic District engineering staff elements have responsibility for properly interpreting and applying criteria and reviewing designs throughout the entire project delivery process.

(5) Recent experiences with failures of project features include:

- site sinkholes due to improper handling of surface drainage
- stairway collapse caused by using improper fasteners
- arc flash in electrical switchgear (root cause under investigation)
- a large scale fire propagated through (cured) epoxy coatings (root cause under investigation)

Additional attention, emphasis and urgency are needed in matters like these, to more quickly determine root cause(s) and to ascertain if similar circumstances might exist on other USACE projects. Lessons should be more expeditiously and widely shared, published, and input to our automated eLL System.

(6) Districts are attempting to accommodate user needs to install equipment and furnishings as soon as possible. However, the definition of, standard for, and application of “Beneficial Occupancy” (BOD) are not being applied in the same fashion across the Enterprise, and are not in accordance with FAR 52.236-11. ECB2012-21 contains definitions and guidance outlining the requirements for predicting, managing, and achieving BOD. Establishing BOD requires formal transfer to and acceptance by the Customer of the entire project, or usable portions of the project. Formal transfer documents (such as a DD 1354 for Milcon Projects) must be executed and signed at the time of BOD.

#### h. COORDINATION AMONG USACE ELEMENTS

Many of our projects are being scrutinized (by GAO and other review/audit agents) for cost and time growth, systemic defects, and acquisition errors. These evaluations further highlight the importance of fielding and maintain project delivery teams:

(1) As project planning, design, construction, and O&M timelines and budgets are being reduced; USACE elements (MSCs, Districts, Centers of Expertise, Production Centers, etc.) are improving their ability to integrate their efforts. Unfortunately, USACE guidance documents (which outline roles and responsibilities) and our program and project management plans are not keeping pace with these changes and shared responsibility for project execution.

(2) Districts are finding ways to deliver projects (or portions thereof) which installations need to meet mission requirements or for which there is a risk-based prioritization (as in the Dam Safety Program). However, some “projects” consist of multiple facilities, consolidated for funding purposes, which may not be “complete and useable” unless/until other projects, features, or contracts are completed. There are many potential pitfalls when individual contracts are stopped due to lack of continuing or adequate funding.

(3) Increasingly complex and costly code requirements, construction materials and techniques have advanced the capability of many individuals at the Centers of Expertise. Unfortunately, in some cases, there is no reliable or continuous source of workload and funding to maintain this expertise.