UFC 3-730-01
01 March 2024

UNIFIED FACILITIES CRITERIA (UFC)

PROGRAMMING COST ESTIMATES FOR MILITARY CONSTRUCTION

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UNIFIED FACILITIES CRITERIA (UFC)

PROGRAMMING COST ESTIMATES FOR MILITARY CONSTRUCTION

Indicate the preparing activity beside the Service responsible for preparing the document.

U.S. ARMY CORPS OF ENGINEERS (Preparing Activity)

NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND

AIR FORCE CIVIL ENGINEER CENTER

Record of Changes (changes are indicated by **\1** ... **/1/**)

Change No.	Date	Location

This UFC supersedes UFC 3-730-01, dated 6 June 2011.

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FOREWORD

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD (AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States is also governed by Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA). Therefore, the acquisition team must ensure compliance with the most stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Systems Command (NAVFAC), and Air Force Civil Engineer Center (AFCEC) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. Recommended changes with supporting rationale may be sent to the respective DoD working group by submitting a Criteria Change Request (CCR) via the Internet site listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

- Whole Building Design Guide web site http://www.wbdg.org/ffc/dod.

Refer to UFC 1-200-01, *DoD Building Code*, for implementation of new issuances on projects.

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CHAPTER 1 INTRODUCTION

1-1 BACKGROUND.

Programming cost estimates are to be prepared as accurately as possible to reflect the cost of providing facilities. To do this, basic data is to be accurate and applied consistently. A basic cost model that reflects all applicable factors derived from accurate data forms the basis for determining facility programming cost at a specific location and under specific conditions.

1-2 REISSUES AND CANCELS.

This UFC reissues and cancels UFC 3-730-01, dated 6 June 2011.

1-3 PURPOSE AND SCOPE.

This UFC establishes criteria and standards for development of programming cost estimates for constructing military facilities using published guidance unit cost (GUC) or using a parametric estimating program. The most current GUCs are provided in UFC 3-701-01 or the U.S. Army Corps of Engineers *Army Facilities Pricing Guide, PAX Newsletter 3.2.2*. The Tri-Services approved Parametric Cost Engineering System (PACES) may also be used for development of programming cost estimates for constructing military facilities.

This UFC addresses programming cost estimates for new construction and alteration projects, and includes cost data (based on historic data and experience) and factors for adjusting facility costs to reflect project conditions. This UFC also addresses supporting facilities cost and project cost.

The equations and examples in this UFC are represented in English units. This does not alleviate the requirement to comply with MIL-STD-3007 to use metric units in criteria documents.

1-4 APPLICABILITY.

This UFC applies to military construction (MILCON) and military operations and maintenance (O&M) projects.

1-5 GLOSSARY.

Appendix D contains acronyms, abbreviations, and terms.

1-6 REFERENCES.

Appendix E contains a list of references used in this UFC. The publication date of the code or standard is not included. Unless otherwise specified, the most recent edition of the referenced publication applies.

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CHAPTER 2 ESTIMATING NEW PRIMARY FACILITIES (LESS FAMILY HOUSING)

2-1 COST ESTIMATE PREPARATION.

Cost estimates may be prepared using the latest approved software for each cognizant design agency and other authorized cost and pricing sources.

2-2 COST ESTIMATES USING PUBLISHED GUIDANCE UNIT COST.

2-2.1 Guidance Unit Cost (GUC).

Cost estimates may use GUCs published in either UFC 3-701-01 or the Army *PAX Newsletter 3.2.2*. These publications contain a listing of expected facility unit costs, updated annually. The prices for facilities in both documents are based on criteria existing at the time of preparation, as authorized by existing regulations.

2-2.2 Adjusted Guidance Unit Cost Equation.

A unit cost for a facility, which should reflect the adjusted GUC conditions for the facility, can be obtained by using the following equation:

Equation 2-1. Formula to Estimate Facility Adjusted Guidance Unit Cost

$$\$A = \$GUC \times S \times ACF \times CE \times TU \times DC \times HR \times SS$$

Where:
$A = adjusted guidance unit cost
$GUC = guidance unit cost
S = size factor
ACF = area cost factor
CE = cost escalation
TU = technological updating factor
DC = design contingency
HR = historical requirement factor
SS = site sensitivity factor

2-2.3 Basic Adjustment Factors.

Programming cost estimates are to include proper allowances for all factors that may be reasonably expected to influence cost through the expected construction period. However, deviations which are significantly above or below the factored unit cost must be explained in detail. If the adjusted cost estimate is over the statutory limit (e.g., family housing), a waiver including complete substantiating data is to be requested in accordance with cognizant agency policy.

2-2.3.1 Size Factor (S).

Use size factors in Table 2-1 when facility gross area differs from a similar type facility's reference size (see Table 2 of UFC 3-701-01). Calculate the size ratio by dividing the programmed facility size by the facility reference size. Use the project size factors in Table 2-2 for barracks/dormitories and Table 2-3 for military family housing facilities. The size factors in Tables 2-1 through 2-3 do not include progressive collapse or seismic requirements; calculations for facilities of three or more stories should include these costs.

Note: Table 2 of 3-701-01 is posted with "Related Materials" on the Whole Building Design Guide at: https://www.wbdg.org/FFC/DOD/UFC/ufc_3_701_01_2022_c3_Data_Tables.xlsx.

2-2.3.2 Area Cost Factor (ACF).

The ACF, updated annually, reflects average statistical differences in normal labor, material, and equipment costs for similar facilities built in different geographical locations. See Table 4-1 of UFC 3-701-01 for factors to adjust estimated costs to specific geographical areas.

2-2.3.3 Cost Escalation (CE).

The unit costs shown in Table 2 of UFC 3-701-01 reflect historical costs only, normalized to the "as of" reference date in the table. These costs are to be escalated to the expected midpoint of construction using the appropriate cost escalation. Table 4-2 of UFC 3-701-01 is updated annually and provides data to use to project cost escalation due to inflationary factors affecting construction costs. Determine the midpoint of construction for each facility based on a realistic assessment of the construction schedule. Refer to the cognizant agency for more details. It may be necessary to interpolate between the escalation rates for the months between the stated years. When using the Army PAX Newsletter for projects scheduled differently than the assumed midpoint of construction, follow the guidance in the newsletter.

2-2.3.4 Technological Updating (TU) Factor.

Technological advances in equipment and operational techniques used in some specialized facilities are being developed rapidly, often resulting in obsolescence before design and construction are completed. Also, revisions in criteria to provide life cycle cost benefits may increase initial funding requirements before feedback data can reflect the added cost. A TU factor may be appropriate in these situations. Fully document and explain use of these factors in the cost estimate notes. Table 2-4 lists technological updating factors by DoD Basic Category group codes of facilities.

Table 2-1 Size Factors

Size Ratio	Size Factor	Size Ratio	Size Factor
≤0.0500	1.2750	1.6000	0.9570
0.1000	1.2690	1.6500	0.9550
0.1500	1.2320	1.7000	0.9530
0.2000	1.2020	1.7500	0.9510
0.2500	1.1750	1.8000	0.9490
0.3000	1.1520	1.8500	0.9470
0.3500	1.1320	1.9000	0.9450
0.4000	1.1140	1.9500	0.9430
0.4500	1.0980	2.0000	0.9420
0.5000	1.0840	2.0500	0.9400
0.5500	1.0720	2.1000	0.9390
0.6000	1.0600	2.1500	0.9370
0.6500	1.0500	2.2000	0.9360
0.7000	1.0410	2.2500	0.9350
0.7500	1.0330	2.3000	0.9330
0.8000	1.0250	2.3500	0.9320
0.8500	1.0180	2.4000	0.9310
0.9000	1.0110	2.4500	0.9300
0.9500	1.0050	2.5000	0.9290
1.0000	1.0000	2.5500	0.9280
1.0500	0.9950	2.6000	0.9270
1.1000	0.9900	2.6500	0.9260
1.1500	0.9860	2.7000	0.9250
1.2000	0.9820	2.7500	0.9240
1.2500	0.9780	2.8000	0.9240
1.3000	0.9740	2.8500	0.9230
1.3500	0.9710	2.9000	0.9220
1.4000	0.9680	2.9500	0.9210
1.4500	0.9650	3.0000	0.9210
1.5000	0.9620	3.0500	0.9200
1.5500	0.9600	>3.05	0.9200

Table 2-2 Barracks/Dormitories Project Size Factors

Numbers of Service Members in the Project	Project Size Factor
1-99	1.07
100-149	1.03
150-199	1.00
200-299	0.97
300+	0.95

Table 2-3 Military Family Housing Project Size Factors

Number of Units in the Project	Project Size Factor
1-9	1.25
10-19	1.15
20-49	1.10
50-99	1.04
100-199	1.00
200-299	0.93
300+	0.90

Table 2-4 Technological Updating Factors

DoD Basic Category	Category Series Description	TU Factor
300	Research, Development, Test, & Evaluation facilities	1.10
500	Hospital and medical facilities	1.05

2-2.3.5 Design Contingency (DC).

The cost estimate may include a DC based on the lack of maturity of design data. The DC covers component items that cannot be analyzed or evaluated at the time the cost estimate is prepared; however, these items are susceptible to cost evaluation as engineering and design progresses. The DC depends on the reliability and refinement of the data on which the cost estimate is based, so reliability and refinement diminishes as design progresses from programming through the design completion stage. Though it decreases at each successive design stage, the initial magnitude of the DC at

programming depends on the technical complexity of the project for which the cost estimate is being prepared. The level of technical complexity must be a prerequisite for determining the magnitude of the DC. DC is listed in Table 2-5. If a cost and schedule risk analysis (CSRA) is required during programming, develop the design contingency using CSRA. Refer to UFC 3-740-05 for further guidance.

Table 2-5 Design Contingency

Technical Complexity Level	Description	Design Contingency
Low	Site adapted, repetitive standard design project involving routine technology	1.050
Medium	Unique design involving complex technology	1.100
High	Unique design involving highly complex technology	1.200
Ultra-high	Unique design involving extremely complex or innovative technology	1.300

2-2.3.6 Historical Requirements (HR) Factor.

A factor for unique architectural features to comply with HR is permitted for facilities to be built at locations listed in the National Register of Historical Places. The factor for HR is typically 1.05. Deviation above the allowed factor must be explained in detail.

2-2.3.7 Site Sensitivity (SS) Factor.

An SS factor may be necessary for special cases where the unique nature of both the site and the project, in relation to one another, will cause a significant impact on the cost. As recommended practice, analysis for SS factor should consider only those unique site conditions which will influence cost by virtue of the uniqueness of the conditions involved. The method outlined in Section 2-5 may be used to determine the cost impact caused by the influence of a project upon itself, resulting from an extremely large concentration of construction effort, or from extreme site limitations, or from both. Appendix B lists examples of SS considerations and computations with a range of values, where applicable, from above normal to substantially below normal. This listing only provides examples and is not comprehensive.

2-3 COST ESTIMATES USING PARAMETRIC MODELS.

2-3.1 Parametric Cost Estimating.

Parametric cost estimating is a computer-based methodology that uses factors based on engineering parameters developed from historical cost databases, construction practices, and engineering and construction technology. These factors include physical properties that describe project definition characteristics, such as size, building type,

foundation type, exterior materials, roof type and materials, number of floors, functional space requirements, and utility requirements. The major advantage of parametric cost estimating is that it can provide detailed construction cost relatively quickly with only limited analysis of the facility. Parametric cost estimating is only as good as the effort expended in identifying the key project inputs. It must be based upon an accurately developed construction scope. All parametric assumptions and key project inputs must be documented to provide rationale for development of the cost estimate. All major entities involved with the project must be energized and actively participate in project scope validation, including installation personnel, the Project Manager, and the Project Delivery Team (PDT). At this time, the only Tri-Services approved computer-based parametric estimating program is PACES, and training is required prior to use.

2-4 OTHER ALLOWABLE COSTS FOR PRIMARY FACILITIES.

There may be situations where additional costs will be required for the project, which are not part of the GUC or parametric model and may be itemized separately. Use of these itemized costs must comply with cognizant design agency guidance and be fully documented and explained in the cost estimate notes.

2-5 ADJUSTED GUIDANCE UNIT COST ESTIMATE EXAMPLE.

The equation for the guidance unit cost adjustment determination is:

$$\$A = \$GUC \times S \times ACF \times CE \times TU \times DC \times HR \times SS$$

Where:
$GUC = guidance unit cost
S = size factor
ACF = area cost factor
CE = cost escalation
TU = technological updating factor
DC = design contingency
HR = historical requirement factor
SS = site sensitivity factor

Paragraphs 2-5.1 through 2-5.10 provide an example for calculating the facility cost estimate for a 48,750 square foot general purpose administration building, Navy category code 61010, to be built at Naval Station Norfolk, Virginia, in the FY25 program. This example assumes a contract award in FY25, a construction start date of Oct 2026, and a construction completion date of Oct 2027.

2-5.1 Step 1 - Unadjusted Cost.

In Table 2 of UFC 3-701-01, find the unit cost for the applicable building type closest to the building type being programmed. The Administrative Facilities: Multi-Purpose Administration facility is the comparable facility with a unit cost of $503/sf and a reference size of 45,000 square feet. **Note:** UFC 3-701-01 Table 2 is updated annually; numbers used within this example may not correspond or be current.

2-5.2 Step 2 - Size Factor.

Calculate a size ratio by dividing the programmed building size by the reference size. Using the closest comparable size ratio, determine the size adjustment factor from Table 2-1 of this UFC. The 48,750 square foot programmed building size divided by the 45,000 square foot reference building size yields a size ratio factor of ~1.08. Using Table 2-1, find the size ratio of 1.05 and obtain an adjustment factor of 0.9950.

2-5.3 Step 3 - Area Cost Factor.

Determine the location adjustment factor from Table 4-1 of UFC 3-701-01. For Naval Station Norfolk, Virginia, the 0.92 applies.

2-5.4 Step 4 - Cost Escalation.

Make allowance for cost growth due to economic factors anticipated between the dates on which the cost and pricing data in Table 2 of UFC 3-701-01 are based and the expected midpoint of construction date for the project being programmed. For this FY25 example project, construction start is Oct 2026 and construction completion is Oct 2027. The midpoint of construction will be six months after the start date. Using UFC 3-701-01, dated March 2022, Change 1, which reflects historical cost and pricing data normalized to Oct 2021 for preparation of the DoD budget for FY25, projected escalation factors from Table 4-2 of UFC 3-701-01 are 1.0000 for October 2021, 1.1062 for October 2026, and 1.1284 for October 2027. The escalation factor to October 2025 would be 1.1062/1.000 or 1.1062. Interpolating for six additional months of projected escalation factor and adding this to the 1.1062 projected escalation factor will provide the total projected escalation factor to be used.

(1.1284 - 1.1062) ÷ 12 = 0.00185

6 months × 0.00185 = 0.0111

1.1062 + 0.0111 = 1.1173

2-5.5 Step 5 - Technological Updating Factor.

Make allowance for cost adjustment due to updated technology by using the technological updating factor from Table 2-4. For this example, administrative facilities are not represented in the table; therefore, the factor is 1.00.

2-5.6 Step 6- Design Contingency.

Determine the DC in accordance with Table 2-5. The building is considered a low complexity. Using Table 2-5, the DC is 1.05.

2-5.7 Step 7 - Historical Requirements Factor.

Make allowance for cost adjustment due to historical requirements by using the HR factor of 5%, or 1.05.

2-5.8 Step 8 – Site Sensitivity Factor.

Make allowance for cost adjustment due to site sensitivity by using the SS factor of 4.55% or 1.0455.

2-5.9 Step 9 - Adjusted Cost.

Calculate adjusted cost using the equation for the adjusted GUC as follows:

$$\$A = \$GUC \times S \times ACF \times CE \times TU \times DC \times HR \times SS$$

$$\$A = \$503/sf \times 0.995 \times 0.92 \times 1.1173 \times 1.00 \times 1.05 \times 1.05 \times 1.0455$$

$$= \$593.00/sf$$

2-5.10 Step 10 – Facility Cost.

Determine the estimated facility cost by multiplying the size of the facility being programmed by the adjusted unit cost ($A) derived in Step 9, and then round off the product. The size 48,750 square feet multiplied by $593.00 per square foot yields a facility cost estimate of $28,908,750, which when rounded to the nearest million dollars yields $29,000,000.

CHAPTER 3 SUPPORTING FACILTIES COSTS AND PROJECT COSTS.

3-1 SUPPORTING FACILITIES UNIT COSTS.

Cost estimates may use supporting facility unit costs published in UFC 3-701-01. Supporting facilities are items of construction directly related to the project such as utilities, roads and parking, and site improvements. Supporting facilities' unit costs need to be adjusted by applying a location adjustment factor, cost escalation, and design contingency. Specific details for unit costs are defined in paragraphs 3-1.1 through 3-1.1.2.

3-1.1 Munitions and Explosives of Concern (MEC) Unit Cost.

Unit costs for MEC are available in UFC 3-701-01. The unit cost is based on surface area. The user will need to determine the depth necessary for MEC investigation to determine which MEC unit costs to include.

3-1.1.1 MEC Investigation and Removal Process (8 Step).

The following steps are part of a typical MEC investigation and removal process. Other items may need consideration depending upon site conditions.

- Step 1: GPS Survey – Survey of subject site boundaries.
- Step 2: Area Assessment – Walkthrough visual assessment of site for potential items on surface.
- Step 3: Area Preparation – Basic site clearing (does not include vegetation clearing (e.g., trees and shrubs).
- Step 4: Surface Clearance – Scan of surface with metal detectors.
- Step 5: Subsurface Detection – Scan of site with high density metal detectors typically reaching to a depth of 2 feet below surface without excavation.
- Step 6: Excavation – Excavation of site removing the top 2-foot layer to allow subsurface scanning 2 feet below the previous scan.
- Step 7: Access and Identification – Object located by scan and identified as possible MEC or other.
- Step 8: Disposal – Removal and disposal of MEC object.

3-1.1.2 Types of MEC Unit Costs.

Two unit costs are available for MEC based on the required depth of investigation. They are listed below and indicate which steps from paragraph 3-1.1.1 apply.

- Surface Investigation (includes Steps 1-5, 7 and 8) – Investigation and clearing.

- Deep Investigation (includes Steps 1-8) – Clearing to 4 feet below surface.

3-2 PROJECT COST.

Project cost is defined as the sum of construction costs, including primary facility costs, supporting facilities' costs, any other allowable costs, cost allowances for contingencies, other allowances for supervision, inspection, and overhead (SIOH), and design-build design cost.

3-2.1 Construction Contingencies.

As recommended practice, include in each programming cost estimate a separate item as a reserve for construction contingencies to cover construction requirements which cannot be foreseen before the contract is awarded. The contingency reserve is used for some adverse or unexpected condition that cannot be predetermined from the data at hand during engineering and design and at the time of contract award -- usually latent difficulties such as unforeseeable relocations; unforeseeable foundation conditions; utility lines in unforeseeable locations; or other unforeseen problems. The contingency reserve is not an allowance for omissions of work items known to be required, but for which quality or quantity has not yet been determined by specific design.

In addition, as recommended practice, make reasonable allowances for all foreseeable requirements in the cost estimate, or include an allowance for cost adjustment. Application for construction contingency reserves must conform to cognizant design agency guidance. The construction contingency reserve for military construction programs and family housing new or replacement construction will typically be five percent of the total contract cost, but may be higher based on the results of the CSRA. Refer to UFC 3-740-05 for CSRA guidance.

3-2.2 Supervision, Inspection, and Overhead (SIOH).

Including a separate item for SIOH in each programming cost estimate is recommended. Application of SIOH rates must comply with Office of the Assistant Secretary of Defense, Energy, Installations, and Environment Memorandum, "Military Construction Supervision, Inspection, and Overhead Fixed Rates for Fiscal Year 2024 and Future Projects," April 14, 2022 (https://www.wbdg.org/FFC/DOD/UFC/ufc_3-701-01_MilCon_SIOH_Rates_Change_14Apr22.pdf).

For a list of applicable remote locations for Navy, refer to NAVFACINST 7820.0 (8 Aug 22) (https://www.wbdg.org/FFC/DOD/UFC/ufc_3-701-01_NAVFACINST_7820.2_SIOH.pdf), and the cognizant design agency for Army and Air Force.

3-2.3 Design-Build Design Cost.

Design-build projects may include a design-build design cost. The percentage used will comply with cognizant design agency guidance.

3-2.4 Other Allowable Cost.

Other allowable costs may include post-construction contract award services (PCAS), commissioning, other taxes (excise tax, gross receipts tax (GRT)), cybersecurity commissioning, low impact development (LID), sustainability, operations and maintenance support information (OMSI), progressive collapse, and design during construction.

Some states and nations do not have sales tax, but impose either GRTs (named variously among the states) or gross excise taxes. (Delaware, Nevada, Ohio, Oregon, Tennessee, Texas, and Washington have varying amounts of GRTs in lieu of a sales tax. Hawaii has a general excise tax.)

3-3 PROJECT COST ESTIMATE EXAMPLE.

Continuing the example from Chapter 2, determine the project cost by adding contingency and SIOH factors to facility cost with adjusted guidance unit cost and supporting facilities cost. (Assume a supporting facilities cost of $500,000.) Since this project is new construction and location is CONUS, a contingency factor of 1.05 and a SIOH factor of 1.065 should be applied as follows:

$$\begin{aligned} \text{Project Cost} &= (\$28{,}908{,}750 + \$500{,}000) \times 1.05 \times 1.065 \\ &= \$32{,}886{,}335 \end{aligned}$$

In accordance with Appendix A, the project cost is $33,000,000.

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CHAPTER 4 ESTIMATING ALTERATION PROJECTS

4-1 ESTIMATING FACILITY ALTERATON.

Alteration is defined as a change to interior or exterior facility arrangements to improve or change its current purpose. This includes installed equipment made a part of the existing facility, but does not include additions, expansions, or extensions. The procedures described in this paragraph provide a step-by-step method for preparing programming cost estimates for facility alteration when current design data is not available. The procedures are based on the ASTM E1557-09 UNIFORMAT II work breakdown structure (WBS) and relate the alteration work to new facility requirements as a percentage of new work.

Figure 4-1 is an example of a completed DA Form 7307-R. Appendix C tabulates the ratio of WBS cost to facility cost based on DoD military construction historical cost data. Table 4-1 shows the percentage of installation cost required for removal and the percentage cost required for installation.

% of Installation Cost Required for Removal: This is judgmental, assuming a percentage to remove (as compared to 100% for install).

% of Cost Required for Installation: The 35% is based on direct cost breakdown of UFC 3-701-01, paragraph 4-1. MILCON ACFs are calculated using a material/labor/equipment (MLE) ratio of 63/35/2.

Note: DA Form 7307-R, Cost Estimating Worksheet – Facility Alteration, is available at: https://armypubs.army.mil/pub/eforms/DR_a/pdf/A7307_R.pdf.

Table 4-1 Cost of Removal Versus Cost of Installation

WBS#	Description	% of Installation Cost Required for Removal	% of Cost Required for Installation
A10	Foundations	50	35
B10	Superstructure	50	35
B20	Exterior Closure	50	35
B30	Roofing	50	35
C10	Interior Construction	50	35
C30	Interior Finishes	50	35
D10	Conveying	50	35
D20	Plumbing	50	35
D30	HVAC	50	35
D40	Fire Protection	50	35
D50	Electrical	80	35
E10	Equipment	80	35
E20	Furnishings	50	35
F10	Special Construction	50	35

4-2 FACILITY ALTERATION COST ESTIMATE EXAMPLE.

Consider an FY25 alteration project for an existing 40,600 square foot multi-purpose administration building, category code 61010, at Naval Station Norfolk, Virginia, with midpoint of construction of April 2027. Step-by-step procedures using DA Form 7307-R in Figure 4-1 include:

Step 1: Identify the percentage of the building systems to be removed and enter in blocks 16a and 21a. Data for this block should be based on the scope of work (in many cases based on best judgment). A walk-through of the facility to be altered is the best way to obtain accurate data. Assume for this example that the substructure, superstructure, and exterior closure are not affected; that 80% of the interior and special construction is to be replaced; and that 75% of the electrical, mechanical, fire protection and plumbing are to be replaced.

Step 2: Using data obtained from Table 4-1, enter in block 16b the percentage of installation cost required for removal and in block 16c the percentage of cost required for installation.

Step 3: Obtain the ratio of WBS systems cost to facility cost for multi-purpose admin building from Appendix C and enter in blocks 16d and 21b.

Step 4**:** Calculate block 16e by multiplying entries in blocks 16a, 16b, 16c, and 16d. Calculate block 17, removal/demolition factor (RDF), by adding all entries in block 16e, which is 9.6% of the cost to build the building new. To calculate the total removal/demolition cost (RDC) for the project, use the following:

Equation 4-1. Formula to Calculate Removal/Demolition Cost

$$RDC = \$GUC \times S \times ACF \times CE \times TU \times DC \times HR \times SS \times RDF$$

Where:
$GUC = guidance unit cost
S = size factor
ACF = area cost factor
CE = cost escalation
TU = technological updating factor
DC = design contingency
HR = historical requirement factor
SS = site sensitivity factor
RDF = removal/demolition factor

RDC = $503 × 1.0110 × 0.92 × 1.1173 × 1.00 × 1.05 × 1.05 × 1.0455 × 0.096 = $57.84

Step 5: Determine replacement/new portion factor. The same method is used in the calculation for removal, except the cost includes 100% labor material and equipment. Calculate block 21c by multiplying entries in blocks 21a and 21b. Calculate block 22, replacement new factor (RNF), by adding all entries in block 21c. Total RNF

is 47.5% (block 22) of the cost to build the facility new. Calculate the total new work cost (NWC) as follows:

Equation 4-2. Formula to Calculate New Work Cost

$$NWC = \$GUC \times S \times ACF \times CE \times TU \times DC \times HR \times SS \times RNF$$

NWC = $503 × 1.0110 × 0.92 × 1.1173 × 1.00 × 1.05 × 1.05 × 1.0455 × 0.475 = $286.20

Step 6: Consider adding a special adjustment factor (SAF) due to construction limitations. Allowed demolition/removal and replacement construction limitations include:

- dust protection for adjacent work areas: 2-7%
- limited use of equipment (noise/power) limitations: 1-6%
- limited storage of construction materials: 1-6%
- protection of completed work: 2-6%
- shift work: 2-10%

Any other adjustment factor must be defined and justified. SAF due to construction limitations may be applied either to the total unit cost or to the total cost of the project. Using the SAF from block 25 of the completed DA Form 7307-R, the demolition and replacement costs are adjusted:

Adjusted RDC:

= RDC x (1+SAF%)
= $57.84 x 1.15 = $66.52/sf

Adjusted NWC:

= NWC x (1+SAF%)
= $286.20 x 1.15 = $329.13/sf

Total alteration cost:

= adjusted RDC + adjusted NWC
= $66.52/sf + $329.13/sf
= $395.65/sf

Step 7: Determine the facility estimated alteration cost by multiplying the area of the facility being programmed for alteration by the total alteration cost as follows:

= $395.65/sf x 40,600 sf
= $16,063,390

Step 8: Determine the project cost in accordance with the example in paragraph 3-3.

Figure 4-1 Example of DA Form 7307-R, Cost Estimating Worksheet– Facility Alteration

COST ESTIMATING WORKSHEET - FACILITY ALTERATION

1. PROJECT NUMBER	2. PROJECT TITLE			3. FY
12345	Renovate Administration Building			2025
4. BUILDING NUMBER	5. LOCATION			6. HISTORICAL
401	Fort Bragg, NC			YES NO
7. FACILITY TYPE	8. CATEGORY CODE	9. FACILITY SIZE *(SF)*	10. AREA TO BE ALTERED *(SF)*	11. FUND TYPE *(MCA/OMA/AFH)*
Multi-Purpose Administration Building	61010	40,600	40,600	MCON
12. ESTIMATOR/OFFICE/DATE	13. BASIS OF ESTIMATE		14. MONTHS	15. CONST START
J. Smith/MIDLANT/ Jan 2025	Walk-Through		12	10/26

16. REMOVAL/DEMOLITION PORTION OF PRIMARY FACILITY

BUILDING SYSTEM WORK BREAKDOWN	PERCENT OF SYSTEM ALTERED *a*	PERCENT OF LABOR TO REMOVE *b*	LABOR PERCENT TO INSTALL *c*	SYSTEM PERCENT OF TOTAL *d*	TOTAL PERCENT REMOVAL *e*
A10 FOUNDATIONS	0	50	35	6.99	0.0
B10 SUPERSTRUCTURE	0	50	35	13.02	0.0
B20 EXTERIOR CLOSURE	0	50	35	13.03	0.0
B30 ROOFING	0	50	35	2.12	0.0
C10 INTERIOR CONSTRUCTION	80	50	35	9.52	1.3
C30 INTERIOR FINISHES	80	50	35	8.22	1.1
D10 CONVEYING	0	50	35	1.11	0.0
D20 PLUMBING	75	50	35	3.39	0.4
D30 HVAC	75	50	35	19.57	2.6
D40 FIRE PROTECTION	75	50	35	2.39	0.3
D50 ELECTRICAL	75	80	35	17.83	3.7
E10 EQUIPMENT	0	80	35	0.18	0.0
E20 FURNISHINGS	0	50	35	1.14	0.0
F10 SPECIAL CONSTRUCTION	80	50	35	1.49	0.2
				17. RDF	9.6

18. FACILITY TYPE	19. CATEGORY CODE	20. AREA TO BE ALTERED *(SF)*
Multi-Purpose Administration Building	61010	40,600

21. REPLACEMENT/NEW PORTION OF PRIMARY FACILITY

BUILDING SYSTEM WORK BREAKDOWN	PERCENT OF SYSTEM REPLACED *a*	SYSTEM PERCENT OF TOTAL *b*	TOTAL PERCENT REPLACED *c*
A10 FOUNDATIONS	0	6.99	0.0
B10 SUPERSTRUCTURE	0	13.02	0.0
B20 EXTERIOR CLOSURE	0	13.03	0.0
B30 ROOFING	0	2.12	0.0
C10 INTERIOR CONSTRUCTION	80	9.52	7.6
C30 INTERIOR FINISHES	80	8.22	6.6
D10 CONVEYING	0	1.11	0.0
D20 PLUMBING	75	3.39	2.5
D30 HVAC	75	19.57	14.6
D40 FIRE PROTECTION	75	2.39	1.7
D50 ELECTRICAL	75	17.83	13.4
E10 EQUIPMENT	0	0.18	0.0
E20 FURNISHINGS	0	1.14	0.0
F10 SPECIAL CONSTRUCTION	80	1.49	1.1
		22. RNF	47.5

23. SPECIAL ADJUSTMENT FACTORS		24. PERCENT TO ADD
a.	DUST PROTECTION FOR ADJACENT WORK AREAS	5.0
b.	LIMITED USE OF EQUIPMENT *(NOISE/POWER LIMITATIONS)*	5.0
c.	LIMITED STORAGE OF CONSTRUCTION MATERIALS	5.0
d.	PROTECTION OF COMPLETED WORK	0.0
e.	SHIFT WORK	0.0
		25. SAF 15.00

DA FORM 7307-R, APR 1994

CHAPTER 5 ESTIMATING FAMILY HOUSING

5-1 FAMILY HOUSING COST MODEL.

Paragraphs 5-1.1 through 5-1.18 may be used to calculate cost estimates for construction of new and replacement family housing.

5-1.1 FY.

FY is the fiscal year in which the project is proposed.

5-1.2 Location.

Location is the installation and state in which the proposed construction will take place.

5-1.3 # Units.

This is the number of family housing dwelling units which will be constructed in this project. Note that for replacement projects, the number of units may be equal to or less than the number of units to be demolished.

5-1.4 AGSF.

AGSF is the average gross square feet (AGSF) of the units proposed for construction. Size of dwelling units must comply with UFC 4-711-01.

5-1.5 $/GSF.

$/GSF is the cost to construct family housing per gross square foot (GSF). The cost will correspond to the fiscal year of the project. Cost includes only the primary facility with sprinklers, including attached two car garage (though GSF of garage is excluded, cost of attached garage GSF is included) and attached exterior bulk storage, but not the supporting infrastructure, demolition, supporting amenities or special construction requirements.

5-1.6 5' Line Cost.

The 5-foot line cost is the cost for the dwelling unit only, and is equal to the number of units multiplied by the AGSF multiplied by the cost per GSF.

5-1.7 ACF.

The ACF adjusts the prescribed costs to the location of the proposed project. These factors are listed in UFC 3-701-01, Table 4-1, and are updated annually based on a construction market survey.

5-1.8 Project Size.

The project size factor allows for economies of scale and depends upon the project size. The prescribed unit cost ($GSF) is based on an average project size. Projects involving a large number of units will realize economies of scale, resulting in a smaller project size factor. Table 2-3 lists project size factors for family housing projects

5-1.9 Project Factor.

The project factor equals the ACF multiplied by the project size factor. One project factor applies to all units being constructed in a project. Do not calculate a separate factor for each type of unit (for example, two-, three-, and four-bedroom junior noncommissioned officers).

5-1.10 Adjusted Housing Cost.

The adjusted housing cost equals the 5-foot line cost multiplied by the project factor.

5-1.11 Solar Cost and Information System Cost.

These are additional costs not captured in the 5-foot line cost. If a project will include solar energy features, multiply the estimated solar cost by the ACF by the number of dwelling units to arrive at the total project solar cost. Note that such features must be justified based on a life cycle cost analysis. The information system cost must be added to every family housing construction project. This cost represents telephone and cable television connections and wiring inside the buildings' 5-foot line. Include cost per dwelling unit for communication and cable television. To arrive at the information system cost, multiply the cost per dwelling unit for communication and cable television by the ACF by the number of dwelling units.

5-1.12 Other.

In some instances, site conditions may involve additional costs for the primary facility (inside the 5-foot building line). Examples include rock excavation, special foundation requirements, soil stabilization, basements, or special architectural features.

5-1.13 Average Unit Cost.

Add the housing unit cost, the solar and information system cost (if any), and any "other" cost, and divide by the number of units.

5-1.14 Supporting Cost.

This includes all work outside the 5-foot building line, such as site preparation, roads, utilities, recreation, landscaping, site amenities, and demolition. Where support cost estimates can be documented, show the unit cost and how derived. Often, support costs for family housing projects are difficult to identity for various reasons. Proposed units may be sited where existing units are planned for demolition or the site is

undeveloped. If documenting support cost is difficult, use a percentage of the housing unit cost until a detailed analysis is completed. A separate cost breakout for demolition of existing units is recommended. Environmental conditions and individual state regulations must be considered when determining demolition cost. When using a "generic" for support cost and demolition, consider the ACF to arrive at the total support cost.

5-1.15 Estimated Construction Cost.

The summary subtotal consists of the -housing unit cost; solar cost, if any; other cost, if any; and the support cost.

5-1.16 Project Cost.

The project cost equals the estimated construction cost multiplied by the contingency cost by the SIOH. Include the appropriate design fee for Design-Build projects in project cost. Refer to paragraph 3-2.3.

5-1.17 Rounded Project Cost.

The rounded project cost is the project cost rounded in accordance with the Congressional rounding rule (see Appendix A).

5-1.18 Project Cost/SF.

The project cost per square foot equals the project rounded cost divided by the product of the number of units multiplied by the AGSF.

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APPENDIX A CONGRESSIONAL ROUNDING RULE

Amount	Nearest
Less than or equal to 1,000,000	10,000
1,000,001 to 5,000,000	50,000
5,000,001 to 10,000,000	100,000
10,000,001 to 15,000,000	200,000
15,000,001 to 20,000,000	500,000
20,000,001 or greater	1,000,000

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APPENDIX B SAMPLE SITE SENSITIVITY COST CONSIDERATIONS

Table B-1 Impact Identifier: Housing Availability

Condition	SS factor	Narrative Description of Condition with Resulting Assumptions and Computations
Normal	0	Adequate housing available in local area, no cost impact
Slightly below	+0.0525	Adequate housing not available in local area; however, housing is available within commuting distance. Assumptions: Provide travel allowance to location of adequate housing for key personnel and critical crafts. Computation example: Assume a travel allowance of $60/day ($0.60/mile for a 100-mile round trip commute), using 20 work days per month for a $1200/month travel allowance. Travel Allow Per Month/Avg Monthly Wages x Key Personnel + Critical Crafts Labor Costs as % of Total/Project Costs as 100%. (use $50/hour for a 40-hour work week and 4 weeks per month or $8,000) = Adjustment Factor ($1,200/8,000) x (35%/100%) = 0.0525
Substantially below normal	+0.0700	Inadequate housing in local area. Housing is not available within commuting distance. Assumptions: Provide trailer housing for majority of contractor personnel and skilled crafts. Computation example: Assume rental of trailers and sale of used trailers will not offset all original cost. Land lease and site development cost to be included in project cost. Loss on Trailers Lease and Development Cost/Total Project Cost = Adjustment Factor $2,000,000/$10,000,000 x (35%/100%) = 0.0700

Table B-2 Impact Identifier: Material Availability

Condition	SS Factor	Narrative Description of Condition with Resulting Assumptions and Computations
Normal	0	Project requirements do not exceed the capabilities of the local area. Site is within the normal delivery distance. No cost impact.
Slightly below	+0.0126	Project requirements do not exceed the capabilities of the local area, but site is outside normal delivery range. Assumptions: Additional hauling allowance required. Computation example: Add'l Cost for Hauling Beyond Normal Delivery Zone/Total Normal Mat'l Cost x Mat'l Cost as % of Total/Project Cost as 100% = Adjustment Factor $1,000,000/$50,000,000 x 63% = 0.0126
Substantially below normal	+0.0252	Project requirements exceed the capabilities of the area. Assumptions: Additional hauling allowance and onsite facilities required. Computation Example: Add'l Cost for Hauling & Storage Allowance/Total Normal Mat'l Cost x Mat'l Cost as a % of Total/Project Cost as 100% = Adjustment Factor $2,000,000/$50,000,000 x 63% = 0.0252

Table B-3 Impact Identifier: Local Site Peculiarities*

Condition	SS Factor	Narrative Description of Condition with Resulting Assumptions and Computations
Congested work area	+0.0280	Lost productivity caused by congested work area Assumptions: 3 hrs of non-productivity per week Computations: Unproductive Hrs Per Week/Productive x Labor Cost as a % of Total/Project Cost = Adjustment Factor (3/37) x (35%/100%) = 0.0280
Inadequate parking	+0.0175	Inadequate onsite parking for labor force. Assumptions: $400 per month parking allowance will be required. Computations: Parking Allowance Per Month/Avg Wage Per Month x Labor Cost as a % of Total/Project Cost as 100% = Adjustment Factor ($400/$8,000) x (35%/100%) = 0.0175

***Individual cost model analysis as required to justify each cost consideration**

Table B-4 Sample Site Adjustment Factor Summary

Impact identifier	Condition	SS Factor	Narrative Description of Condition with Resulting Assumptions and Computations
Housing availability	Normal	0	Adequate housing available in the local area
Material availability	Normal	0	Local area can meet all project requirements
Local site peculiarities	Individual analysis to justify each consideration	0.0280	Small congested work site
		0.0175	No parking onsite. No free parking near site.

Site Sensitivity Factor = 0 + 0 + 0.0280 + 0.0175 = 1.0455

Notes:
1. The first number in the SSF equation will always be 1 because the SSF must always be equal to or greater than 1.
2. The method outlined in this appendix may be used to determine the cost impact resulting from an extremely large concentration of construction effort, or from extensive site limitations, or both.
3. Determine the site sensitivity adjustment based on an analysis of site conditions, which will influence cost.
4. Factors applied take into account a material/labor/equipment (MLE) ratio of 63/35/2.

APPENDIX C RATIO OF WBS SYSTEMS COST TO FACILITY COST BY FACILITY TYPE

FACILITY TYPE	A10 Foundations	B10 Superstructure	B20 Exterior Enclosure	B30 Roofing	C10 Interior Construction	C30 Interior Finishes	D10 Conveying	D20 Plumbing	D30 HVAC	D40 Fire Protection	D50 Electrical	E10 Equipment	E20 Furnishings	F10 Special Construction
Intelligence Communications Center	6.14	9.68	7.08	3.87	5.61	7.41	0.52	3.65	21.86	2.3	31.57	0.12	0.05	0.14
Aircraft Operations Building	5.94	14.09	10.79	4.75	7.31	9.91	1.11	3.1	16.53	2.02	24.11	0.16	0.11	0.07
Military HQ/ Operations Building (Operations)	7.33	12.09	9.03	7.31	9.56	6.1	0.31	8.33	19.06	2.89	15.62	0.38	1.21	0.78
Military HQ/ Operations Building (Battalion)	5.56	13.11	9.14	3.91	7.93	8.53	1.46	3.45	18.01	2.3	22.32	1.41	0.18	2.69
General Instructions Building	3.61	11.47	13.66	3	9.69	8.54	0.61	5.94	17.2	2.51	22.56	0.41	0.71	0.09
High Bay Simulation Training Building	7.25	11.78	8.23	3.13	6.31	13.59	0.9	4	19.8	2.34	21.64	0.07	0.01	0.95
Applied Instruction Building	7.01	17.25	11.5	5.42	7.79	7	1.74	5.01	17.89	2.55	14.41	1.6	0.26	0.57
Reserve Center	4.56	12.84	12.22	3.99	7.89	11.15	0.68	5.29	19.68	2.62	18.15	0.78	0.01	0.14
General Purpose Maintenance Hangar	10.29	10.91	15.07	3.79	6.2	4.43	0.48	6.58	13.51	5.73	16.55	0.16	0.05	6.25
High Bay Maintenance Hangar	11.87	27.04	11.59	4.23	4.99	4.1	0.51	3.52	10.17	4.09	16.11	0.45	0.3	1.03
Shop, Vehicle Maintenance, Wheel & Track	13.78	13.34	18.52	3.84	5.18	4.6	1.08	5.19	17.73	1.94	13.95	0.85	0	0
Low Bay General Purpose Warehouse (<16', <15,000sf)	11.86	14.96	13.2	4.99	5.34	4.92	0	3.24	11.86	4.63	14.26	9.67	0	1.07
High Bay General Purpose Warehouse	14.97	16.24	17.92	6.55	6.07	3.56	0.69	2.37	10.48	5.7	12.81	1.81	0.35	0.48
High Explosive Magazine	23.5	27	34.19	2.85	0.03	0.19	0	0.09	0.87	0	9.22	0.08	0	1.98
Armory	8.67	16.47	9.91	6	5.56	3.31	0	3.52	17.14	2.81	16.05	9.47	0.29	0.8
Medical Clinic (<60,000 sf)	5.13	15.34	16.65	2.61	9.23	6.33	0.68	3.98	18.78	2.28	13.37	4.83	0.79	0

FACILITY TYPE	A10 Foundations	B10 Superstructure	B20 Exterior Enclosure	B30 Roofing	C10 Interior Construction	C30 Interior Finishes	D10 Conveying	D20 Plumbing	D30 HVAC	D40 Fire Protection	D50 Electrical	E10 Equipment	E20 Furnishings	F10 Special Construction
Mental/ Behavioral Health Clinic	6.59	11.73	12.06	2.79	11.73	7.27	1.27	7.21	18.83	1.04	17.38	1.86	0.15	0.09
Multi-purpose Administrative Facility	6.99	13.02	13.03	2.12	9.52	8.22	1.11	3.39	19.57	2.39	17.83	0.18	1.14	1.49
Enlisted Unaccompanied Personnel Housing	4.07	14.14	11.81	1.82	12.71	11.04	1.17	12.51	12.51	2.31	15.43	0.32	0.01	0.15
Enlisted Mess Hall	9.04	7.8	9.99	4.06	2.73	9.37	0.43	6.69	20.61	1.97	10.70	16.49	0.12	0
Child Development Center (<6 Years Old)	8.65	10.47	11.31	6.37	8.89	7.91	0.52	7.66	16.83	2.78	15.87	2.11	0.03	0.6
Physical Fitness Center	6.35	10.77	11.38	5.39	7.82	8.53	0.26	5.96	20.88	2.13	14.52	2.93	0.18	2.9
Parking Building/ Garages	23.49	44.54	5.89	5.02	1.75	3.04	2.22	2.09	0.23	1.82	9.09	0.82	0	0

APPENDIX D GLOSSARY

D-1 ACRONYMS.

A	adjusted unit cost
ACF	area cost factor
AGSF	average gross square feet
CE	cost escalation
CONUS	Continental United States
CSRA	Cost and Schedule Risk Analysis
DC	design contingency
GRT	gross receipts tax
GSF	gross square feet
GUC	guidance unit cost
HR	historical requirement factor
LID	low impact development
MEC	munitions and explosives of concern
MILCON	military construction
MLE	material/labor/equipment
NWC	new work cost
O&M	operation and maintenance
OMSI	operations and maintenance support information
PACES	Parametric Cost Engineering System
PAX	Programming Administration and Execution
PCAS	post-construction award services
PDT	Project Delivery Team
RDC	removal/demolition cost

RDF	removal/demolition factor
RNF	replacement new factor
S	size factor
SAF	special adjustment factor
SIOH	supervision, inspection, and overhead
SS	site sensitivity factor
TU	technological updating factor
WBS	Work Breakdown Structure

APPENDIX E REFERENCES

DEPARTMENT OF DEFENSE

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U.S. Army Corps of Engineers *Army Facilities Pricing Guide, PAX Newsletter 3.2.2*
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UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*

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E1557-09, *Standard Classification for Building Elements and Related Sitework* – UNIFORMAT II