

CECW-EC

Regulation
No. 1110-2-1302

31 March 1994

Engineering and Design CIVIL WORKS COST ENGINEERING

1. Purpose

This Engineer Regulation (ER) provides policy, guidance, and procedures for cost engineering responsibilities for all Civil Works projects assigned to the U.S. Army Corps of Engineers (USACE).

2. Applicability

This regulation applies to all HQUSACE elements, major subordinate commands (MSC), districts, laboratories, and field operating activities (FOA) having civil works responsibilities.

3. References

References are included in Appendix A.

4. Policy

All cost estimates required to support Civil Works projects will be prepared in accordance with this regulation.

5. General Definitions

Various acronyms are commonly used in this regulation to describe phases, types, and parts of estimates. For commonality, and to ensure understanding, definitions used in this regulation are described in Appendix B.

This regulation supersedes ER 1110-2-1300, 18 March 1988; EM 1110-2-1301, 31 July 1980, and EM 1110-2-1302, 15 January 1982. Also changes ENG Forms 1738, 1739, 1740, 1741, 1741a, 1741b, and 1741c to ENG Forms 1738-R, 1739-R, 1740-R, 1741-R, 1741a-R, 1741b-R and 1741c-R, respectively.

6. General

The Water Resources Development Act (WRDA) of 1986, Public Law 99-662, made numerous changes in the way potential new projects are funded. It established a new role for the Federal Government and the non-Federal sponsors in project planning and the cost sharing responsibilities for Civil Works projects. Furthermore, it established guidelines to limit the total cost of projects.

a. USACE is committed to a greater role of effective management by increased accountability for scope, quality, cost, and schedule for each project. An integral part of this challenge requires that the cost engineering staff be part of the project team and the project cost estimate be recognized as a major management tool for establishing and monitoring costs from the study phase, through project completion.

b. Cost estimates shall reflect the experience, judgment, and expertise of the cost engineer, along with input from the other team members.

7. Civil Works Cost Estimates

a. Cost Engineer. The Cost Engineer is a principal member of the project team. The Cost Engineer is held accountable for a reliable and well documented construction cost estimate. The cost estimate, including assumptions and schedule, is a major tool of project management. The efforts of all project team members will be coordinated to ensure that sufficient project information, including assumptions, is made available to the Cost Engineer. The construction cost estimate will be prepared to a level of detail commensurate with the information provided. Project schedules shall reflect the Cost Engineer's requirement to receive all pertinent design information to complete the estimate.

b. Cost estimates. The Cost Engineer will prepare cost estimates for the construction features on all projects from the planning phases through construction and rehabilitation. Requirements for cost estimates at different phases of project development are discussed in Appendix C. In addition, the Cost Engineer will prepare cost estimates for the maintenance of facilities as requested by Operations Division. The two major types of estimates used in Civil Works construction are the Total Current Working Estimate (TOTAL CWE) and the Government estimate. The technical details and procedures for the preparation of civil works cost estimates are provided in Appendix D. The TOTAL CWE consists of all project costs and will vary as design details are refined at each phase in project development. The Baseline Cost Estimate (BCE), developed to support the recommended scope and schedule in the Feasibility Report, is the TOTAL CWE at this specific point in time. The Government estimate is an independent construction cost estimate prepared as if the Government were in competition for the contract award.

8. Total Current Working Estimate (TOTAL CWE)

The TOTAL CWE includes all Federal and authorized non-Federal costs. It must be developed using the Microcomputer Aided Cost Engineering System (MCACES) software and formatted in accordance with the Civil Works Breakdown Structure (CWBS). The CWBS is further described in subsequent paragraphs of this regulation. The estimate is based upon the level of design and the project schedule at the time it is prepared or updated. It is prepared with an identified price level date and each contract and/or element is then escalated for inflation according to the schedule. A narrative is required addressing contingency development, general project assumptions, additional investigations, quantity variations, and refinements in design. Specific components and requirements of the TOTAL CWE are addressed in the following paragraphs:

a. Lands and damages. Costs will be developed for all Federal and non-Federal real estate activities necessary for implementation of the project after completion of the feasibility study for land acquisition, construction, and completion of crediting lands, easements, right-of-way, relocation, and disposal (LERRD), mitigation requirements, and other items as delineated in the CWBS. Lands and damages costs, including contingencies, will be estimated based on each

phase or construction contract. The Project Manager (PM), in coordination with Engineering Division, will determine the need for phased construction contracts and advise the Chief of Real Estate and the Cost Engineer. The development of lands and damages costs and contingencies will be the responsibility of Real Estate Division. The cost estimate for all lands and damages activities will be formatted in the CWBS by Real Estate Division and forwarded to the PM to ensure all schedules and commitments are fulfilled for project development. This portion of the cost estimate is then provided to the Cost Engineer for incorporation into the TOTAL CWE utilizing MCACES.

b. Construction features. Estimated costs will be developed using MCACES in accordance with the CWBS for all construction features associated with each construction contract within the total project. Contingencies will be applied at the appropriate level within the CWBS where the risks or uncertainties are identified. Notes supporting the basis for the assigned contingency will be prepared for related groupings of elements and included in the cost estimate. Each cost estimate will be prepared in detail for labor, equipment, and materials with related productivity to the extent possible based upon the available design detail. Descriptive statements regarding methods of construction, material sources and prices, type of equipment required, access, haul distances, estimated production rates, placement procedures, environmental restrictions, crew sizes and labor rates, dewatering, job conditions, and other assumptions used in developing the cost estimate will be included as appropriate in MCACES as estimate notes. The development and preparation of the cost estimate for the construction features is the responsibility of the Cost Engineer. Policy, general information, and handling of the Government estimate are contained in ER 1110-1-1300, Cost Engineering Policy and General Requirements.

c. Engineering and design. Costs will be developed for all activities associated with the planning, engineering, and design effort necessary for preparation of each construction contract and for support during construction through project completion. This will include in-house labor based upon work-hour requirements, material and facility costs, Architect-Engineer (A-E) contracts with breakdown of services, additional studies, travel, overhead, and contingencies. Costs will be developed in detail for each product in accordance with the CWBS. All costs for these activities will be developed by the appropriate office, e.g., Planning, Engineering, and Program/Project

Management, and forwarded to the PM to ensure all schedules and commitments are fulfilled for project development. The PM will provide this portion of the cost estimate to the Cost Engineer for incorporation into the TOTAL CWE utilizing MCACES.

d. Construction management. Costs will be developed for all construction management activities from preaward requirements through final contract closeout, including in-house labor based upon work-hour requirements, materials, facility costs, support contracts, travel, overhead, and contingencies. Costs will be developed in detail in accordance with the CWBS. Costs for all construction management activities will be developed by Construction Division and forwarded to the PM to ensure that all schedules and commitments are fulfilled for project development. The PM will provide this portion of the estimate to the Cost Engineer for incorporation into the TOTAL CWE utilizing MCACES.

e. Price escalation for inflation. Since the components of each estimate are prepared with an identified common price level date, inflation factors must be utilized to adjust pricing to the project schedule to fully fund the estimate. The PM is responsible for ensuring that this process is complete and the estimate is escalated for inflation in accordance with the approved project schedule using the total project cost summary sheets specified in ER 5-7-1(FR). With inflation added to each major component previously described, the TOTAL CWE is developed.

9. Government Estimate

The Government estimate is the formal, approved construction cost estimate prepared to support contract award. A Government estimate is required for all contracts, or modifications exceeding \$25,000 (FAR 36.203). It is used to evaluate bids or proposals, assist in negotiations, and serve as a guide in establishing a schedule for partial payments during contract execution. The Government estimate is based on final plans and specifications. Profit, contingencies, and Government costs associated with the contract award and execution are not included in the Government estimate. Government estimates prepared for contract modifications will include profit based on the factors as determined by use of the weighted guidelines.

10. Informal Cost Terms

Terms such as control estimates, study estimates, alternative or comparability estimates, budget estimates, "scratch" estimates, and project estimates are sometimes used for special purposes such as budget forecasting; making "rough" estimates based on sketches at the early stages of project development, or during construction. Normally, the Cost Engineer will provide cost data appropriate to the situation. These costs are sometimes based on historical data and unit prices from similar projects previously constructed. Terminology, as described above, is presented for general information, but their use is limited and not recognized as formal documentation for contract award or modifications.

11. Civil Work Breakdown Structure (CWBS)

The CWBS identifies all project products beginning with the reconnaissance phase and continues through project completion. It provides a standard product related format to identify all costs throughout the project life cycle necessary to accomplish the work required under each Civil Works feature shown in Table 1. A Cost Engineer checklist, included in the MCACES model database as a template, groups these CWBS products by feature and further expands the levels of detail as necessary to assist in recognizing all the specific work items which may be required. The TOTAL CWE is then prepared by the Cost Engineer by incorporating all the feature costs into a single document as follows.

a. The construction features identified as 02 through 20 in Table 1 are a part of the overall checklist and provide the standard format for developing cost estimates associated with each of the construction features.

b. The checklist further groups all established CWBS products for the nonconstruction features into the appropriate feature categories for Lands and Damages, Planning, Engineering and Design, and Construction Management. The cost data related to these products will be supplied in the checklist (CWBS) format by the organization having the particular expertise or responsibility, e.g., Real Estate Division, Planning Division, Engineering Division, Construction

Table 1
Feature Codes and Descriptions

Number	Feature Description
01	Lands and Damages
02	Relocations
03	Reservoirs
04	Dams
05	Locks
06	Fish and Wildlife Facilities
07	Power Plant
08	Roads, Railroads, and Bridges
09	Channels and Canals
10	Breakwaters and Seawalls
11	Levees and Floodwalls
12	Navigation Ports and Harbors
13	Pumping Plants
14	Recreation Facilities
15	Flood Control and Diversion Structures
16	Bank Stabilization
17	Beach Replenishment
18	Cultural Resource Preservation
19	Buildings, Grounds, and Utilities
20	Permanent Operating Equipment
21	Reconnaissance Studies
22	Feasibility Studies
30	Planning, Engineering, and Design
31	Construction Management

Division, Programs/Project Management Division through the PM to Cost Engineering to ensure all project requirements identified in the Project Management Plan (PMP) are included.

c. The cost estimate is developed with an identified price level date by cost engineering incorporating all the construction feature costs developed by cost engineering and the nonconstruction feature costs obtained through project management. The structure of the cost estimate permits identification of costs by feature for each product defined in the CWBS to the level of detail required by the type of estimate being prepared.

d. The CWBS further provides an identical structure for managing and capturing the actual costs. With this interrelationship, the cost estimate structure provides the hierarchy that becomes the library or storage system for the collection of cost data on each project and is the basis for the development and maintenance of the cost engineering historical database.

12. Contingencies

a. Project cost estimates will be prepared with an appropriate amount of contingencies, depending on the level of investigation data and design detail available, to support each stage or milestone of project development. Contingencies represent allowances to cover unknowns, uncertainties, and/or unanticipated conditions that are not possible to adequately evaluate from the data on hand at the time the cost estimate is prepared but must be represented by a sufficient cost to cover the identified risks. Contingencies are not a means of adding costs to the project for possible schedule slippage or to cover items which are thought to be a project requirement but are not specifically being considered in the current scope.

b. Contingency allocations are specifically related to the project uncertainties and will not be reduced without appropriate supporting justification. The decision to reduce these uncertainties and improve the cost estimate through additional investigations or studies, or to proceed with the higher cost estimate, is a management decision.

c. At construction contract award, a minimum contingency allowance of five percent of the contract amount must be available at the project level in accordance with ER 5-7-1(FR). As a project nears completion, this contingency allowance must be reduced accordingly.

13. Price Level Update/Forecast

a. *CWCCIS*. The Civil Works Construction Cost Index System (CWCCIS), EM 1110-2-1304, will be used to update unit prices and various project cost features to current price levels. Inflation factors for use in predicting future costs will be those developed by the Office of Management and Budget (OMB). The OMB factors are published by HQUSACE, Programs Division (CECW-B), in the Engineer Circular (EC) for the Annual Program and Budget Request for Civil Works Activities.

b. *Update of cost estimates*. For projects with cost estimates more than two years old without an update in pricing, special consideration is required. In these situations, it is the responsibility of the Cost Engineer to perform an appropriate analysis to ensure that the project estimate is based on the current design and schedule. The construction cost estimates for major

or unique projects will be repriced using current labor and material rates. For other projects, it is acceptable to use the cost indices to update the estimate for projects that have been inactive for two years. This decision should be based on the judgment and experience of the Cost Engineer.

14. Cost Risk Analysis

Cost risk analysis is the process of identifying and measuring the cost impact of project uncertainties on the estimated total project cost. It should be accomplished as a joint analysis between the Cost Engineer and the designers or appropriate project team members that have specific knowledge and expertise on all possible project risks.

a. To accomplish this process, it is vital to identify those areas that significantly contribute to cost uncertainty. Historically, 80 percent of the cost of a project is contained in 20 percent of the estimated work elements. The object is to focus on the uncertainties associated with these so called 20 percent "critical" elements. Variables such as quantity, productivity, and unit cost, which are related to the critical elements affecting the cost, should be evaluated to determine their range of values (lowest and highest) and probability for the outcome. Computer programs are commercially available to perform these tasks.

b. Cost risk analysis provides a graphic display of the risks associated with the cost estimate and the probability of having a cost overrun. Cost risk analysis identifies the amount of contingency that must be added to a cost estimate to reduce the uncertainties to an acceptable level. It should be noted that the use of cost risk analysis will not reduce the uncertainties associated with the project cost estimate or solve the problems of cost variance due to insufficient investigations or design data. This process more readily identifies areas in the study or design where additional effort could reduce the uncertainties and provide a more reliable cost estimate.

c. When considerable uncertainties are identified, cost risk analysis can establish the areas of high cost uncertainty and the probability that the estimated project cost will or will not be exceeded. This gives the management team an effective additional tool to assist in the decision making process associated with project planning and design. It does require additional funds, time, and effort to develop the cost estimate. The

added benefits obtained should be identified and compared with the extra cost. The management team should review the possible use of cost risk analysis techniques for projects with considerable uncertainties.

15. Computer Software for Cost Estimates

MCACES is the required software for the preparation of Civil Works cost estimates throughout USACE. The software was developed by Building Systems Design, Inc., of Atlanta, GA.

a. MCACES has six title levels that support the CWBS. The goal is to have a hierarchy of titles that describe the type of work and will allow the costs to be "rolled up" in a uniform manner.

b. This regulation recognizes that there are some exceptions to the use of the MCACES software program for certain types of projects which are listed in the appropriate paragraphs of this regulation.

16. Project Development

The traditional and most common way for the Corps to help a community solve a water resource problem is to conduct a study and, if shown by the study to be feasible, construct a project. This approach uses a six-step process and requires that Congress provide the authority to both study and construct a project. The process is: A local community perceives or experiences a water resource problem that is beyond its ability to alleviate or solve alone. The community asks its congressional delegation for assistance, and Congress authorizes the Corps to study the identified problem in a reconnaissance study/report. The Corps studies the identified water resource problem and reports its findings in a Feasibility Report. A project may be recommended for construction if it is feasible and meets certain requirements. The Feasibility Report is reviewed at the Washington level by the Corps, the Assistant Secretary of the Army, Civil Works (ASA(CW)), and OMB. When approved, the report is sent to Congress and Congress may authorize the Corps to construct the project. If authorized, the Corps designs the project and a Project Cooperation Agreement (PCA) is signed by the non-Federal project sponsor and the ASA(CW). The project is then built and turned over to the non-Federal sponsor for ongoing use, including operation and maintenance.

a. Close coordination is required between the Project Manager, Technical Manager, Planning and Programs offices, and the Cost Engineer in managing the process from the study phases through project completion. The TOTAL CWE evolves in structure and detail during the initial study phases, based on preliminary design concepts to the final design and completed plans and specifications. It is essential to maintain the Government's credibility that the design, award, and contract execution as a quality product, leading to completion within scope, budget, and schedule. The sponsor must be kept aware of the current and forecasted total cost of the project.

b. The PM will coordinate inputs from the functional elements during formulation of the TOTAL CWE to ensure interdisciplinary teamwork during preparation of the total project cost estimate. For budgetary purposes, the preparation and submission of the Project Cost Estimate, PB-3, will be the responsibility of the Programs/Project Management Division. The Cost Engineer will develop the cost estimate for the construction features and assemble the TOTAL CWE.

c. The Chief of Engineers furnishes the ASA(CW), OMB, and Congress with an annual budget request. The budget request includes information on which to base a decision for the appropriation of funds for individual studies and projects that make up the overall Civil Works program. The requirements for development of the budget request are set forth in the EC for the Annual Program and Budget Request for Civil Works Activities issued by HQUSACE, Programs Division, CECW-B, which reflects directives and criteria supplied by ASA(CW) and OMB. Accurate cost estimating and scheduling is a prerequisite to dependable programming, and the portrayal of such information is an important part of the overall budget submission. The PB-3 is a summary of the features and accounts of the total project cost estimate. It provides basic cost information necessary for preparation of budget requests, project reports, allocation, project cost sharing, and serves as a historical tracking document. The Detailed Project Schedule (PB-2a) is prepared for scheduling, lands and damages, engineering and design, construction, and management activities, determining funding requirements, and reporting on the disposition of funds previously made available for each project.

d. As a project progresses through design and construction, Schedule and Cost Change Requests (SACCR) will be fully documented with accurate

records maintained by the PM. Cost changes on the Project Executive Summary (PES) must be supported with an approved SACCR justifying the changes. Where changes affect the construction features, the Cost Engineer will provide a revised estimate to the PM for developing the required SACCR. Cost data presented on a PES must agree with that shown on a PB-3.

e. WRDA 86, Section 902, established a maximum project cost. Guidance for developing the maximum project limit is described in ER 1105-2-100 and is the responsibility of the PM.

17. Project Phases

The major phases of project development are briefly reviewed in the following paragraphs, describing the responsibilities of the Cost Engineer throughout each phase, including the appropriate interface with the other team members. A timeline, denoted "Civil Works Project Development," has been developed to indicate the major steps used in accomplishing a typical Civil Works project and is attached as Appendix E.

a. Reconnaissance phase.

(1) The purpose of the reconnaissance phase is to determine Federal interest and whether an identified problem has a practicable, economically feasible, and environmentally consistent solution acceptable to a local sponsor, and if so, whether the sponsor is willing to cost share in the feasibility phase. The reconnaissance phase begins when the responsible district obligates appropriated Federal funds to conduct the study and ends with either the execution of a Feasibility Cost Sharing Agreement (FCSA) or the issuance of the District Commander's report recommending no further Federal action. The reconnaissance phase is 100 percent Federally funded and is completed within 12 months.

(2) The major documents prepared during the reconnaissance phase include the Reconnaissance Report, which describes the results of the study with a preliminary project cost estimate for the proposed solution, and the FCSA, which includes an Initial Project Management Plan (IPMP) and describes the scope, tasks, cost and schedule, and Federal and non-Federal responsibilities for the feasibility phase.

(3) During the reconnaissance phase, Planning Division assesses potential alternatives to determine if

they will function safely, reliably, efficiently, and economically. The project cost estimate is the responsibility of the Cost Engineer and will be prepared to support this effort, for potential solutions.

b. Feasibility phase.

(1) During the feasibility phase, the study team evaluates alternative plans to identify the National Economic Development (NED) plan. The feasibility study is usually cost shared equally between the non-Federal sponsor and the Federal Government except for inland waterway projects. This phase begins after the FCSA has been signed and the District Engineer receives both the sponsor funds and the Federal funds needed to initiate the study. The phase ends when the ASA(CW), submits the Feasibility Report to the OMB. After receiving OMB clearance, the ASA(CW) submits the report to Congress for authorization to construct the recommended project. The Feasibility Report contains an engineering appendix, which includes the TOTAL CWE for the NED plan. On occasion the sponsor may request a plan different from the NED plan. When this occurs, the engineering appendix will contain the cost estimate for both the NED plan and the locally preferred plan.

(2) Upon completion of a Feasibility Report recommending Congressional authorization of a project or a project modification, a PB-3 will be prepared within 90 calendar days from the issuance of the public notice by the Division Engineer. The PB-3 will update the constant dollar project cost estimate to a 1 October of the budget year minus one price level. Thereafter, each PB-3 will be updated annually based upon the current MCACES developed cost estimate to 1 October of the budget year minus one price level in accordance with ER 11-2-240 and the annual program and budget request EC for Civil Works activities until the project is financially completed, as long as it remains in the active category. This effort will assure that all projects which are recommended for construction funding in the budget year have a common cost estimate base. PB-3's will normally be prepared by the Programs/Project Management Division at each district.

c. Planning, engineering, and design phase.

(1) The first stage in this process is the Preconstruction Engineering and Design (PED) phase which consists of completing all detailed technical studies and design needed to initiate construction of the project. PED begins after the Division Commander's

public notice is issued and funds are allocated, and ends with completion of plans and specifications for the first construction contract.

(2) The second stage is the completion of all design for the remaining contracts and the design to support ongoing construction required during the construction phase (Engineering During Construction).

(3) As the project design documents are prepared and the design is refined, the baseline cost estimate must be used as a guide in managing the engineering and design process. The effect of changes to the design and progress schedule developed in the feasibility study must be reflected in appropriate revisions to the TOTAL CWE. The BCE that was developed in MCACES software will be the basis for maintaining the updated TOTAL CWE.

(4) With the completion of the plans and specifications, a Government estimate for construction award is prepared. As engineering and design continues for the remaining plans and specifications for multicontract projects, the total project cost must be updated. The update is based on actual contract costs, completed contracts, design of future contracts, and the Government estimate for new contract awards.

(5) Each milestone establishes a more realistic update on actual expenditures and the total estimated costs required for completing the remaining portions of the project and provides a management tool for evaluating the project schedule and authorized costs.

d. Construction phase.

(1) The construction phase for the project begins when funds for project authorization are appropriated for a new construction start, permitting the initial construction contract award. This phase is considered complete when the project has been inspected and accepted from the contractor.

(2) Changes. All design changes developed in Engineering Division during construction will be supported by a cost estimate prepared by cost engineering using MCACES and formatted in the CWBS. The Cost Engineer should also be a member of the negotiating team for major design and value engineering change orders.

(3) Government estimates for changes, modifications and claims less than \$100,000, that occur

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during construction may be prepared in the field office and approved by the Administrative Contracting Officer (ACO). The cost estimate may be prepared in MCACES or a suitable format (see Appendix F) based on the experience and judgement of the preparer. The field office must ensure that the selected format follows the appropriate CWBS for adequate accounting and tracking of the TOTAL CWE by the PM.

(4) Government estimates for changes, modifications and claims exceeding \$100,000, may also be prepared by the field office using a suitable format and the appropriate CWBS as described in paragraph 17d(3) above. In this case the Cost Engineer will be consulted or involved in the review process and the final approval of the estimate will be made by the Chief, Engineering Division or the Chief, Construction Division (as appropriate). The Government estimate will be included in the contract modification documentation and is subject to the approval of the Contracting Officer or ACO. Depending on workload and availability of personnel, the Cost Engineer will participate in these negotiations.

(5) When the Government estimate is changed during or subsequent to conferences or negotiations, the details of the basis for the revisions or changes in price shall be fully explained and documented in the price negotiation memorandum, see FAR 36.203(102).

e. Operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) phase.

(1) Guidance. This project phase is managed by the Operations Division and the following guidance is applicable to Corps constructed facilities after completion of the construction phase. Additional funds are required to operate, maintain, repair, rehabilitate and/or replace all completed Corps projects. In some cases, responsibility for this work is assigned to a non-Federal sponsor via a PCA, while in others this responsibility is retained by the Corps. When retained by the Corps, this work is divided into two categories, Major Rehabilitation and all other work, e.g., O&M General and maintenance dredging.

(2) Major rehabilitation. Major rehabilitation work is specifically defined in guidance provided by HQUSACE, Operations Division (CECW-OM-O), for Major Rehabilitation Evaluation Reports. This work falls into two major categories, (a) reliability and (b) efficiency improvement, which are subject to qualitative and quantitative criteria including minimum

capital outlays. The development of these projects is based on an Evaluation Report which is similar in purpose to the Feasibility Reports developed for "traditional" Civil Works projects. This similarity extends to economic justification, the evaluation of alternatives and identification of a recommended plan. The study/project is managed using the Corps' project management system and a technical project team with Operations Division acting as both team member and user. In addition, a PMP must be developed to accompany this report. The report is submitted to HQUSACE and ASA(CW) where it competes for available funds with other types of new construction projects. Cost estimates developed to evaluate alternatives considered in the report may be accomplished based on historical data using standard forms and techniques. The cost estimate for the recommended plan shall be developed using MCACES in the detail commensurate with the level of design and formatted in the CWBS.

(3) Operations and maintenance projects. Projects not meeting criteria for Major Rehabilitation will be considered in this general category. These projects include routine work, the need for which would be expected to recur. These projects are usually coordinated with Engineering Division for design development including drawings, specifications, and cost estimates. The recurring nature of these projects facilitates the development of a credible database of historical costs upon which project estimates may be based. For these projects, which are generally small in scope and cost, the cost estimate may be developed using MCACES or the standard estimating forms described in Appendix F. The MCACES database is construction oriented and does not contain maintenance cost data. Recurring routine cost data for a local area could be developed and added to MCACES. This would permit ready access to models or assemblies for developing future estimates. The preparation of the cost estimate by Cost Engineering is based on project size, complexity, and familiarity with the particular type of work. The Chief, Cost Engineering, in coordination with the Chief, Operations Division, will determine responsibility for cost development. A fully documented cost estimate shall be prepared for all changes.

18. Cost Estimates for Other Programs

a. The continuing authorities program (CAP).
The CAP is a group of legislative authorities under

which the Secretary of the Army is authorized to plan, design, and construct certain types of water resources improvements without specific Congressional authorization.

(1) ER 1105-2-100 contains detailed policy and procedural guidance for the CAP. CAP projects are subject to statutory Federal cost limitations. All Federal expenditures for study, design, and construction of a project are included in the cost limitation. Therefore, judgment is required when limited funds preclude the more detailed studies commonly undertaken for projects which are specifically authorized by the Congress. The Division Commander is delegated certain approval authority under the CAP, including the technical adequacy of planning documents.

(2) Project development for these projects begins with a one or two-step planning process resulting in a Detailed Project Report (DPR). The two-step process follows the guidelines for reconnaissance and feasibility studies while the one-step process combines these studies. In both cases, the DPR provides the basis for making the decision to proceed to plans and specifications. See Appendix C for cost estimate procedures.

b. Dam safety assurance program. The Dam Safety Assurance Program provides for modification of dams and related facilities constructed or operated by the Corps of Engineers which are potential safety hazards, as defined by changes in hydrologic or seismic data. See Appendix C for cost estimate procedures.

c. Dredging projects. Dredging projects are considered in two categories. The first, maintenance dredging, is performed to maintain authorized project dimensions and is managed by Operations Division. The second is new work or improvement dredging which is performed to construct a newly authorized project or increase the dimensions of a previously authorized project and is managed using the Corps' Project Management system.

(1) Maintenance dredging. The policies and procedures for the Corps dredging program are outlined in ER 1130-2-307. Maintenance dredging provides for the removal of shoal material from authorized constructed navigation projects. The maximum practicable benefits involving the discharge of dredged or fill material will be in accordance with 33 CFR 209 and 335-338.

(2) New work dredging. New work dredging projects are processed as regular Civil Works projects requiring specific Feasibility Reports, PMP and authorizations as the project develops. Cost estimates for both maintenance and new work dredging projects shall be prepared by Cost Engineering.

(3) Each MSC and district command that is involved in the preparation of plans and specifications, cost estimates, and contract management for dredging projects should promote the development of expertise related to dredging process within the Planning, Engineering, and Construction-Operations functions. The cost estimates will be prepared by a Cost Engineer preferably experienced in dredging, in coordination with the dredging program manager. Dredge cost estimates will be developed using the USACE software systems entitled "Corps of Engineers Dredge Estimating Program (CEDEP)." Since many Corps field offices have already developed expertise specific to dredging, technical advice and assistance for project designs and cost estimates are available through these offices upon request. Cost estimate summary reports shall be prepared using MCACES and the current CWBS. The CEDEP printout containing all detail and back-up data will be retained on file in the District Cost Engineer Branch. Specific guidance regarding the preparation of dredge cost estimates is outlined in Appendix G.

(4) Site visits. Dredging projects often present Cost Engineers with unique situations. Observing ongoing operations provides the best opportunity for individuals to gain insight and understanding of the dredging process. Site visits, therefore, are considered extremely important in providing accurate estimates.

(5) Data collection. Cost Engineering Branch will collect and retain data of on-going projects regarding mobilization, daily production, and overall quantity computations historical data for future projects. Many areas are subject to restricted dredging seasons. To minimize environmental impacts creating scheduling conflicts, higher costs may occur and must be considered and documented in the cost estimate.

(6) Special problems. For special cost engineering dredging problems or concerns, the use of the Corps' Regional Dredge Teams are recommended. These teams are composed of cost engineering and construction-operations personnel most experienced in dredging and established for the East Coast, West Coast, Gulf Coast, the Great Lakes, and Mississippi River and tributaries. The appropriate team is

convened at the request of the District Engineer. The chairman of the regional dredge teams shall be appointed by HQUSACE, Chief, Cost Engineering Branch, CECW-EC, and Chief, Operations Branch, CECW-OM, and is responsible to ensure that the teams are maintained with competent cost engineering and construction-operations personnel and that requests for assistance are promptly fulfilled. The regional dredge teams are designed to provide assistance to all districts in the evaluation of bid protests, mistakes in bids, or any unique issues that may be required to validate the estimate for the Government. Further, the teams are available to support districts that seldom do large dredging contracts and therefore may have little expertise or historical cost data that is needed to prepare accurate planning estimates and/or Government estimates for contract award. The teams' role in all cases is to act in an advisory capacity with the requesting district having the responsibility and authority to make all final decisions. A list of the regional geographical areas and office of the chairman is designated in Appendix H.

d. Beach fill and nourishment. To provide adequate protection from coastal storm damage, projects are undertaken to restore beach shorelines. These projects are grouped as either initial construction or periodic nourishment.

(1) Initial construction projects are considered as new Civil Works projects that must be specifically authorized and budgeted for construction.

(2) Periodic nourishment projects are considered continued construction. Cost estimates for both of these groups must be prepared in the same manner as for other construction projects.

(3) Beach nourishment, when performed as an adjunct to a dredging project for the disposal of dredged material, will be considered a feature of the dredging project. The above guidance provided for preparing dredge estimates shall apply.

e. Emergency work. On occasion, emergencies occur, whereby the Cost Engineer may be requested to prepare estimates for natural disasters, e.g., floods. Cost estimates will be prepared based on conditions and circumstances at the site of the emergency.

19. Preparation and Approval of Baseline Cost Estimate

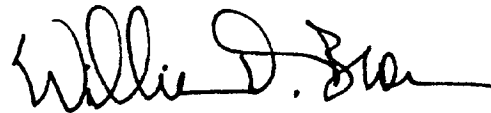
The TOTAL CWE, that is developed to support the recommended scope and schedule in the Feasibility Report is defined as the project BCE. Corporate support is necessary to ensure that only the costs defined in the approved BCE are used in upward reporting. The following procedure establishes the guidelines for development and approval of the BCE:

a. The constant dollar cost estimate covering all project features including 01-Lands and Damages, 30-Planning, Engineering and Design, and 31-Construction Management must be prepared with an identified price level date. Cost engineering is responsible for preparation of the detailed estimate for all construction features and for incorporation of the cost for lands and damages, planning, engineering and design, and construction management provided through the PM. All cost data obtained by the PM for incorporation into the estimate by cost engineering must be in accordance with the established CWBS format and approved by the responsible functional chief, e.g., Chief of Real Estate Division for lands and damages costs, prior to completion of the cost estimate by cost engineering. Approval and signature by the Chief, Cost Engineering Branch, affirms that the construction feature costs are correct and that the backup data for the nonconstruction features (01, 30, and 31) support these feature costs.

b. The PM will ensure that the cost estimate is fully funded, based upon the project schedule developed in the Feasibility Report. The signature by the PM recommending approval of the BCE acknowledges that the inflation factors and current schedule used were accurate in developing the fully funded project cost estimate. Upon review and endorsement by the District Project Review Board (PRB), the BCE is forwarded to the Division for review and approval by the Chief, Cost Engineering, the Chief, Programs and Project Management and by the Division PRB. Upon the release of the Division Engineer's public notice, the BCE becomes fixed in price. A copy of the final approved BCE with comments, if applicable, must be returned to the District Cost Engineering Branch.

c. The approved BCE, within the Engineering Appendix of the Feasibility Report, will be forwarded to HQUSACE. The submission to HQUSACE will include, as a minimum, the MCACES summary sheets for direct costs, indirect costs, and owner costs to the subfeature level, and a total project cost summary following the format in ER 5-7-1(FR) that addresses inflation through project completion. It must contain a narrative that discusses cost relationships and assumptions made, based on the level of design, quantity issues and unknowns, and identified risks or uncertainties used in the development of contingencies. In addition, the submission to the Washington Level Review Center (WLRC) must also include a floppy disk containing the complete estimate and all associated data bases.

FOR THE COMMANDER:



WILLIAM D. BROWN
Colonel, Corps of Engineers
Chief of Staff

- 8 Appendices
- App A - References
- App B - Abbreviations
and Acronyms
- App C - Type of Cost Estimates
- App D - Procedures for Preparation of
Cost Estimates
- App E - Typical Civil Works Project
Development
- App F - Standard Estimating Forms
- App G - Preparation of Dredge
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- App H - Regional Dredge Teams