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# Development of Construction Cost Estimates for Energy Conservation

## UFC 3-400-01

# UFC 3-400-01 Requirements

- United Facilities Criteria for Energy Conservation
- Purpose-establish minimum standards for energy conservation in new construction and in renovation
- Scope-All new and existing DOD facilities (CONUS and OCONUS)
- Scope-All new buildings (all renovations that are over 25% of the building-50% for the Navy)

# UFC 3-400-01 Requirements

- Buildings shall achieve an energy consumption level at least 30% below the level achieved by ASHRAE 90.1 (American Society of Heating, Refrigerating and Air-Conditioning Engineers)
- If 30% is not achievable in a life cycle cost effective manner then achieve the maximum savings that can be achieved in a life cycle cost effective manner

# UFC 3-400-01 Requirements

- All energy consuming products shall be either Energy Star Qualified or FEMP (Federal Energy Management Program) approved.
- All Energy consuming products shall be designated as low standby power.
- Both Recovered and renewable energy shall be used in the design. Solar hot water shall be used in each design to furnish a minimum of 30% of hot water demand (if life cycle cost effective)
- Must use Building Life Cycle Costing program developed by NIST-National Institute of Standards and Technology for the economic determination of whether the design meets the intent of the UFC

# Development of Construction Cost Estimates

- Types of estimates-
  - Budgetary/ROM
  - Parametric
  - Bottoms up

# Development of Budgetary Estimate

- PAX Newsletter-3.2.2 20 Mar 2009

Provides unit costs for many facilities-this is historical cost however and must be adjusted for any energy design criteria

1391 Charettes

Historical Analysis Generator-HAG II-Provides the actual costs of many types of facilities over the years-again historical and must be adjusted with a typical average and maybe a sizing adjustment

# Development of Parametric Estimates

- Parametric estimates are often used to determine cost for non-construction purchases (service or commercial items type procurement)
- For Construction use PACES (Parametric Cost Estimating System)-Contact Karen Schofield at HNC for further details 256-895-1069
- Using SF cost from HAG and from RS Means to determine a rough estimate

# Development of Detailed Estimate

- For Construction Estimates under FAR part 36- must be bottoms up-assume you were a contractor bidding on the work
- COE regulations ER1110-2-1302 Civil Works Cost Engineering
- Applicable UFCs
  - UFC 3-700-01-A Programming Cost Estimates for Military Construction
  - UFC 3-700-02A Construction Cost Estimates
  - UFC 3-701-07 DOD Facilities Pricing Guide

# Basis of any Estimate

- What you know at the time you are developing the estimate. Must have some scope. From that you develop the estimate.
- Impact of energy conservation requirements is still unknown-the Design community will have to assist in development of cost estimating relationships that will allow us to project effectively

# Who you should bug depends upon the type of estimate

- If this is a COS (Center of Standardization) then we have a standard design-the COS will have to describe the changes to that design
- If this is not a COS then you must talk with all the designers to determine what the impact will be
- You can always back into an estimate (i.e. what is the maximum price I can pay and still meet the 30% reduction in energy life cycle requirement) and see if it passes the smell test

# Typical Components of an Estimate

- Quantities-The King
- Productivity-The Queen
- Crews/Assemblies-An amalgam of what is required to do a job
- Equipment
- Labor
- Mob/Demob
- Conditions
- Profit/Bonds

# Steps in Development of Life Cycle Cost Decisions

- Feasibility Study-Determine what possible savings candidates there are and what are the potential savings
- Savings include-Energy, Ops& Maint Reduction, Avoided Cost
- Technical disciplines Develop The technical impacts i.e. savings of so many hours for O&M or KWH or KW
- Cost Branch will take those numbers and determine a return on investment for each alternative
- Sensitivity analysis applied to each alternative to determine the impact of the assumptions on each decision
- Will decide based on the Savings to Investment Ratio which should be pursued
- Those to be pursued will be part of the Request for Proposal

# Soup To Nuts on Life Cycle Cost Decision Process

- Government becomes aware of potential savings through a Study or some other method
- Government will perform a feasibility study to determine the best alternatives to pursue
- Government will put those alternatives into a n RFP
- Contractor will bid may also provide other alternatives.
- Government
- Government will evaluate the offerors alternative and design which to pursue
- The Government and contractor will negotiate the particulars of each contract
- Savings are Typically measured and monitored

# Many Trade offs in the decision

- Life Cycle is all about trade offs-one typically spends more at first but less over all
- The types of trade offs made are not only first cost versus life cycle cost but also security issues or maintenance issues or many of a litany of other things
- The main purpose of life cycle, however, is to make the most cost effective decision .

# Life Cycle Methodology

- Life of the alternative is based on the particular parameters of the system unless dictated by regulation or law
- Determine first cost, energy cost, O&M cost, Repair and Renewal cost, other ancillary costs
- Run a life cycle analysis including sensitivity analysis based on OMB A-94
- Make recommendations based on ROI or SIR or energy reduction