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Introduction

Federal Assistance for Disaster Damage

The Robert T. Stafford Disaster Relief and Emergency Assistance Act (PL 93-288, as amended) authorizes the Federal government to assist State and local governments with recovery from disasters. In accordance with this legislation, which is referred to as the Stafford Act, State and local governments may receive financial assistance to restore disaster-damaged public facilities and other infrastructure components. The Federal Emergency Management Agency (FEMA), in partnership with State governments, is responsible for managing the provision of this assistance under the Public Assistance Program.

Through the Public Assistance Program, FEMA pays the Federal share of the cost of repair, restoration or replacement of a facility as it existed prior to the disaster. The estimate of this cost is determined by a team of Federal and State technical specialists working in cooperation with a representative of the State or local government entity applying for the assistance (the applicant). For large projects¹, this estimate is used to determine the initial Federal obligation of funds for the work, but it is not necessarily the final cost that will be approved for the project. Rather, the final cost is based upon the reasonable, actual costs incurred by the applicant in completing the eligible scope of work. Actual costs are determined through a reconciliation process initiated by the State when the work is complete. Discrepancies between the initial estimate and the final cost are addressed through the obligation (or de-obligation) of Federal funds.

The Federal-State team typically prepares the initial construction estimate using the best available unit cost data for the elements of the facility. These unit costs (also referred to as “construction costs”) represent the itemized breakdown of construction work activities for completing the project. The unit costs usually do not include project design and management costs, contractor overhead and profit, fees, cost escalation due to inflation, and other factors affecting the overall cost of the project. These costs (also referred to as “non-construction costs”) are addressed through the reconciliation process once the project is complete. While the applicant may eventually receive reimbursement for these costs, the final amount of the grant is unknown at the time of construction. Further, the grant is subject to review during the reconciliation process, and the outcome of this review can affect the amount. To provide the applicant with a better representation of actual costs at the beginning of the assistance process, FEMA developed the Cost Estimating Format (CEF).

This Instructional Guide describes the CEF process and how it fits into the Public Assistance Program. This guide also describes each of the factors that makes up the CEF, how the factors are to be applied to the base construction cost estimate, and how to use the CEF spreadsheet in the estimate calculation. The teams using the CEF will be comprised of professional engineers and cost estimators who have been in responsible charge of important engineering work or have extensive experience in the construction industry.

¹The Stafford Act provides for separate grant processes for small and large projects and set the minimum threshold for large projects at \$35,000 when it was passed in 1988. FEMA adjusts this amount at the beginning of each Federal fiscal year to reflect changes in the Consumer Price Index for All Urban Consumers. For Federal Fiscal Year 1999 (ending September 30, 1999), the large project threshold has been set at \$47,800.

The Cost Estimating Format

The concept of the CEF was first developed for use at the Northridge Long Term Recovery Area Office in Pasadena, California. Repair and replacement costs for Category E facilities damaged during the 1994 Northridge earthquake were estimated using a version of the CEF and final grant offers were made to applicants on the basis of those estimates. A revised version has since been developed for all types of infrastructure damage in all types of disasters. This version has been tested against data from large project closeouts and undergone a peer review by an independent group of industry experts who evaluated the methodology, substantiated component factors, and recommended improvements necessary to apply the CEF nationally.

The CEF provides a worksheet, called Part A, that allows the user to estimate the base construction costs. The user then applies a series of factors (Parts B through H) that represent the non-construction costs. These expenses can reasonably be expected to occur because they are construction-related costs usually encountered during the course of construction. These factors are applied to the Part A base construction costs to estimate the total cost of completing the project. This “forward-pricing” methodology provides an estimate of the total eligible funding at the beginning of the project. This estimate, which is used to obligate the funds for the project, allows the applicant to more accurately manage the budget with a greater degree of confidence.

The CEF provides a more uniform method of estimating costs for large projects. While the CEF accounts for costs incurred across the entire spectrum of eligible work (from design to project completion), it is *not* a final cost settlement instrument. Eligible costs will be reimbursed on the basis of actual expenses incurred by the applicant; that is, approved grant funds will be reconciled against actual costs after project completion and the grant amount adjusted accordingly. The cost reconciliation process is described, beginning on page 12.

The parts of the CEF, which are described in greater detail later in this guide, are listed below.

Part A is the estimated sum of construction costs, referred to in this guide as the base cost.

Part B includes construction costs, not typically itemized in Part A that facilitate the work. Part B includes such costs as the general contractor’s field supervision costs and job site costs such as temporary services and utilities, safety and security measures, quality control and administrative submittals.

Part C reflects construction cost contingencies and is designed to address budgetary risks associated with project complexity in determining scope of work. Part C factors are determined on the basis of the amount of design work completed at the time the estimate is prepared, the complexity of the project and the degree of difficulty for site access, storage, and staging.

Part D accounts for the contractor’s home office overhead, insurance, bonds, and profit. This factor is typically not used for projects completed using the applicant’s labor, equipment and materials (referred to as “force account” work).

Part E accounts for cost escalation over the duration of the project and is based upon an inflation adjustment from the time the estimate is prepared until the mid-point of construction for the eligible scope of work.

Part F includes fees for building permits, plan checks, and special reviews.

Part G is the applicant's reserve for change orders and differing site conditions.

Part H accounts for the applicant's cost to manage the design and construction of the project. These costs are not part of the statutory administrative cost allowance provided to the applicant to manage the overall recovery effort. The administrative allowance, which is authorized by the Stafford Act and is intended to defray the cost of requesting, obtaining and administering Federal assistance, does not account for project management costs.

These factors and recommended ranges are described in detail in subsequent sections of this guide and were developed using guidance available from the Construction Specifications Institute (CSI) and the R.S. Means Company. The factors were verified using data from closed-out grants for large projects nationwide. The CEF spreadsheet (in Microsoft Excel format) is used to apply the factors in Parts B through H, to the Part A estimate. An electronic copy of the CEF spreadsheet, on diskette, is enclosed with this guide.

Typically, an applicant (the owner or party responsible for repairs) utilizes a general contractor and a number of subcontractors to complete a large construction project in a competitively bid environment. The structure of the CEF mirrors the applicant-general contractor-subcontractor relationship for eligible work in that:

- Part A costs are representative of the construction efforts of the subcontractor(s).
- Parts B, C, D, and E represent the general contractor or equivalent non-construction costs; they can be considered as "as-bid" costs and represent the costs of completing the work in a competitively bid environment.
- Parts F, G, and H represent the applicant's markups and non-construction costs once the design and construction contractor(s) have been hired.

Eligible Work and Cost

Grants administered under the Public Assistance Program must comply with the provisions of the Stafford Act. Application of these provisions is described in Part 206 of Title 44 of the Code of Federal Regulations (CFR). These regulations define the types of facilities, work, and costs that are eligible for reimbursement under the Public Assistance Program. When a large project estimate is developed, the base cost (Part A) must include only that work which is eligible under these regulations.

Public Assistance grants must also comply with Part 13 of 44 CFR, which defines procedures for grant administration by the State and provides specific guidance on allowable costs. The factors included in the CEF represent only those non-construction costs that are allowable under Part 13. The factors also represent costs that an applicant can reasonably expect to incur during construction. Excessive mark-ups for *possible* contingencies are not allowable under the provisions of Part 13.

Applicability and Limitations

In general, to qualify for CEF consideration, a project must be:

- a large project (according to the FEMA threshold for the applicable fiscal year); and
- permanent restorative work (Categories C – G).

The CEF is intended for use on projects that are eligible under the Stafford Act, Federal regulations, and FEMA policy. It may be used for all types of disasters and all types of facilities, including:

- Transportation facilities, including roadways, bridges, and tunnels.
- Water control facilities, such as irrigation and drainage systems.
- Buildings and similar structures, including warehouses, garages, offices, schools, libraries, municipal buildings, museums, research facilities, laboratories, and hospitals.
- Utilities, such as water treatment, wastewater treatment, and power generation facilities, including the associated transmission, distribution, and collection systems.
- Special facilities such as railroads, ports, marinas, and airports.

The CEF should not be used for small projects, or for emergency work, such as large-scale debris removal operations (whether a small or a large project).

In addition, the CEF should only be used if a project is less than 50 percent complete, or will take four or more months to reach a stage of being 90 percent complete (pre-punch list and contractor retainage stage). *Actual eligible costs* should be used for large projects that are more than 50 percent complete, or will be 90 percent complete within four months.

The results obtained with the CEF are only as accurate as the data that are input into the CEF spreadsheet. The base cost (Part A) is critical to the accuracy of the results. The Federal-State-Local team must ensure that Part A is complete, accurate, and based on sound engineering and estimating judgment. This is especially important when considering situations in which damage or necessary repairs may not be immediately evident. The CEF is not designed to account for the failure of the team to develop an adequate base construction cost estimate as depicted in this instructional guide. The results are also dependent on the appropriate selection of the factors in Parts B through H. These factors must not be applied in an arbitrary manner, and must be correlated specifically with the design and construction activities as they are to be executed.

Credentials of CEF Users

Given that the success of the CEF system is predicated upon the development of an accurate scope of work in Part A and selection of the appropriate factors in Parts B through H, the professional experience of the user is an important consideration. Members of the CEF team should be engineers, cost estimators, or technicians with experience in design, construction, and cost estimating. A complex infrastructure project may require a more experienced engineer or cost estimator with specialized experience in the functional area of the damaged facility. Team members should possess:

- experience as a fully competent engineer in all conventional aspects of the subject matter of the functional area of the assignment;

- the ability to plan and conduct work requiring judgment in the independent evaluation, selection and modification of standard techniques, procedures, and criteria; and
- the ability to devise new approaches to problems encountered.

An individual with cost estimating experience who qualifies as an Engineer IV, according to the American Society of Civil Engineers, or as a U.S. Army Corps of Engineers GS-11 would be considered qualified to use the CEF.

FEMA is currently implementing a training and credentialing program for all Public Assistance Disaster Assistance Employees as a component of the Cadre 2000 Initiative. This program will match personnel qualifications with Public Assistance Program job requirements.

Updates to the CEF

The CEF will be periodically reviewed and updated as data on the completion of large projects is gathered. These updates will occur on an as-needed basis. Comments and suggestions should be sent to:

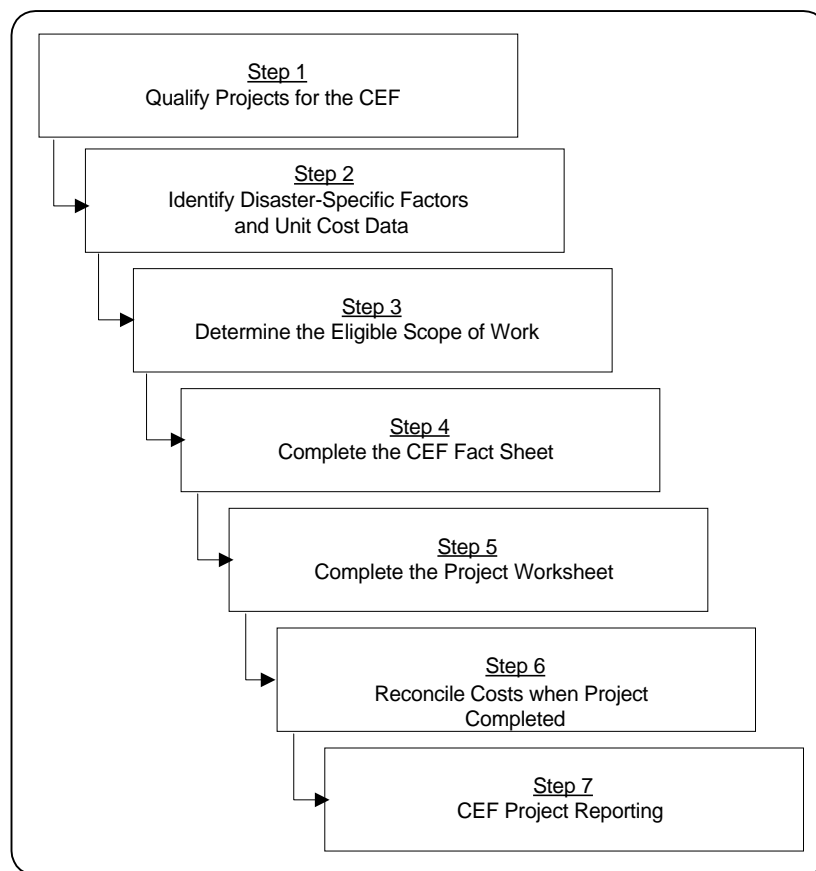
James D. Duffer, RR-IS
Federal Emergency Management Agency
Federal Center Plaza
500 "C" Street, S.W. - Room 713
Washington, D.C. 20472

Additionally, the Public Assistance Officer (PAO) for each disaster is responsible for reporting on the performance of the CEF. Reporting procedures are described on page 13 of this guide.

The Cost Estimating Format Development Process

The CEF is used as part of the large project formulation process. A FEMA representative, the Project Officer (PO), is responsible for developing large projects in partnership with State and local representatives. The CEF is used to develop the cost estimate for the project and the estimate is then used as the basis for obligating funds.

Figure 1
Development and Processing of a CEF Estimate



Step 1 - Qualify Projects for the CEF

As stated above, the CEF should only be used on large projects for which the permanent restorative work is less than 50 percent complete, or will take four or more months to reach the stage of being 90 percent complete. Percent complete for all types of projects (including improved and alternate projects) is derived from the approved design and construction timeline for eligible work. The start and completion dates of the project should be used to determine project duration.

The issues described below may also affect the manner in which the CEF is applied.

Hazard Mitigation Proposals: The PO may include an appropriate hazard mitigation proposal when developing a large project estimate. To be approved, such a proposal must comply with applicable statutory and regulatory requirements and with FEMA policies. If FEMA approves the proposal, the base cost (Part A) must include the cost of the hazard mitigation measures. After approved mitigation measures have been included in the base cost, the CEF is applied to the base cost to calculate the final estimate. See page 20 for a description of FEMA's policy on hazard mitigation.

For improved projects involving a replacement facility, at the same or new site, 406 hazard mitigation work items will *not* be eligible and therefore are excluded from consideration in the CEF, and the PW.

For alternate projects, 406 hazard mitigation work items will *not* be eligible and therefore are excluded from consideration in the CEF, and the PW.

Improved Projects: If an applicant elects to make improvements beyond the pre-disaster design of a facility, FEMA will not include the costs associated with proposed improvements in the estimated base cost. Rather, the base cost will only reflect the work associated with the eligible disaster-related repair or replacement. The CEF will be applied to the base cost to calculate the final estimate, and the Federal share of this estimate will be forwarded to the State for disbursement through the progress payment system. As with projects that do not involve the CEF, the funds are capped at the estimate amount and any expenditures in excess of this amount are borne by the applicant, because the work actually accomplished on the project will normally be quite different from the work described on the PW. The state is responsible for ensuring project compliance with Federal regulations.

Alternate Projects: An applicant may request that FEMA approve the use of Public Assistance funds for alternatives to repair or replacement projects. Only the costs associated with the eligible disaster-related repair or replacement will be included in the base cost. The CEF will still be applied to the base cost to calculate the final estimate. Ninety percent of the Federal share of the final estimate will be forwarded to the State for disbursement through the progress payment system. As with alternate projects that do not involve the CEF, the funds are capped at 90 percent Federal share of the estimate amount, or the actual cost of the completed approved project, whichever is lesser.

Replacement Projects (50 Percent Rule): A facility is eligible for replacement when the cost of repairing the facility exceeds 50 percent of the replacement cost. This comparison must be based on the following:

- The cost of repair is that which is necessary to repair disaster-damaged components using current methods and materials. This cost does *not* include triggered or mandatory upgrades for codes and standards, even if these upgrades are eligible for FEMA funding.
- The replacement cost is that which is necessary to replace the facility with one of equivalent capacity using current codes for new construction.

Both the repair and replacement costs should be calculated for comparison using the CEF. If the resultant ratio of repair to replacement is greater than 50 percent, then the replacement of the

facility is eligible. The final estimate is equal to the cost associated with the replacement work, as applied using the CEF.

Refer to the Public Assistance Guide, FEMA 286, and the Public Assistance Policy Digest, FEMA 321, for additional information regarding the 50 percent rule and the eligibility of codes and standards for restoration work. Also refer to the **Repair vs. Replacement** section of this Instructional Guide beginning on page 19.

Step 2 – Identify Disaster-Specific Factors and Unit Cost Data

Local factors affect the development of project cost estimates. Specific items include local unit prices, city cost indices (if applicable), escalation to the mid-point of construction and local costs for plan checks, building permits, or special reviews. The PAO or designee is responsible for collecting and evaluating this information at the beginning of each disaster and making the information available to the POs. The POs are responsible for applying the factors in a uniform manner for all CEF analyses.

Unit Cost Data: When evaluating a project, the PO should request average weighted unit prices (local costs derived from actual contract history) from the applicant, or from a relevant state or regional agency, for example, the State Department of Transportation. The average weighted unit price information should be evaluated for compatibility with the eligible scope of work.

If the applicant does not have *appropriate* average weighted unit price data (meaning that the data does not apply to the eligible scope of work), the PO should use the most current available R.S. Means cost data. Care should be taken in selecting the appropriate R.S. Means cost data reference for the work. For example, major infrastructure repair and construction projects, such as roads, railroads, bridges and water control facilities, should be estimated using the *Heavy Construction Cost Data* book. Building and structural work, such as that necessary for schools, hospitals and municipal buildings, should be estimated using *the Building Construction Cost Data* book. The following R.S. Means cost data references should be available in the Disaster Field Office for use by the POs:

- ADA Pricing Guide
- Building Construction
- Concrete & Masonry
- Electrical
- Facilities
- Heavy Construction
- Mechanical
- Plumbing
- Repair and Remodeling
- Site Work and Landscape
- Square Foot Costs

If R.S. Means cost data are used in Part A, city cost indices for each CSI Division of work must be applied to adjust the R.S. Means unit prices to the nearest city for the declared counties. The PAO or designee is responsible for identifying the zip codes included in the declared area, researching R.S. Means references for the appropriate city cost indices, and tabulating them for use by the POs.

Only if the previously mentioned sources are unavailable should FEMA Cost Codes, or other commercial cost-data estimating resources, be used for unit prices in preparing Part A base costs.

Factors: The PAO or designee is responsible for checking the appropriateness of individual factors and ranges (Parts B through H), and for uniform application of these factors during large project formulation. This is especially important with regard to force account efforts, use of contingencies, time frames for escalation, post-disaster inflation adjustments (e.g., when local costs are used in Part A, etc.), and the need for engineering design and construction phase services.

The type of damage experienced will dictate how range selections are made for many of the factors. For example, visual identification of damage may be less difficult after a flood (once floodwaters have receded) than after an earthquake. The PAO may decide that the contingency factors in Part C should therefore be at the higher end of the range for an earthquake than for flooding. *The PAO will be responsible for justifying range selections in writing.*

Plan Review and Construction Permit Costs: The PAO or designee is responsible for obtaining documentation related to plan review and construction permit costs and for distributing this documentation to the POs. These costs will be determined directly from the controlling jurisdictions in the declared counties. Typical sources include the City Building Department or the Office of the State Architect. Important considerations are listed below.

- How is the plan review or construction permit cost defined?
- What cost item (construction cost or total project cost) serves as the basis for calculation of plan review and construction permit costs?
- What percentage(s) is applied to the base cost?
- Are these percentages on a sliding scale?
- Are these fees ever waived by the State or local jurisdiction in post-disaster situations?

Step 3 - Determine the Eligible Scope of Work

The PO is responsible for identifying the eligible scope of work in accordance with the requirements of the Stafford Act, Federal regulations, and FEMA policies. All work activities needed to perform the eligible scope of work must be individually listed, as described below in the discussion of preparing the base cost estimate. The scope should also reflect all applicable special considerations, such as historic preservation, environmental and floodplain management issues, and approved 406 hazard mitigation measures. Reference the PO Checklist for CEF Implementation - page 15.

Step 4 – Complete the CEF Spreadsheet

The PO is responsible for completing and documenting the CEF Spreadsheet. The spreadsheet is described in greater detail under “Completing the CEF Spreadsheet,” below.

When preparing the spreadsheet, the PO must obtain the appropriate supporting documentation. This documentation may include:

- a site map or location plan;
- photographs and sketches;
- measurements and calculations;
- 406 hazard mitigation proposals;
- force account summary sheets;

- documentation that applies to applicable codes and standards;
- schematic drawings; and for major construction activities such as water control facilities and large buildings - a set of plans (preferably reduced) containing basic information such as elevations, floor plans, a site plan, structural details, and sections;
- insurance declarations;
- actual/anticipated insurance settlements; and
- construction permits/clearances.

Source documents such as invoices, vouchers, timesheets, purchase orders, item slips, weight slips, plans, specifications and insurance policy information reside with the applicant and need not be collected by the PO.

Step 5 – Complete the Project Worksheet

Once the PO has developed an estimate using the CEF Spreadsheet, he or she must complete a Project Worksheet using that estimate. A printout of the CEF Spreadsheet should be attached to the Project Worksheet, along with all supporting documentation. The PO should work with the Public Assistance Coordinator to ensure that the case management file is updated to reflect the completion of the estimate and that the Project Worksheet package is submitted for approval, processing, and storage in accordance with procedures established for that disaster.

Many projects, particularly buildings, to which the CEF is applied, are insurable. The PO, working with the applicant and the Public Assistance Coordinator, must identify insurable facilities and ensure that the appropriate actions are taken to account for actual or anticipated proceeds from an insurance settlement. If a facility is insurable, a specialist will be responsible for determining the amount by which the grant for that facility should be reduced. The amount of actual or anticipated insurance proceeds should be a line item deduction from the CEF total cost line item on the Project Worksheet (PW). The total is depicted at the “Total Cost” block of the PW. Further instructions on completing the PW can be found in Appendix E on page 3. This situation could also apply to salvage value or depreciation for equipment.

Step 6 –Reconcile Costs When Project Is Completed

The CEF estimate shown on the Project Worksheet will be used to obligate the Federal share of project costs. This does not mean, however, that these funds are immediately available to the State (the grantee) or to the applicant (the subgrantee). As stated above, the CEF is used to provide an estimate only; it is not used as a final cost settlement instrument. For large projects, funds are made available to the subgrantee on a progress payment basis. The subgrantee may request progress payments for bills already in hand or for funds anticipated to cover project costs in the near future (less than a week). The grantee may draw from the Federal government only the Federal share of the payment in making progress payments. The regulations for grant administration (44 CFR, Part 13) provide that payments may be made in advance of actual expenditure if recipients demonstrate the willingness and ability to maintain procedures to minimize the time elapsing between the transfer of funds and their disbursement by the grantee to the subgrantee. Department of Treasury regulations (31 CFR, Part 205) govern these procedures. The general guidelines are to allow no more than three to four days between the transfer of funds to the grantee's account and disbursement to the subgrantee.

Upon completion of a large project, the grantee must submit supporting documentation and an accounting of all eligible costs incurred for the project to FEMA for a final determination of eligible project costs. The grantee must certify that the reported costs were incurred in the performance of eligible work and that the project was completed in accordance with FEMA approval. In order to satisfy itself for this certification, the grantee may perform such inspections and audits, as it deems necessary. FEMA will review the reported costs to determine if the costs are eligible, conducting inspections or audits as necessary to verify eligible costs. Upon completing this review, FEMA will reconcile final costs for eligible work against the original estimate and prepare a supplemental Project Worksheet to adjust the approved amount upward or downward as necessary. If additional funds are approved by FEMA, the grantee may then make an additional drawdown of any funds remaining for that project.

Within 90 days following completion of the last large project, the grantee must submit a final progress report that includes the final amount paid for each large project. If FEMA determines that the grantee has drawn Federal funds for ineligible costs, then the grantee must return those funds to FEMA.

Reference Appendix E (Standard Operating Procedure - CEF for Large Projects) at page 3, second bullet for additional information relating to the cost reconciliation process.

Step 7 - CEF Project Reporting

The CEF will be revised periodically, as data from actual projects become available. To facilitate revisions, a standard report, called the CEF - Large Project Report, has been developed to collect these data. The report is a Word spreadsheet that is distributed with the electronic CEF template. For each disaster, the PAO or designee will prepare the report using, as appropriate, the following information:

- the disaster number and name of the PA Officer preparing the report;
- the declaration date and the date prepared;
- the applicant name;
- the PA ID number;
- the Project Worksheet number;
- category of permanent work (C, D, E, F or G);
- the CEF estimated cost;
- the CEF actual post-construction cost;
- the dollar amount of obligation or de-obligation;
- the reason for cost reconciliation; and
- the primary function of the facility.

A sample copy of the report has been included in Appendix C, and an electronic copy has been included with this guide. The PAO should submit the report to the address given on page 7.

Summary of PAO and PO Responsibilities

The respective responsibilities of the PAO and PO throughout the CEF process are outlined in the following checklists given below.

PAO Checklist for CEF Implementation

To implement the CEF during the large project formulation process, the PAO or designee is responsible for the actions listed below.

Obtain the following:

- Disaster-specific Public Assistance Program policies.
- List of approved, cost-effective hazard mitigation measures.
- Current versions of R.S. Means publications (listed on page 10).
- Current FEMA cost codes.
- City cost adjustment factors appropriate for the disaster area.
- CEF factors appropriate for the disaster (*such as the escalation factor*).
- Plan review and construction permits fee information for the controlling jurisdictions in the declared counties.

Set policies regarding the application of CEF, particularly with regard to:

- force account efforts;
- use of contingencies;
- time frames for escalation;
- adjustments for post-disaster inflation;
- the need for engineering, design, and construction phase services; and
- distribute information to CEF users.

Complete the CEF Large Project Report, as described above, and submit the report to FEMA Headquarters at the address given on page 7.

PO Checklist for CEF Implementation

During the formulation and processing of large projects, the PO is responsible for the actions listed below.

- ❑ Obtain the following from the PAO or designee:
 - Disaster-specific Public Assistance Program policies.
 - List of approved, cost-effective hazard mitigation measures.
 - Current versions of R.S. Means publications.
 - Current FEMA cost codes.
 - City cost adjustment factors appropriate for the disaster area.
 - CEF factors appropriate for the disaster (*such as the escalation factor*).
 - Plan review and construction permits fee information for the controlling jurisdictions in the declared counties.
- ❑ Meet with the Public Assistance Coordinator (PAC) to discuss the applicant's needs.
- ❑ Meet with the applicant and the State to assess the applicant's large projects.
- ❑ Obtain average weighted unit cost data from the applicant or relevant state or regional agency.
- ❑ Determine if the large project qualifies for CEF use.
- ❑ Conduct a site visit and determine the eligible scope of work.
- ❑ Identify any special considerations issues, including insurance, potential hazard mitigation measures, floodplain management, and compliance with environmental and historic preservation legislation, and executive orders. Notify the PAC of potential issues and revise the scope of work as appropriate.
- ❑ Assemble all appropriate back-up documentation, and a design/construction timeline.
- ❑ Prepare the CEF Spreadsheet. Document all assumptions on the CEF Notes Sheet.
- ❑ Review the estimate with the PAC.
- ❑ Complete the Project Worksheet.
- ❑ Attach the CEF Spreadsheet to the Project Worksheet. Submit the Project Worksheet and appropriate back-up data to the PAC for processing and filing. See Appendix E - page 3.
- ❑ Assist the PAC in updating the case management file.
- ❑ Assist the PAO in preparing the CEF Large Project Report as necessary.

Completing the CEF Spreadsheet

The CEF Spreadsheet has been organized to make it user-friendly and flexible enough to respond to individual project conditions and to promote uniformity in the development of cost estimates. While many projects are simple to analyze, others will need to be analyzed by level of completion and type of work activity being conducted. Therefore, the user can structure the spreadsheet to address specific project characteristics by simply clicking on those parameters that define the project.

The parts of the spreadsheet are separated onto individual tabs at the bottom of the spreadsheet. They are:

- CEF Fact Sheet
- Part A – “Base Costs” for Construction Work In Trades
- Summary for Completed Work
- Summary for Uncompleted Work
- Total Project Summary
- CEF Notes

Each of these parts is described below. A printout of a blank electronic spreadsheet is given in Appendix A for illustration purposes. Please refer to it.

CEF Fact Sheet

The CEF Fact Sheet is the first tab in the spreadsheet and should be completed first. It is designed to allow the user to document basic information about the project and the estimate, including the date the CEF was prepared, the declaration number, the FEMA Region, the applicant, the category of work, and the name and location of the facility. The user should also provide a clear and concise description of the eligible scope of work.

The fact sheet also allows the user to customize the spreadsheet for the type of work being performed and the level of project completion. This customization occurs automatically when the user answers questions on the fact sheet, and includes changes to the formatting and labeling.

Type of Work: The fact sheet asks the user for the type(s) of work that must be performed and types of work include:

- Repair work: activities that are solely allocated to restore a damaged facility to its pre-disaster condition.
- Retrofit and upgrade: activities undertaken to upgrade a damaged item to current codes and standards.
- New construction: the replacement of part or all of a facility, as opposed to repairing or retrofitting discrete elements.
- Hazard mitigation: measures taken to reduce or eliminate future damage from hazards similar to that which caused the damage, or from multiple hazards.

- **Other work:** activities that are typically undertaken outside of the typical applicant-general contractor-subcontractor relationship. Examples include hazardous material abatement, selective demolition, and force account activities.

A project can consist of one type of work, or multiple types, depending upon how the restoration activities match the requirements of the Public Assistance Program. The user should select the work type(s) to be analyzed and enter them into the fact sheet. Once the fact sheet is completed, a CEF Spreadsheet tailored specifically for this analysis will be created. To change the prepared format, the user should go back to the fact sheet and redefine the parameters of the project.

Work Completion: projects being analyzed will likely have completed and uncompleted work elements. Since several of the CEF factors are based upon unknowns that result from the level of completion, the spreadsheet is structured to analyze completed and uncompleted work separately. Therefore, it is recommended that the user separate completed and uncompleted work in Part A.

Mixing actual costs with estimated costs in mid-construction can lead to inaccurate estimates, unless the already completed work is a discrete, stand-alone portion of the project without the potential for change orders. For example, cost inaccuracies can result by using unit costs applicable to Interstate Highway construction for rural road projects, or by using concrete unit costs applicable to batch plant operations in situations where truck supplied concrete is the preferred method of operation. Therefore, to be considered “completed work,” a project work element must be:

- a specific type of work (repair, retrofit, new construction, hazard mitigation, or other) for which actual incurred costs documentation for eligible work can be easily obtained; and
- a discrete work activity (such as grading or laying foundations) that is complete and has no potential for future change orders.

In some cases, an applicant may have solicited bids for the project before the CEF is prepared. The lowest qualified bid amount obtained through a competitive bid process can be accepted for purposes of developing an estimate, as long as the bid conforms substantially to the eligible scope of work and the qualified bidder has been given the notice to proceed. The application of the CEF in such cases is described on page 26.

Part A – Base Costs for Construction Work In Trades

Part A of the CEF Spreadsheet is designed to capture the detailed construction cost associated with each work activity that makes up the eligible scope of work. Estimates are defined using the Cost Item Number, Item Description Title or Component Description, and Cost Codes columns. The total estimated cost for each work activity is a product of the quantity, unit price, and city adjustment index by CSI Division.

Summary for Completed Work

Using the Summary for Completed Work, the user selects factors that are applied to the base cost estimate for completed work. The user employs either check boxes or specific values to apply each factor or sub-factor in the spreadsheet. Check boxes are used when the factor is fixed (such as with B.2, the factor for General Conditions) or is calculated by the spreadsheet automatically (such as with H.1, the factor for Applicant's Project Management – Design Phase).

Guidance on selecting factors in Parts B through H is provided below. The components of each factor are described and a recommended range for each factor is provided. All assumptions made by the user and rationale for selecting values, particularly values outside of recommended ranges, should be documented in the CEF Notes section of the spreadsheet. Selection of values outside the recommended ranges will be based on guidance provided by the PAO, and shall be included in the supporting documentation for the project.

Summary for Uncompleted Work

Similarly, the Summary for Uncompleted Work allows the user to select factors that are applied to the base cost estimate of uncompleted work. As with the Summary for Completed Work, factors in Parts B through H are applied using check boxes or by selecting specific values. Refer to the description of each factor, below, for guidance on selecting factors.

Total Project Summary

The Total Project Summary merges estimated costs for completed and uncompleted work into a single estimate for the entire project. This estimate is used in the preparation of the Project Worksheet (PW).

CEF Notes

The CEF Notes sheet provides the user with a place to document the logic, assumptions, and reasoning for the selection of each factor. To ensure proper documentation, the user must enter notes for each work type and must indicate the values chosen for each factor. The sheet also contains an area for miscellaneous comments and notes.

Part A: “Base Costs” for Construction Work In Trades

Background

Part A contains the “base costs” for the project. It includes costs for all eligible permanent and non-permanent trade work. These costs represent the “complete and in-place” cost components; that is, the cost of all labor, equipment, materials, small tools, incidentals and hauling costs necessary to complete an item of work. Each of these components, as they apply to permanent and non-permanent work, is discussed below. As stated above, the preparation of a precise base cost estimate in Part A is critical to the accuracy of the total project estimate developed with the CEF.

Adjusting Part A

Part A can be formulated to meet the specific requirements of a particular estimate. The user may add rows to the spreadsheet to accommodate additional items of work as necessary, by performing the steps listed below.

1. Select the last row before the total.
2. Select **I**nsert from the tool bar. Select **R**ows from the pull down menu. This inserts a new row above the selected area.
3. Select the last row again and select **C**opy from the **E**dit tool bar.
4. Highlight the newly inserted row and select **P**aste from the **E**dit tool bar.

The user should check to ensure that formulas have been properly copied after inserting rows.

Scope of Work

Before Part A can be completed, it is necessary to have a clear definition of the FEMA eligible scope of work. This scope is defined as the work required to repair or replace the damaged facility on the basis of the design of the facility as it existed immediately prior to the disaster. Regulations outlining Public Assistance eligibility are found in 44 CFR, Part 206. As described on page 11 above, the scope of work must include any eligible upgrades necessary to comply with current codes and standards and it must include any approved hazard mitigation measures. The scope of work must not include ineligible work that would be considered part of an improved or alternate project.

The PO in partnership with State and local representatives develops the eligible scope of work. The PO is also responsible for developing the CEF estimate and must ensure that Part A does not contain ineligible work. The application of the CEF is the last step in the large project formulation process; therefore, any eligibility conflicts involving scope of work items must be resolved *before* the CEF is prepared.

Repair vs. Replacement

The determination of eligibility for a replacement facility shall include **only** costs for the repair of damage, and not the costs of any triggered or mandatory upgrading of the facility beyond the

repair of the damaged elements (even though these upgrade costs may be eligible for FEMA funding). Thus, the determination of eligibility of a facility for replacement will be calculated by the following fraction: The cost of repair of the disaster damage (repair of the damaged components only, using present day materials and methods) divided by the cost of replacement of the facility with a facility of equivalent capacity, using current codes for new construction. If this calculation is greater than 50%, then replacement is eligible for FEMA funding.

Refer to the Public Assistance Guide and the Public Assistance Policy Digest, for additional information relating to the 50 percent rule and the eligibility of codes and standards for restoration work.

In most cases, the criteria outlined in the "Eligible Cost Determinations" table (found in the Public Assistance Guide) are adequate for repair and replacement projects. However, particular attention should be paid to the repair of damaged historic buildings. Such repair could trigger a requirement to upgrade a structure to new construction standards, while at the same time maintaining historic features. The total restoration cost, which would include the triggered upgrades in this situation, may exceed replacement cost, as in condition 3 found in the table referenced previously. The regulations contain an exception to the funding limitation depicted in the table that applies only to a very narrow range of situations. Such a situation would exist when there is a standard that requires a facility to be restored in a certain manner and disallows other options, such as leaving the facility unrestored. If an applicable standard requires such action, the eligible cost to complete the restoration may exceed the replacement cost.

The repair vs. replacement calculation is begun by completing two separate Part A base cost estimates using CEF (do not apply parts B through H). Prepare one estimate for each of the repair and replacement scenarios. The "Total Part A Base Construction Cost" from the estimates are used in calculating the actual repair vs. replacement fraction. The percentage result determines whether the type of work will be repair or replacement. Once the type of work has been selected for a project (i.e. either repair or replacement) then the project is estimated using CEF in the standard manner (including the appropriate B through H factors for the project) as described further on.

Hazard Mitigation

Section 406 provides discretionary authority to fund mitigation measures in conjunction with the repair of damaged facilities. The mitigation measures must be related to eligible disaster-related damages and must directly reduce the potential of future, similar disaster damages to the eligible facility. These opportunities usually present themselves during the repair/replacement efforts.

While all parties must remain mindful of relative costs and benefits and prudent use of Federal disaster funds, a calculation of benefits and costs, using the FEMA-approved computer model, is no longer necessary for justification of Section 406 funds.

Mitigation measures must be determined to be cost-effective. Any one of the following means may be used to determine cost-effectiveness:

- Measures may amount to up to 15 percent of the total eligible cost of the eligible repair work on a particular project.

- Certain mitigation measures (see Appendix D) will be determined to be cost-effective, as long as the mitigation measure does not exceed the eligible cost of the eligible repair work on the project.
- For measures that exceed the above costs, the Grantee or Subgrantee must demonstrate through an acceptable benefit/cost analysis that the measure is cost-effective.

Proposed projects must be approved by FEMA prior to funding. They will be evaluated for cost effectiveness, technical feasibility, and compliance with statutory, regulatory and executive order requirements. In addition, the evaluation must ensure that the mitigation measures do not negatively impact a facility's operation or risk from another hazard.

Costs of meeting applicable codes and standards in accordance with 44 CFR, 206.226 are distinct from mitigation funding.

There may be no duplication in funding between Sections 404 and 406. Therefore, the Grantee and Subgrantee must be able to identify specific hazard mitigation work that will be accomplished with funding through Section 406. Section 404 funding may not duplicate that work, although Section 404 may be additive and accomplished on Section 406 facilities.

Costs approved for project-specific mitigation measures under Section 406 of the Stafford Act may not be applied to improved projects that will involve the *replacement* of the disaster-damaged facility, whether on the same site or an alternate site. However, funds recommended for mitigation measures may be approved for an improved project, which will include the work required to *repair* the disaster-damaged facility and restore its function, as well as improvements.

The cost caps (15 percent or 100 percent) for Section 406 hazard mitigation measures related to windowpanes will be based on the total cost of damage to: 1) the damaged element, and 2) the affected building contents.

Force Account Work

As stated above, the term “force account” refers to the applicant’s own resources, in terms of labor, equipment or materials. Not all of the CEF factors are applicable to force account work. The profit and overhead factors represented by Part D should not be applied to force account work. In the absence of information regarding the method for completing the project, the PO should prepare the CEF estimate as if the applicant plans to complete the project using a contractor. However, the PO shall make every effort to determine how the applicant intends to complete the work. For those instances in which the applicant has begun the work using force account resources or expresses the intent to complete the work with force account resources, the estimate should reflect this fact. If the project will be completed by a combination of contractual and force account resources, the PO should prepare two separate Part A estimates—one for the force account portion of work and one for the contract portion of the work—and should apply the factors separately to each Part A as appropriate.

Line-items may also be included for an applicant's fringe benefit costs or productive hourly rate.

Organization of “ Base Costs”

The user should list work items in Part A with as much detail as possible. The Part A spreadsheet is organized to allow the user to:

- differentiate between permanent and non-permanent work;
- differentiate between completed and uncompleted work; and
- sort items by work type (repair, retrofit, new construction, hazard mitigation, and other discrete work elements such as selective demolition and force account). The types of work specified should match those selected when the user completes the CEF Fact Sheet.

Once the user has organized the line items using these categories, the line items within each category should be further organized using standard CSI divisions, as follows:

- ⇒ Division 1: General Requirements
- ⇒ Division 2: Site Work
- ⇒ Division 3: Concrete
- ⇒ Division 4: Masonry
- ⇒ Division 5: Metals
- ⇒ Division 6: Woods and Plastics
- ⇒ Division 7: Thermal and Moisture Protection
- ⇒ Division 8: Doors and Windows
- ⇒ Division 9: Finishes
- ⇒ Division 10: Specialties
- ⇒ Division 11: Equipment
- ⇒ Division 12: Furnishings
- ⇒ Division 13: Special Construction
- ⇒ Division 14: Conveying Systems
- ⇒ Division 15: Mechanical
- ⇒ Division 16: Electrical

All construction work activities must be itemized and quantified. Lump sum construction cost estimates are not acceptable for preparing an estimate. If eligible unforeseen site conditions are present or eligible hidden damage is discovered and the scope of work must be revised, unit costs lend themselves to this task more readily than lump sum items.

Using this system, a project may be broken into a series of separate sub-estimates for each major item of work. This facilitates:

- application of the city cost factors by CSI division;
- checking the estimate;
- analyzing the work to determine if alternative solutions exist;
- use of the estimate for policy determinations; and
- future changes in scope without requiring that the estimate be recalculated.

Once the user has developed estimates for completed and uncompleted work, the user must enter these estimates in the Summaries of Completed Work and Uncompleted Work, respectively. The estimates are entered in the appropriate fields under Part A on each summary sheet. The distinction between permanent and non-permanent work must be maintained when completing the summary sheets.

Examples of a completed Part A can be found in Appendix B. Permanent and non-permanent work is discussed in more detail below.

A.1: Estimate for Permanent Work

“Permanent work” refers to those work items that are necessary to repair or replace damaged elements of a facility, or that are part of the reconstruction of a facility. Typically, these items relate to a fixed part of the facility and are left in place once the work is complete (for example: installation of an asphalt surface; placement of riprap; patching and painting interior walls; repairing cracked water distribution lines). If appropriate, permanent work should be separated into structural and non-structural elements to facilitate the application of FEMA policy, particularly with regard to upgrades for codes and standards.

Americans with Disabilities Act (ADA) Compliance: Measures necessary for compliance with applicable codes and standards regarding ADA requirements may be eligible. The increase in design and construction costs associated with ADA compliance will vary considerably according to the category, use and location of the facility. If possible, ADA costs should be developed using a line item estimate and is specified in Part A. For example, highway and bridge work undertaken by State Departments of Transportation, typically include separate work items for ADA compliance, such as wheelchair ramps and utility pole setbacks. Alternatively, set factors for specific cost items may also be used. Reference should be made to nationally accepted or locally set standards for such factors, such as the most recent Means ADA Pricing Guide.

For Category E buildings that sustain *structural* damage, ADA compliance costs are less site-specific but are more easily quantified, and therefore less variable. If the damaged portion of the building does not comply with ADA, and a detailed scope of work for completing ADA upgrades is not available to be included in Part A, a cost factor for ADA compliance can be estimated using Table A.1. The range provided covers the inherent differences between less complex facilities (warehouses, factories, garages) and facilities where ADA compliance could be more costly (historic and monumental buildings). This factor should be applied only on the basis of the eligible *structural* damage to the facility. ADA allowances cannot be applied on the basis of damage to non-structural elements or architectural finishes. The factors given in Table A.1 should be applied to buildings (Category E) with eligible structural damage only.

When using Table A.1 to select the ADA compliance factor, the user should consider the need for ADA compliance, based on local requirements, then the facility’s use and function. The user should also compare the selected factor to other, similar projects undertaken by the applicant, if the information is available.

Table A.1
ADA Compliance Allowance for Category E Facilities

Cost of Structural Repairs (\$)	ADA Compliance Allowance (%)
0 to 82,000	20.00
82,000 to 100,000	12.5-19.75
100,000 to 125,000	8.50-19.50
125,000 to 150,000	5.75-19.00
150,000 to 175,000	5.00-18.50
175,000 to 200,000	4.99-18.00
200,000 to 225,000	4.85-17.50
225,000 to 250,000	4.75-16.50
250,000 to 275,000	4.73-15.00
275,000 to 300,000	4.70-12.50
300,000 to 500,000	4.68-11.50
500,000 to 1,000,000	4.65-12.50
1,000,000 to 2,500,000	4.63-9.75
2,500,000 to 10,000,000	4.60-5.50
Over 10,000,000	4.50-5.50

A.2: Estimate for Non-Permanent, Job-Specific Work

“Non-permanent work” includes job-specific work activities or equipment required to complete the permanent work but are not left in-place at the completion of the construction. Examples include:

- construction aids such as safety nets, scaffolding, construction signs, lighting, and personal safety equipment;
- major equipment such as cranes and other lifting or hoisting equipment; and
- activities such as de-watering, temporary relocation of utilities, and the installation of blasting pads, coffer dams, and temporary access roads.

Non-permanent work items are included in CSI Division 1 (General Requirements). They should not be specified as part of the permanent work (A.1) or duplicate the job site factors covered in Part B.1.

Methods for Preparing the “Base Cost” Estimate

As described above, the PO should attempt to obtain average weighted unit prices (local costs derived from actual contract history) from the applicant, or from a relevant state or regional agency when preparing Part A. However, if appropriate local data cannot be developed, the R.S. Means cost data publications are the recommended source of cost data for the CEF. These publications have been chosen based on their wide acceptance in the industry and the availability of data for nationwide use. The PO must ensure that the current R.S. Means cost data publications are used in these cases.

R.S. Means publishes cost data for union and non-union activities. Typically, large, publicly funded projects are completed with union labor. Therefore, union rates should normally be used for estimating purposes, unless the PO can establish that non-union labor will be used to complete the scope of work. The PO should document use of non-union rates in the CEF Notes Sheet.

While R.S. Means publications are recommended for use with the CEF, these publications may not always provide work items that are appropriate or applicable to the construction activities required to complete the project. There are numerous sources that may be used in the preparation of cost estimates for large projects when it is determined that R.S. Means cost data are not appropriate. Some additional sources are listed below.

- Other commercial estimating sources (as approved by the PAO).
- Low bids or construction contracts.
- FEMA Cost Codes.
- U.S. Army Corps of Engineers cost information, including pamphlet EP 1110-1-8, entitled “Construction Equipment Ownership and Operating Expense Schedules.”
- Applicant force account labor, equipment and material costs.

In all cases, the PO should ensure that the components of the unit costs are fully understood. Each unit cost must represent a complete and in-place cost that includes all labor, equipment, materials, small tools, incidentals, and hauling costs necessary to complete the work. Unit costs should not include surveying and construction inspection costs. The PO should understand cost elements that could potentially be duplicated in Parts B through H, such as general contractor’s overhead and profit.

The unit costs in Part A should be “base costs”; that is, they should include the subcontractor’s overhead and profit, but should not include general contractor’s overhead and profit. Factors for general contractor overhead and profit are included in Part D. The R.S. Means publications provide unit cost data with and without overhead and profit. If a source other than R.S. Means is used, such as contract or bid costs, costs obtained from that source should be analyzed to determine if general contractor overhead and profit are included in the unit cost. Overhead and profit are normally part of the unit price for an item of work within a contract (if the contract was let in a bid environment), or as a separate line item in a verbal or written quote (if obtained from the contractor in a non-bid environment).

If a prime contractor and subcontractor relationship is anticipated during completion of the work, then the Part A costs should include the subcontractor overhead and profit, and the Part D factor should also be included to cover general contractor overhead and profit. The prime contractor and subcontractor relationship is generally used for more complex facilities in which prime contractors subcontract specialized work. In all cases the Federal-State-Local team should verify the relationship before the PO prepares the CEF.

Disaster conditions may cause shortages of skilled labor, building materials, and energy sources, resulting in fluctuations in costs. When these conditions prevail, the available unit cost data may not be accurate. The PO should identify such conditions during large project formulation and adjust unit cost data before applying the CEF.

The following paragraphs describe various scenarios that may be encountered when developing costs in Part A. Record all assumptions or the basis for development of Part A in the CEF Notes Sheet.

a) Development of an estimate when no work has been completed by the applicant:

- i. Define all work activities required to complete the work and determine the quantities and units associated with each work item. As stated above, lump sum work items should be avoided.
- ii. If the applicant intends to use force account labor, equipment and materials to complete the project, these costs should be treated as contractual work and included in Part A. As stated above, not all CEF factors are applicable to force account work. Home office overhead and profit factors represented in Part D should not be included for force account work.
- iii. Using the appropriate cost data source, as recommended above, determine the unit cost for each work item. List the item number, item description, cost code, quantity, and unit price on the Part A worksheet. Care should be taken to avoid combining multiple definable work items in a single loaded unit cost.

A critical factor in developing cost estimates is the appropriateness of using assembled (as opposed to non-assembled) costs. Using an assembled cost for work activities that can be represented by a single unit of measurement is acceptable, as long as the source of the assembled costs is valid.

For example, R.S. Means provides assemblies cost tables for a variety of construction components. These assembled cost tables have unique identification numbers; illustrations, descriptions and design criteria; listing of system components, their quantities and units of measure; derived assembly unit costs for materials and installation; and total cost. Deviations from the assumed condition upon which the assembly cost is based would require additional line items in the CEF Part A cost estimate.

Assembled costs are most applicable for new or replacement type projects. On the other hand, repair projects are typically characterized by a number of discrete unrelated work activities (represented by different units of measurement); therefore, assembly costs should not be used and a detailed line item cost estimate should be prepared.

- iv. After itemizing each work item required to complete the project in Part A, apply the appropriate city adjustment factor from R.S. Means to each line in Part A. If local average weighted unit prices (local costs derived from actual contract history) are used, no city cost adjustment is necessary.
- v. Enter the totals for permanent and non-permanent work in the appropriate fields at the top of the summary for uncompleted work.

b) Estimate based on an Architect and Engineering (A&E) report:

If an A&E report with a construction cost estimate for uncompleted work is available check the reasonableness of the estimate as follows-

- i. Verify that all items of work included in the estimate are eligible.
- ii. Check the ten largest cost items against local average weighted unit prices or R.S. Means cost data.
- iii. Check 20 to 30 percent of the remaining cost items at random against local average weighted unit prices or R.S. Means cost data.
- iv. If the line item unit costs checked in the A&E construction cost estimate are within 10 percent of the local average weighted unit prices or R.S. Means cost data, use the A&E construction cost estimate in Part A.
- v. If the line-item unit costs checked in the A&E construction cost estimate are not within 10 percent of the local average weighted unit prices or R.S. Means cost data, assume the entire estimate is not comparable and develop a new Part A. Care should be exercised to ensure that the scope of work used to develop the new Part A contains eligible items only.

All work items specified in the report should be listed in Part A and quantified; do not use lump sum items. Each work activity should be reviewed to determine if the estimate reflects costs that could be duplicated by factors in Parts B through H. Examples include contingencies, which could be included in the quantities that would be duplicated by Part C; overhead and profit that could be duplicated in Part D; and escalation that could be duplicated in Part E.

- vi. After completing Part A, enter totals in the appropriate fields at the top of the summary for uncompleted work.

c) Estimate based on a bid or construction contract:

If an appropriately procured construction contract or bid for uncompleted work is available, it can be used in the CEF. It must be checked for eligibility, reasonableness, and applicability.

- i. Prepare an objective line item estimate of the work to compare it with the bid. This can be done using the verification process explained in (b)(ii) and (b)(iii) above. If the bid or construction contract is reasonable and the scope of work is eligible, use that value in Part A.

- ii. After completing Part A, enter totals in the appropriate fields at the top of the summary for uncompleted work.
- iii. Identify those factors in Parts B through H that might already be included in the construction contract bid amount. The contractor's unit costs probably include part or all of the contractor's overhead and profit reflected in Part D, allowance for contingencies reflected in Part C, and escalation reflected in Part E. These unit costs could even include permit and plan review fees (Part F), and allowances for change orders (Part G). Therefore, the CEF should be adjusted to reflect the inclusion of these factors in the contractor's unit costs as appropriate.

d) Developing an estimate when the applicant has partially completed the work:

Mixing actual costs with estimated costs in mid-construction can result in significant inaccuracies, unless the completed work is a discrete, stand-alone portion of the project. Complete the Part A spreadsheet as follows:

- i. Separate completed and uncompleted work.
- ii. If the applicant had an estimate prepared before the work was completed, compare the actual costs against that estimate and reconcile any differences. Enter the result in Part A, Summary for Completed Work.
- iii. If no estimate exists, prepare a CEF Part A estimate of the eligible completed work activity, and compare it against the actual costs and reconcile any differences. Enter the result in Part A, Summary for Completed Work.
- iv. Prepare a Part A estimate for uncompleted work. Enter the result in Part A, Summary for Uncompleted Work.
- v. Using the values that are most applicable to the eligible scope of work will minimize questions on the application of Parts B through H.

Part A Checklist for CEF Implementation

Eligible Scope of Work

- Does the scope of work address the damage caused by the disaster?
- Has a site visit by the project formulation team (Federal, State and local members) been conducted?
- Is the scope of work eligible?
- Has the most effective method for accomplishing the work been selected?
- Does the scope of work include required code upgrades?
- Are upgrades for compliance with ADA eligible (for structural damage only)? If so, does the scope of work include ADA upgrades?
- Does the scope of work include approved hazard mitigation proposals? (See page 9 for improved or alternate project requirements.)
- Does the scope of work address special considerations such as insurance, floodplain management, compliance with the National Environmental Policy Act and other environmental laws, and compliance with the National Historic Preservation Act?
- Has special considerations clearance been obtained?
- Is the scope clearly defined in terms of repair, retrofit, new construction, hazard mitigation and other activities that might be contracted separately?
- Are completed work items separated from uncompleted work items?
- Are permanent and non-permanent work items clearly separated?
- Have all eligibility decisions been made and agreed upon with the applicant?

Itemized Cost Estimate

- Has each itemized work activity been identified, described, quantified, and assigned the appropriate cost item number or cost code?
- Can the eligible scope of work be clearly related to the itemized cost estimate?
- Have the quantities and units been established and spot-checked?
- Is the source of the unit prices appropriate?
- Do the unit prices include the installing contractor's overhead and profit?
- Have the current year values been used?
- Have the values been adjusted for regional differences using city cost adjustment factors?
- Have lump sum items been used? If so, eliminate them and provide itemized units of measurement.

Part A Totals

- Are there separate totals for completed work and are they separated by work type (repair, retrofit, new construction, hazard mitigation, and other)?
- Are there separate totals for uncompleted work and are they separated by work type (repair, retrofit, new construction, hazard mitigation, and other)?
- Are all situations where Part A includes factors that could be duplicated in Parts B through H noted?
- Have all assumptions or clarifying notes been included in the CEF Notes Sheet?

Part B: General Requirements and General Conditions

Part B accounts for non-permanent job site work that could not be readily itemized in A.2. The Part B factors are applied directly to the work type subtotals from Part A. To apply the B.1 factors, enter the percentage factors for each work type. To apply B.2, select each work type to which the factor (which is fixed) should be applied. If no percentages or check boxes are selected, the B factor will be zero. Parts B.1 and B.2 are described in greater detail below.

B.1: General Requirements

The General Requirements factor B.1 addresses those costs typically described in the general requirements of construction specifications. B.1 items include safety and security items, temporary services and utilities, submittals, and quality control. Whenever possible, these items should be specified in the non-permanent work section of Part A. If any of these costs have been included in Part A, do not duplicate them in Part B. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet.

Safety and security: This factor includes such items as:

- guard service;
- first aid; barricades, uniformed traffic persons, flagging, railings, toe-boards, and rented fencing;
- harnesses, scaffolding and other safety equipment;
- fire protection, such as fire extinguishers and temporary hydrants; and
- temporary signage that may be required by a regulatory authority (e.g. the FHWA) to control pedestrian or vehicle detours within and around the construction zone.

For most construction sites, 4 percent is a reasonable factor for safety and security items. It can be increased to 6 percent as project complexity increases. The higher end of the range would be applicable on projects such as airports, marinas, and ports; large segmented sites with phased construction; and projects in urban areas.

Temporary services and utilities: This factor includes construction trailer or office space, and related office equipment. The space may be for the construction job superintendent or for inspectors. The factor also includes temporary utilities such as construction water, electricity, telephones and construction craft sanitary facilities; and weather protection that may be necessary for temporary services or utilities. A recommended value of 1 percent has been established.

Quality control: This factor reflects completion of quality control by an organization other than the applicant or the contractor. Typically, this organization is an independent testing and inspection service with expertise specific to the project scope of work. Examples include concrete break testing, water quality testing, non-destructive examination of welds. These costs typically range from 0.5 percent to 1.0 percent of the hard construction cost. We recommend using a default of 0.5 percent for most projects and increasing this value toward 1.0 percent as the overall project or specific complexities increase (e.g. a broader spread footing required on one side of a building project because of unforeseen, unstable soil conditions at that location).

Submittals: This factor includes the contractor's costs for preparation of shop drawings, materials certifications and instructions, providing samples and product data, and construction progress schedules. A recommended value of 5 percent has been established.

B.2: General Conditions

The B.2 factor represents a prime contractor's on-site project management costs. It covers field supervision and quality control costs. A recommended value of 4.25 percent has been established. Before applying this factor, the PO should verify that the prime contractor's on-site project management costs have not already been included in any unit costs or bid prices. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet.

Part C: Construction Cost Contingencies (Design and Construction)

A contingency is a monetary provision for uncertainties and unforeseeable costs. It is included in an estimate to create an appropriate level of probability for completing the project within that estimate. The cost allowances added to the estimate in Part C of the CEF represent financial protections for the final delivery of the eligible scope of work (developed in Parts A and B), defined during the engineering and design phase. Part C includes:

C.1 – Design Phase Scope Contingencies: This factor represents standard cost estimating contingencies based on the design and engineering process as a function of time. This contingency is based on the concept that there are typically more unknowns and items at the schematic design stage than, at the final design stage.

C.2 – Facility or Project Constructability: C.2 allows for premiums due to site conditions or construction process complexities that could increase the cost of a project.

C.3 – Access, Staging, and Storage Contingencies: This factor addresses varying degrees of difficulty in mounting the particular job at a specific site. For example, work in an urban environment may require storage of materials and equipment several miles away from the actual construction site, increasing the project cost.

C.4 – Economies of Scale: This factor offsets the overstatement of costs when CEF factors are applied to large projects.

To apply the C.1, C.2, and C.3 factors, enter the percentage for each work type. To apply the C.4 factor, check the boxes for the work types to which the factor should be applied. If no percentages or check boxes are selected, the C factor will be zero. Record all assumptions for selecting factors in the CEF Notes Sheet.

C.1: Standard Design-Phase Scope Contingencies

The project should be evaluated to determine the design phase at the time the estimate is prepared. The level of completion of A&E work as a function of time can characterize the construction. The unknowns gradually decrease as the scope of work is defined, details for completing the work are developed, and the project advances towards a set of construction drawings and specifications that can be used by a construction contractor. The C.1 factor is designed to account for these unknowns. Two levels of design development are considered in C.1, as described below.

Preliminary Engineering Analysis Stage: At this stage, concepts have been developed, usually without a significant level of detailing. It is difficult to accurately quantify work at this stage, and contractors would assume a relatively high level of risk in bidding a project at this time. A recommended range of 15 to 20 percent is established to allow some differentiation between simple and more complex projects.

Working Drawing Stage: At this stage, the design is more advanced, concepts have been determined, detailing is more complete, and work tasks and quantities have been readily defined. Contractors would assume a low to medium level of risk in bidding this type of project. The recommended range of 2 to 10 percent allows for some differentiation depending on the level of completeness of working drawings. A project in the preliminary working drawing stage, which would have an average level of detail and readily identifiable quantities, should be assigned a factor at the upper end of the range. A project in the final working drawing stage should be assigned a factor at the lower end of the range.

It is important to note that the C.1 contingency is intended to represent the state of the project design development at the time that the CEF is prepared. The PO should obtain all information necessary to prepare the CEF for the current state of project development. As stated above, record all assumptions or the basis for selecting factors in the CEF Notes Sheet.

C.2: Facility or Project Constructability

The C.2 factor is intended to address project complexity, as it relates to the type of facility, and to the type of repair or retrofit being performed.

The complexity of construction activities varies among different types of projects. New construction is comprehensive in scope; that is, something is created where nothing existed before. Conversely, repair and retrofit projects, which must be accomplished within the physical and operational constraints of existing facilities, tend to consist of tasks that are more selectively located, are more intensely detailed and sequenced, and require closer supervision throughout the process. Therefore, the C.2 factor applies to repair and retrofit projects only. No complexity allowance is provided for new construction; it is assumed that the design process takes the complexity of the project into account.

The constructability factor represents site conditions or construction process complexities such as the following:

- steep site embankments;
- unstable soil conditions;
- difficult subsurface construction conditions requiring such activities as de-watering and rock excavation;
- extreme weather conditions affecting productivity, such as winter shutdowns;
- urban sites;
- special building code requirements;
- availability of adequate energy, skilled craft labor, and building materials;
- the applicant’s special requirements and restrictions; and
- environmental considerations.

The applicant’s requirements and restrictions must be reasonable; that is, they must apply to the specific services related to the eligible scope of construction. For example, specific tolerances related to sports facility floors and seating; end user and/or environmental requirements for hospitals and museums; and special site-specific construction requirements, or restrictions, mandated by state or local regulatory agencies. Such requirements or restrictions could include, for example, interstate construction during night hours because of peak traffic flow impacts.

If possible, project complexity issues should be addressed in Part A. If all complexity issues are addressed in Part A, the C.2 factor should not be used. However, if certain project conditions cannot be identified or quantified, select a suitable factor from the range of values given in Table C.2.

**Table C.2
Constructability Factors**

Project Category and Type	Percentage Range
Category C – roads (rural-urban)	1-2
Category C – bridges and culverts (simple-complex)	1-5
Category D – water control facilities	1-5
Category E – simple open buildings	1-2
Category E – schools, libraries, and offices	1-5
Category E – hospitals, museums and historic buildings	1-7
Category F – public utilities	1-5
Category G – park and recreation facilities	1-5

Simple construction projects should be assigned a C.2 factor of 0 or 1 percent; projects with a combination of features that increase complexity should be assigned factors at the upper end of the appropriate range. For example, two bridges may require the same materials and equipment. However, if unstable soil conditions exist at one of the bridges, the work at this bridge will require more detailed sequencing and greater supervision. As stated above, record all assumptions for selecting factors in the CEF Notes Sheet.

C.3: Access, Storage, and Staging Contingencies

The C.3 factors address project site conditions that impose additional costs on the work activities listed in Part A. As with C.2, these items should be specifically defined in Part A, if possible. However, if the need for these contingencies is unclear and is not accounted for in Part A, the C.3 factors should be applied. The factors represent the following:

Site Access: This factor addresses access to the project site. Examples include difficult or long access routes for trucks delivering materials; a temporary access roadway or driveway constructed to provide access for equipment; site loading conditions requiring heavy equipment such as barges, cranes, or forklifts; off-site parking for workers; and obstructions created by utilities or exposed systems.

Storage: This factor addresses the storage of construction materials and equipment on site to support proper staging and construction activities. Examples include off-site storage of materials due to space constraints; temporary easements; and lot, sidewalk, or roadway space rental costs.

Staging: This contingency addresses the timing and execution of the work, which could be complicated by occupation of facilities, lack of space, and access to the facility. This factor should be used for sites that have work access limitations because services must continue to run in spite of the construction, such as hospitals and city halls.

The recommended range of values for the C.3 factors is 1 to 4 percent. The PO should assign the appropriate value according to the impact each of these factors has on project cost. All assumptions for selecting factors should be recorded in the CEF Notes Sheet.

C.4: Economies of Scale

Economies of scale are the increases or decreases in cost, resulting from task or project size. For example, the mobilization cost associated with putting a laborer to work is proportionally higher for one day's work than they would otherwise be for 30 days work. Typically, unit costs are applicable for projects of a given size; use of these costs for projects outside of this range can result in distorted estimates. This concept also applies to the factors in the CEF. Therefore, economies of scale must be accounted for when using the CEF. Economy of scale is particularly applicable to new construction projects, but it is also applicable for other types of work where there is a reduction in cost due to the project size.

Table C.4 lists the construction cost changes (in percentages) that can be anticipated due to economies of scale. The multiplier is set automatically when the user checks the box for the type of work to which the factor should be applied. If the user does not check a box, the factor will be zero. If it can be determined that the unit costs in Part A and the factors in Part B reflect economies of scale, the C.4 factor should not be used. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet.

**Table C.4
Economies of Scale**

<i>Project Size</i>	<i>Construction cost change (%)</i>
Under \$500,000	0
Under \$2 million	-0.5
Under \$10 million	-1
Over \$10 million	-2

Part D: General Contractor’s Overhead and Profit

Part D accounts for the general contractor’s construction costs that have not been included in Parts A, B or C. These factors reflect the general contractor’s home office overhead and costs that are related to the construction contract, such as insurance, bonding costs, and profit. Part D factors should not be applied to force account work. Additionally, Part D does not reflect the subcontractors’ overhead and profit, which should be included in the line items listed in Part A.

To apply Part D, select the type of work to which the factor applies or enter the percentage, depending on the factor. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet.

D.1: General Contractor’s Home Office Overhead Costs

The general contractor’s main office expenses include labor and salary costs for personnel including the principals, estimators, project managers, and general office staff, plus all other operational expenses associated with working out of the main office. The value for D.1 is established at 7.7 percent. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet.

D.2: General Contractor’s Insurance, Payment, and Performance Bonds

This factor includes an allowance for general contractor’s payment and performance bonds (1.5 percent), builder’s risk insurance (0.3 percent), and public liability insurance (1.5 percent). The total value of the factor is fixed at 3.3 percent. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet.

D.3: Contractor’s Profit

The general contractor’s profit should be taken from Table D.3 below and is applied to the sum of Parts A, B, C, D.1, and D.2. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet.

**Table D.3
General Contractor's Profit**

Project Size (Sum of Parts A, B, C, D.1, and D.2)	General Contractor's Profit (%)		
	Repair	Retrofit	New Construction
Under \$500,000	10	10	10
\$500,000 to \$750,000	9	9	9
\$750,000 to \$1.5 million	8	8	7.5
\$1.5 million to \$3 million	7	7	6.5
\$3 million to \$5 million	5.5	5.5	5
\$5 million to \$10 million	4.5	4.5	4
Over \$10 million	3	3	3

Part E: Cost Escalation Allowance
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Part E allows the user to adjust the estimated construction costs to account for inflation during the design and construction period. This factor should only be used for escalating the cost of uncompleted work. To apply Part E, which employs a nationally recognized economic inflation factor, the user establishes a design and construction time line to the mid-point of construction of the eligible portion of the work. This time line will vary according to whether the eligible work has already started or is delayed. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet. The escalated cost of construction is equal to:

$$\text{Escalated cost} = (\text{sum of Parts A through D}) \times (\text{number of months to the midpoint of uncompleted construction}) \times (\text{escalation factor})$$

Before further discussion relating to the cost escalation allowance to the mid-point of uncompleted construction; a design and/or construction timeline needs to be developed and analyzed for eligibility, reasonableness and applicability to the type of construction activity being contemplated.

The Applicant is responsible for submitting their design and/or construction timeline (as appropriate) to the PO during the project formulation stage. The timeline must include start and finish dates for both the design and/or construction phases. The timeline must be referenced to the eligible scope of work only, and the criterion also applies to improved and alternate projects as well. For further information, reference the Applicant Handbook (FEMA Publication 323) - Chapter 6, Handling Large Projects. This reference describes a subgrantees' large project roles and responsibilities.

The PO will check the eligibility, reasonableness, and applicability of the design and/or construction timeline submitted by the Applicant, against the appropriate local data or the R.S. Means cost data referenced at items 1 to 3 (beginning at page 36), prior to application of the CEF, as follows:

- i. Check the ten largest cost item work activities against the local data or the R.S. Means cost data.
- ii. Check 20 to 30 percent of the remaining cost item work activities at random against the local data or the R.S. Means cost data.
- iii. If the line-item work activities checked within the Applicant timeline are within 10 percent of the local data or the R.S. Means cost data, use the Applicant timeline for determining the midpoint of uncompleted construction.
- iv. If the line-item work activities checked in the Applicant timeline are not within 10 percent of the local data or the R.S. Means cost data, assume the entire timeline is not comparable, and attempt to resolve discrepancies with the Applicant. If discrepancies cannot be resolved and the design and/or construction timeline include ineligible items of work (as agreed by the PAC or PAO) use the PO developed timeline. Care should be exercised to ensure that the work activities used to develop the timeline contain eligible items of work only.

In the absence of an applicant submitted design and/or construction timeline, the PO will develop the timeline considering the following elements described in items 1 to 3. The number of months in the escalated cost formula depicted on page 35, is referenced to the *mid-point of uncompleted construction*, based on the durations necessary to complete the following timelines, as applicable:

1. Preparation of design and bid documents: The duration for design can be estimated using data provided by the applicant for completion of similar projects (local data). If this information is not available, the design time will have to be estimated. Use the appropriate R.S. Means cost data book according to the type of infrastructure being analyzed for estimating design times. For example, R.S. Means' *Facilities Cost Data* recommends estimating the design time for different building types at 25-40 percent of the construction duration (see "Construction Time Requirements," R01-020). For this example, the lower bound should be used for typical flood and hurricane wind disasters, where the damage necessitates less complex design; the upper bound would be applicable to major seismic and hurricane disasters where greater damage necessitates more complex analysis and design.

Repair and replacement activities that are based on a facilities "As-Built" drawing will typically not require a design duration similar to that of a new construction project. For this example, the design effort may be limited to updating applicable permits, assembling boiler plate contract language, assembling applicable construction standards and specifications, tabulating work activity descriptions and quantities with their itemized unit prices, and deriving an engineers estimate for the eligible scope of work prior to bid solicitation. In all cases, the PO should ensure that the components of the design effort are fully understood, and are reasonable and applicable to the type of construction activity being contemplated for the eligible scope of work.

2. Solicitation of bids, review of bids and award of contract: The duration for bidding and award can be estimated using data provided by the applicant for completion of similar projects (local data). If this information is not available, the estimated bidding and award time will have to be estimated. A period of two to three months for bidding and award

duration is typical. Extremely large projects (over \$5,000,000) may need additional time for the bidding and award process.

3. Construction start and completion dates: The duration for construction can be estimated by one of two methods. For the first method, the PO may use information provided by the applicant for completion of similar projects (local data). For the second method, the PO should prepare an outline of the major construction tasks, and determine the duration and linkages (critical paths and dependencies) associated with each of these tasks to arrive at a total construction time.

The construction start date is determined from the date that the applicant gives notice to proceed to the contractor. The construction completion date occurs when the owner accepts the project and agrees to pay any outstanding retainage due the contractor (normally after project punch-list work has been completed and accepted). Use the appropriate R.S. Means cost data book according to the type of infrastructure being analyzed and reference the "Construction Time Requirements" section to determine the total eligible construction value, for eligible work only.

It is important that the construction timeline reflect only eligible items of work. For example, owner activities such as maintenance, capital improvement planning efforts, ineligible facility improvements, and ineligible code upgrades, are not considered part of the eligible scope of work and should be excluded from the construction timeline.

For improved projects involving a replacement facility, at the same or new site, 406 hazard mitigation work items will *not* be eligible and therefore are excluded from the construction timeline. For alternate projects, 406 hazard mitigation work items will *not* be eligible and therefore are excluded from the construction timeline. When evaluating improved or alternate projects, the construction duration should reflect the eligible items of work only.

Having affirmed the eligibility, reasonableness, and applicability of the design and/or construction timeline (whether applicant or PO developed) to the construction activity being contemplated, the *cost escalation allowance to the mid-point of uncompleted construction* can now be computed as follows:

The escalation factor is based on a 2-year average of either the Building Cost Index (BCI) or the Construction Cost Index (CCI) according to the *Engineering News Record*. Definitions for the BCI and CCI can be found in this publication. The appropriate index should be chosen according to the nature of the project. The 2-year average of the appropriate index should be used to calculate an average, monthly cost escalation percentage. The PAO or designee is responsible for calculating this percentage at the beginning of a disaster. BCI or CCI information can be obtained from the *Engineering News Record* internet site located at <http://www.enr.com/cost/cost2.asp>. The escalation factor should be calculated annually and distributed to the POs for application within the CEF for disasters of longer duration.

For example, a disaster is declared in September 1998. For large building projects, the PAO references the BCI for September 1996 (3246) and August 1998 (3391). The index has risen 145 points, meaning that the 2-year average can be calculated as $(145/3246 \times 100) = 4.5$ percent. For CEF purposes, the escalation factor used is a linear interpolation rather than a compound rate. The monthly value can be calculated by dividing the 2-year average by 24 (the number of

months accounted for in the 2-year average). This equates to a rate of 0.188 percent per month.

To apply the Part E factor, enter the monthly escalation rate and the number of months to the midpoint of *uncompleted* construction. Example 1 in Appendix B shows the monthly escalation factor being applied to a project where the work is uncompleted. In the example, the time for completing the outstanding eligible scope of work was calculated. This value, in months, was then multiplied by the monthly escalation rate and divided by two to escalate to the midpoint of construction. The factor was then applied to each work type for the sum of Parts A through D. All assumptions for selecting the escalation factor should be recorded in the CEF Notes Sheet.

Part F: Plan Review and Construction Permit Costs

Part F reflects fees charged by state and local agencies for plan reviews and construction permits. It should include all fees that are paid to others to obtain approvals required before construction can commence. The actual cost of the fees should be entered into the spreadsheet.

The applicant is generally responsible for obtaining all of the required reviews and producing a bid-ready set of plans and specifications that have been through agency reviews, plan checks, and general building permit processes. Sometimes an applicant may, at his or her option, require the contractor to obtain specific permits necessary for actually performing the eligible scope of work. Record all assumptions or the basis for selecting factors in the CEF Notes.

F.1: Plan Review Fees

At the beginning of the disaster, PAO or designee is responsible for defining the required plan review fee schedules and distributing that information to the POs. The PO, working with the applicant, should determine exact figures for plan review fees. Note that state-owned facilities (such as schools, medical facilities, bridges, and treatment plants) may have different approval requirements than other facilities. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet.

F.2: Construction Permit Fees

As with plan review fees, the PAO is responsible for defining the required construction permit fee schedules at the beginning of the disaster and distributing that information to the POs. The PO, working with the applicant, should determine exact fees for construction permits.

Part F is not applicable in those situations where state and local agencies waive fees during disaster recovery situations. The PAO is responsible for notifying the POs of these circumstances. All assumptions for selecting factors should be recorded in the CEF Notes Sheet.

Part G: Applicant's Reserve for Construction

Part G reflects the applicant's reserve for construction. This reserve is intended to be controlled by the applicant; it is to be used to fund approved change orders to eligible work and any other incidental costs that may be incurred after the construction contract is awarded. However, it does not reflect discretionary change orders for upgrades or for any ineligible work. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet.

When a work type selection box is highlighted, the applicant's reserve in Part G is applied to the work type subtotal of Parts A through F. The applicant's reserve is based on project size, as shown in Table G.1.

**Table G.1
Applicant's Reserve for Construction**

Project Size (Sum of Parts A through F)	Percentage
Less Than \$200,000	7
\$200,001 to \$800,000	6
\$800,001 to \$1,400,000	5
\$1,400,000 to \$2,000,000	4
Greater Than \$2,000,000	3

Part H: Applicant's Project Management and Design Costs

Part H represents the applicant's costs for overall project development and management throughout the design and construction phases. The factor includes the applicant's costs for:

- managing the design process;
- basic design and inspection services normally performed by an A&E firm; and
- managing the construction phase (either third party or in-house).

Incidental development costs should be absorbed into these categories.

As stated above, Part H *does not* duplicate the administrative allowance provided to the applicant under the Stafford Act. That allowance is provided to meet the cost of requesting, obtaining, and administering disaster assistance. Part H covers the cost of managing the project, not grant funds. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet.

H.1: Applicant's Project Management - Design Phase

The applicant's costs to manage the project during the design phase include:

- managing the A&E contracts for final design;
- managing the permitting and special review process; and
- interfacing with other agencies.

A value of 1 percent has been established for this factor. To apply the H.1 factor, select the box under each work type to which the factor is to be applied. If the factor box is not highlighted, the factor will be zero. The H.1 factor is not applicable in those situations where design is not required. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet.

H.2: A&E Design Contract Costs

This factor covers the cost of basic design and inspection services, normally performed by an A&E firm, as well as a number of additional services not necessarily required with every construction project. The basic services consist of:

- preliminary engineering analysis;
- preliminary design;
- final design; and
- construction inspection.

The engineering service curves found in the Public Assistance Guide, FEMA 286 are used to estimate the cost of basic engineering services as a percentage of the estimated construction cost. One of two curves, *Curve A* and *Curve B*, may be used to determine the appropriate percentage. These curves have been incorporated into the CEF Spreadsheet.

Curve A applies to projects with above-average complexity and non-standard design. Examples include:

- Airports with extensive terminal facilities
- Water, wastewater and industrial waste treatment plants
- Hospitals, schools, and office buildings
- Power plants
- Large dams and complicated small dams
- Highway and railway tunnels
- Pumping stations
- Incinerators
- Complicated waterfront and marine terminal facilities

Curve B applies to projects of average complexity. Examples include:

- Industrial buildings, warehouses, garages, hangars and comparable structures
- Bridges and other structures of conventional design
- Simple waterfront facilities
- Roads and streets
- Conventional levees, floodwalls, and retaining walls
- Small dams
- Storm sewers and drains
- Sanitary sewers
- Water distribution lines
- Irrigation works, except pumping plants
- Airports, except as classified for Curve A

The user must select the appropriate project complexity curve and check the box for that curve on the spreadsheet. The spreadsheet automatically calculates the percentage to be applied. If a box is not checked, the factor is zero.

In addition to the basic services described above, the following special services may be required and are not usually included in the fee for basic engineering services. These services should be specifically described and justified in Part A, and the cost estimated, before the services are included in the CEF. Examples include:

- Engineering surveys
- Soil investigations
- Resident engineer services
- Feasibility studies

When the nature of work requires only basic construction inspection services, a fee that does not exceed 3 percent of construction cost should be used to cover the following items:

- Review of bids
- Work site inspection visits
- Checking and approval of material samples
- Review of shop drawings and change orders
- Review contractors request for payment
- Acting as the applicant's representative

The user must enter the percentage for basic construction services. If the box for this factor is not checked, the factor will be zero.

Parts H.2 is not applicable in those situations where design, construction inspection or other basic services are not required. All assumptions for selecting factors should be recorded in the CEF Notes Sheet.

H.3: Project Management - Construction Phase

Project management costs during the construction phase are estimated using Table H.3 and include:

- quality assurance and management of additional testing during construction;
- advertising and awarding the construction contract;
- decisions on construction problems and requests for information;
- management of change orders for on-site construction conditions and design errors; and
- omissions and unforeseen problems, such as differing site conditions and hidden damage.

Table H.3
Project Management – Construction Phase

Construction Costs	Project Management - Construction Phase (%)
under \$500,000	6
\$500,000 to \$1,000,000	5
\$1,000,000 to \$5,000,000	4
Greater than \$5,000,000	3

To apply the H.3 factor, select the box under each work type to which the factor is to be applied. The values will be automatically calculated. If a box is not checked, the factor will be zero. Record all assumptions or the basis for selecting factors in the CEF Notes Sheet.