

# **US AIR FORCE FAMILY HOUSING GUIDE**

for Planning, Programming, Design, and Construction



# **U.S. AIR FORCE**

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## CHAPTER 1 INTRODUCTION AND BACKGROUND

### 1-1 PURPOSE AND USE OF THIS GUIDE

This Guide provides definitive guidance for the planning, programming, design and construction of both United States Air Force (USAF) owned and privatized Family Housing (FH). It implements the Unified Facilities Criteria (UFC) 4-711-01, *Design: Family Housing*. It supplements Air Force Instructions (AFI) 32-6002, *Family Housing Planning, Programming, Design, and Construction*, AFI 32-6003, *General Officer Quarters (GOQ)* and AFI 32-6007 *Privatized Family Housing* by providing more detailed and quantifiable standards and technical guidance. For GOQs, this guide supplements the Air Force (AF) *GOQ Standards for Programming, Design, and Construction – Volume 2*.

- It provides standards and criteria for all AF FH unit and neighborhood projects. These projects include neighborhood planning, construction, acquisition, improvement, maintenance, repair and privatization of FH units and utility systems. The *Air Force Housing Support Facilities Guide* contains guidance for housing support facilities, such as the Housing Management Office, the Housing Maintenance Facility and the Furnishings Management Warehouse.
- Major Commands (MAJCOMs) will use this Guide to implement AF policy and provide oversight/control; each installation will use this Guide as a definitive implementation tool, with consideration given to local standards at overseas installations.
- It provides a consolidated source of relevant residential construction information and references other supporting publications.

### 1-2 AIR FORCE FAMILY HOUSING GOALS AND OBJECTIVES

The Air Force FH Goal statement defines the ideal end-state for military communities and housing. It is not intended to be a static end-state, but one that responds to the dynamics of Air Force families.

The Air Force FH Goal:

- **Provide Air Force families quality, energy-efficient, sustainable, low maintenance housing that supports the needs of the military family and reinforces the development of a strong sense of community.**

Air Force FH Objectives support the achievement of the FH goal. These objectives are:

- **Bring the existing required housing inventory up to contemporary housing standards (codes, functionality and amenities) through privatization or either improvement or replacement by traditional Military Construction (MILCON).**
- **Ensure the design of housing neighborhoods results in pedestrian friendly environments that encourage social interaction and are desirable places to call home.**

### **1-3 THE WHOLE-HOUSE/WHOLE-NEIGHBORHOOD CONCEPT**

The terms "whole-house" and "whole-neighborhood" are used to define a comprehensive approach to the improvement/replacement and repair of existing FH units and neighborhoods, in compliance with Department of Defense (DoD) Manual 4165.63-M, *DoD Housing Management*. In the past, because of previous programming constraints, installations performed many FH unit and infrastructure repairs and improvements in a piecemeal fashion. Ultimately, this method caused work to be duplicated and often created more problems than it solved. The Air Force paid start-up costs for multiple projects when one comprehensive renovation project could have addressed all of the improvement or repair issues at one time. It is difficult to ensure the compatibility of subsequent projects and their respective materials and systems when the projects overlap or when several projects run concurrently. Multiple housing projects also put undue inconvenience on military families living in the homes since workers must enter homes several times, as opposed to entering the homes once to complete a comprehensive project.

Whole-house/whole-neighborhood improvement efforts must:

- Improve housing units and neighborhoods to current codes and contemporary standards
- Be comprehensive
- Extend the useful life of facilities and infrastructure by 25 years
- Be cost effective
- Achieve acceptable energy efficiencies
- Apply appropriate sustainable design principles
- Apply force protection measures where necessary and feasible

Whole-House improvements and repairs to the FH units may include:

- Improvements and repairs to mechanical, electrical and plumbing systems
- Improvements and repairs to building foundations, walls and roofs restoring the unit to structural soundness
- Floor plan modifications to improve functionality
- Utility laterals, systems, or infrastructure provided for the sole use of the unit
- House lot amenities (driveway, walkways, patios, landscaping and privacy fences)

Whole-Neighborhood improvement efforts address the environment outside the housing units not provided for the sole use of the unit. These improvements may include but are not limited to:

- Utility and infrastructure repairs, improvements and replacement
- Community and housing perimeter fencing
- Streetscape and lighting repair, improvements and replacement
- Community amenities, such as playgrounds, community walkways and fitness trails
- Community area landscaping

Replacement of housing units is an option when improvement is no longer cost effective, i.e.: improvement costs exceed 70% of replacement costs.

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## CHAPTER 2 PROJECT DEVELOPMENT

### 2-1 INTRODUCTION

The AF operates and maintains approximately 104,000 housing units at installations in the United States and Overseas, consisting of government owned, privatized, and leased housing. The Office of the Secretary of Defense (OSD) policy has always been to rely on local communities to provide housing for military families.

The 2006-2011 Strategic Planning Guidance requires the AF to privatize 60% of the family housing inventory in the United States and its territories, eliminate inadequate housing at all but four United States installations by 2007, eliminate inadequate housing at the remaining four northern tier installations by 2008, and eliminate inadequate housing overseas by 2009. See Appendix A for the OSD definition of inadequate housing. The AF uses a two-part approach to address housing requirements:

- Air Force Family Housing Master Planning Process
- Project Planning and Programming

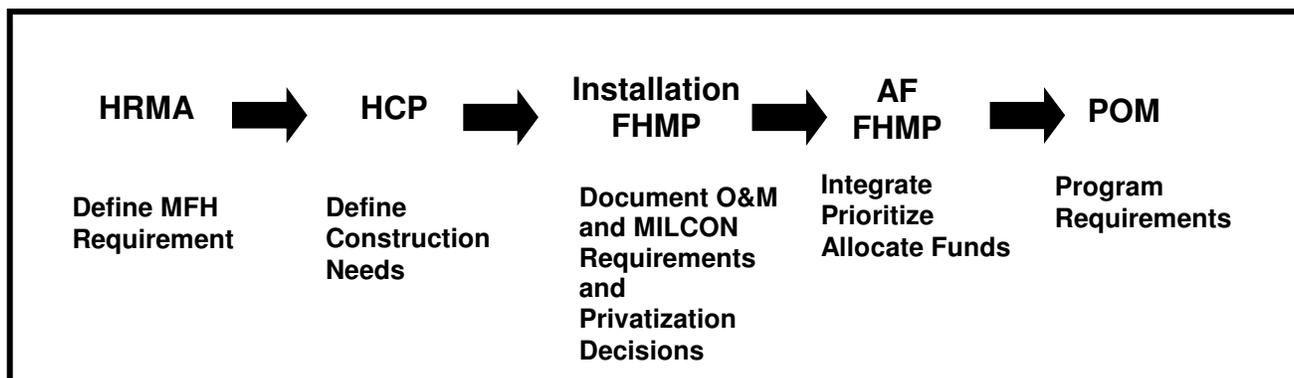
Each process is addressed in this chapter.

### 2-2 AIR FORCE FAMILY HOUSING MASTER PLAN

The AF Family Housing Master Plan (FHMP) provides a corporate, requirements-based housing investment strategy that integrates and prioritizes traditional construction and operations and maintenance funding with private sector financing within a single “road map”. The road map identifies the most cost-effective investment option for each installation (i.e., use of the new privatization authorities or traditional MILCON) to meet its military family housing requirements consistent with Congressional and OSD constraints and directives.

A standardized methodology and set of tools are used to develop the AF FHMP. Figure 2-1 depicts the steps taken to generate program requirements.

Figure 2-1: Air Force Family Housing Master Plan Process



- Housing Requirements and Market Analysis (HRMA): Determines the total military family housing requirement for personnel at each AF installation with military families.
- Housing Community Profiles (HCP): Provides a plan for the planning, programming, and design of improvement, replacement, and construction projects for military family housing areas based on the installation housing requirements identified in the HRMA, and recommends solutions to correct deficiencies.
- Installation Family Housing Master Plans (IFHMP): Incorporates the data from the HRMA and HCP and adjusts the HCP data to reflect the programmed start date for projects for each installation.
- Air Force Family Housing Master Plan (AF FHMP): Used by MAJCOMs and the AF to prepare Program Objective Memoranda (POM) and Budget Estimate Submissions. Accordingly, future budget documents will be based on and will be consistent with the Plan and supporting installation data.

### 2-2.1 Housing Requirements and Market Analysis

Current DoD guidance states that the local community should be the first source for satisfying the demand for housing generated by military families. The DoD requires that all military services determine their housing requirements based on a thorough analysis of the ability of local communities to house military families. The AF meets this need by the use of a HRMA at its installations. The HRMA assesses the type and amount of housing, including privatized housing both on and off base, which is available in the local community and satisfies DoD suitability criteria. On-base housing constructed with appropriated funds or the use of privatization authorities can be used to meet housing demand that is not satisfied in the local community.

The HRMA is a detailed study to determine the quantity and type of FH assets the U.S. Government must provide to ensure that the installation has acceptable housing for all military families they house. Typically, this study occurs every three years, but may occur more often as necessary. When major mission changes occur within the normal 3 year cycle, a new HRMA may be accomplished to assess the impact of the new requirements.

The result of the HRMA is the first step in the AFFHMP process and becomes the basis for Housing Community Profiles and the IFHMP.

### **2-2.1.1 Housing Requirements and Market Analysis Procedures**

While every installation is different and requires its own analysis, based on the specific situation at that installation, the HRMA process does have some common elements. The major milestones for developing an installation's HRMA include:

- Installation Data Collection Visit
- Preliminary Results Submittal
- Installation Commander Approval Brief on HRMA preliminary results
- Pre-Final Submittal
- Final Submittal

At each milestone, comments are provided by the Installation and MAJCOM to ensure that a fair representation of the unique situation at each installation is achieved.

### **2-2.1.2 Housing Requirements and Market Analysis Methodology**

OSD and AF policy establishes a minimum family housing requirement (Floor Requirement) for military housing assets at an installation. The Floor Requirement for each grade is identified as the greater of the following four criteria:

- 10% of each grade
- Housing for personnel in key and essential positions
- Preservation of required historic housing
- Housing for personnel whose level of Regular Military Compensation (RMC) is below 50 percent of the median family income in the local area

The process for creating a HRMA is outlined below, but for a more detailed explanation, see the latest HRMA Guidance Manual.

- Determine housing market area based on the greater of a 60-minute commute or 20 miles from the installation's headquarters building or major work centers
- Establish the military family housing requirement for each year of the analysis
- Determine the Floor Requirement as described above
- Determine potential private sector (community) absorption rate for each year of the analysis such that only the Floor Requirement remains occupied by the fifth year
- Determine competing military and civilian demand for suitable and unsuitable occupied housing
- Determine available suitable rental supply
- Compute military market share for each military segment:
  - $\text{Military Market Share} = (\text{Competing Military Demand} / \text{Total Competing Demand}) \times \text{Available Suitable Supply} + \text{Suitable Housing Occupied by Military Not Seeking Other Housing}$
- Compare military market share to competing military requirement to determine a shortfall, if any, in the fifth year
- Establish Total Military Housing Requirement as the sum of the Floor Requirement plus any Private Sector Shortfall

The HRMA determines if the private sector could potentially provide sufficient affordable and suitable housing for military families under the assumption that only the Floor Requirement will be available by the projected year of the analysis.

The AF housing inventory includes both government owned, leased, and privatized housing.

The methodology used in HRMAs simulates a dynamic process of adjustment between market area housing demand and supply. The analysis incorporates changes in military manpower, competing civilian demand and rental housing supply over a five-year period estimating the military market share for each year of the analysis.

The military market share is based, in part, on competition among military families, unaccompanied personnel and civilians who actively seek housing during the year. The Total Military Family Housing Requirement is the sum of the Floor Requirement (including privatized housing) plus any shortfall in private sector (community) housing.

## 2-2.2 Using Housing Requirements and Market Analysis Summary Tables

Once the HRMA has been completed, the Housing Inventory and Family Housing Requirements are used to create the tables found in Chapters 2 and 4 of the HCP. Table 2-1 is the HRMA summary table "Total Military Family Housing Requirements." Tables 2-2 thru 2-11 show the tables that are generated through the HCP process. Past HCP efforts may have used slightly different table formats than those shown, but the general process is the same. Each table contains an explanation as to its function.

- **Remember that it is DoD policy to first satisfy military personnel and FH requirements in the local community.** New construction for deficit reduction is justified only if the HRMA concludes that there is a shortfall of suitable units in the local community.

The AF does not program 5-bedroom units for new construction. Where a requirement for a 5-bedroom house exists, and only if it is cost effective, the requirement may be satisfied through the conversion of existing units.

### Table 2-1: Total MFH Requirements – FYXX

This table shows the total housing requirement from the HRMA for the last year of the analysis, as documented in Chapter 8 of the HRMA. Except for the column for 5+ bedrooms, this table is similar to Table 13A *Total Family Housing Requirement by Grade Grouping*, in Section 2.2 of the HCP. All GOQ and SOQ requirements are assumed to be four-bedroom units and all FGO, E-9, and SNCO requirements are assumed to be three- or four-bedroom units.

**Table 2-1: Total MFH Requirements – FYXX**

Designation	1BR	2BR	3BR	4BR	5+BR	TOTAL
GOQ	0	0	0	1	0	1
SOQ	0	0	0	9	0	9
FGO	0	0	27	17	0	44
CGO	0	70	29	15	0	114
<b>Subtotal</b>	<b>0</b>	<b>70</b>	<b>56</b>	<b>42</b>	<b>0</b>	<b>168</b>
E9	0	0	9	1	0	10
SNCO	0	0	103	42	0	145
JENL/JNCO	0	899	443	228	0	1,570
<b>Subtotal</b>	<b>0</b>	<b>899</b>	<b>555</b>	<b>271</b>	<b>0</b>	<b>1,725</b>
<b>Total</b>	<b>0</b>	<b>969</b>	<b>611</b>	<b>313</b>	<b>0</b>	<b>1,895</b>

**Table 2-2: MFH Assets – Existing Inventory – FYXX**

Found in Chapter 2 and Chapter 4 of the HCP. This table summarizes existing AF-owned, leased, and privatized FH units and is the summary of assets verified during the HRMA data collection. These assets also include units under construction at the time of the HCP assessment.

**Table 2-2: MFH Assets – Existing Inventory – FYXX**

(Sum of *FYXX Existing Inventory Unit Grade Mix* column on HCP Report 4.2.2 *Existing & Proposed Unit Grade Mix Report*)

Designation	1BR	2BR	3BR	4BR	5+BR	TOTAL
GOQ	0	0	0	1	0	1
SOQ	0	0	0	14	0	14
FGO	0	0	58	20	0	78
CGO	0	0	63	30	0	93
<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>121</b>	<b>65</b>	<b>0</b>	<b>186</b>
E9	0	0		0	0	0
SNCO	0	0	100	47	0	147
JENL/JNCO	0	427	628	142	0	1,197
<b>Subtotal</b>	<b>0</b>	<b>427</b>	<b>728</b>	<b>189</b>	<b>0</b>	<b>1,344</b>
<b>Total</b>	<b>0</b>	<b>427</b>	<b>849</b>	<b>254</b>	<b>0</b>	<b>1,530</b>

**Table 2-3: Mismatches – Surplus (Deficit)**

This table shows the apparent deficit or surplus of FH units on the installation, based only on quantity. The numbers are determined by subtracting the Total MFH Requirements (Table 2-1) from the Existing Inventory (Table 2-2). Parentheses “( )” in the table indicate that the requirement is greater than the current existing inventory for a particular grade and bedroom count. Positive numbers indicate that the current existing inventory is greater than the requirement for a particular grade and bedroom count. It does not determine whether existing assets are fully adequate for the Grade/Bedroom requirement they fulfill. This data becomes the basis of the HCP development concepts.

**Table 2-3: Mismatches – Surplus (Deficit)**

(*MFH Assets - Existing Inventory - FYXX* from HCP report 4.2.3 minus *Total MFH Requirements - FYXX* from HCP report 4.2.3)

Designation	1BR	2BR	3BR	4BR	5+BR	TOTAL
GOQ	0	0	0	0	0	0
SOQ	0	0	0	5	0	5
FGO	0	0	31	3	0	34
CGO	0	(70)	34	15	0	(21)
<b>Subtotal</b>	<b>0</b>	<b>(70)</b>	<b>65</b>	<b>23</b>	<b>0</b>	<b>18</b>
E9	0	0	(9)	(1)	0	(10)
SNCO	0	0	(3)	5	0	2
JENL/JNCO	0	(472)	185	(86)	0	(373)
<b>Subtotal</b>	<b>0</b>	<b>(472)</b>	<b>173</b>	<b>(82)</b>	<b>0</b>	<b>(381)</b>
<b>Total</b>	<b>0</b>	<b>(542)</b>	<b>238</b>	<b>(59)</b>	<b>0</b>	<b>(363)</b>

**Table 2-4: Proposed Units Remaining Same Grade/BR**

This table depicts use of existing assets to fulfill the requirements without a change of grade or bedroom. Each unit type is evaluated to determine if it is adequate for the existing grade and bedroom assignment. Once a particular unit type is determined to be adequate, it can be assigned to satisfy the Grade/Bedroom requirement it fulfills. This adequacy analysis is accomplished in the HCP.

**Table 2-4: Proposed Units Remaining Same Grade/BR**  
(Sum of *Grade/BR Same as Exist.* column on HCP Report 4.2.2)

Designation	1BR	2BR	3BR	4BR	5+BR	TOTAL
GOQ	0	0	0	1	0	1
SOQ	0	0	0	9	0	9
FGO	0	0	24	8	0	32
CGO	0	0	29	14	0	43
<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>53</b>	<b>32</b>	<b>0</b>	<b>85</b>
E9	0	0	0	0	0	0
SNCO	0	0	20	22	0	42
JENL/JNCO	0	383	209	83	0	675
<b>Subtotal</b>	<b>0</b>	<b>383</b>	<b>229</b>	<b>105</b>	<b>0</b>	<b>717</b>
<b>Total</b>	<b>0</b>	<b>383</b>	<b>282</b>	<b>137</b>	<b>0</b>	<b>802</b>

**Table 2-5: Proposed Units Converted**

This table is used to determine which existing assets can be used to fulfill the requirements through a change of grade or bedroom. Each unit type is evaluated to determine if the unit type is adequate for the grade and bedroom assigned. Once a particular unit type is determined to be inadequate it can be reassigned to satisfy a different Grade/Bedroom requirement, but only if that change makes the unit adequate.

**Table 2-5: Proposed Units Converted**  
(Sum of *Converted Grade/BR* column on HCP Report 4.2.2)

Designation	1BR	2BR	3BR	4BR	5+BR	TOTAL
GOQ	0	0	0	0	0	0
SOQ	0	0	0	0	0	0
FGO	0	0	0	7	0	7
CGO	0	42	0	0	0	42
<b>Subtotal</b>	<b>0</b>	<b>42</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>49</b>
E9	0	0	2	6	0	8
SNCO	0	0	50	6	0	56
JENL/JNCO	0	388	152	0	0	540
<b>Subtotal</b>	<b>0</b>	<b>388</b>	<b>204</b>	<b>12</b>	<b>0</b>	<b>604</b>
<b>Total</b>	<b>0</b>	<b>430</b>	<b>204</b>	<b>19</b>	<b>0</b>	<b>653</b>

**Table 2-6: Proposed Demolished/Lost Units (Due to conversion and/or neighborhood density reduction)**

This table depicts demolition/loss of existing assets due to reasons relating to neighborhood density or unit conversions. This table summarizes the "Proposed Demo/Lost" column of HCP Report 4.2.2. For example, if guest parking areas of playgrounds are inadequate, some units could be demolished to provide space for these amenities. Another example is when a duplex or multiplex building is converted to contain a smaller number of units.

**Table 2-6: Proposed Relocated Units**  
(Sum of *Proposed Demo/Lost* column on HCP Report 4.2.2)

Designation	1BR	2BR	3BR	4BR	5+BR	TOTAL
GOQ	0	0	0	0	0	0
SOQ	0	0	0	0	0	0
FGO	0	0	0	0	0	0
CGO	0	0	0	0	0	0
<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
E9	0	0	0	0	0	0
SNCO	0	0	0	0	0	0
JENL/JNCO	0	0	0	75	0	75
<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>75</b>	<b>0</b>	<b>75</b>
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>75</b>	<b>0</b>	<b>75</b>

**Table 2-7: Total Proposed Housing from Existing Inventory**

By adding the units in the three previous table examples (Tables 2-4 through 2-6) a table is developed that provides a summary of the HCP recommendations for use of all existing on base assets, except for surplus units. This table will be used to determine the remaining surplus (deficit) requirements that remain after using existing assets (Table 2-2 minus Table 2-7). There is the potential that some mismatches still exist and those can be seen in Table 2-8, if they exist.

**Table 2-7: Total Proposed Housing from Existing Inventory**  
(Sum of *Proposed Units Remaining Same Grade/BR plus Proposed Units Converted plus Proposed Demolished/Lost Units* from HCP Table 4.2.3)

Designation	1BR	2BR	3BR	4BR	5+BR	TOTAL
GOQ	0	0	0	1	0	1
SOQ	0	0	0	9	0	9
FGO	0	0	24	15	0	39
CGO	0	42	29	14	0	85
<b>Subtotal</b>	<b>0</b>	<b>42</b>	<b>53</b>	<b>39</b>	<b>0</b>	<b>134</b>
E9	0	0	2	6	0	8
SNCO	0	0	70	28	0	98
JENL/JNCO	0	771	361	158	0	1,290
<b>Subtotal</b>	<b>0</b>	<b>771</b>	<b>433</b>	<b>192</b>	<b>0</b>	<b>1,396</b>
<b>Total</b>	<b>0</b>	<b>813</b>	<b>486</b>	<b>231</b>	<b>0</b>	<b>1,530</b>

**Table 2-8: Remaining Surplus (Deficit) Requirements after Using Existing Assets**

This table provides a summary of the revised deficit or surplus units for each grade and bedroom category. It shows any remaining deficit or surplus units by grade and bedroom after all HCP recommendations are implemented. Positive numbers indicate a surplus in a particular grade/bedroom category, while numbers in parentheses “( )” show the number of deficit housing units per grade/bedroom category. The number of units identified as deficit that remain to be programmed (90% of the total) is further illustrated in the table 2-9. When the HCP identifies surplus units it further categorizes them into adequate/inadequate surplus.

**Table 2-8: Remaining Surplus (Deficit) Requirements after Using Existing Assets**

*(Total Proposed Housing from Existing Inventory minus Total MFH Requirements - FYXX from HCP Report 4.2.3)*

Designation	1BR	2BR	3BR	4BR	5+BR	TOTAL
GOQ	0	0	0	0	0	0
SOQ	0	0	0	0	0	0
FGO	0	0	(3)	(2)	0	(5)
CGO	0	(28)	0	(1)	0	(29)
<b>Subtotal</b>	<b>0</b>	<b>(28)</b>	<b>(3)</b>	<b>(3)</b>	<b>0</b>	<b>(34)</b>
E9	0	0	(7)	5	0	(2)
SNCO	0	0	(33)	(14)	0	(47)
JENL/JNCO	0	(128)	(82)	(70)	0	(280)
<b>Subtotal</b>	<b>0</b>	<b>(128)</b>	<b>(122)</b>	<b>(79)</b>	<b>0</b>	<b>(329)</b>
<b>Total</b>	<b>0</b>	<b>(156)</b>	<b>(125)</b>	<b>(82)</b>	<b>0</b>	<b>(363)</b>
<b>90% of Remaining Deficit =</b>						<b>(327)</b>

**Table 2-9: Proposed Deficit Construction**

In this table, the HCP contractor recommends the quantity of FH units by grade and bedroom category to be programmed for construction to reduce the deficit of units. The total quantity should match 90% of the remaining deficit total indicated in Table 2-8 above.

**Table 2-9: Proposed Deficit Construction**

*(Total equals 90% of Table 2-8)*

Designation	1BR	2BR	3BR	4BR	5+BR	TOTAL
GOQ	0	0	0	0	0	0
SOQ	0	0	0	0	0	0
FGO	0	0	3	2	0	5
CGO	0	28	0	1	0	29
<b>Subtotal</b>	<b>0</b>	<b>28</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>34</b>
E9	0	0	2	0	0	2
SNCO	0	0	33	14	0	47
JENL/JNCO	0	92	82	70	0	244
<b>Subtotal</b>	<b>0</b>	<b>92</b>	<b>117</b>	<b>84</b>	<b>0</b>	<b>293</b>
<b>Total</b>	<b>0</b>	<b>120</b>	<b>120</b>	<b>87</b>	<b>0</b>	<b>327</b>

**Table 2-10: Remaining (Deficit) Requirements after Building Deficit Construction**

This is a summary of the remaining (10%) deficit after building 90% Deficit Construction units.

**Table 2-10: Remaining (Deficit) Requirements after Building 90% Deficit Construction**

(Sum of Table 2-8 plus Table 2-9)

Designation	1BR	2BR	3BR	4BR	5+BR	TOTAL
GOQ	0	0	0	0	0	0
SOQ	0	0	0	0	0	0
FGO	0	0	0	0	0	0
CGO	0	0	0	0	0	0
<b>Subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
E9	0	0	(5)	5	0	0
SNCO	0	0	0	0	0	0
JENL/JNCO	0	(36)	0	0	0	(36)
<b>Subtotal</b>	<b>0</b>	<b>(36)</b>	<b>(5)</b>	<b>5</b>	<b>0</b>	<b>(36)</b>
<b>Total</b>	<b>0</b>	<b>(36)</b>	<b>(5)</b>	<b>5</b>	<b>0</b>	<b>(36)</b>

**Table 2-11: Total End State Constructed Inventory – Unit Grade Mix after Building Deficit Construction (and HCP recommended improvements).**

This is a summary of the Unit Grade Mix (UGM) of the total installation housing community at the end of the investment (improvement/replacement/new) construction. The table is based on the construction of deficit housing at 90% of the requirement (Table 2-10).

**Table 2-11: Total Constructed Inventory – UGM after Building Deficit Construction (and HCP recommended improvements)**

(Sum of Table 2-7 plus Table 2-9)

Designation	1BR	2BR	3BR	4BR	5+BR	TOTAL
GOQ	0	0	0	1	0	1
SOQ	0	0	0	9	0	9
FGO	0	0	27	17	0	44
CGO	0	70	29	15	0	114
<b>Subtotal</b>	<b>0</b>	<b>70</b>	<b>56</b>	<b>42</b>	<b>0</b>	<b>168</b>
E9	0	0	4	6	0	10
SNCO	0	0	103	42	0	145
JENL/JNCO	0	863	443	228	0	1,534
<b>Subtotal</b>	<b>0</b>	<b>863</b>	<b>550</b>	<b>270</b>	<b>0</b>	<b>1,689</b>
<b>Total</b>	<b>0</b>	<b>933</b>	<b>606</b>	<b>318</b>	<b>0</b>	<b>1,857</b>

### 2-2.3 Housing Community Profile

The HCP provides a long-range plan for the planning, programming, design and construction of improvement, replacement and privatization of FH projects. The HCP is the key to the Whole-House/Whole Neighborhood program. It is the justification for housing design projects submitted to AF/ILEH by the installation's respective MAJCOM. The AF has completed HCPs for all installations with a housing inventory and an update will be accomplished approximately every 3 years, depending on the mission requirement of the installation. In many cases, an update may consist of simply revising the HRMA. The HCP provides assessments of the current conditions of FH and describes actions and associated costs to bring the FH up to modern standards. The HCP determines the best investment decision (improvement or replacement) for each installation.

An HCP accomplishes the following:

- It identifies the total FH requirement by grade and number of bedrooms per dwelling unit.
- It provides assessments of the current conditions of housing units, neighborhoods and infrastructure within the FH area.
- It provides comprehensive housing unit and neighborhood-level concept designs and cost estimates for FH improvement projects. The HCP then serves as the basis for the development of all FH projects.
- It provides a comprehensive construction execution/phasing plan for programming out year investment projects.
- It incorporates Maintenance and Repair (M&R) and improvement requirements into a comprehensive whole-house improvement project.
- It provides a comprehensive, cost-effective programming and implementation plan in support of the AF FHMP, which defines project funding allocations and priorities.

### 2-2.3.1 Housing Community Profile Organization

The HCP is organized into the following chapters:

**Chapter 1, Introduction:** Provides general information and background data on the installation and explains the HCP purpose, process and methodology.

**Chapter 2, Housing Requirements and Market Analysis:** The HRMA, which demonstrates the supply and demand for FH.

**Chapter 3, Community Improvements:** Infrastructure and community improvements, with designs for circulation, streetscape, recreational opportunities, infrastructure and utilities.

**Chapter 4, Unit Improvements:** Unit improvements, with designs for floor plans, building exteriors, yards/patios and building systems.

**Chapter 5, Replacement Analysis:** Provides a systematic replacement analysis for an installation's neighborhoods and units.

**Chapter 6, Phasing Plan:** Provides a coordinated phasing plan that incorporates all investment decisions and recommendations from Chapter 5 requiring investment funding.

The third and fourth chapters, Community and Unit Improvements, contain detailed design/improvement recommendations accompanied by cost estimates for the particular item being discussed. The Community Improvements section contains master plans for each FH neighborhood. Each neighborhood plan defines the character or identity for that neighborhood in terms of the areas of focus described above. The Unit Improvement section addresses each type of unit according to the areas of focus noted above.

The fifth chapter, Replacement Analysis, compares the cost of replacing whole areas or neighborhoods with the costs of implementing the Whole Neighborhood/Whole House Improvement costs recommended and estimated in Chapters 3 and 4. Investment decisions (improvement/replacement) are based on this analysis.

The sixth chapter, the HCP Phasing Plan, summarizes the long-range plan. Both community and housing unit improvements are summarized and priced by neighborhood and phase. Each phase becomes the basis for programming documents (DD Form 1391) submitted by the MAJCOM to AF/ILEH for inclusion in the construction budget submission. AFI 32-6002 provides additional guidance for programming procedures.

### 2-2.3.2 Housing Community Profile Process:

- Detailed assessment of the entire housing area is performed at the installation to define the investment requirements for the MFH units and their associated neighborhoods. The total assessment includes a detailed physical assessment of one sample unit of each unit type in the MFH inventory and each distinct neighborhood. These physical assessments include both a detailed component condition assessment as well as a functional assessment against the AF Standards as defined in this guide. The assessment also includes interviews and document reviews with knowledgeable installation/MAJCOM staff to gather detailed operational and maintenance information that affects the plan development. Information gathered in this process should include documentation of all conditions known to the installation that may not be readily apparent during a visual inspection. Based on this detailed assessment, the “preliminary” Condition Assessment Matrix (CAM) for each unit type and neighborhood is developed.
- HRMA requirements are analyzed against the existing inventory at the installation to determine the best and most cost effective use of the existing inventory to satisfy the on base requirements. Preliminary decisions are made on rank re-designation and conversions of units. Also, if the HRMA shows a surplus at the installation, the potential surplus units/areas are identified typically based on worst condition and location.
- Based on preliminary decisions made in the above process, a functional review against the AF Standards is then conducted for each unit type and neighborhood/area in order to develop a renovation concept scheme for both the units and the associated neighborhoods/areas. The CAMs are finalized, capturing both component conditions and functional deficiencies.
- With the renovation concepts complete, the cost estimates are developed for both the units and neighborhood/areas to capture the cost to renovate the entire housing area including community and infrastructure costs. Replacement cost estimates are also developed for the same scope, type of units and infrastructure/community requirements.
- Once all the improvement and replacement cost estimates are complete, an improvement and replacement analysis is performed by neighborhood/area to determine the best MILCON investment decision. If the total neighborhood/area analysis is <70% of the replacement cost, the investment decision is to improve, and if it is >70% of the replacement cost, the investment decision is to replace.
- Based on the investment decisions, a construction phasing plan is then developed.

Refer to Figure 2-2 for a diagram of the HCP process and approval points.



### 2-2.3.3 Housing Community Profile Update Policy

HCP updates are provided by HQ AF every 3 years. Installations and MAJCOMs are responsible for ensuring that the updates revise the comprehensive concepts in accordance with changing requirements and investment policies.

- Updates must build upon the existing HCP and should not completely revise the comprehensive concepts generated in the original HCP, unless major mission changes warrant this action.
- HCP decisions are approved at the 15%, 50%, and final submittals by the Installation Wing Commander (CC). Final HCP results define the basis for funding allocations and priorities for the installation when integrated into the FHMP approved by the Chief of Staff – Air Force (CSAF) for funding allocations and priorities.

If, during the design phase of a housing project, the economic analysis indicates that replacing units rather than improving them is the most economical means to upgrade the housing inventory, the designer should complete a comprehensive site plan for the entire housing area. This will then be incorporated as an appendix of the existing HCP and will be used as the primary site plan in a subsequent HCP update.

By using the generic statement of work for HCP updates, the integrity of the original HCP can be ensured.

HCP updates are required after a new HRMA has been completed (every 3 years). When major mission changes occur within the normal 3 year cycle and a new HRMA is accomplished, a “Tabletop” HCP update may be accomplished based on the degree of impact to the overall plan. This effort, when required, will be validated by the MAJCOM and ILEH.

All contracts for HCP updates will be funded by AF/ILEH.

- AF/ILEH reviews and validates the MAJCOM HCP update programmatic requirements prior to releasing the contract for execution.
- AF/ILEH, working with AFCEE, has set up multiple Indefinite Quantity (Open End) Architect-Engineer (A-E) contracts which are available to support all MAJCOMs in completing the HCP updates.
- After updating the HCP, AFCEE will ensure copies are distributed to all respective office levels (installation, MAJCOM, and HQ USAF).

The results of the HCP will be used to develop the IFHMP and for the development of project specific DD Forms 1391. The HCP determines grade and bedroom requirements based on the HRMA and develops comprehensive neighborhood and unit concepts and costs which establish the parameters for construction projects.

## **2-2.4 Installation Family Housing Master Plan**

The IFHMP incorporates the data from the HRMA and HCP and adjusts the HCP data to reflect the beginning of the FYDP. This adjustment assumes projects programmed in years prior to the beginning of the FYDP are complete and future investment funding requirements start with beginning of the FYDP. The IFHMP also documents the Operation and Maintenance (O&M) funding requirements including operations, utilities, leases, privatization support costs, and sustainment costs including real property maintenance activities (RPMA) and real property maintenance by contract (RPMC). All of the O&M costs, with the exception of RPMC, are based on actual housing accounting records.

The sustainment RPMC costs are estimated by the real property maintenance (RPM) model. The RPM model uses the results of the CAM inspections conducted in support of the HCP to predict the timing and cost of major repair/replacement for housing components and infrastructure and community systems.

### **2-2.4.1 Real Property Maintenance Model**

The RPM Model, developed by the AF, provides a sound engineering basis for determining housing maintenance and repair requirements. The model calculates the required maintenance and repair costs for each government owned FH type and size at an installation. The model estimates the remaining economic life of each subsystem based on current condition, type of construction and location. It also calculates the costs to annually maintain each subsystem throughout its economic life and to replace it at the end of its economic life. By adding the annual costs of maintaining and replacing each subsystem, the model provides a projection of the total annual costs required to properly maintain and repair a house.

### **2-2.4.2 Housing Accounting Records**

Housing accounting records maintained at each installation provide a projection of recurring costs associated with the operation and maintenance of existing housing units. These costs include: utilities; services; leases; and routine, urgent, emergency and change-in-occupancy maintenance and repair.

### **2-2.4.3 Air Force Housing Privatization Proforma Model**

The proforma model is used to analyze data from the IFHMP. The data is used as a baseline to analyze the privatization potential and produce a "scored cost" for installations located in the United States and its territories not yet identified for privatization. The scored cost represents the amount of funding the AF would need to provide a private developer to perform improvement, replacement and deficit construction, as well as demolition of surplus housing, identified in the IFHMP. In addition to the scored costs, a life cycle cost analysis is performed that calculates the cost to maintain government ownership of the units versus privatization of the units.

#### 2-2.4.4 Corporate Decision Model

The data and decisions from the IFHMPs are rolled up into a Corporate Decision Model (CDM) used to produce the AF FHMP. The CDM prioritizes investment projects and allocates the projects to a fiscal year based on funding limits. These funding limits are established to ensure all investment projects can be completed to meet the OSD goals discussed earlier in this section.

#### 2-2.5 Guidelines for Addressing Surplus Housing

This section addresses disposal and maintenance of surplus family housing units at AF installations.

##### 2-2.5.1 Goal for Addressing Surplus Housing

- All inadequate surplus housing in the US and territories must be disposed of by 30 Sep 07 (except inadequate surplus housing at Minot, Mountain Home, Malmstrom, and Grand Forks AFBs must be disposed of by 2008 and inadequate surplus housing at overseas (foreign) installations must be disposed of by 2009).
- Installations will make every effort to remove units from the real property records in a timely manner after disposal.

##### 2-2.5.2 Housing Requirement

An installation's total family housing requirement is determined by an approved HRMA. Units in excess of those determined by the HRMA are considered surplus to the installation requirement. Once surplus housing units are identified, the installation must develop a disposal plan using a methodical and phased approach to reduce and consolidate family housing. The plan will consider government owned, leased, and Section 801 leased housing.

- Only two categories of surplus housing, "adequate" and "inadequate" are possible (reference Appendix A for definitions). Disposition will vary for each category depending on various factors as outlined in subsequent paragraphs.
- Identify surplus housing by unit type and neighborhood. Give consideration to economic investment, condition (dispose of the worst first based on the CAM score), location, size and occupancy. Consider disposing of leases and annexes first where economically feasible. Also support and enhance the community environment by reducing density, where possible, and maintaining neighborhood continuity. Historical housing units and those eligible to be historic may also be declared surplus with State Historic Preservation Office (SHPO) coordination.
  - Installations must actively manage surplus unit inventory to ensure proper accounting. Annotate surplus units in the *Automated Civil Engineer System-Housing Management* (ACES-HM).

Foreign overseas installations should follow appropriate guidelines for disposal of family housing as stipulated in status of forces agreements or other governing documents.

### 2-2.5.3 Scenarios

The Deputy Secretary of Defense memorandum, *Housing Requirements Determination Process Policy Guidance*, dated 8 Jan 03, defines the occupancy requirements necessary to retain surplus housing. Use a 3-year average occupancy rate (100 minus the vacancy rate as calculated by ACES-HM) to determine the average occupancy rate. Calculate twice per year (1 Apr and 1 Oct) for the previous 3 years to account for seasonal variations. When historical ACES-HM data is not available, supplement it with manual data. Subsequent paragraphs outline requirements and scenarios to guide installations on disposition of surplus housing.

- **Disposal Plan.** A plan to vacate and dispose of surplus units: when the occupancy rate drops below 97%, when the units become inadequate, and as units reach the end of their “useful economic life”. Adequate surplus units may be disposed of gradually to maintain the occupancy rate at 97% or higher as outlined above.
- **Funding.** Surplus housing units are not eligible to receive programmed MILCON or programmed RPMC funds.
  - Installations will receive no funding beyond RPMA (as indicated by historical records) for maintenance of surplus housing. The FHMP will be used to model funding for installations. MAJCOMs develop distribution funding accordingly.
  - Limit maintenance and repair costs (to include change of occupancy maintenance, emergency repairs, etc.) to no more than \$3,800 per unit per fiscal year. Per unit costs in excess of this amount must be approved by The Civil Engineer (AF/ILE). Submit waivers IAW current guidance.
  - Use MFH O&M funding to perform RPMC level work on surplus units under emergency conditions only (affecting life, health and safety) and when no option exists to relocate families into adequate housing.
  - Include demolition in MILCON or privatization projects where possible. Headquarters USAF, Housing Division (AF/ILEH) will establish and centrally manage an O&M program for housing demolition as funds are available.
  - Identify impacts to existing and future housing maintenance and other contracts and take appropriate action early in the process.
- **Scenario 1.** If adequate surplus housing units exist and an installation has maintained a 97% occupancy average over the past 3 years, the installation is authorized to retain surplus housing with the following provisions:

- Do not maintain units past their “useful economic life” (reference Appendix A for definition).
- The only repairs allowed are for health, safety, minor cosmetic repairs and change of occupancy maintenance required to keep units habitable.
- Mandatory assignment of surplus housing to military members is prohibited.
- **Scenario 2.** If adequate surplus housing units exist and an installation has failed to maintain a 97% occupancy average for the past 3 years, then dispose of units according to the installation disposal plan and as outlined below:
  - Do not move new occupants into units once vacated by the current occupant.
  - Dispose of vacant units immediately, or when the current occupant vacates, as outlined in Paragraph 2-2.5.4.
  - Repair units only for minimal health and safety to keep habitable for the current occupant.
  - When occupancy for a neighborhood (to include stairwell buildings, or multifamily buildings) falls below a level such that, in the opinion of the Wing commander, personal safety, unit discipline, and the general quality of life for the remaining occupants is compromised, the installation shall move the remaining families, at government expense, to other government, privatized, or community housing.
  - Use MFH RPMA funds within budget limitations to maintain units/neighborhoods in an inactive status pending demolition or disposal. Examples of appropriate expenses include minimal lawn maintenance and winterizing units. As housing areas/neighborhoods are consolidated for future disposal, it may be necessary to perform less-than-normal common area maintenance.
  - Mandatory assignment of military members to surplus housing is prohibited.
  - If an installation fails to meet the occupancy threshold, MAJCOMs may request a one-time extension from AF/ILE based on unusual or unavoidable circumstances. Provide compelling justification for not meeting the threshold.
- **Scenario 3.** If inadequate surplus housing units exist, dispose of units as quickly as possible but not later than the date in Paragraph 2-2.5.1. Follow the guidance for Scenario 2, or as follows:
  - If the surplus units are inadequate primarily due to an unsuitable floor plan and are otherwise in adequate condition (CAM score greater than or equal to 3.75 after suitability factors are eliminated) manage the units per Scenario 1 or 2, depending on the occupancy rate.

- For units declared surplus, adjust future CAM scoring criteria during the HCP process. Score units on the condition assessment only. This provides a mechanism to prioritize units/neighborhoods for disposal.

#### 2-2.5.4 Disposition

Following are options for determining disposition of surplus housing units.

- **Disposal of MFH units.** Below are various methods for disposal of family housing units. Use the method most appropriate for the situation.
  - Housing units and/or excess land may be disposed or transferred as part of a housing privatization initiative. **Note:** Conveyance and lease of existing property and facilities as part of privatization are exempt from provisions of the McKinney-Vento Homeless Assistance Act per 10 U.S.C. 2878.
  - Housing units may be disposed of as part of an approved MILCON project.
  - In some instances in-house resources may be used for demolition if allowed under federal and state environmental statutes.
  - Surplus housing units and improvements on non-excess land with no commercial value may be donated to any agency of the Federal Government or to a “public entity”. Prior to donation, make sure there is no reasonable prospect of selling the housing units.
  - Family housing units may be transferred to a recognized Indian Tribe (Walking Shield Program) under special legislation.
  - Disposal of family housing with excess land: Follow the process in AFI 32-9004, *Disposal of Real Property*, Chapter 1 (paragraph 2-2.4.6 provides a condensed version of Chapter 1) and AFH 32-9007, *Managing Air Force Real Property*, Chapter 4.
    - Methods of land disposal include:
      - ◇ Transfer of excess land to another federal agency
      - ◇ Conveyance, exchange or transfer under a specific legislative authority, such as privatization or Base Realignment and Closure
      - ◇ Termination of leasehold with federal improvements
      - ◇ Return of withdrawn public lands
  - Disposal of family housing on non-excess land: Follow the process in AFI 32-9004, *Disposal of Real Property*, Chapter 2 (paragraph 2-2.4.7 provides a condensed version of Chapter 2) and AFH 32-9007, *Managing Air Force Real Property*, Chapter 4.

- MAJCOM/CEs have the approval authority to dispose of buildings and facilities on non-excess land with an estimated value not to exceed \$25,000. This authority may be delegated to the installation commander.
  - The Deputy Assistant Secretary (Installations) (SAF/IEI) is the approval authority to dispose of buildings and facilities on non-excess land when the estimated value of the building or facility does not exceed \$500,000.
  - The BCE determines facility values. The estimated value may be reduced by the cost required to restore the land. (AFI 32-9004, *Disposal of Real Property*, paragraph 2.10).
- Conduct appropriate environmental, safety, cultural, and historic assessments as needed.
- If the sale or transfer of residential real property is contemplated, applicable legal requirements and governmental policies concerning asbestos, lead-based paint, and other environmental conditions must be addressed in the decision making process (for example, disclosure, inspection, risk assessment, and abatement requirements). While many requirements apply to housing constructed before 1978 (“target housing”), legal requirements or policies may be broader (for example, soil abatement requirements). Legal requirements may include, but are not limited to, requirements in the Residential Lead-Based Paint Hazard Reduction Act of 1992 and its implementing regulations.
  - Legal requirements and governmental policies concerning asbestos, lead-based paint and other environmental conditions may differ for housing sold and or transferred outright and housing to be privatized. Decision makers must include appropriate provisions in the sale and or transfer documentation during the privatization initiative.
- Secure MAJCOM approval before disposing of Capehart or Wherry housing units. Disposal includes sale, transfer, demolition, replacement, relocation or other arrangements that remove these units from the AF inventory. Note: Capehart housing (category Code 711-111) and Wherry housing (category 711-121) are different from other AF family housing because of ownership. The United States Air Force Housing, Inc., a Delaware corporation, rather than the AF, holds title to the Capehart and Wherry housing. Obtain prior consent from the record owner corporation before disposing of any Capehart or Wherry housing. Staff the request from the MAJCOM through AF/ILEH to the Deputy General Counsel (Installations and Environment) (SAF/GCN).
- MAJCOMs report requirements and request approval through AF/ILEH to SAF/IEI annually (Reference draft AFI 32-6002, *Family Housing Planning, Programming & Construction*, paragraph 4.6).

- **Conversion (Change in Use).**
  - Conversion of surplus family housing units is allowed only if the unit is adequate.
    - If converted, the conversion must be permanent. To request a permanent conversion of family housing units, follow guidance in AFI 32-9002, *Use of Real Property Facilities*, Chapter 2, paragraph 2.6.
  - Inadequate family housing units may not be converted and must be disposed of as described above.
  - Installations with surplus units temporarily converted must request approval to permanently convert these units.
  - Do not use FH appropriated funds to pay for any conversion costs.

### 2-2.5.5 Reporting

MAJCOMs report quarterly (1 Jan, 1 Apr, 1 Jul, 1 Oct) to AF/ILEH on progress to dispose of surplus housing units and remove the units from the AF Real Property records using data extracted from ACES-HM. Pre-formatted reports will be provided separately. MAJCOMs and installations must ensure data in ACES-HM is accurate and complete.

### 2-2.5.6 Disposal Process for Excess Family Housing with Excess Land

The process below generally describes how installations should dispose of excess housing units with excess land. Refer to AFI 32-9004, *Disposal of Real Property*, Chapter 1 for specific guidance. Also refer to AFH-32-9007, *Managing Air Force Real Property*. Foreign overseas installations may need to follow Host Nation guidelines.

- Determine the number of excess family housing units using the HRMA results.
- Identify specific excess units by address and neighborhood.
- Prepare AF Form 300, *Facility Disposal* and if appropriate, an AF Form 1192, *USAF Installations Characteristics Report* (Reference AFH 32-9007, *Real Property Handbook*, Chapter 5).
  - Complete appropriate environmental documentation to include National Environmental Policy Act (NEPA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and air conformity requirements as necessary.
- Prepare a Declarations of Excess (DE) for Facilities Board approval. AFI 32-9004, *Disposal of Real Property*, Attachment 2, details specific requirements for completing the DE, therefore, they are not duplicated in this document. The following requirements must be considered.

- Include appropriate environmental documentation and the McKinney-Vento Act Checklist. Note: Installation submits McKinney-Vento Act Checklist and environmental documentation to the MAJCOM 180 days prior to submission of the DE to the MAJCOM.
- Determine value of land and housing via appraisal from the U.S. Army Corps of Engineers. (Note: Determining the land value drives the requirement for a COE appraisal.)
- After Facilities Board Approval, forward to MAJCOM/CE.
  - SAF/IEI is the approval authority for all fee-owned land disposals with or without improvements.
  - Congressional notification is required under 10 U.S.C. 2662, for disposals with an estimated fair-market value of \$750,000 or more.
  - Estimated value of a facility may be reduced by the land restoration costs.
- MAJCOM/CE reviews the request and ensures appropriate documentation is complete, then forwards to the Air Force Real Property Agency (AFRPA) for processing.
  - MAJCOM must consult with AFCEE/EC, Natural Resources Manger, prior to disposing of land with marketable timber.
  - Family housing located on land to be declared excess may not be demolished or otherwise disposed of separately from the land.
- AFRPA staffs package to SAF/IEI and obtains approval or forwards to Congress for approval.
  - AFRPA submits a disposal report to Congressional Armed Services Committee through SAF/LLP.
  - AFRPA issues a preliminary real estate disposal directive.
- The land must be screened by other Federal agencies for possible use:
  - MAJCOM prepares a Notice of Availability and circulates it to all military activities within a 50-mile radius.
  - AFRPA coordinates DEs with AF/ILEPB (Bases and Units Branch), Departments of the Army and Navy, and defense agencies to determine if they need the property.
- AF must retain accountability and protect property from vandalism and theft until disposal has been completed at all levels.

- DE is submitted to Corps of Engineers by the installation, MAJCOM, or AFRPA depending on value.
- Corps of Engineers reviews documentation and prepares a report of excess (SF 118) then forwards to GSA for final disposal.
- Once the disposal action is complete, update ACES-RP within 15 days. (Reference AFH 32-9007, *Real Property Handbook*, Chapter 5.)

### 2-2.5.7 Disposal Process for Excess Family Housing on Non-Excess Land

The process below generally describes how installations should dispose of excess housing units on non-excess land. Refer to AFI 32-9004, *Disposal of Real Property*, Chapter 2 for specific guidance. Also refer to AFH 32-9007, *Managing Air Force Real Property*. Foreign overseas installations may need to follow Host Nation guidelines.

- Determine the number of excess family housing units using the HRMA results.
- Identify specific excess units by address and neighborhood.
- Prepare disposal request for Facilities Board approval. Include the following:
  - AF Form 300, Facility Disposal and if appropriate, an AF Form 1192, *USAF Installations Characteristics Report*. (Reference AFH 32-9007, *Real Property Handbook*, Chapter 5.)
  - AF Form 813, *Request for Environmental Impact Analysis*. Perform assessments as needed to include: lead, asbestos, PCBs, radon, pesticides, arsenic treated-lumber, playgrounds, etc.
  - Perform Cultural and Historic assessments as needed.
  - Conduct McKinney-Vento Homeless Assistance Act Screening (Checklist).
- After Facilities Board Approval, forward to approval authority (if necessary).
  - Estimated value of facility may be reduced by the land restoration costs. The BCE establishes facility values.
- MAJCOM/CE acts on request (either approves or forwards to AFRPA for processing).
- AFRPA staffs package to SAF/IEI.
- After SAF/IEI approval, AFRPA forwards approved package to MAJCOM/CE who returns the approved package to the installation.

- The BCE initiates disposal action:
  - Disposal or transfer as part of a housing privatization initiative. Conveyance or lease of existing property and facilities is exempt from provisions of the McKinney-Vento Homeless Assistance Act per 10 U.S.C. 2878.
  - Disposal as part of a MILCON project. Facilities must be committed to Congress in the DD Form 1391.
  - Disposal by burning or using in-house resources for demolition.
  - Installation should program a demolition project either through O&M or MILCON.
  - Issue bid to sell the excess facilities through GSA with off-site removal.
  - Offer to donate facilities with no commercial value to any agency of the Federal Government or to a “public entity.”
  - Transfer family housing units to a recognized Indian Tribe (Walking Shield Program) under special legislation.
    - HUD may fund relocation of units. A Bill of Sale is used instead of a Deed in the transfer.

Once the disposal action is complete, update ACES-RP within 15 days. (Reference AFH 32-9007, *Real Property Handbook*, Chapter 5.)

### **2-2.6 Guidelines for Overseas (Foreign) Locations**

The AF modified its approach in preparing FHMPs for installations located in other countries. The planning tools described above are used to prepare the initial assessment of required actions. However, considerations unique to the specific locations are incorporated into the final plans. Examples are as follows:

- The HRMA process first assumes use of off base housing consistent with local community housing standards and availability.
- At overseas (foreign) locations, force protection is a concern. Where intelligence sources indicate there is a potential threat to military families, the AF proposes to house all military families within the installation’s cantonment area. This is a concern in both Turkey and Korea.
- The authorities provided by the 1996 National Defense Authorization Act do not apply to overseas (foreign) locations. Accordingly, the AF studies did not include analysis of privatization potential at overseas (foreign) installations. Therefore, privatization of family housing units is not a consideration at overseas locations.

- In some instances, the host-country, under the Status of Forces Agreement or applicable Joint Committee agreements, agrees to support family housing requirements.
  - The Government of Japan is responsible for funding all new housing construction, selected utilities (by agreement) and selected maintenance activities (by agreement) for military families assigned to Japan. The AF currently funds maintenance/repair, utilities, services, and improvements. Only AF-funded requirements are identified in the Installation FHMPs for Kadena, Misawa and Yokota Air Bases.
  - The Government of Korea is responsible for funding all new military construction for Korea. However, there are numerous competing requirements for Korean host nation funding; therefore, the AF intends to fund construction, utilities, services and maintenance and repair for military family housing in Korea.
- In some countries, such as Italy and the United Kingdom, build-lease is the preferred approach to meeting new housing requirements. The funds required to meet housing shortfalls in these countries under new leases are identified in the Plan.

## **2-3 PROJECT PLANNING AND PROGRAMMING**

### **2-3.1 Guidelines for Determining FH Revitalization Actions**

Actions necessary to meet the FY07/FY09 MFH Revitalization goal are determined through analysis, including use of the following rules:

- Units with an HCP condition score of  $\geq 3.75$  are considered adequate and will not be replaced or improved; they will be retained with no construction and maintained using O&M funds.
- Housing units with an HCP condition score  $< 3.75$  are considered inadequate. Accordingly, revitalization, either improvement or replacement, is required.
- FH improved or programmed for improvement since completion of the last HCP is assigned an HCP condition assessment score of 4.00. Housing replaced or programmed for replacement is assigned an HCP score of 5.00.
- Inadequate units privatized or programmed for privatization since the completion of the last HCP are assigned an HCP condition assessment score of 4.00. Adequate units privatized or programmed for privatization retain their existing HCP condition assessment score.
- Units with an improvement to replacement cost  $\geq 0.70$  will be replaced if required. Units with an improvement to replacement ratio  $< 0.70$  will be improved if required.

If the requirement for any rank/bedroom category exceeds the inventory, the installation can program new construction up to 90 percent of the deficit for each category. The number of units proposed in acquisition or construction projects shall not exceed 90 percent of the projected housing deficit.

## **2-3.2 Guidelines for Determining Investment Strategy (Privatization vs. MILCON) for Revitalization**

There are three criteria for determining the appropriate investment strategy for revitalization. If all criteria are met, privatization is generally selected. If any one of the three criteria is not met, the use of traditional construction options is generally selected. The three criteria are:

### **2-3.2.1 Installation Location**

The installation must be located in the US or its territories to be eligible for privatization.

### **2-3.2.2 Economic Feasibility – “Scored” Cost**

OSD established a fiscal criterion to determine whether or not to pursue housing privatization. The criterion requires the Office of Management and Budget (OMB) “scored” cost for housing privatization to be one third or less of the estimated MILCON (i.e., leverage greater than three to one) costs to bring the housing units up to modern standards. The “scored” cost is the amount of funds the AF must have available at the time a privatization project is executed. For more detail refer to AFI 32-6007.

### **2-3.2.3 Economic Feasibility – Life Cycle Costs**

Leverage is only one indicator of the economic attractiveness of an installation’s FH for privatization. The AF also desires that the net present value (NPV) of privatization costs be less than the costs for continued AF ownership and management of FH. The NPV of privatization costs is calculated based on annual Basic Allowance for Housing (BAH) payments to persons living in units being considered for privatization and annual costs for management and leases. The NPV of government ownership is calculated based on annual costs for management, utilities, services, leases and maintenance and repair.

## **2-3.3 Programming Limitations and Procedures**

For both Privatization and MILCON projects, all projects must comply with the phasing and investment decisions in the HCP and must be programmed within the costs identified in the approved HCP.

Use the following guidance found in AFI 32-6002, *Family Housing Planning, Programming, Design, and Construction* when programming FH projects:

### **2-3.3.1 Size Standards**

Refer to the Size Standards and Implementation Policy in Paragraph 4-3 for programming of all MFH projects. Table 2-12 contains the MFH Unit Size Standards in both Metric and English units.

TABLE 2-12: MFH UNIT SIZE STANDARDS

Pay Grade	No. Bdrms.	Improvement Minimums						Replacement / New Construction Minimum						Replacement / New Construction Benchmark						Garages							
		Improvement Target			Improvement Maximums			Improvement Target			Improvement Maximums			Replacement / New Construction Benchmark			Replacement / New Construction Maximums			Detached Units	Attached Units						
		NSF	NSM	GSF	GSM	NSF	NSM	GSF	GSM	NSF	NSM	GSF	GSM	NSF	NSM	GSF	GSM	NSF	NSM	GSF	GSM	NSF	NSM	GSF	GSM		
JENL (E1-E3)	2	870	81	1,080	100	950	88	1,180	110	1,080	100	1,340	124	1,210	112	1,500	139					2 car				2 car	1-2 car
	2 Modified	980	91	1,220	113	1,070	99	1,330	124	1,180	110	1,480	137	1,300	121	1,630	151					2 car				2 car	1-2 car
		1,100	102	1,370	127	1,200	111	1,490	138	1,310	122	1,630	151	1,420	132	1,760	164					2 car				2 car	1-2 car
	4	1,230	114	1,530	142	1,350	125	1,670	155	1,570	146	1,950	181	1,790	166	2,220	206					2 car				2 car	1-2 car
		1,420	132	1,760	164	1,550	144	1,920	178	1,850	172	2,300	214	2,150	200	2,670	248					2 car				2 car	1-2 car
CGO (O1-O3)	2	870	81	1,080	100	950	88	1,180	110	1,200	111	1,490	138	1,440	134	1,790	166					2 car				2 car	1-2 car
	2 Modified	1,050	98	1,300	121	1,150	107	1,420	132	1,350	125	1,670	155	1,540	143	1,920	178					2 car				2 car	1-2 car
		1,230	114	1,530	142	1,350	125	1,670	155	1,500	139	1,860	173	1,650	153	2,050	190					2 car				2 car	1-2 car
	4	1,330	124	1,650	153	1,450	135	1,800	167	1,730	161	2,150	200	2,020	188	2,500	232					2 car				2 car	1-2 car
		1,420	132	1,760	164	1,550	144	1,920	178	2,020	188	2,510	233	2,490	231	3,090	287					2 car				2 car	1-2 car
FGO (O4-O5) E9 PRESTIGE	3	1,280	119	1,590	148	1,400	130	1,740	162	1,630	151	2,020	188	1,850	172	2,300	214					2 car				2 car	1-2 car
	4	1,420	132	1,760	164	1,550	144	1,920	178	1,860	173	2,310	215	2,180	203	2,700	251					2 car				2 car	1-2 car
ISNCO (E9)	4	1,490	138	1,850	172	1,620	150	2,010	187	1,940	180	2,410	224	2,180	203	2,700	251					2 car				2 car	1-2 car
SO (O6)	4	1,560	145	1,930	179	1,700	158	2,110	196	2,030	189	2,520	234	2,350	218	2,920	271					2 car				2 car	1-2 car
ICO SO (O6)	4	1,710	159	2,120	197	1,870	174	2,320	216	2,230	207	2,770	257	2,350	218	2,920	271					2 car				2 car	1-2 car
GO (O7+)	4	1,920	178	2,380	221	2,100	195	2,600	242	2,690	250	3,330	309	3,270	304	4,060	377					2 car				2 car	1-2 car
SCP GO (O7+)	4	2,110	196	2,620	243	2,310	215	2,860	266	2,960	275	3,660	340	3,270	304	4,060	377					2 car				2 car	1-2 car
		IMPROVEMENT RANGE												REPLACEMENT / NEW CONSTRUCTION RANGE													

**TABLE 2-12: MFH UNIT SIZE STANDARDS (continued)**

**GROSS FLOOR AREA:**

All interior spaces (finished and unfinished) including full height, 7'-0" and above ceiling height, attic and basements within the exterior faces of exterior walls and center line of party walls (in multiplex units) of housing units with the following areas of exclusion:

- Carports and Garages.
- Exterior bulk storage (detached from the conditioned space of the house), up to the maximum allowance for exterior storage for the grade and bedroom type. See Tables 4-6 to 4-14 and Footnote \*5.
- Exterior mechanical rooms (detached from the conditioned space of the house), sized only for mechanical equipment. See Tables 4-6 to 4-14 and Footnote \*7.
- Trash enclosures.
- Porches, open or closed, which are not heated or cooled and which retain the basic characteristics of a porch.
- Terraces, patios, decks, balconies, and entrance stoops.

**NET FLOOR AREA:**

The space within the interior faces of exterior walls and party walls of living units, with the following exclusions:

- Carports and Garages.
- Exterior bulk storage up to the maximum allowance for exterior storage for the grade and bedroom type. See Tables 4-6 to 4-14 and Footnote \*5.
- Interior bulk storage up to the maximum allowance for interior storage for grade and bedroom type. See Tables 4-6 to 4-14 and Footnote \*4.
- Trash enclosures.
- Porches open or enclosed, which are not heated or cooled and which retain the basic characteristics of a porch.
- Terraces, patios, decks, balconies, and entrance stoops.
- Utility Rooms/ Laundry Rooms and/or washer and dryer space, if not located in separate utility or laundry room, up to the maximum allowance indicated in Tables 4-6 to 4-14.
- Stairways on each floor and open space to below (including intermediate landings between floors).
- Stair landing at each floor level above the first floor (not to exceed 10 square feet per floor).
- Unfinished space under stairs.
- Unfinished attic space.
- Common stairways, halls, and entries in multi-family dwellings.
- Areas required solely for installed solar energy systems, including collection and storage equipment and mass walls as well as interior spaces required by and designed specifically for passive solar energy systems.
- Increase required to meet accessibility standards (not to exceed 75 SF). Additional square footage over the allowance is countable against the net and gross.
- Mechanical rooms and chases.
- Fireplaces where applicable.

**Notes:**

1. Detached homes are authorized 2-car carports/garages; attached homes are authorized 1 or 2 car carports/garages. Number of carports/garages are based upon site and funding allowances for all unit types.
2. For Required Functional Areas, functional area allowances and more detailed exclusionary guidelines, refer to Paragraph 4-9.1, Tables 4-6 to 4-14, and accompanying footnotes.
3. Finished rooms with sloped ceilings must have a ceiling height of not less than 7'-0" for at least one-half of their square footage.
4. The portions of finished rooms with sloped ceilings, where portions of the ceiling height measures less than 5'-0" in height, shall not be countable against the net square footage.

### 2-3.3.2 Statutory Unit Improvement Cost Limit

- **Unit Improvement Cost:** The unit improvement cost includes the costs for both the housing unit and the lot. The housing unit costs include the total housing structure facilities such as a carport, garage, exterior storage and other attached facilities. The lot costs include items for the sole use of the unit such as walkways, unit landscaping and irrigation, driveway or other assigned parking, uncovered patio, fencing and utility (water, sewer, electricity, gas, etc.) service laterals. Environmental issues are included in housing unit costs or in lot costs as appropriate. This is identified as “family housing” cost in Block 9, DD Form 1391.
- **Neighborhood Improvement Cost:** The neighborhood improvement cost (including concurrent maintenance and repair) includes the housing area or facilities outside of the housing units and the lots that support the entire housing community and are not associated with individual units or discrete groups of units, such as main/secondary roads and their sidewalks, jogging and recreation paths, common area landscaping and irrigation, general common-use parking areas, utility mains (water, sewer, electrical, gas etc.), playgrounds and bus shelters, etc. (This is identified as “support facilities” cost in Block 9, DD Form 1391.)
- **Statutory Improvement Cost Limit:** The unit improvement cost limit is \$50,000 (for a non-accessible unit) or \$60,000 (for a unit that is accessible to disabled persons) times the Area Cost Factor (ACF) at the time of contract award. The ACF is a local escalation or de-escalation factor based on the local economy. Refer to the Army Corps of Engineers web site for the latest DoD ACF. The ACF does not apply to foreign installations. This limit includes both the unit improvement cost and lot cost, but excludes common neighborhood improvement cost. The unit with the highest combined cost total (unit improvement cost plus lot cost) becomes the “Most Expensive Unit” for a project and is identified in Block 9, DD Form 1391. The unit improvement cost is the total funded cost, which includes construction cost, contingency and supervision, inspection and overhead (SIOH). Projects where the cost of the most expensive unit exceeds the statutory limit require SAF/IEI approval, Congressional notification and an economic analysis showing the cost effectiveness of improvement over other alternatives. These projects are included in the president’s annual budget.

### 2-3.3.3 Three-Year Rule

Installations should not undertake a replacement, improvement, minor improvement, major M&R or minor alteration project on a new or improved dwelling or non-dwelling unit within three (3) years after beneficial occupancy. The rationale for this policy is that all work necessary to bring the unit up to current standards should be programmed in a single improvement project. There are exceptions to this rule for health and safety issues and for certain other issues. See AFI 32-6002, paragraph 1.4.1.

### **2-3.3.4 Minor Improvement Project**

Minor Improvement Project (MIP) costs cannot exceed the statutory improvement unit cost limit. The limit includes the cost of all improvement, maintenance and repair and minor alteration work planned and accomplished during the current fiscal year.

- Indicate all current fiscal year planned or accomplished work for the unit in the DD Form 1391 to ensure the total cost does not exceed the statutory limit (AFI 32-6002, paragraph 1.13.4).
- See AFI 32-6002, Table 1.1 for limitations on non-dwelling units.
- The three-year rule also applies to MIPs. Subsequent MIPs year after year would be considered pyramiding.

### **2-3.3.5 Unit Maintenance and Repair Thresholds**

- General Officer Quarters Operation, Maintenance and Repair Threshold: The annual obligation limit for the total cost of all operation, maintenance and repair, and minor alteration work accomplished by job order, work order, or contract on general officer quarters is \$35,000 per unit (AFI 32-6002, paragraph 1.14.3.1).
- Non-General Officer Quarters Maintenance and Repair Threshold: The annual obligation limit for total cost of major maintenance and repair and minor alteration work, accomplished by job order, work order, or contract on non-general officer quarters is \$20,000 per unit (AFI 32-6002, paragraph 1.14.3.2).

### **2-3.3.6 Application Rule**

Apply only one threshold at any time. The improvement unit cost limit applies during the construction period of an improvement project. Once the construction is completed and the unit is occupied, the three-year rule and maintenance and repair thresholds apply.

Refer to AFI 32-6003, paragraphs 2.5.1 thru 2.5.6 for special rules for GOQs.

### 2-3.4 Funding Sources

Following the determination of the requirements, each installation must select the appropriate investment strategy, within AF and DoD directives. AF/ILE provides the appropriate funds, through P-711, P-713, P-714, P-722, and P-727 fund codes, in accordance with requirements. P-714 funds are used for planning and designing projects in the Acquisition Program and Post Acquisition Improvement Program (PAIP). Upon appropriation, these funds are issued in a lump sum to the MAJCOM for distribution. P-711 funds are used for new construction and replacement construction projects. P-713 funds are used for projects that provide improvements to existing FH units/facilities. Both P-711 funds and P-713 funds are provided to the MAJCOM for distribution upon award of a project. P-722 funds are used for planning, designing and constructing projects in the Maintenance and Repair Program. P-713 funds are used for scoring costs of privatized family housing projects. P-727 funds are used for concept and Request For Proposal (RFP) development, and for project management of privatized family housing projects. Upon appropriation, these funds are issued in a lump sum to the MAJCOM for distribution.

Typically, patios/decks are provided in a construction/replacement (P-711) project or an improvement (P-713) project. They may be accomplished in a minor improvement project if the unit cost does not exceed statutory improvement cost limit (\$50,000) or a minor alteration (P-722) project if the unit cost does not exceed \$7,500. They may also be accomplished by self-help if the project costs do not exceed \$2,500 and the additional project costs do not cause the GOQ Operation, Maintenance, and Repair and Non-GOQ Maintenance and Repair Thresholds (\$35,000/unit and \$20,000/unit respectively) to be exceeded.

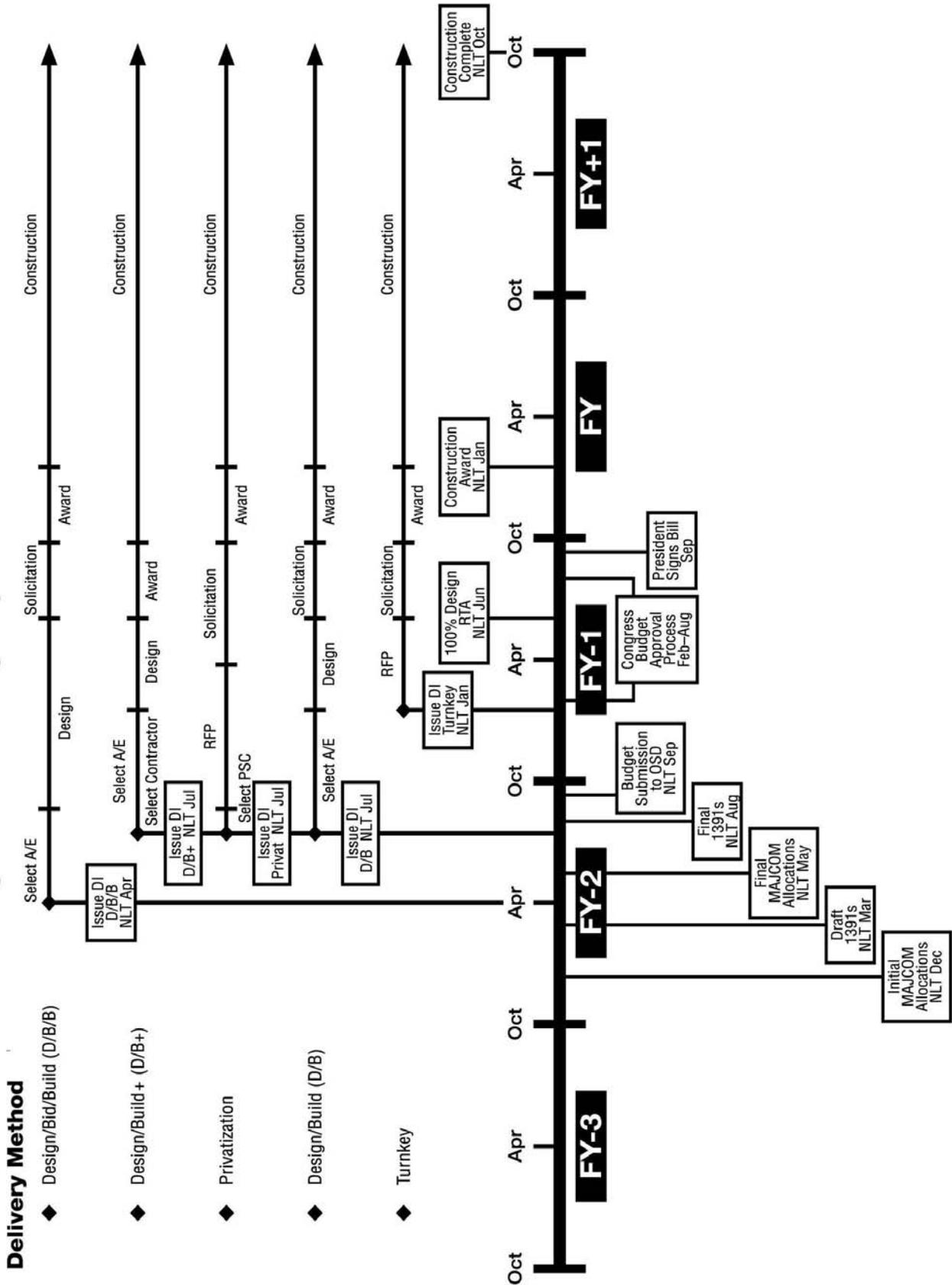
### 2-3.5 Planning, Programming, and Execution Timeline

The execution goal is to have construction funds obligated within the fiscal year they are appropriated and to expend the funds not later than (NLT) the end of the next fiscal year (refer to Figure 2-3). The key objectives to achieving this goal are:

- To reach 100% design or RFP/Ready to Advertise (RTA) status NLT June of FY-1.
- To be prepared to award construction contracts NLT 30 days after the AF receives construction funds, ideally within the window of October to December of the fiscal year of execution, depending on the appropriation.

Figure 2-3 illustrates a model timeline for housing project execution. It indicates the timeframe in which the steps of the project should be executed to ensure the project is completed on time. It assumes that all planning and programming coordination has been accomplished through AF/ILEH. It also indicates project design timelines for four commonly used delivery methods (Design/Bid/Build, Design/Build, Turnkey and Privatization). Family Housing Privatization is further described in Paragraph 5.4.

Figure 2-3: Housing Project Execution Timeline



**2-3.6 Development of DD Form 1391**

The development of DD Form 1391 varies for different types of projects. This section outlines the differences for the various types of projects as well as discussing the DoD Family Housing Cost Model Guidance. Refer to Appendix C for additional information on development of the DD Form 1391 from the Family Housing Community Profile (FHCP)/HCP to ACES-PM. Refer to Appendix D for examples of DD Form 1391.

**2-3.6.1 DD Form 1391 for New/Replacement Construction Project**

In block 11 under "REQUIREMENT" identify all work required; under "CURRENT SITUATION" describe the condition of existing housing; under "ADDITIONAL" provide the information of improvement cost as a percentage of replacement cost and identify the name and commercial number (including area code) of the Base Civil Engineer (BCE).

- **DD Form 1391/DoD Family Housing Cost Model:** All DD Form 1391 and DoD Family Housing Cost Model must be prepared using metric units of measurement. OSD mandated the use of the metric system.
- **Program Elements:** Use 88741
- **Category Code:** Use 711-142
- **Dwelling Costs:** Use the unit prices for the appropriate grade and bedroom as defined in the HCP in ACES-PM for the cost estimate of housing units (the DoD Family Housing Cost Model). Necessary dwelling unit costs in excess of these unit costs shall be clearly documented as described in the DD1391.
- **Support Costs:** Use cost elements for infrastructure and community items as developed in the HCP. Include lot costs, site improvement, utility mains, streets, recreation, etc.
- **Contingency and Supervision, Inspection and Overhead:** Use the percentages in the Table 2-13 and identify them in Block 11, "ADDITIONAL REQUIREMENTS", of DD Form 1391.

**Table 2-13 – Contingency and SIOH for New/Replacement Construction**

Agent	AF	COE		NAVFAC	
Location	CONUS & O/S	CONUS	O/S	CONUS	O/S
Contingency	5.0%	5.0%	5.0%	5.0%	5.0%
SIOH	5.5%	5.7%	6.5%	6.0%	6.5%

- **Requirement, Adequate, and Substandard (Inadequate):** The data should be abstracted from your MAJCOM and Installation FHMPs (MFH Summary). For Block 11 of DD Form 1391s (**Requirement = Adequate + Substandard (Inadequate)**):

- **New/Replacement Project:**
    - Requirement = Current HRMA Requirement
    - Adequate = AF-Owned Adequate per the FHMP
    - Substandard = [Requirement – Adequate]
- **Mission Type:** Each project should identify the requirement as either "new mission" or "current mission". This identification should be shown in parentheses after the short project description in Block 11 of the DD Form 1391.
- **Design Data:** Provide all information required for Block 12a Estimated Design Data for FYXX projects. Note that FYXX projects must be completed to 35% design prior to 31 Dec XX-2.
- **Demolition:** Since the AF must stem the growth of facility square footage, all replacement construction projects will include the cost of demolishing existing MFH units or support facilities. Demolition costs are a mandatory entry in Block 9 of the DD form 1391. Use demolition cost identified in the FHMP Installation Plans.
- **Air Force Family Housing Guide Certification:** A statement indicating the project meets the criteria of *Air Force Family Housing Guide for Planning, Programming, Design, and Construction* should be included in the Block 11 "ADDITIONAL" section of the DD Form 1391.
- **School Certification:** A certification from state and local school authorities is required indicating their ability to accept any increase in the student population. The statement should be included in the Block 11 "ADDITIONAL" section of the DD Form 1391.
- **Host-Nation Program Ineligibility:** For projects in Europe, Japan, and Korea, include a statement indicating that they are not eligible for North Atlantic Treaty Organization (NATO) Security Investment Program, Japanese Facility Improvement Program (JFIP) or the Korean Combined Defense Improvement Program (CDIP) and the Republic of Korea Funded Construction (ROKFC) Program. Identify the host-nation program ineligibility statement under Block 11 "ADDITIONAL" of DD Form 1391.

### 2-3.6.2 DD Form 1391 for Improvement Project

In Block 10, indicate the project scope (number of units) and identify general officer quarters if applicable. In block 11 under "PROJECT" identify project composition such as 20 CGO (4 BR), 10 SNCO (3 BR) and 70 JNCO (2 BR); under REQUIREMENT" identify all work required; under "CURRENT SITUATION" describe the condition of existing housing; under ADDITIONAL" provide the information of improvement cost as a percentage of replacement cost and identify the name and commercial number (including area code) of the BCE.

- **Project scope:** The number of units and grade and bedroom mix must be programmed in accordance with the HCP phasing and concepts as outlined in the FHMP.
- **Program Elements:** Use 88742
- **Category Code:** See Appendix E for applicable category codes.
- **Dwelling Costs:** Use the unit prices for the appropriate grade and bedroom as defined in the HCP.
- **Support Costs:** Use cost elements for infrastructure and community items as developed in the HCP. Include lot costs, site improvement, utility mains, streets, recreation, etc.
- **Contingency and Supervision, Inspection and Overhead:** Use the percentages in Table 2-14 and identify them in Block 11, “ADDITIONAL”, of DD Form 1391.

**Table 2-14 – Contingency and SIOH for Improvement Construction**

Agent	AF	COE		NAVFAC	
Location	CONUS & O/S	CONUS	O/S	CONUS	O/S
Contingency	5.0%	5.0%	5.0%	5.0%	5.0%
SIOH	3.0%	5.7%	6.5%	6.0%	6.5%

- **Requirement, Adequate, and Substandard (Inadequate):** The data should be abstracted from your MAJCOM and Installation FHMPs (MFH Summary). For Block 11 of DD Form 1391s (**Requirement = Adequate + Substandard (Inadequate)**):
  - **Improvement Project:**
    - Requirement = Current HRMA Requirement
    - Adequate = AF-Owned Adequate per the FHMP
    - Substandard = [Requirement – Adequate]
- **Statutory Improvement Cost limit:** Identify the most expensive unit cost in Block 9 of the DD Form 1391. The cost limit applies to both improvement and major maintenance and repair work of the housing unit. It includes construction cost, contingency, and supervision, inspection and overhead.
- **Host-Nation Program Ineligibility:** For projects in Europe, Japan, and Korea, include a statement indicating that they are not eligible for NATO Security Investment Program, JFIP or the CDIP and the ROKFC Program. Identify the host-nation program ineligibility statement under Block 11 “ADDITIONAL” of DD Form 1391.

### 2-3.6.3 DD Form 1391 for Privatization Project

In block 4, PROJECT TITLE, include the word "PRIVATIZE". In block 5, PROGRAM ELEMENT, program your candidate in the Improvement (P-713) program. In block 9, COST ESTIMATE, include the privatization end state as the number of units, your OMB "Scored Cost" from the AF FHMP as the cost of your privatization candidate and calculate the cost per unit entered as the unit cost. Finally, include the area cost factor. In block 10, DESCRIPTION OF PROPOSED CONSTRUCTION, include a general description of the housing privatization project to include the number of units conveyed, the number of units for deficit reduction, the total number of units in the privatization end state, whether you will convey or lease land and the approximate acreage, the MILCON cost without privatization, and the estimated leverage. In Block 11, ADDITIONAL, add the statement:

"This privatization project contains no resale merchandise, services or commercial recreational operations or activities in accordance with the SAF/MI Housing Privatization Interim Operating Instructions memorandum dated 2 Mar 99 and AF/IL memo regarding coordination with AAFESS, DeCA, and MWR Board dated 19 Mar 99. A viable proforma and a preliminary economic analysis will be developed and provided during the concept approval process, and a certified economic analysis will be accomplished prior to completion of the solicitation process. In the event the privatization is financially infeasible, the Air Force will execute an improvement project for xxx units at the programmed amount requested by this privatization project in accordance with the installation's Housing Community Profile."

- **Requirement, Adequate, and Substandard:** The data should be abstracted from your MAJCOM and Installation FHMPs (MFH Summary). For Block 11 of DD Form 1391s (**Requirement = Adequate + Substandard**):
  - **Privatization Project:**
    - Requirement = Total units for the project (project scope/end state)
    - Adequate = [Requirement – Substandard]
    - Substandard = Total conveyed on-base units that require replacement or improvement + total new units constructed for deficit reduction
- Reference your HCP and back into the number of units you can improve using the available programmed amount. This is to provide us the flexibility to revert back to MILCON in the event that the privatization is not financially feasible.
- Where feasible, include both deficit reduction and revitalization requirements in the privatization projects.

## 2-3.6.4 DoD Family Housing Cost Model Guidance

### 2-3.6.4.1 Preparation of the DoD Family Housing Cost Model

DD Form 1391 typically has four pages, including Design schedule data (Block 12) and the DoD Family Housing Cost Model. The DoD Family Housing Cost Model is described in this section.

- **Dwelling Costs** (Average *per unit* cost based on the DoD Family Housing Cost Model):
  - Contains all “Standard House” basic construction including patio, front door stoop, porch, privacy fence, exterior storage, appliances, gutters, trash enclosure, telephone/cable, etc. Refer to the Air Force “Standard House” described in paragraph 4-4.1.
- **Adjustments to Dwelling Costs** includes the following:
  - **Additional Fire Protection** such as fire sprinklers. (Average *per unit* cost (in whole \$\$), if required.)
    - A description and justification **must** be included in narrative (Block 10, 11).
  - **Renewable Energy Source** such as solar. (Average *per unit* cost (in whole \$\$), if required.)
    - A description and justification **must** be included in narrative (Block 10, 11).
  - **Other Special Construction** (Average *per unit* cost (in whole \$\$), if required)
    - A description and justification **must** be included in narrative (Block 10, 11: “Special Construction features include:”).
    - This item contains costs associated with construction of each unit, rather than the community. Examples of these costs include garages (for all sizes of units), special foundation requirements (i.e., seismic bracing, etc.), tile/slate roofs (rather than standard asphalt shingles), all brick facing (rather than brick accents), historic requirements (i.e., special windows, etc.), wind load supports, footings for problem soils, force protection (when required), and tornado and high wind shelters, etc.
    - For programming costs associated with tornado and high wind shelters, refer to paragraph 4-12.2.1.
- **Support Costs** are those costs associated with construction of the community, rather than each unit. Cost Elements are given as a function of Dwelling Costs (element details are included in Cost Element listing) in either Low, Mid or High ranges; or Override, as appropriate.
  - Examples of **Mid** Range costs include:
    - Lot Costs = 3.65% of Dwelling Costs
    - Site Improvements = 5.42% of Dwelling Costs
    - Landscaping = 2.34% of Dwelling Costs
    - Utility Mains = 14.27% of Dwelling Costs
    - Streets = 3.60% of Dwelling Costs
    - Recreation = 1.10% of Dwelling Costs
    - Demolition = 6.00% of Dwelling Costs
    - Environmental = 4.31% of Dwelling Costs
    - Other Site Work = 0.78% of Dwelling Costs

### 2-3.6.4.2 Automated Civil Engineer System (ACES)

This section delineates the step-by-step processes for inputting data into the ACES program.

- “Old,” existing ACES page:
  - Select project
  - **Modify Project** (Modify Selected Project)
  - **DD 1391** (Create a DD Form 1391 from Project)
- “New” incorporation of the DoD Family Housing Cost Model into ACES:
  - New browser window for worksheets:
    - Tabs for Header, Costs (sub-tabs for Primary Facilities, Supporting Facilities, and Additional), and Narrative
    - Fill in the blanks, as appropriate:
      - ◇ *Adjustments to Dwelling Costs* (as described in detail in Paragraph 2-3.6.4.1)
      - ◇ *Support Costs* (as described in detail in Paragraph 2-3.6.4.1):  
Range: Low, Mid, High, Override  
Support costs may need to be adjusted to balance to the programmed amount.
      - ◇ *Other Supporting Costs*:  
Costs associated with construction of the Community, rather than each unit. (Land purchase)  
If Unit of Measure = “Lump Sum;” then Scope = “0”  
Support costs may need to be adjusted to balance to the programmed amount.
    - *Additional Costs*:
      - ◇ Block 9
      - ◇ Block 10
      - ◇ Block 12
    - *Narrative*
    - Block 11:
      - ◇ Narrative section titled *Additional* has a technical glitch: doesn’t appear to save in worksheet, but will print, in formatted DD 1391, as typed.
    - **Save** after modifying each page
    - **Print**
  - New browser window for formatted DD 1391:
    - **Print** from browser menu (**File, Print**)

Refer to Appendix C for additional information on development of the DD Form 1391 from the FHCP/HCP to ACES-PM. Refer to Appendix D for examples of DD Form 1391 and refer to Appendix E for Family Housing Category Codes and Program Elements.

## 2-4 ECONOMIC ANALYSIS

An Economic Analysis (EA) is required:

- For all new FH construction as well as replacement projects
- For FH support facility construction projects with a total cost of over \$2,000,000
- For improvement projects when the most expensive unit exceeds \$50,000 (\$60,000 for accessible handicapped units) multiplied by the local area cost factor, except foreign locations. In foreign locations, installations may not apply the area cost factor to increase the cost limit. (AFI 32-6002, paragraph 1.13.2.1.)

When an EA is required, it must be submitted as a part of the project submission. The due date is identified in the annual program call letter.

Installations prepare the EA in accordance with the AFMAN 32-1089, *Air Force Military Construction and Family Housing Economic Analysis Guide*. The MAJCOMs then certify the EA.

Other special analysis procedures apply when privatized family housing is a feasible alternative. The EA calculates the life-cycle costs for various methods the AF could use to achieve its housing goal of revitalizing deteriorated housing.

Department of Energy indices should be used to analyze utility costs. The EA must be documented to allow for complete replication by reviewers. This includes costs that are traceable to their most basic inputs and units of measure. Department of Energy indices can be found in the latest edition of the annual publication *Energy Price Indices and Discount Factors for Life Cycle Cost Analysis*.

The EA methodology provides the opportunity for cooperative analysis between the installation-level civil engineer (CE) and financial manager (FM), the MAJCOM CE and FM, and the Air Staff CE and FM. The EA is used to determine if replacement or improvement is most cost effective.

## 2-5 FORCE PROTECTION

Force Protection issues must always be considered during the planning and programming for all AF owned and privatized FH projects. In accordance with UFC 4-010-01 *DoD Minimum Antiterrorism Standards for Buildings*, FH with 12 units or fewer per building are exempt from all requirements of those standards. However, compliance with the standards is recommended where possible. In addition, compliance may be mandated by local conditions or by the installation commander. For additional discussions on Force Protection issues, refer to Paragraphs 3-3 and 4-11.

## 2-6 ENVIRONMENTAL PLANNING/COMPLIANCE

The principal guidance documents for ensuring environmental compliance for construction are the *National Environmental Policy Act of 1969* as amended (40 CFR 1500-1508) and AFI 32-7061, *The Environmental Impact Analysis Process*. The AF Environmental Impact Analysis Process (EIAP) specifies the responsibilities of HQ USAF, MAJCOMs and installation-level environmental offices, installations, environmental protection committees and the Air Force Center for Environmental Excellence (AFCEE).

The NEPA and AFI 32-7061 require the AF to incorporate environmental considerations into its planning and decision-making through a systematic, interdisciplinary approach.

Three levels of environmental analysis are provided in the following documents:

- The *Categorical Exclusion* (CATEX) is used for classes of actions that have been evaluated and determined to have no environmental impact. A complete listing of AF-related actions that can be categorically excluded appears in AFI 32-7061.
- An *Environmental Assessment* is an analysis of the potential environmental impacts of a proposed action. It requires minimal public interaction during preparation. Actions that generally require an Environmental Assessment are: new construction and improvement projects, real estate acquisitions, and some waste site cleanup efforts.
  - If significant impacts are not identified, the AF signs a Finding of No Significant Impact (FONSI). Informal coordination with appropriate environmental agencies is encouraged while the Environmental Assessment is being prepared; however, there is no requirement for formal review of documents outside the AF. The resulting FONSI must be made available to the interested public.
  - If the determination is made that significant environmental impacts may occur from the proposed action, then there must be a finding that preparation of an Environmental Impact Statement is necessary.
- An *Environmental Impact Statement* (EIS) is a detailed study of major federal actions that may have significant environmental ramifications. The format for the EIS is documented in the Council for Environmental Quality (CEQ) regulations. For unclassified actions, the AF must notify the public that a project or proposal with potential significant environmental impacts is being considered.
  - Input from the public is solicited and included in the preparation of the EIS.

- The outcome of the EIS process is a Record of Decision (ROD) which is a document, signed by the agency sponsoring the proposed action, explaining the action and its potential environmental consequences, and discussing any potential mitigation that has been adopted to minimize the impact of the proposed action.

## **2-7 SUSTAINABLE DEVELOPMENT**

Sustainable development concepts shall be incorporated into all aspects of FH, beginning with the HCP process. A sustainable facility achieves optimum resource efficiency and constructability while minimizing adverse impacts to built and natural environments through all phases of its life cycle. Sustainable development concepts must be addressed at the beginning of the process to be within the budget and to achieve AF mission requirements. Refer to Paragraphs 3-4 and 4-16 for more detailed information.

## **2-8 METRIC MEASUREMENTS**

This document uses the English measurement system; the metric equivalents of English measurements are not shown, except for Tables 2-12 and 3-3. However, in compliance with Executive Order 12770, *Metric Usage in Federal Government Programs*, July 25, 1991, all FH studies and documents will be programmed using both metric and English units.

## **2-9 REPROGRAMMING LIMITATIONS AND PROCEDURES FOR MILCON**

### **2-9.1 Line Item Authorization Requirements for New and Replacement Projects**

10 U.S.C. 2821 and 2822 require that the acquisition and construction of any housing units must be specifically authorized by law.

### **2-9.2 Housing and Urban Development Notification**

Under 10 U.S.C. 2823, SAF/IEI must notify the Housing and Urban Development (HUD) Secretary and wait 21 days before awarding contracts for all new and replacement projects within the United States.

### **2-9.3 Cost/Scope Variation and Reprogramming**

#### **2-9.3.1 Approval Authority**

AF/ILEH reprograms family housing projects in accordance with 10 U.S.C. 2853 when unforeseen conditions arise during construction causing cost increases and/or scope variations.

MAJCOM/CEs submit a written justification for reprogramming that includes:

- Current working estimates based on validated bids or proposals, including bid extensions
- Economic analysis, if required, justifying an upward adjustment of high unit cost (HUC)
- Impact of terminating the contract
- DD Form 1391 marked with change(s)
- Justification for the reprogramming including floor plans, building elevations, site plans, square footage calculations and interior and exterior amenities

Responsibility for approvals for family housing project costs exceeding programmed amount (PA), scope reductions, and scope increases lies with:

- AF/ILEH approves cost increases less than 15 percent over the programmed amount or greater than \$2,000,000, whichever is less, and scope reductions of less than 15 percent. Requests for AF/ILEH approval may come from MAJCOM Division Chiefs or higher.
- AF/ILE approves cost increases over the programmed amount between 15 and 25 percent or \$2,000,000, whichever is less, and scope reductions from 15 to 25 percent. Requests for AF/ILE approval must come from MAJCOM/CEs.
- Congress approves all new construction projects with cost increases greater than 25 percent over the programmed amount or greater than \$2,000,000, whichever is less. Congress also approves cost increases for all improvement projects greater than \$2,000,000, and all scope reductions greater than 25 percent.
- Scope reduction notification also applies when a reduction of 25 percent or more is taken from the programmed amount while maintaining the scope for a project. The 21-day prior notification is independent of any request to reprogram funds that are excess to a project due to a scope reduction.

Requests for congressional approval must come from MAJCOM/CEs.

Requests for approval of project costs exceeding the programmed amount or scope reductions/increases must include:

- Current working estimates based on valid bid approach
- Thorough justification for the request to include an analysis of the cause(s) for the change
- Impact if not provided
- Plan to prevent future occurrences (except scope increases)

## **2-9.4 High Unit (Most Expensive Unit) Cost Notification**

### **2-9.4.1 Improvement Projects Exceeding Statutory Improvement Cost Limit**

In compliance with 10 U.S.C. 2825, congressional notification is made within the budget submission for improvement projects wherein the high unit cost (HUC) exceeds the Statutory Improvement Cost Limit. The statute does not require congressional notification when, during project execution, units' costs are expected to exceed the HUC identified on the DD Form 1391 contained in the approved budget submission. However, AF/ILE approval is required to exceed the approved HUC, and SAF/IEI approval is required to exceed the HUC by more than 25 percent.

### **2-9.4.2 Improvement Projects Less Than the Statutory Improvement Cost Limit**

The congressional budget submittal only includes DD Form 1391 for those projects estimated to exceed the statutory improvement cost limit. Therefore, if a DD Form 1391 with an HUC is not included, by default, the approved unit cost is less than the Statutory Improvement Cost Limit. If during project execution, costs are projected to exceed the Statutory Improvement Cost Limit, then the installation must accomplish the statutory requirement to notify Congress. A 21-day notice-and-wait to Congress is required prior to executing the improvements. Once congressional notification is complete, the preceding paragraph applies.

### **2-9.4.3 MAJCOM/CE Request**

Requests for AF/ILE or SAF/IEI approval to exceed HUC and requests for congressional notification, as outlined in the two preceding paragraphs, must be signed by MAJCOM/CE and submitted to AF/ILEH.

#### **2-9.4.4 Utilities and Infrastructure Inclusion**

The high unit (most expensive unit) cost should be calculated to include all utilities and infrastructure that are the exclusive use of the unit. For example, include sewer lateral for sewer line, water branch for water line, patio, porch, walkways, privacy fencing and driveway in the cost calculation since it exclusively services the housing unit.

#### **2-9.4.5 Environmental Exclusion**

For new construction and improvement projects, the reprogramming thresholds are set at 125 percent of the programmed amount, or \$2 million, whichever is less. However, the costs associated with legally required environmental hazard remediation is excluded from the application of the reprogramming thresholds if the remediation could not have reasonably been anticipated at the time the project was originally approved by Congress.

For maintenance and repair projects, Congress allows an after-the-fact notification (in lieu of prior notification) if the GOQ and non-GOQ maintenance and repair thresholds are exceeded solely due to the costs associated with environmental hazard remediation that could not have reasonably been anticipated at the time of the budget submission.

#### **2-9.5 Substituting Improvement Projects with Replacement Projects**

If an authorized improvement project cost exceeds 70 percent of the cost to replace the housing, and an economic analysis further shows the improvement project no longer is the most cost effective alternative after a review of post-design or bid cost estimates, MAJCOMs and installations may request to substitute a replacement project at the improvement project program limit.

SAF/IEI must approve project substitutions, notify Congress and wait 21 days before the contract can be awarded. The notification includes the economic analysis and marked DD Form 1391.

#### **2-9.6 Prior Consent and Annual Reporting Requirements for Disposing of Capehart and Wherry Housing**

Installations must secure approval from the MAJCOM before disposing of Capehart or Wherry Housing units. Disposal includes sale, transfer, demolition, replacement, or any other arrangements that remove these housing units from the AF inventory. MAJCOMs will report requirements and request permissions from SAF/IEI through AF/ILEH for disposal requirements annually (i.e. FYXX requirements will be requested on 15 JAN XX).

### **2-9.7 Waiver to Exceed the Programming Benchmark and Construction Maximum Unit Sizes**

Waivers to exceed programming benchmark and construction maximums for a housing unit shall only be considered when sizes can be obtained within the total original program scope and cost, including all project amenities.

- Variances greater than the programming benchmark up to the construction maximum must be approved by AF/ILE.
- Units shall not exceed the construction maximum size unless previously approved by SAF/IEI. Congressional notification and a 21 day wait is also required.

#### **2-9.7.1 MAJCOM/CE Request**

MAJCOM/CE's submit a written justification for reprogramming that includes:

- Current working estimates based on validated bids or proposals, including bid extensions
- Impact of terminating the contract
- DD Form 1391 marked with change(s)
- Justification for the reprogramming including floor plans, building elevations, site plans, square footage calculations and interior and exterior amenities

## CHAPTER 3 NEIGHBORHOOD DESIGN

### 3-1 INTRODUCTION

Family Housing planning is a comprehensive process that considers the entire neighborhood and site environment conditions in addition to the housing units themselves. The “whole neighborhood” process cannot be successful if attention is given only to the quantitative issues such as the housing unit living space allowances and the number of bedrooms.

The purpose of the Housing Community Profile and its Whole House/Whole Neighborhood focus is to increase the overall quality of the entire FH area. It provides a comprehensive plan for improving the overall quality of the FH environment by integrating elements such as utility and infrastructure planning, site planning, vehicle and pedestrian circulation, open/recreation space development, playgrounds and picnic shelters, and “streetscape” development. Following are key elements to keep in mind when developing a neighborhood design:

- Coordinate residential improvements with site furnishings to improve the community’s appearance. Site fixtures, including signage, street lights, unit trash enclosures, pavilions, storage sheds or built-in storage units (coordinate storage design with the housing unit and yard design), benches and picnic tables in public areas and litter receptacles are visually prominent features. Coordinate the selection of each item in order to present a unified architectural appearance.
- Develop a standard sign style to coordinate signage throughout the community.
- Coordinate site elements for public services such as dumpster enclosures, bus shelters and cluster mailboxes.
- Place and screen dumpsters to reduce their negative impacts, while maintaining convenience to those using them and efficiency to the collection efforts.
- Provide each neighborhood with bus shelters as appropriate for the expected number of school children. Enhance these structures with low maintenance plantings, sitting areas and night lighting. New shelters should complement other site furnishings.
- Provide cluster mailboxes for units that complement the architecture of the neighborhood.

Other important elements include the consideration of community support functions, such as youth centers, child development centers, schools, fire stations and other community service functions similar to those found in the civilian community.

The **Goal** of neighborhood design for Air Force FH is to develop and sustain a residential environment that responds to the Air Force family and reinforces the connection between the families and the community.

Planners can accomplish the Air Force neighborhood design Goal by using the following site development **Objectives**:

**Objective No. 1:** Use residential planning units to create a neighborhood identity that is consistent with the entire community.

**Objective No. 2:** Provide efficient, safe pedestrian and vehicular circulation that enhances the neighborhood and community.

**Objective No. 3:** Provide a full range of recreational facilities for all ages.

**Objective No. 4:** Use cost effective, environmentally sensitive landscape design to enhance the environment.

**Objective No. 5:** Plan/provide sustainable, aesthetic, infrastructure that meets current needs, provides for future development, and is within the project budget.

While all installations must comply with this guide, it is recognized that building codes and practices in overseas (foreign) locations are different in many cases than those encountered in CONUS installations. Local building codes and practices in overseas (foreign) locations should be incorporated except where doing so will adversely affect life safety, fire protection, or accessibility issues. MAJCOMs with overseas (foreign) installations are responsible for approving any deviations concerning codes and standards from this guide for overseas (foreign) installations.

### **3-2 SITE DEVELOPMENT**

The design of a housing project must include all site preparation, site improvements and off-site road and utility systems that are required exclusively for the support of the housing project. **This work is provided within the total project cost.**

Site preparation work includes the demolition of existing structures, correction of drainage problems and unsuitable subsurface conditions, clearing, grubbing and rough grading, as applicable.

Site improvements include utility systems, roads, streets, curbs and gutters, walks, driveways, off-street parking, recreation areas, bike/jogging paths, lawns, landscaping and finish grading as required to support the function and livability of the housing neighborhood.

#### **3-2.1 Site Density**

Land area for density calculations excludes slopes greater than 10 percent, major highways, flood plains and flood areas, lakes and watercourses and protected areas such as wetlands and dense forested areas. Major recreation areas greater than 3 acres (ballfields, playgrounds, picnic areas) are excluded from the density calculation.

The densities for FH projects, expressed in units per acre, are listed in Table 3-1. Various categories of housing types and locations are shown. Density ranges shown on this table represent minimums and maximums for new construction and other acquisition projects and target ranges for existing housing areas. The standard for Air

Force housing allows the construction of single family units, attached multiplex units (2-6 attached units), and, if space is limited, a maximum of 8 attached units as defined by rank and number of bedrooms in Table 3-3: Unit Configuration Criteria on page 67. Neighborhood layouts shall take into consideration the housing type and size to be developed and be designed appropriately and cost effectively based on site parameters, rank category being designed for, and project budget. Density can be a major cost driver if neighborhood layouts are not well designed. Lower density neighborhoods can impact the project more because of increased infrastructure costs. Neighborhood designs must be in accordance with the approved budget.

- Low density is usually associated with suburban and rural single detached units and is appropriate when existing Government land is readily available for residential use.
- Medium density is usually associated with single detached or attached row or townhouse developments and usually equates to developed urban areas. Medium density is appropriate when Government land is in short supply or private sector land can be purchased for reasonable prices (less than 15 percent of the unit cost) or local land use practice dictates this density.
- High density is usually associated with row or townhouse developments and is required when Government land is in extremely short supply or unavailable, land purchase is costly (greater than 15 percent of the unit cost), the surrounding zoning is urban, or local land use practice dictates this density.

Overseas (foreign) sites are normally built to higher density than those in the continental United States. Where a large number of units are desired on a small area of land the density can range up to 40 units per acre. Figure 3-1 and Figure 3-2 show examples of high density housing concepts that use high-rise apartments and townhouse housing units.

Open space is a precious resource in FH areas. Site plans must be as efficient as possible with the land available. When the site allows provide standard minimums for unit separation, setbacks and backyards. Refer to Paragraph 4-6 for more information.

**Table 3-1: Housing Density by Location and Type of Unit (Units/Acre)**

Housing Type	Density Factors – Units per Acre		
	Low <sup>1</sup>	Medium <sup>2</sup>	High <sup>3</sup>
Field Grade and above	3-4	5-6	7-8
Enlisted/Company Grade	4-6	7-10	11-15
1. Suburban, moderately developed, and rural areas. 2. Developed urban areas not included under “High” location. 3. Dense metropolitan areas and most overseas (foreign) locations. High-rise building density can be up to 40 units per acre.			

**Note:** Density ranges in the above table represent minimums and maximums for new construction and other acquisition projects and target ranges for existing housing areas.

Figure 3-1: High-Rise for Overseas (Foreign) Locations



Figure 3-2: Multifamily Townhouse



### 3-2.2 Site Environment

Ensure that special attention areas, such as wetlands, coastal/shoreline zones and natural habitats, are considered when making Whole Neighborhood improvements and when planning new construction.

Consider locating new housing in compatible areas (outside of environmental constraint areas and with consideration for environmental enhancements) with respect to airfield and flight pattern restrictions/recommendations, other incompatible noise sources, unsafe land uses, wetlands, historic districts and sites, high voltage power lines and interstate/interregional fuel and natural gas right of ways (ROWs), as well as related installation opportunities and constraints. Project specific mitigation techniques are required where housing is encumbered by marginal flightline constraints. All housing development shall comply with and be sited in accordance with Attachment 4 of AFH 32-7084, *AICUZ Program Manager's Guide*. The following requirements are important:

- Housing is not compatible within noise level zone Ldn 75 or higher. Prohibit new or replacement housing in this noise level area.
- Housing development is discouraged in noise level zone Ldn 65-75.
- Housing is prohibited within runway clear-zones or accident potential zones per UFC 3-260-01, *Design: Airfield and Heliport Planning and Design* and the AICUZ program guidance.
- When no other viable alternative exists and residential uses are planned in areas above Ldn 65, designers must incorporate sound-proofing measures into the design and construction of the housing to achieve an outdoor to indoor noise level reduction (NLR) of at least 25 dB in the Ldn 65-70 range and 30 dB in the Ldn 70-75 range. Since normal construction can be expected to provide a NLR of 20 dB, the reduction requirements are often stated as 5 or 10 dB over standard construction and normally assume mechanical ventilation and closed windows year round.
  - Special requirements must be validated/identified in the HCP development and costs programmed as special construction items in the DD Form 1391.

### 3-3 FORCE PROTECTION AND ANTI-TERRORISM

Force protection requirements for planning and design of family housing and neighborhoods are determined by the local threat analysis or risk assessment. The designer and civil engineer should coordinate with the local security forces to determine if there are any specific family housing force protection design requirements.

Since most of the existing Air Force Family Housing inventory is exempt from DoD Minimum Antiterrorism Standards, it is the community planning issues for military family housing that are most commonly driven by the Installation Force Protection Guide. Therefore, the design of family housing neighborhoods should be coordinated with the base's Installation Security Plan or comparable installation force protection plan based on the local risk assessment and, when feasible and cost effective, the stand-off distance requirement should be met in new construction. Reference the Air Force *Installation Force Protection Guide*, found on the AFCEE web site, for more information.

Family housing structures with less than 12 units per building are exempted from UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*. Family housing buildings with 12 units or more per building are to be designed in accordance with the UFC 4-010-01.

#### 3-3.1 Low Density Family Housing

The exemption of family housing with 12 units or fewer in a single building acknowledges that the density of such units is generally low, reducing the likelihood of mass casualties. It also acknowledges the fact that low-density housing has rarely been directly targeted by terrorists. A further assumption for existing family housing with 13 or more units per building is that by designating parking spaces for specific residences, the risk of parking vehicle bombs in those parking areas is reduced due to increased awareness of the vehicles that are authorized to park there.

## **3-4 SUSTAINABLE DESIGN**

### **3-4.1 Introduction**

Sustainable development creates high-performance buildings that protect ecosystems, conserve resources, improve the indoor and outdoor environment and enhance people's living conditions and health. Sustainable development is an investment in the future. It uses conservation, improved maintainability, recycling, reuse, reduction and other actions and innovations to meet today's needs without compromising the ability of future generations to meet their own. The goals of sustainable development are to conserve energy, water and raw materials; prevent the environmental degradation that can be caused by building construction, operations and disposal; and create built environments which are livable, healthy, maintainable and productive. This approach reflects the USAF commitment to environmental stewardship and conservation while balancing cost, environmental and mission needs. Reference the *Air Force Sustainable Facilities Guide*. Another resource for sustainable development is the *Low Impact Development (LID) Center*.

### **3-4.2 Benefits**

Sustainable homes consume less energy and water, provide better indoor environmental quality and are durable and easy to maintain. Some examples include:

- Effective day-lighting, combined with well insulated building envelopes and efficient HVAC systems, creates pleasant indoor environments while cutting energy bills.
- Careful material selection reduces resident exposure to potentially carcinogenic volatile organic compounds and formaldehyde.
- Durable finishes that don't need painting, such as fiber cement board siding, brick or integrated color coat stucco, will cut maintenance costs, avoid maintenance intrusions into the residents' lives and prevent environmental impacts.

A commitment to sustainable development also sends the message to family housing residents that the Air Force values their health and well-being.

Sustainable development enables us to improve national security by moving toward energy independence. Force protection standards can also be successfully integrated with sustainable development. Trade-offs and synergies are discussed in the Whole Building Design Guide resource page on "Balancing Security/Safety and Sustainability Objectives." See the Whole Building Design Guide web site at [www.wbdg.org](http://www.wbdg.org).

### 3-4.3 Requirements

It is Air Force policy to apply sustainable development concepts in the planning, design, construction, operation, maintenance and disposal of facilities and infrastructure projects, consistent with budget and mission requirements. Use of sustainable planning and development principles is required for family housing construction and improvements. Sustainable planning and development principles should also be considered for housing privatization projects.

Planners and designers must use integrated design practices that consider the entire building life cycle. Site planning sets the stage for a project to minimize environmental impacts and resource loss during construction. Designers can minimize health and environmental impacts by selecting materials and systems that reduce the demand for energy and water, allow renewable energy use, include recycled and renewable products and avoid maintenance practices that require the use of undesirable raw materials or chemicals. It is important to realize that high-performance buildings don't necessarily require "high-tech" engineering solutions. Simple, integrated systems are often more effective. For example, day-lighting and natural ventilation work well in many climates when integrated with the home's lighting, HVAC, envelope design and landscaping.

The earlier in the process that sustainability is considered, the more effective the process will be. Sustainable strategies must be thought of in the context of the entire project design and not layered on after the fact. There are often tradeoffs between green building practices, first costs and life cycle costs that need to be discussed from a "whole systems perspective." To be successful and cost effective, these issues must be thought about by an expanded project team including the HCP contractor, the design firm, project managers, construction managers, user representatives, pollution prevention and energy specialists and the contracting officer. Sustainable development requires continuous integration between programming, planning, design and construction.

Setting sustainable development goals early in the planning, programming and budgeting process and ensuring these goals are attained during design and construction is critical to project success. Selecting knowledgeable and experienced consultants, and seeking practical applications of sustainability within the unique culture of the military, are also keys to success. Sustainable design should not add cost to the budget if considered early in the process.

The architect-engineer firm must take the lead in coordinating the integrated design team, helping the users to establish sound sustainability goals and including strategies to achieve the goals in the design documents. Goals and strategies should be developed with the aid of the tri-service family housing rating system described in Paragraph 4-16. After the initial charrette and goal setting process, the project follows a more traditional path with occasional sustainability meetings to review progress, address changes and evaluate alternative strategies.

Because of the number of people involved, this approach takes more time up front but usually results in saving time over the course of the project. Expanded teams have reported that better communication results in fewer change orders, more innovative solutions, a less stressful value engineering process and, in many cases, significant cost savings to systems.

Not all sustainable design adds cost to the project. It is more about “good design” and conservation than about cutting-edge, expensive technological “fixes.” It is about managing the entire design process to integrate all disciplines and take small, incremental steps that lead to big savings and healthier facilities.

To summarize, sustainable development minimizes a building’s adverse economic and environmental effects while optimizing its performance throughout its life cycle. It is an iterative series of trade-offs that consider a wide range of issues. It ensures the “best fit” of the built environment to the natural environment, and it requires changes to the facility delivery process. These process changes include:

- Identifying appropriate sustainability goals early in project planning, developing them further during the charrette, and following through during design and construction to ensure their achievement
- Including planners, programmers and environmental managers as active participants in the project development team
- Selecting architectural-engineer firms with knowledge and experience in sustainable design
- Requiring integration between design disciplines to ensure that all building systems will work together for the highest performance at the lowest cost
- Partnering with the construction contractor and the quality assurance evaluators to discuss the sustainable development goals and features of the project
- Providing residents with information about the sustainable features of their new home, and how they can clean and maintain it so that it continues to perform sustainably

### **3-4.4 Principles**

Sustainable development in the built environment includes six fundamental principles:

- 1 Optimize Site Potential.** Creating sustainable buildings starts with proper site selection, including consideration of the reuse or rehabilitation of existing buildings. The location, orientation and landscaping of a building affects the local ecosystems, transportation methods and energy use.

- 2 Minimize Energy Consumption.** A building should optimize system efficiencies and also employ conservation measures. Renewable energy technologies should be used in facility projects whenever feasible and cost effective. New facilities should meet or exceed current Air Force energy performance goals, including *Energy Star Homes* standards found at [www.energystar.gov](http://www.energystar.gov).
- 3 Protect and Conserve Water.** Fresh water is an increasingly scarce resource near many of our bases. A sustainable building should use Low Impact Development techniques, found at the EPA website [www.lowimpactdevelopment.org](http://www.lowimpactdevelopment.org), to reduce and purify site runoff and maximize groundwater recharge. Buildings must also use water efficiently and implement as many *Federal Energy Management Program (FEMP)* Water Efficiency Best Management Practices found at the DOE website ([www.eere.energy.gov/femp/](http://www.eere.energy.gov/femp/)) as possible.
- 4 Use Environmentally Preferable Products.** Buildings should be constructed of materials that minimize life cycle environmental impacts such as global warming, resource depletion and toxicity. In a materials context, life cycle includes raw materials acquisition, product manufacturing, packaging, transportation, installation, use and ultimate disposal. Although the science of life cycle analysis is still in its infancy, a number of tools such as NIST's Building for Economic and Environmental Sustainability (BEES) (found at [www.epa.gov/oppt/epp/tools/toolsuite.htm](http://www.epa.gov/oppt/epp/tools/toolsuite.htm)) are being developed to fill this void. Rating systems such as Green Seal (found at [www.greenseal.org](http://www.greenseal.org)) develop standards for environmentally friendly products, and identify products meeting the standards.
- 5 Enhance Indoor Environmental Quality (IEQ).** The IEQ of a building has a significant impact on resident health, comfort and productivity. Among other attributes, a building should optimize day-lighting, be well ventilated, control moisture and avoid the use of materials that produce chemical emissions.
- 6 Optimize Operational and Maintenance Practices.** Buildings should be designed to take into account the energy and environmental impacts of operating and maintaining the building. Designers are encouraged to specify materials and systems that reduce maintenance requirements, and/or require less water, energy and toxic chemicals to maintain.

The Whole Building Design Guide, [www.wbdg.org](http://www.wbdg.org), provides additional technical guidance for each of these principles. Refer to the "Design Guidance" section, then select "Design Objectives" and view the "Sustainable" criteria.

### **3-4.5 Assessment Metric**

The United States Green Building Council's (USGBC) "Leadership in Energy and Environmental Design (LEED)" Green Building Rating System is the Air Force preferred self-assessment metric for sustainable development. Since LEED doesn't rate residential construction, a tri-service residential sustainable rating system was developed for family housing. See Paragraph 4-16 for details.

## **3-5 INFRASTRUCTURE**

This Guide defines infrastructure as the systems required to support the community. These systems include electrical power, area lighting, telephone, cable television, communications/data, water supply, natural gas, sewage/waste disposal, storm water management systems, roads, accessibility routes and easements. The Air Force, local government entities, utility companies, private companies, or any combination of these organizations could own all or part of these systems. Ideally, utilities should be located in the rear of the housing units. If utilities are to be placed near the street in front of the housing unit, locate them away from the sidewalk to allow for maintenance activities. Avoid conflicts by coordinating landscape and utility design.

Utility systems not addressed in this guide may exist at specific installations. These may include steam or hot water heating systems, or other systems.

### **3-5.1 Utilities Systems Metering**

To accurately monitor the consumption and cost data for electricity, gas and water utilities, master meters are required for FH areas. For new construction and whole house renovations, provide electric meter bases for individual housing units and provide adequate space for future installation of other individual utility meters. For privatization projects, provide individual utility meters for all services for all new and retained units.

Segregate utility metering for family housing from the remainder of installation uses. Within the family housing community, master meter utilities by neighborhood. FH projects with fewer than 25 units normally will not be master metered but may be considered for master metering if local conditions indicate its desirability.

For any existing project, no more than two primary line meters are used for the metering of a specific utility. Normally, if additional housing units are constructed, the existing master metering system is modified to meter the new area. However, if it is more economical, the new area may be designated as a separate project with no more than two additional primary line meters installed for each utility.

When the project layout is such that it is not possible to meter a specific utility for the entire project with two primary line meters, then the installation may select two typical areas of the project for partial metering. The demand and consumption figures for the

specific utility are in direct proportion to the number metered. The installation selects a typical area that provides a reasonably uniform sampling of all housing configurations and resident grades. If metering two typical areas is not reasonable, the two meters should be located so that combined readings will provide a uniform sample.

If permanent metering facilities for FH units are not installed, temporary meters may be used periodically to spot check utility costs. Consider provisions to ease the installation of temporary meters in the design of utility supply feeders.

### 3-5.2 Collocation of Utilities

Where feasible and acceptable to the local utility supplier or servicing agency, consider the joint use of trenches for two or more utilities. However, do not collocate water supply and sewage lines, but space these in accordance with local codes. Whenever gas lines are installed near other buried utilities, take precautions during the design and installation process to minimize the risk of damaging the gas line during subsequent work on other utilities, and adversely affecting other utilities should a leak occur in the gas line. If gas lines are installed in the same trench as other utilities, locate the gas line on a shelf of undisturbed earth at least 12 inches above and to one side of the other utilities. All new underground utilities must also incorporate a method for locating them from the surface (trace wire or other means).

### 3-5.3 Water Systems

HUD 4940.2, *Minimum Design Standards for Community Water Supply Systems* contains basic water systems criteria.

Total water requirements are based on average daily and peak-day consumption data, when available. When such data are not available, demand requirements are calculated as illustrated in Table 3-2:

**Table 3-2: Water Usage**

No. of Bedrooms	Gallons/Day/Unit
2	250
2/Modified or more	350

- For fire suppression, provide water systems capable of maintaining a minimum residual pressure of 20 psi at the hydrants. Hydrant water demand for unsprinkled FH is 500 gallons per minute (GPM) for one-story structures, 750 GPM for two-story structures and 1,000 GPM for three-story (and greater) structures, with a duration of 90 minutes. Water demand for sprinkled FH is the sprinkler water demand plus domestic water demand and 250 GPM for hose stream, with a duration of 60 minutes.

- Locate fire hydrants such that no dwelling unit is more than 300 feet from one hydrant and no more than 500 feet from a second hydrant. Measure the distances between dwelling units and hydrants along paved roads, streets, or parking areas.
- Size the water service lines to provide the minimum flow pressure for fixtures and equipment, as established by the International Plumbing Code, with a maximum velocity of 10 feet per second (fps). The minimum size of service lines is 3/4 inch.

### **3-5.4 Sanitary Sewer**

HUD 4940.3, *Minimum Design Standards for Community Sewage Systems* provides the basic sanitary sewer criteria for new construction. Concrete pipe, steel pipe and asbestos cement non-pressure pipe are not acceptable materials for use in new sanitary sewage systems.

Pipe materials to be used can be lined ductile iron, polyvinylchloride (PVC), or high density polyethylene (HDPE). Pipes shall be sufficiently sloped to provide a minimum waste flow velocity of 2-3 feet per second and a maximum velocity of 9 feet per second. Lift stations shall be provided where required.

### **3-5.5 Gas Distribution System**

The American National Standards Institute (ANSI) Standards B31.8, *Gas Transmission and Distribution Piping Systems*, provides the basic criteria for gas distribution systems. The design of gas distribution systems, up to the outlet of the service regulator (or to the outlet of an individual service-line valve when multiple units are served from a single regulator), must also comply with the following criteria:

- Do not install gas lines under buildings or under slabs adjacent to buildings, unless the lines are placed in sleeves that vent to open air. Check building code requirements for the separation of the vent from the building.
- Provide a separate service regulator with the service-line valve for each housing unit. The required service-line valve located upstream of the service regulator will suffice if a regulator is provided for each unit. If a single regulator supplies more than one unit, equip each individual service line with an additional service-line valve between the regulator and the building.
- Install all regulators and service-line valves on the exterior of the buildings above the finish grade. For other than polyethylene piping, install an insulating coupling in each service line (above ground and in a dry location) to interrupt the continuity between the piping buried underground and the piping inside the living unit.

### 3-5.6 Electrical Distribution System

Electrical systems must conform to the applicable criteria in the National Fire Protection Association (NFPA) 70, *National Electrical Code*, the ANSI C2, *National Electrical Safety Code* and the International Code Council *Electrical Code*.

- Any items containing polychlorinated biphenyl (PCB) are prohibited.
- All new or replaced electrical and communications systems shall be in underground conduit with a spare conduit. Overhead distribution shall not be used.
- The primary electrical distribution system should be a 'looped' distribution type system. A 'radial' distribution system with conduits run for a future looped distribution system may be considered. The conductors and conduits shall be sized for a looped system with the conduits not looped back in the same trench.
- The secondary electrical service distribution system should be radially fed directly from the transformer to each house. A daisy-chained, house to house, secondary feeder shall not be used.
- Provide a residential walkway lighting system that supplies an average minimum illumination level of 0.2 horizontal and 0.5 vertical foot-candles. Strict attention should be paid to light pollution issues. Neighborhood walkway lighting should come from illumination sources no less than 8 feet and no more than twelve feet above the ground unless part of a combined lighting area. (Illuminating Engineering Society of North America (IESNA) *Lighting Handbook* Latest Edition using a uniformity ratio of 6:1 average to minimum.)
- Provide a residential street lighting system that supplies an average illumination level of 0.4-foot candles, minimum of 0.2-foot candles at any point, average to minimum uniformity ratio of 6:1, and maximum to minimum uniformity ratio of 10:1. Collector and major streets shall have increased illumination. Luminaries shall be of the "full cutoff type" to reduce light pollution, spill light and glare. Luminaire mounting heights and pole locations need to consider all the areas to be lighted as a combined area with each sub-area contributing to the other areas, i.e., roadways, sidewalks, bikeways, walkways, pedestrian malls, parking lots, street intersections, etc. Lighting design shall use the IESNA Recommended Practices for "*Roadway Lighting, RP-8*", "*Lighting for Exterior Environments, RP-33*" and "*Guidelines for Security Lighting for People, Property, and Public Spaces, G-1-03*."

### 3-5.7 Storm Drainage

Storm water management system capacity is based on the amount of paved surfaces, the frequency of severe storms and the inches of precipitation for the locality. Use the 10-year storm frequency as a minimum base-line when developing a storm water management system. Initial planning should allow adequate space for storm water retention areas.

Installations should identify secondary drainage patterns. Provide redundancy in drainage systems, such as retention or detention ponds, for support of overloaded or blocked primary systems.

Positive drainage ensures that water drains away from all buildings. Locate collection swales at a minimum of 20 feet from any building. When natural drainage is used in lieu of underground systems, provide sufficient finish grades and the lengths and slopes of swales to provide protection for living units and yards and to prevent ponding in common areas.

### 3-5.8 Sedimentation and Erosion Control

Design and construction will incorporate Best Management Practices (BMP's) to meet or exceed the most stringent of Federal, State and local regulations. The Stormwater Pollution Prevention Plan will meet the standards of the applicable state's Soil & Erosion Control Manual, Latest Edition. Sedimentation and erosion will be controlled throughout the construction period. Design and construction will be performed in accordance with *National Pollutant Discharge Elimination System (NPDES)* requirements.

### 3-5.9 Corrosion Control

Avoid using ferrous materials in underground utilities where possible. Protect ferrous materials in the underground utility systems from corrosion by providing coating, wrapping, cathodic protection, or isolation of dissimilar materials, in accordance with UFC 3-570-06 *O & M: Cathodic Protection System*, AFH 32-1290, *Cathodic Protection Field Testing*, AFI 32-1054, *Corrosion Control* and MIL-HDBK 1004/10 *Electrical Engineering, Cathodic Protection*. Some piping systems, i.e. fire protection, as well as local conditions, may require more than one corrosion control method.

### **3-5.10 Communications Systems (TV, Telephone, Cable and Security)**

The telephone company serving the installation is responsible for installing and maintaining the telephone distribution system up to the demarcation point (the point where the telephone company wiring connects to government-owned wiring.) The state public utility commission governs the location of, and the terms and conditions applicable to, the demarcation point. The installation communications-computer systems officer can provide specific guidance on local conditions.

Where commercial cable TV (CATV) service is available, the CATV service contractor is responsible for installing and maintaining the distribution system from the signal source to the service connection point of the house. Government-owned antenna wiring in housing units may be used to provide the service if local conditions permit. The state utility commissions and local franchise agreements govern the terms and conditions for CATV service. If satellite TV service is allowed by the installation, a plan for locating satellite dishes on housing units so as not to adversely impact the building's aesthetics and structural integrity must be implemented by the BCE.

The installation communications-computer systems officer can provide specific guidance on local conditions and installation internet requirements for command, key and essential personnel. AFI 64-101, *Cable Television Systems on Air Force Bases*, and ETL 02-12, *Communications and Information System Criteria for Air Force Facilities*, also provide detailed guidance. The designer must determine system ownership early in the design phase of the project.

## **3-6 PLANNING UNITS AND NEIGHBORHOOD IDENTITY**

Using a "planning unit" model can help organize the design of an overall neighborhood. The following paragraphs describe how to use this model.

### **3-6.1 Cluster Development**

In either designing or improving an Air Force neighborhood, it is essential to understand the "planning unit" concept - the relationship of each dwelling unit to a cluster of units, a neighborhood and the installation as a whole.

This is an important planning concept since the monotony often found in large tract-housing neighborhoods makes it difficult for families to develop a sense of identity, ownership and belonging within their home, street and neighborhood.

People relate more easily to small groups of homes than to a large undifferentiated housing tract. Therefore, it is imperative that means be found to strengthen peoples' sense of belonging to their own local street or cluster.

A designer developing a housing area plan on an empty site should employ the principle of a spatial "hierarchy." This means designing the planning units in order to give shape to the community and to achieve a sense of local identification for residents. See Figure 3-3, Hierarchy of Neighborhood Planning Units.

The planning unit design starts with the individual homes. Table 3-3, Unit Configuration Criteria, is used to determine the size of the units and how housing units can be configured to achieve desirable configurations and densities.

**Table 3-3: Unit Configuration Criteria**

<b>Rank</b>	<b>Single-Family Housing Type</b>	<b>No. Bedrooms (Benchmark GSF/GSM)</b>	<b>Maximum No. Attached Units</b>
GO (O7+)	Detached	4 (3,330/309 )	0
SO (O6)	Detached or Attached	4 (2,520/234)	2
FGO (O4-O5)	Detached or Attached	4 (2,310/215)	2
E9 Prestige	Detached or Attached	3 (2,020/188)	4
CGO O1-O3  SNCO (E7-E8)	Detached or Attached	5 (2,510/233)	2
	Detached or Attached	4 (2,150/200)	4
	Detached or Attached	3 (1,860/173)	4
	Detached or Attached	2/Modified (1,670/155)	6 <sup>1</sup>
	Attached <sup>2</sup>	2 (1,490/138)	6 <sup>1</sup>
JENL (E1-E3)  JNCO (E4-E6)	Detached or Attached	5 (2,300/214)	2
	Detached or Attached	4 (1,950/181)	4
	Detached or Attached	3 (1,630/151)	6 <sup>1</sup>
	Detached or Attached	2/Modified (1,480/137)	6 <sup>1</sup>
	Attached <sup>2</sup>	2 (1,340/124)	6 <sup>1</sup>
<b>NOTES:</b>			
1. In cases with extreme site and/or cost constraints, the maximum number of attached units may be increased to eight.			
2. Detached single-family units may be planned if, due to site conditions, they are shown to cost less than attached single-family units.			
3. See Glossary for definitions of "Detached" and "Attached" Single Family Housing.			

The next planning unit would encompass a group of homes comprising a sub-neighborhood or "cluster." Plan the site so that housing units are clustered into mini- or sub-neighborhoods organized around a central element, such as a cul-de-sac or common area. See Figure 3-3.

Finally, clusters would be joined to create "neighborhoods." This type of relationship makes it possible for people to be part of a very large housing area while instilling a sense of place and pride in the individual street or cluster within which they live. See Figure 3-3.

Plan all housing areas so that community members can identify "their own" place in the overall neighborhood.

Where surpluses exist and units are candidates for demolition (identified in the HCP), select units for demolition such that the cluster concept is strengthened.

Design other functional aspects, such as signs denoting housing areas, traffic flow and recreation spaces to work with the neighborhood planning units.

Some Air Force housing areas are already designed using the planning unit principles. At other installations, however, the existing street layout is essentially a grid, with very large, relatively undifferentiated housing areas. Following are possible techniques for breaking up large undifferentiated areas into smaller, sub-neighborhoods:

- Modify traffic patterns to support the "planning unit" concept.
- Provide shared facilities, such as recreation and open spaces, to help create a network of neighborhoods within the housing tract. See Figure 3-4.
- Use landscape design and earth-shaping techniques to emphasize the hierarchy of spaces within the neighborhood.

These key methods are discussed further in Paragraphs 3-7, 3-8 and 3-9.

**Figure 3-3: Hierarchy of Neighborhood Planning Units**

**PLANNING UNIT 1**  
 The individual dwelling unit and private space.



**PLANNING UNIT 2**  
 A cluster of units forming a sub-neighborhood and its related recreational space.



**PLANNING UNIT 3**  
 A neighborhood made up of a group of clusters.

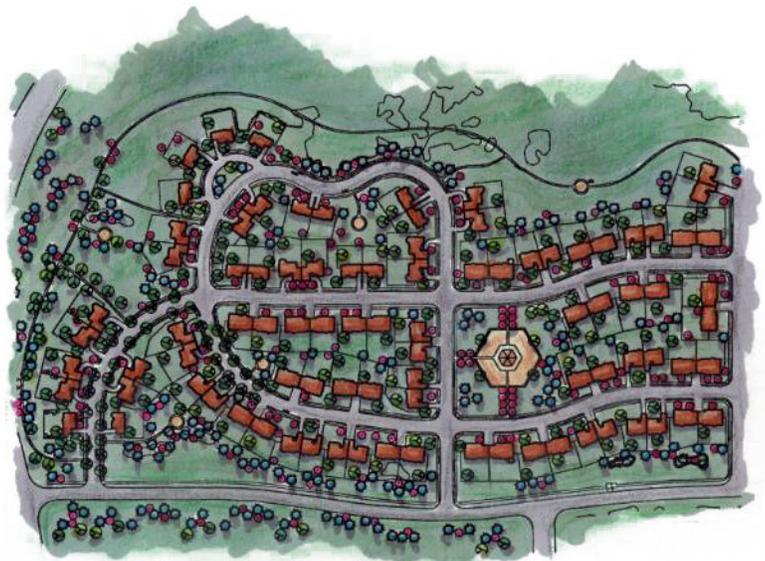


Figure 3-4 illustrates a development incorporating sustainable design by preserving a natural stream with its native vegetation and a small natural lake. These natural elements divide the neighborhood into clusters all sharing the open space. Designers must incorporate safety features as appropriate when designing in these environments.

**Figure 3-4: Development Incorporating Sustainable Features**



### 3-6.2 Mobile Home Park

The Air Force does not consider mobile homes to be suitable permanent party housing because they are not constructed on permanent foundations. Improvements to existing mobile home parks are to be for maintenance and repair only. Installations should not program for any major improvements or build any new parks. Refer to AFI 32-6001, *Family Housing Management*. In mobile home park neighborhoods, maintain year-round vision blocking vegetation for landscape screening. Landscaping within the park and at the park perimeter should be used in the same manner as in conventional neighborhoods to create a hierarchy of spaces. In addition, consider the following:

#### 3-6.2.1 Services Provided for Mobile Home Parks

- Utility connections and disconnect services shall be provided with owner providing all the materials.
- Management services shall be provided.
- Maintenance and repair of streets, parking areas, existing sidewalks, community facilities, existing storage sheds and common recreational areas are provided.
- Trash collection, snow removal and street cleaning are provided.
- Grounds maintenance for community public areas is provided.
- Retain existing trees and groups of trees where possible.
- Utility and street lighting requirements for mobile home parks are the same as for a conventional housing neighborhood.

### 3-7 VEHICULAR AND PEDESTRIAN CIRCULATION

The development of improved vehicular circulation systems is one of the most desirable ways to strengthen the identity of neighborhood planning units. Although the street system should provide safe, convenient access to and from the housing units and the neighborhood, it must not play a dominant role with respect to the overall housing area environment.

In the housing areas, pedestrian-oriented circulation, such as walks, jogging/exercise paths and bike paths, must be integrated into the neighborhood circulation system to create a "walkable" community. The street system must defer to and be supportive of the pedestrian-oriented system. All Air Force housing neighborhoods shall be designed to be accessible to and usable by persons with disabilities. New construction, as well as renovations to existing facilities, must be designed and constructed to meet the requirements of the *Americans with Disabilities Act (ADA) Architectural Guidelines (ADAAG)* and the *Uniform Federal Accessibility Standards (UFAS)*, with the most stringent standards applied in the event of conflicts. Further guidance on accessibility may be found in the appendices.

### 3-7.1 Neighborhood Sidewalks

- Sidewalks should be designed as an internal network separated from, but connected to, vehicular circulation systems. Increased emphasis should be placed on safer pedestrian accessibility to recreation areas, as well as appropriate off-site amenities. A concept found in New Urbanism designs is to show relationships between the residential neighborhoods and nonresidential such as a connection to the shopette and movie rental. This allows the residents the opportunity to walk a short distance and eliminates the use of a car. See Figure 3-5. Walkway design is as important as street design. The sidewalk system should be designed as an alternative circulation to vehicular. It should allow residents to move and walk safely to various elements of the neighborhood without being tied to the road edges. Sidewalks are required at a minimum on one side of the street. If the project budget and site allows, sidewalks on both sides of streets are encouraged. Also consider a 5 foot grass buffer or a 6 foot planted buffer between the sidewalk and the street.
- Neighborhood sidewalks are walks that are located along the local street that connect to unit walkways and to other neighborhood sidewalks. These sidewalks should serve all facilities or areas that are subject to pedestrians, such as school, bus stops, cluster mail boxes, community center and recreational areas such as playgrounds, courts, trails and jogging paths. These sidewalks should be a minimum of 5 feet in width and if along the street be a minimum of 5 feet from the curb separating the street from the sidewalk. If the desired 5-foot sidewalk is not achievable a 4-foot sidewalk is allowed if a turnaround area is provided to meet ADA or UFAS requirements, whichever is more stringent. If space is not available for a buffer consider a 6-foot sidewalk adjacent to curb. Sidewalks adjacent to parking lots should be a minimum of 6 feet wide to accommodate vehicle overhang and still allow walking space. Curb cuts meeting ADA or UFAS requirements shall be provided at all intersections for persons with disabilities to move from one sidewalk to another safely.

**Figure 3-5: Connection to Nonresidential**



### 3-7.2 Neighborhood Parking

- Current Air Force policy allows 2 car garages. Where 2-car garages are provided, narrower streets, with no on-street parking, are encouraged to promote pedestrian safety and improve the visual character of the street.
- As a minimum, provide off-street parking at the rate of 2.0 spaces per individual unit. Count carports, garage spaces and driveways in satisfying the off-street parking requirements. Count garages and carports as one or two spaces, whichever is applicable. For community planning purposes and if land is available, provide an additional 0.5 spaces per unit to accommodate guest parking in the FH community. Guest parking should be planned for and costed in the HCP.
- Where side-by-side parking is provided, either in driveways or in common parking spaces, provide a minimum parking space width of 9 feet for parking lot space and 12 feet for driveway.
- Do not design common parking areas such that vehicles are required to back into main collector streets.
- Provide driveways with a minimum width of 12 feet for single car garages, 21 feet for double car garages. When the driveway is intended to provide space for off-street parking, the minimum length is 24 feet, exclusive of any street sidewalks.

### 3-7.3 The Street System

Use a hierarchy of streets in the same way that the planning unit hierarchy has been identified for homes, clusters and neighborhoods. Each street serves an identifiable function. Plan streets based on the following criteria (see Figure 3-6):

Provide street signs and markings in accordance with the Federal Highway Administration's *Manual of Uniform Traffic Control Devices* and UFC 3-120-01, *Air Force Sign Standard*.

**Figure 3-6: Street Hierarchy**



**Table 3-4: Family Housing Street Development**

<b>Street Type</b>	<b>Characteristics:</b>
<b>Local</b>	Block, Cluster, or Cul-de-sac Level; Serves individual units; Feeds collectors.
<b>Collector</b>	Neighborhood or Community Level; Serves dwelling unit clusters; Feeds arterials.
<b>Arterial</b>	Installation Level; Connects different areas of the Installation; Feeds off-installation streets.

### 3-7.3.1 The Local Street

This is a street that carries low volumes of traffic. Its function is to provide access to the housing cluster. It can be a cul-de-sac type configuration, a looped street, an alleyway, or part of a grid layout.

Street systems must provide convenient and safe access and circulation within the housing area. The street system should minimize through traffic in the housing area. Roads and streets must be adequate to accommodate resident traffic, service vehicles (including maintenance, trash removal, buses, moving vans and firefighting equipment) and snow removal equipment, where applicable.

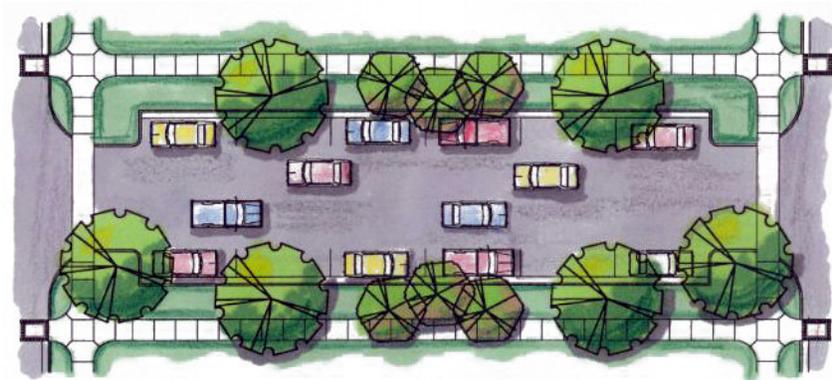
Provide curbs and gutters on all new streets and design these in accordance with MAJCOM and installation Facilities Excellence Plans. If an installation does not have such a plan, the MAJCOM will provide specific guidance. Curbs may be the standing or rollover type. Provide curb depressions at driveways and at handicap accessible ramps. The minimum curb radius at intersections (except alleyways) is 20 feet.

- Size cul-de-sacs to accommodate the minimum turning radii of emergency vehicles on the installation. Design cul-de-sac to have a minimum outside turning radius of 50 feet, including driving lane.
- Vehicular speed on these streets should not exceed 15 mph. Drivers must have a clear view of the entire street since children will be playing in and around the street.
- Design streets with traffic calmers. Traffic calmers are elements incorporated into the street layout that slows down the speed of drivers: some examples are curved streets, narrowing of streets at intersections and roundabouts. See Figure 3-7.
- When cost effective, alleyways are used to remove garages from the front of the housing unit and to accommodate service traffic (trash removal, utility, maintenance, etc.). See Figure 3-8.

Figure 3-7: Traffic Calming Techniques



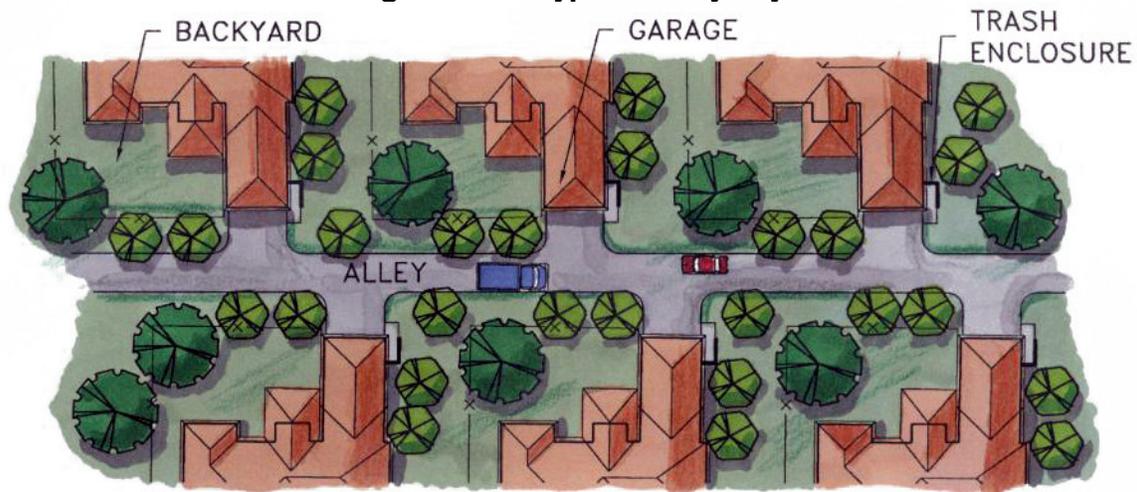
Curved Street



Street Narrowing at Intersections



Roundabout

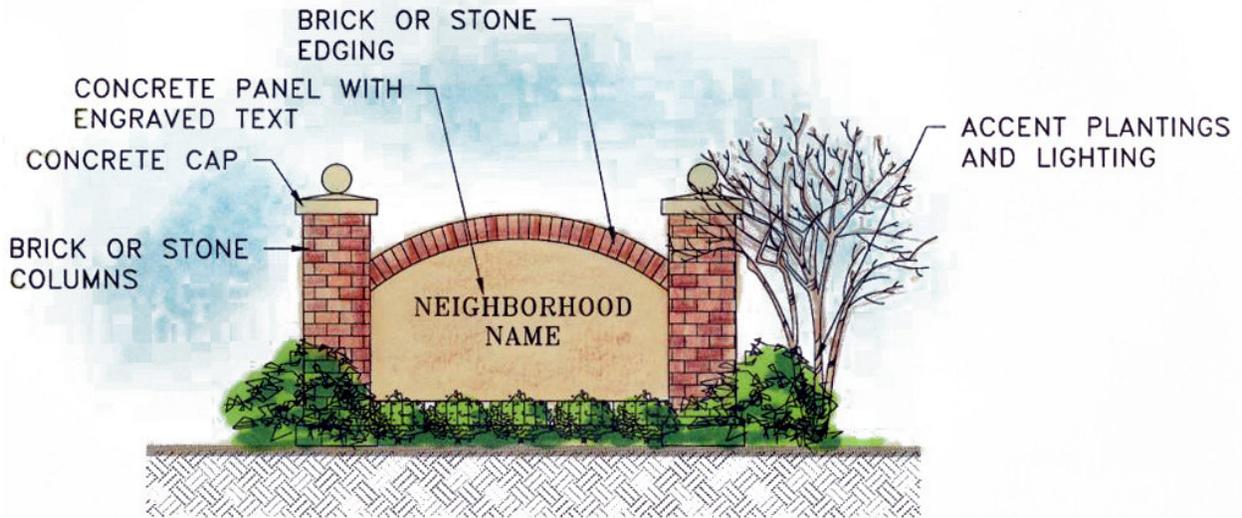
**Figure 3-8: Typical Alleyway**

### 3-7.3.2 The Collector Street

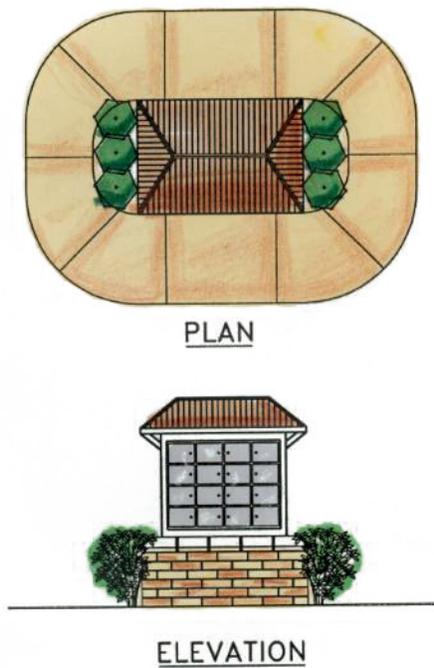
This street handles the traffic from a group of clusters and their respective local streets. A collector street provides access to the installation traffic arterials or to adjoining neighborhoods on the installation.

- Housing units should not be located adjacent to collector streets. If this situation is unavoidable, provide safety fencing and/or a noise barrier. Avoid driveways located on collector streets.
- At sidewalks, bicycle and jogging path intersections with the collector street, consider providing pedestrian-activated traffic lights or street level marker lights.
- Provide a clear delineation of pedestrian and bicycle/jogger crossings on the street pavement. A change of texture and/or color, such as pavers or imprinted and/or colored concrete or asphalt, at crossings is highly desirable.
- Use entry landscape architecture and landscaping features such as neighborhood signage and cluster mailboxes that incorporate building materials and architectural features that are similar to the housing elements. These help to identify each individual neighborhood. A neighborhood entry sign and cluster mailbox as shown in Figure 3-9 and Figure 3-10 are examples of such architecturally identifying features.
- Intersections should be at right angles and be separated by a minimum of 125 feet.
- ROWs include the street pavement, plus a planting strip on either side of the street to accommodate street signage, sidewalks, bus stops and landscaping. The planting strip width should be 10 feet on collector streets. For privatization projects, ROWs could include utilities in response to local codes.

**Figure 3-9: Typical Neighborhood Entry Sign**  
(Actual design is location specific)



**Figure 3-10: Typical Mailbox Cluster**  
(Actual design is location specific)



### 3-7.3.3 The Arterial Street

Arterial streets carry traffic from collector streets and provide access to other areas of the installation. Housing units should not be accessible from an arterial street.

- Arterial streets should not pass through FH areas. If this is an existing condition, analyze options for redirecting traffic patterns and making the former arterial street a collector street.
- Where arterial streets are located adjacent to housing areas, provide visual buffers, such as swales, landforms, trees, berms, and/or other landscape forms, between the arterial streets and FH units.
- If an arterial street serves abutting homes, planners should take steps to rework the street system in order to reduce traffic volumes on the street.
- On arterial streets, provide pedestrian-activated traffic lights at crosswalks leading to and from housing areas. Consider street level marker lights or other options.
- Use entry landscape architecture and landscaping features to identify neighborhood entry points. Allow for appropriate setbacks at street intersections to provide clear views of vehicular and pedestrian traffic at all corners.
- ROWs include the street pavement, plus a planting strip on either side of the street to accommodate street signage, sidewalks, bus stops and landscaping. The strip width should be a minimum of 15 feet on arterial streets. For privatization projects, ROWs could include utilities in response to local codes.

Traffic counts are not given in Table 3-4. This is due to the fact that traffic volumes vary widely from installation to installation; so a collector at one installation may constitute a major street at another installation. Rather, a street's designation is based on the function it serves. The Installation Civil Engineer can provide traffic counts for the installation. Table 3-5 shows the widths for collector and local streets.

**Table 3-5: Street Widths  
(in feet from backs of opposite curbs)**

Type of Street	No Parking	Parking on One Side	Parking on Both Sides
<b>Collector Streets</b>	24	*30	*36
<b>Local Streets</b>	24	26	32

\* Note that it is an undesirable situation to have housing units facing (front entry and driveway) a collector street and should be avoided in new and improvement projects. Installation's emergency management vehicle dimensions (widths and turning radii) may justify and/or require variances to these street width standards to accommodate specific unique equipment requirements.

### 3-7.4 Street System Guidelines

Let the street system follow the natural topography of the site to the maximum extent practical. Align the streets vertically and horizontally to minimize grading. Design gradients at intersections to be as flat as possible to improve sight lines and safety.

If properly designed, the street system will support the FH neighborhood and will not impose itself upon the neighborhood. Older FH neighborhoods may require some modifications. Following are key points for planning traffic patterns in FH areas:

- Use shorter street segments rather than long, straight streets in housing clusters.
- The cul-de-sac configuration is one form for a local street. It restricts traffic volumes to local traffic. In addition, because it is a short street, traffic doesn't build up speed as it would on a long, straight street.
- Design the cul-de-sac length not to exceed 750 feet. This length is measured from the center of the turnaround to the centerline of the intersecting street. Verify the cul-de-sac length restriction with the installation fire department.
- Another option is the *looped street*, as illustrated in Figure 3-11. A looped street should not be circuitous. By looping back to the street it began on, it also effectively discourages all but local traffic.
- A combination of loops and cul-de-sacs within the neighborhood is sometimes desirable. See Figure 3-12.
- A repetitive street grid pattern, with all 90-degree turns, needs reference points for defining housing clusters and neighborhood edges. See Figure 3-13. Differentiation between local, collector and arterial streets must be clear, or the sense of neighborhood is degraded. A modified grid provides reference points and breaks up the neighborhood, thus enhancing the character of the entire housing area. See Figure 3-14.
- Use a combination of loops and cul-de-sacs off of collector streets to service residential unit clusters and to strengthen neighborhood clusters.
- Make street modifications with the "big picture" in mind. Evaluate the impact of closing or eliminating streets on overall installation circulation patterns as well. For example, although it is highly desirable to remove arterial streets from housing areas, it may not be practical, depending on the location of the street and the costs associated with reconfiguring it. This should be analyzed in the HCP.

- Employ speed reduction methods, such as lowering the speed limit or adding traffic lights, on streets that must be left open or accessible to non-housing area traffic.
- Provide vehicular circulation patterns that acknowledge pedestrian circulation.
- Provide for a separate and distinct pedestrian circulation system that emphasizes safety. Also, make sure the pedestrian system conforms to currently accepted accessibility requirements (curb cuts, ramps, slip resistant surfaces, etc.) Ensure all elements of the walkway system conform to the ADAAG or UFAS, whichever is stricter.
- Provide 5 feet (minimum) wide walks that connect residential unit clusters and recreation areas. Evaluate the need for providing walkways on both sides of the street.
- Provide demarcation for crosswalks either through conventional striping or a change in materials at collector and arterial streets. Locate crosswalks at intersections to the maximum extent possible. Also see Paragraph 4-6.4, Walkways.
- If community support projects, such as a neighborhood community center, are planned, consider locations at the end of collector streets or centrally locate to provide a neighborhood focus and point of reference, for a stronger connection to the community. See Figure 3-15.

Figure 3-11: Looped Street



Figure 3-12: Combination of Loop and Cul-de-sac



Figure 3-13: Grid Layout



Figure 3-14: Modified Grid

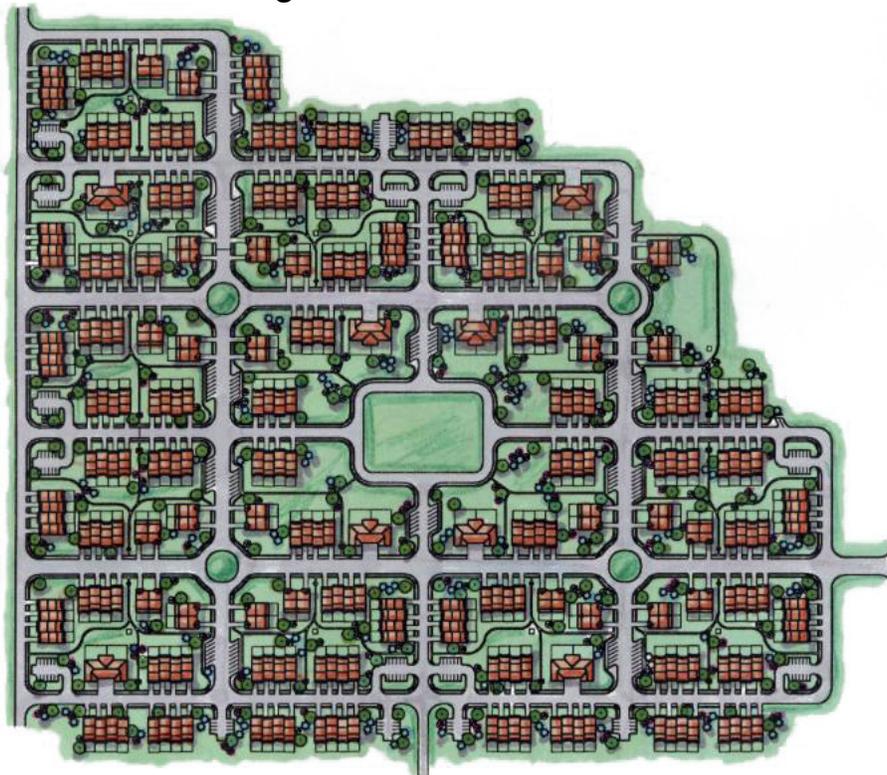


Figure 3-15: Neighborhood Central Focus

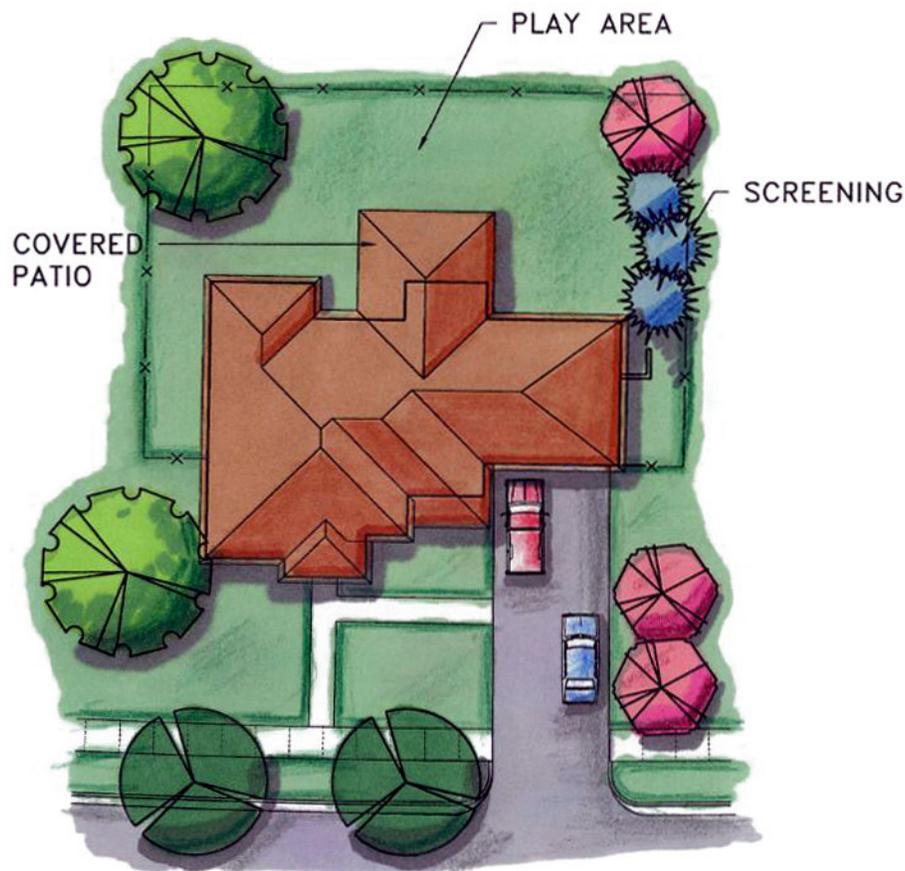


### 3-8 RECREATIONAL FACILITIES

Just as the housing area and street system should be composed of planning units, it is also important that recreational opportunities be developed in a series of related units (Figures 3-16, 3-17, 3-18 and 3-19, Public and Private Outdoor Spaces), as follows:

- **Recreational Unit 1:** For each family dwelling, provide an adjoining private or semi-private outdoor space (patio or similar space). This space should be partially or completely surrounded by a privacy screen.

**Figure 3-16: Recreational Unit 1 – Private Outdoor Space**



- **Recreational Unit 2:** For each cluster, provide common open space, picnic tables, benches, children’s play equipment and litter receptacles for common use.

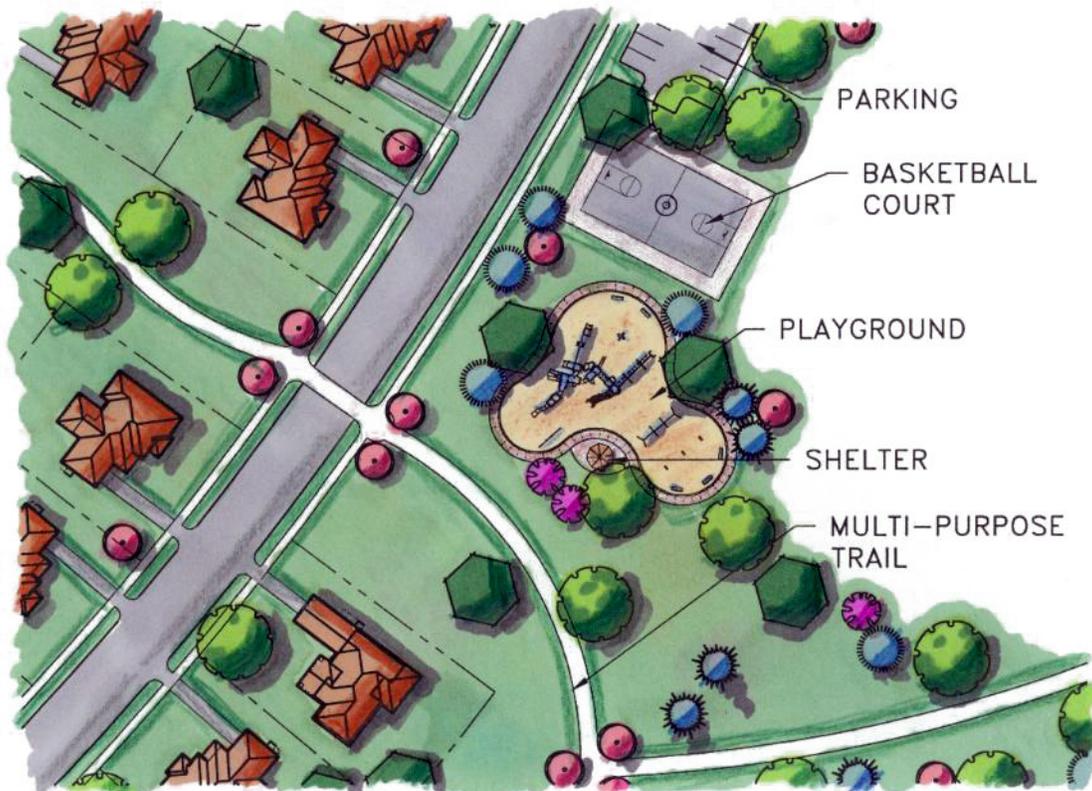
**Figure 3-17: Recreational Unit 2 – Cluster Facilities**



- **Recreational Unit 3:** For each neighborhood, provide playgrounds, common open space, sitting areas, pavilions, walkways, bikeways, jogging trails, landscaped areas with trees and other recreational activities for common use by the residents of several clusters of units. A large open space that is centrally located can create lasting value for the neighborhood.

When possible, surround area with public streets so that the space belongs to the whole community rather than a few residents. See Figure 3-20.

**Figure 3-18: Recreational Unit 3 – Neighborhood Facilities**

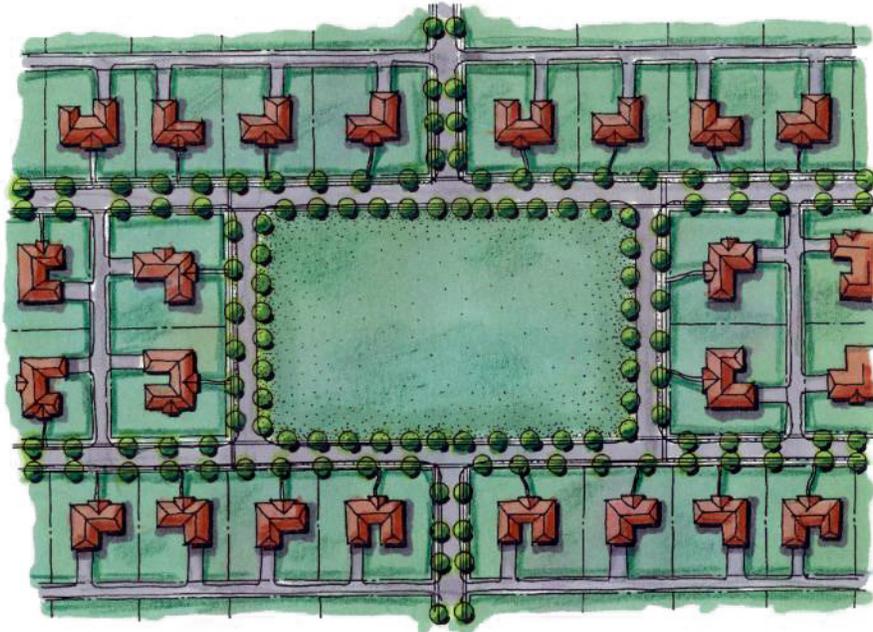


- **Recreational Unit 4:** For each housing area as a whole, provide good access to specialized recreation facilities (funded by AF Services), including large playfields for baseball and football, tennis courts, rooms for clubs and other activities, bikeways, jogging and walking trails, informal landscape areas and other recreational opportunities found in similar local communities. Biking and walking trails should link individual neighborhoods and provide easy access to major play areas, schools and work locations. These facilities reinforce the residents' sense of identification with the housing area and installation as a whole.

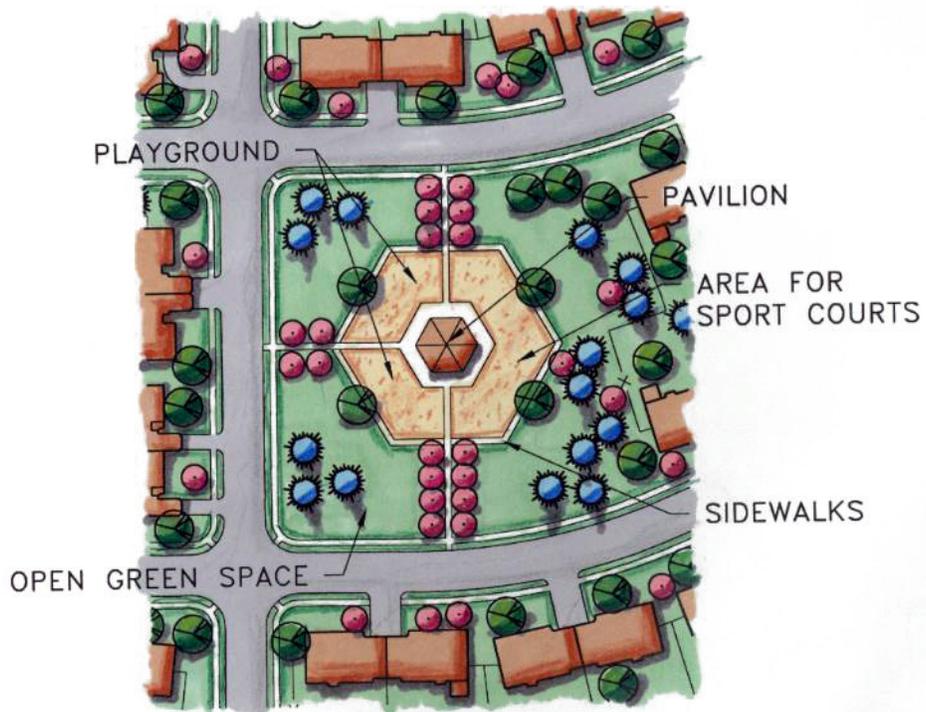
**Figure 3-19: Recreational Unit 4 – Access to Entire Housing Area Facilities**



Figure 3-20: Community Open Space



Undeveloped Open Space



Developed Open Space

Recreational facilities shall be defined and costed during the HCP development process and shall be designed and constructed in accordance with DOD standards. All playgrounds are required to meet Consumer Product Safety Commission (CPSC) and American Society for Testing and Materials (ASTM) guidelines and be approved by the International Playground Equipment Manufacturer's Association. Playground equipment purchases should include installation and warranty coverage, and when appropriate, a maintenance contract. Playgrounds and equipment are required to be approved by a playground inspector certified by the National Playground Safety Institute and inspected at least annually.

### **3-8.1 Age Groups**

Recreational facilities shall be provided for three age groups:

- Tot Lots: Ages 2 through 5 years
- Play Lots: Ages 6 through 8 years
- Playfields: Ages 9 through 16 years

### **3-8.2 Accessibility**

Design outdoor play areas such as Tot Lots, Play Lots and Picnic Areas convenient to the sidewalk system, convenient to each other and to residential units. Afternoon shade, either by structures or landscaping, should be provided at each location. Recreational facilities shall be located so that every residential unit has access to a nearby play lot without having to cross a collector street. At a minimum, provide 5 feet wide accessible routes with ADAAG (or UFAS, whichever is more stringent) approved solid surface material, ramps and transfer points at outdoor play areas. Locate accessible outdoor play areas, so that they may be approached, entered and used by children with varied physical abilities. Activities such as swinging, sliding and climbing should be available to all. Outdoor play areas should be designed to stimulate the development of all users, to encourage all children to become a part of the play activity.

### **3-8.3 Recreational Facilities Per Number of Units**

- Tot Lots: One Tot Lot per 50 units or less
- Play Lots: One Play Lot per 100 units or less
- Play Fields: One Acre per 100 units is desirable
- Picnic Areas: One picnic area per 50 units
- Tennis: One full court per 150 units
- Basketball: One full court per 100 units or less, add one-half court for each additional 50 units
- Jogging Course connected to installation wide system: One per project

(Note: Adjust ratios for "younger" or "older" families.)

### 3-8.4 Tot Lots

Design tot lots to accommodate 8 or more children and provide a variety of play activities, including:

- One multi-activity with a minimum of two platforms (maximum height of 48 inches, one wheel chair accessible)
- One four-unit kindergarten swing set, 8 feet high. Two “baby swing” seats and two belt swing seats.
- One spring mounted plastic rider. Do not use a coil spring.
- Benches on a paved base, sloped to drain

### 3-8.5 Play Lots

Separate play lots from tot lots. Design play lots to accommodate up to 16 children and to provide a variety of play activities, including:

- One multi-activity climber with a minimum of three platforms (maximum height of 60 inches, one covered and one wheel chair accessible)
- One four-unit swing set, 8 feet high, with belt swing seats
- Benches on a paved base, sloped to drain

### 3-8.6 Concrete Play Area:

An area separate from the walkway system, stamped for hopscotch and accents (i.e., imprints of animal paws, etc.)

### 3-8.7 Safety Standards

#### 3-8.7.1 Equipment

Tot Lot and Play Lot equipment shall be factory finished institutional quality, in compliance with the ASTM F 1487-01e1, *Standard Consumer Safety Performance Specification for Playground Equipment for Public Use* and United States Consumer Products Safety Commission. Use acrylic or metal construction equipment, powder coated or vinyl/PVC coated galvanized steel and high-density polypropylene non-wood components. Wood structures are prohibited.

### 3-8.7.2 Use and No-Encroachment Zones

Equipment shall be sited in accordance with ASTM F 1487-93.

A use zone is a clear, unobstructed area under and around play equipment where a child would be expected to land when jumping or falling from a piece of play equipment. Requirements for use zones vary for the age group and for different pieces of equipment. All use zones for play equipment shall be shown on the site plan to ensure there is no conflict between play activities on the ground and swinging or jumping from the equipment.

The no-encroachment zone is an additional area beyond the use zone where children using the equipment can be expected to move about and should have no encroaching obstacles. This area will vary according to the types of adjacent equipment and their orientation to one another. However, a 72 inch minimum no-encroachment zone shall be provided at the active end of each piece of equipment.

Tot Lot and Play Lot surfaces shall be bordered with permanent curbs or retaining structures in accordance with CPSC.

### 3-8.7.3 Surfacing Materials

A playground safety surface, in accordance with *ASTM F 355, Shock-Absorbing Properties of Playing Surface Systems and Materials* and *ASTM F 1292, Impact Attenuation of Surface Systems Under and Around Playground Equipment*, shall be provided throughout all use zones and under all play equipment.

For additional information refer to references listed in the appendices.

## 3-9 NEIGHBORHOOD LANDSCAPE DESIGN

Landscape design helps soften the hard edges of structures in the neighborhood and enhances the visual environment. It is DoD policy to utilize environmentally compatible and economically efficient landscaping practices that conserve water and prevent pollution. This includes the use of native plant species that fit naturally into the environment, linking the neighborhood environment to its structures and that can minimize site maintenance demands. Native landscapes soften the hard edges of our neighborhoods, provide shading to built structures and provide transitions to the built-environment's native setting. Consult the installation's Base General Plan, the *USAF Landscape Design Guide* and *Executive Memorandum, dated 26 April 94, Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds*, for guidance.

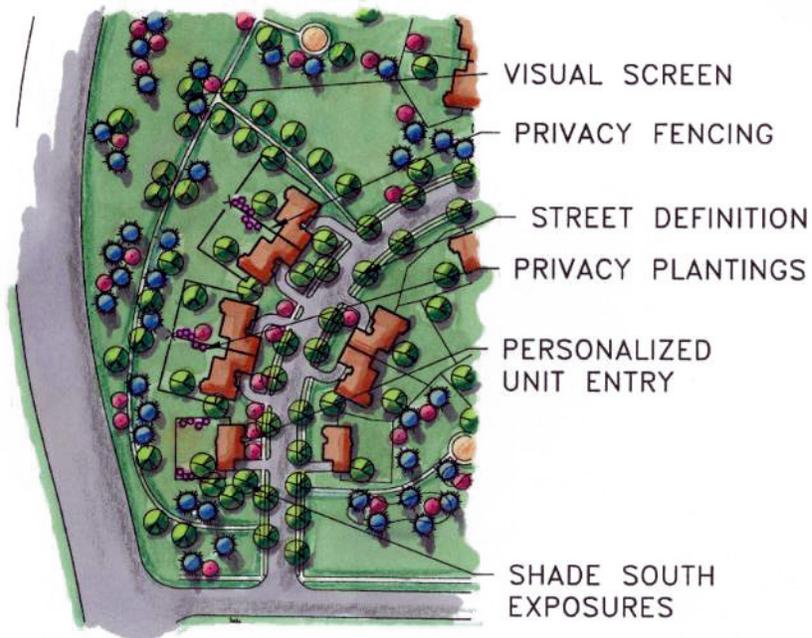
Include both evergreen and deciduous plants of differing heights, shapes, colors and textures in the design. Tree planting alone can provide a major improvement in the housing environment. It is also very important to remember that the choice of landscaping materials should consider local conditions and minimize maintenance requirements.

- Attractively landscape the entrances of neighborhoods, since they provide a first impression of the area beyond. Strive for a unified appearance and balance between hard (street furniture, walls, fences, etc.) and soft (plantings, berms, etc.) items.
- Landscape neighborhood edges more heavily to separate neighborhoods from major streets or other installation activities outside the housing area. This landscaping can take the form of large shrubs, wooded areas, fences or walls, berms, or a combination of these methods.
- Landscape to emphasize and to reinforce sub-neighborhoods within the community. Landscaping can separate neighborhoods and clusters from one another, thus helping to break up monotonous housing into smaller identifiable units.
- Cul-de-sac islands provide opportunities for additional low maintenance landscaping. An earth berm and trees in a cul-de-sac can create an attractive area, provide screening and soften the hard edges of the built environment's edges.
- Provide privacy screening in the form of shrubs, berms, or fences to separate private outdoor spaces from public use areas. Privacy screening can increase the effective size of the residential unit by providing more useable outdoor space. Screen private outdoor spaces from public streets and hide clutter such as toys, grills, lawn chairs, etc. from public view. See Figures 3-21 and 3-22.

**Figure 3-21: Lack of Privacy Screening**

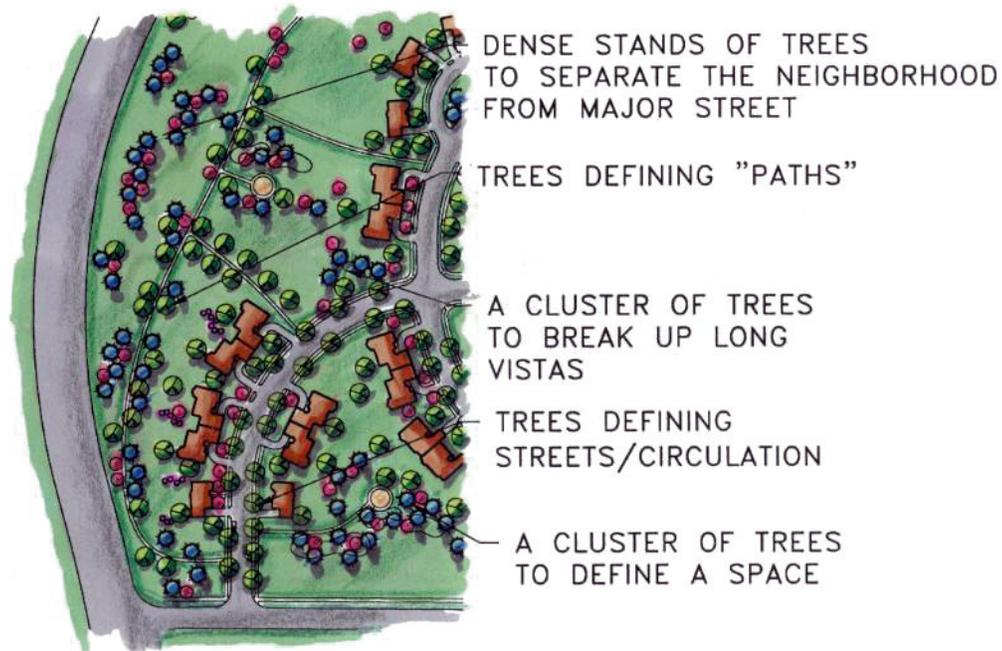


**Figure 3-22: Added Privacy and Separation**



- Plant various types of trees to emphasize the individual character of each space. See Figure 3-23, Different Functions of Trees within the Landscape. Consider the following use of plant material:
  - Plant trees to define streets and paths. This will reduce glare and soften the man-made environment. Flowering trees add color and interest to the neighborhood.
  - Plant trees to provide afternoon shade and to reduce heating/cooling usage and costs of the home.
  - Use dense stands of trees to separate housing from an arterial street or nonresidential area. Plant a cluster of trees to break up long, barren vistas, or long, repetitious building facades.
  - Provide foundation planting around the base of residential units. Foundation plantings visually tie the house to the ground. Arrange foundation plantings in masses to be more effective.
  - Plant shrubs in beds separated from turf areas with steel edging, brick, stone or concrete mow strips or other acceptable products. Areas of the shrub bed can be personalized by residents incorporating seasonal color. When planting trees outside the planting beds, create a mulch area around the tree.

**Figure 3-23: Different Functions of Trees within the Landscape**



- Landscape parking lots to reduce the visual impact of parked cars while providing shade for the vehicles and also to visually separate parking areas from the dwelling units. Parking areas, if close to units, create a feeling of clutter and increase the sense of density.
- Landscape to define a visual edge to the neighborhood. This can be accomplished through the use of trees, shrubs, berms, or combinations of these treatments.
- Modify flat topography to the extent practical. Flat topography tends to emphasize negative visual elements of a housing area. Gentle berm grade changes at neighborhood entrances, around parking areas, or between clusters can help screen negative elements and further define neighborhoods.

### **3-9.1 Sustainable Planting and Site Design**

Xeriscape is an attractive, sustainable landscape design process that conserves water and is based on sound horticultural practices. The Xeriscape philosophy can be applied regardless of the region or climate. This philosophy challenges us to create landscapes that convey a sense of regional context in plant selection and placement and minimizes supplemental irrigation. It is creating and maintaining a resource-wise, low maintenance landscape in tune with the environment using the following seven basic principles:

- Plan the Xeriscape design integrating irrigation and maintenance.
- Evaluate and improve the soil using amendments.
- Limit turf grass areas that require high water and use more appropriate climate adapted grasses.
- Select plants adapted to your climate and soils and group them according to their water needs. Installations should list native and drought-tolerant adapted plant material on their plant lists.
- Avoid use of silver maple or other fast growing trees such as rubber tree, banyan, etc. with fast spreading roots.
- Water efficiently using irrigation methods that will water plants in each area most effectively. Water deeply and infrequently.
- Use mulches to reduce evaporation, to protect against erosion, to buffer daily temperature and to discourage weeds.
- Develop a maintenance program that preserves the design and is efficient in its use of resources.

Sustainable planting design uses Xeriscape planting principles and incorporates the use of native and well-adapted plant material that reduces maintenance and irrigation requirements. Strategies to make a site sustainable include:

- Where possible work with the existing topography to limit cut and fill. Sites requiring excessive cut and fill and sites requiring extensive excavation in bedrock should be avoided.
- Consider local soil conditions in landscape design and use good erosion control practices.
- Urban heat islands are minimized by planting grass and trees and by using light colored material for sidewalks and streets.
- Reduce runoff by using pervious materials such as pavers on sand, plant material and turf areas. Detention ponds reduce storm water runoff; if possible, work with natural drainage systems.
- Provide shade for parking and for housing units on the south and west sides. Deciduous trees will provide summer shade but will not block winter sun.
- Reduce water usage by implementing Xeriscape principles such as grouping plants with similar water requirements, mulching planting beds and individual tree wells, and using native plants or plants adaptable to the local soil and climatic conditions and water availability.
- Where possible, maximize positive effects of solar orientation and wind patterns.
- Where possible, preserve natural site features, existing native trees, shrubs and groundcover and areas of open space.
- Minimize large lawn areas by incorporating native grass species or native groundcovers in the common areas.

The *USAF Landscape Design Guide* provides a comprehensive source of information on landscape design that conforms to Air Force goals.

### 3-10 SITE IRRIGATION

Irrigation is the supplemental application of water to support plant growth. The irrigation system is an essential part of landscape development. The conservation and restricted use of irrigation water is an important factor in sustainable design. Limited water and energy resources require wise system planning and places greater importance on the need for irrigation efficiency. Irrigation systems must consider the characteristics of the soil, climate, topography, and the quantity, quality and availability of water as well as the specific plant material requirements. Landscapes are managed for water efficiency and conservation by applying and using water carefully by following some basic guidelines.

Provide a complete, permanent automatic irrigation system with manual override and controllers covering all common areas and slopes if this is normal practice in the region. Lawns shall be watered with low precipitation rate pop-up heads. All other areas shall be watered by automatic controlled drip irrigation and/or pop-up heads. Design the sprinkler head layout to provide complete coverage. Use sprinkler heads with a small spray radius, as necessary, to avoid watering structures and pavement.

To reduce irrigation requirements in arid and semi-arid climates, Xeriscape principles should be used to the maximum extent practical. Consider implementing Xeriscape water saving practices at all installations for sustainability. Reclaimed-water or captured-rainwater systems should be used in lieu of potable water. If potable water is used, provide anti-siphon/backflow prevention devices. Gray-water systems should only be used for sub-surface irrigation in common areas.

- Do not rely on automatic timers. Set them seasonally and adjust to weather conditions. Sensors for rain, moisture and freezing temperatures incorporated into the system will prevent the system from working during periods of rain, adequate moisture, or freezing temperatures. This will prevent damage to the system and will reduce unnecessary water usage.
- Know when to water by observing plants for signs of water stress and by observing the soil.
- Water plants when needed. Watering needs vary with the season, exposure, microclimate, plant types and soil condition.
- Observe different microclimates, soils and plants. Southern and western exposures need more water than eastern exposures. Northern exposures usually require the least water. Sandy soil requires more water than clay. Also, young plants that have not been established require more frequent irrigation than more mature plants.
- Water should be directed to plant roots and be slow enough for penetration without runoff.

- Watering should moisten the entire root system. Most roots are established between 6 to 18 inches deep. The deeper or more extensive the root system, the longer plants can go without water.

There are many types of irrigation methods. You can water by hand, basin irrigation, automatic sprinkler system, drip irrigation or subsurface irrigation.

- Hand watering is a water saving method and usually is applied when needed. Various types of sprinkling heads can be attached to the hose or a soaker hose is available.
- Basin irrigation works well with tree planting. The tree is surrounded by a circular ridge of soil 4 to 6 inches high just beyond the plant's root ball. The basin is filled with water and percolates through the soil to the roots. This is a type of water harvesting.
- The automatic sprinkler system is fully automated with a timer to adjust watering times. It must be designed to be a water-efficient system using rotary heads for the lawn and spray heads for the shrub and groundcover area. The heads should be pressure compensating to aid in minimizing water waste. Turf areas should be irrigated separately from other plantings. Landscape plantings should also be grouped according to similar water needs.
- Drip irrigation is the frequent, slow, application of water to the specific root zone of the plant. It uses low-volume emitters, micro-bubblers, micro-sprays or flexible plastic tubes. The savings in water consumption over spray systems can be 50%. Some of the disadvantages include becoming entangled with roots, plugged lines, visually not attractive and subject to damage.
- Subsurface irrigation is similar to drip irrigation, but is installed 4 to 6 inches underground. Some of the disadvantages include the inability to readily identify problems and the difficulty in making modifications as the landscape changes.

There are many ways to irrigate. Choose the method that fits your community's individual needs as well as regional practices.

## CHAPTER 4 UNIT DESIGN CRITERIA

All houses shall include all authorized functional interior spaces and meet no less than the functional minimum size standard.

### 4-1 PURPOSE

The requirements and guidance stated in this Guide apply to all Air Force FH projects in the United States, its territories and possessions, and in foreign countries. This includes all projects for the acquisition of new housing; for the improvement of existing housing; and for the site development or site improvement of FH areas, including utility services and distribution systems, in any of the Air Force FH programs listed below:

- New Construction
- Build-Lease (CONUS)
- Build-Lease (overseas)
- Host Nation Funded Construction
- Rental-Guarantee
- Land Out-Lease
- Post-Acquisition Improvement
- Maintenance and Repair
- Privatization

### 4-2 FUNCTIONALITY

When determining the acceptability of a design, consider factors such as:

- The effective and appropriate use of the site
- The compatibility with local conditions, requirements, and customs
- The aesthetic and functional characteristics of the design
- The responsiveness to the needs of the users
- Cost effectiveness

These standards describe the characteristics of a project that will provide long-term functionality, maximum utility, durability, economy of maintenance, and a safe, healthy environment. The following guidelines are intended to provide housing professionals the maximum flexibility in the design and selection of materials or methods of construction. This guide defines the minimum requirements of the standard. In some cases, it may be desirable to exceed the minimum, particularly for such amenities as usable space or the quality of equipment, materials, and finishes. Generally, exceeding minimum standards should be an objective as long as the end result is practical, cost-effective, and within the level of funding and scope authorized for the project. For Replacement/New construction projects, the total house size is programmed and funded based in the "Benchmark" size of the Replacement/New Construction range and should be designed to meet those standards. Construction proposals above or below the "Benchmark" may be evaluated within the construction size range of the size standards, see Table 4-1. Proposals may be accepted within this range as long as they provide the full scope (programmed number of units and bedroom mix) and within programmed amount for the project. The ultimate success of the design solution for any project will depend on the degree of architectural and engineering judgment used in the application of these standards.

### **4-3 POLICIES AND STANDARDS**

#### **4-3.1 Size Standards and Implementation Policy**

All installations (CONUS, OCONUS, and overseas (foreign)) must plan, program, design and budget replacement and new construction units to the programming "Replacement / New Construction Benchmark" (net and gross square footage) of the "Replacement/New Construction Range", see Table 4-1. All improvement projects must fall within the "Improvement Range" of the standards, see Table 4-1. Improvement projects developed through the HCP that are beyond the "Improvement Range" due to unique circumstances, but are the best cost solution and prudent, must be fully documented and justified.

##### **4-3.1.1 Improvement Policy**

The policy below shall be used to apply the new size standards when determining requirements to improve existing military family housing units. Improvements to adapt new size standards shall be done in conjunction with improvements required to correct housing component condition deficiencies. Units shall be replaced when the cost to improve a unit exceeds 70% of the cost to construct a unit equivalent in size to the programming "Replacement / New Construction Benchmark" unless the unit is historic.

###### **4-3.1.1.1 General Rules**

- Assess all units against the "Improvement Minimum" size of the family housing standards. If the unit does not meet the minimum acceptable size and/or does not meet the minimum functional area requirement, then functional deficiencies must be corrected through conversion of unit, reconfiguration of existing space or additions. See Table 4-1.

- Verify compliance with minimum functional requirements (relationship among spaces and minimal dimensions of each space) for all required spaces and sizes as outlined in this Air Force Family Housing Guide.
- Use professional judgment and balance value added versus cost.
- Conversions and changes in designations to other grade and bedroom types are permitted when the change in use provides the most economical solution to satisfy core requirements identified by the Housing Requirements and Market Analysis (HRMA).
- The following options shall be used to determine application of size standards when determining improvement requirements for existing military family housing units:

Option 1: Family housing unit meets minimum unit size and provides the minimum functional requirements: Conversions and additions will not be considered if the unit meets the minimum acceptable size standard of the improvement size range and has all the required functional spaces.

Option 2: Family housing unit meets minimum unit size but does not provide the minimum functional requirements. If overall Gross Square Feet (GSF) of the house meets the minimum acceptable size standard but it lacks a required functional space, analyze the following options to bring the house to functional adequacy within the limits of the "Improvement Range":

- Reconfigure to accommodate functional space within existing envelope of the house.
- Analyze requirements against existing assets by grade and bedroom, considering addition for functional requirement within grade or conversions to higher grade, lower grade, or two units into one.
- Implement most cost-effective option that satisfies functional space and base requirements.

Option 3: Family housing unit provides the minimum functional requirements but does not meet the minimum unit size. If unit meets functional requirements, but overall GSF of the house is less than the minimum acceptable size standard:

- Analyze addition for functional requirement within grade.
- Analyze requirements against existing assets by grade and bedroom, considering addition for functional requirement within grade or conversions to higher grade, lower grade, or two units into one.
- Implement most cost-effective option that satisfies functional space and base requirements.

Option 4: Family housing unit provides neither the minimum functional requirements nor the minimum unit size: Reference Options 2 and 3.

- When required, unit size increases are permitted through additions and conversions up to the programming “Improvement Maximums” of the “Improvement Range” as feasible.
- All additions and/or conversion must be carefully analyzed to maximize efficiency, functionality, and provide improved quality of life while applying value engineering and common sense approach to minimize cost. All improvements with additions and/or conversions must not exceed 70% of replacement cost on a per unit basis.

#### **4-3.1.1.2 Conversion Policy**

- Conversion is renovating units to a lesser number of bedrooms per unit.
- Analyze conversion alternatives in lieu of additions only when it is more cost effective to meet the requirement and when necessary to achieve rank segregation requirements at the installation. (Conversions for rank segregation shall be minimized as much as possible. Segregation shall be applied to the lowest possible level; segregate buildings and streets before segregating whole areas and neighborhoods.)
- Carefully select conversions that provide optimum functional layout and required functional spaces within the “Improvement Range” with minimal interior layout changes.
- Before reducing the inventory through conversion, consider the overall housing requirement (deficit/surplus) at the installation (overall and by grade and rank).
  - When a deficit exists and/or is created, the cost to replace the lost unit/units shall be included in the conversion cost analysis.
- Compare conversion/addition costs to assure the best value and most cost efficient solution for the program cost.

#### **4-3.1.1.3 Space Addition Policy**

- Do not add space solely to reach the “Improvement Maximums” (“Replacement/ New Construction Benchmark”) on Table 4-1.
  - When an addition is necessary in an existing house, the addition should be designed to meet all functional deficiencies but shall not exceed the “Improvement Target” on Table 4-1. Any improvement unit design that requires an addition beyond the “Improvement Target” must be fully justified in the HCP.

- When there are existing units that do not meet the minimum GSF but through efficient design meet all functional area requirements and total NSF minimums, these units shall be considered to meet AF standards and additions shall not be considered.
- Add only required functional spaces that are deficient and/or additional square footage as needed to provide a well-proportioned functional layout with the focus on livability and improved quality of life.
- All added spaces must be properly sized to meet the requirements of the intended function, must be in relative proportion to the rest of the unit, and compliment the scale and mass of the existing structure.
- Reconfigure existing spaces/walls, only when cost effective, to meet functional requirements and/or to enhance livability.
- Always balance quality impact/value added and cost when analyzing additions and existing wall/space reconfigurations.
- Consolidate additions and changes to existing spaces/walls for cost efficiency. Split additions only when it minimizes reconfiguration of existing interior layout and structure and/or is the most cost-effective approach to satisfying a deficiency in different functional areas (living versus bedroom) of the house.
- Coordinate all additions with site constraints to avoid unnecessary demolition of existing units.

#### **4-3.1.2 Replacement and New Construction Policy**

- Plan, program, design and budget replacement and new construction units to the programming “Replacement / New Construction Benchmark” of the “Replacement / New Construction Range”. Allow local markets to impact bid proposals. Proposals that fall within the “Replacement / New Construction Range” can be accepted. Refer to Table 4-1.
  - Replacement and new construction proposals up to the “Replacement / New Construction Maximums” may be accepted with prior AF/ILE approval as long as there is no increase in program cost or a reduction in program scope (number of units, bedroom mix and amenities).
  - Proposals can be accepted down to the “Replacement / New Construction Minimums” of the “Replacement / New Construction Range” when necessary to meet project scope and program cost.
- Only provide required functional spaces within the allowable square footage.

- Provide good functional layout with well-proportioned spaces.
- Do not provide basements unless required to satisfy unique site or climatic conditions.
- Do not provide attic storage space as a means of meeting interior storage functional area requirement indicated in Tables 4-6 through 4-14 unless approved by AF/ILE due to special circumstances. In no case, shall the attic space be finished.

#### **4-3.1.3 Allowances Over “Replacement / New Construction Benchmark” For Special Conditions**

- Handicap Accessibility: Up to 5% allowance, over the “Replacement / New Construction Benchmark,” but within the “Replacement / New Construction Maximum” is permitted to accommodate accessibility requirements when providing adaptable designs to meet ADA requirements or UFAS, whichever is more stringent. This allowance should be used only to satisfy the additional clearance requirements in select spaces and not as a means to provide unnecessary added space.
- Arctic Entries/Recreation Rooms: Up to 300 square feet allowance, over ““Replacement / New Construction Benchmark,” solely dedicated to additional functional spaces designated as Recreation Room and Arctic Entries in arctic regions if required.
- The Arctic Recreation Room can typically be accommodated in the basements (if proper egress exists). This additional functional space is only applicable for Eielson AFB, Elmendorf AFB, F.E. Warren AFB, Grand Forks AFB, Minot AFB, Malmstrom AFB, and Cavalier AFS. This additional allowance cannot be used to increase the area of any other functional space of the unit.
- 10% Differential for Position: Up to 10% differential allowance, over the ““Replacement / New Construction Benchmark,” but within the “Replacement / New Construction Maximum” for the Installation Commanding Officer, the Installation Senior NCO and Special Command Positions as designated by the Secretary of Defense.
- **In no case shall the size of the housing unit exceed the “Replacement / New Construction Maximum” size noted in Table 4-1.**

- Existing Attic and Basements:
  - Finished spaces in attics and basements must meet all life and safety codes and count towards the allowable Net Square Footage of the unit.
  - All finished spaces provided in an attic and/or basement must be to provide a required functional space.
  - Any existing finished space in attics and basements that does not meet life and safety codes and is not feasible to bring up to code must be returned to storage areas at time of renovation with appropriate finishes for such space.

#### 4-3.1.4 Garages

- A maximum of a two-car garage is authorized for all units. For attached units, the number of garages (one versus two) should be in direct relation to the type of construction and site constraints.
- Garages are not required for improvement when site constraints exist and when construction is cost prohibitive and/or results in loss of units.
- Size standards indicated in Paragraph 4-8.1 within this Guide will be followed.
- Analyze incorporating exterior storage (if required/feasible) integrated with garage structure.

#### 4-3.1.5 Waiver to Exceed the Programming “Replacement / New Construction Benchmark” and “Replacement / New Construction Maximum” Unit Sizes

- Waivers to exceed the programming “Replacement / New Construction Benchmark” and “Replacement / New Construction Maximums” for housing units shall only be considered when sizes can be obtained within the total original program scope and cost that includes total number of programmed units, same grade and bedroom mix and all project amenities.
  - Variances greater than the programming “Replacement / New Construction Benchmark” up to the construction “Replacement / New Construction Maximums” must be approved by AF/ILE.
  - Units shall not exceed the “Replacement / New Construction Maximum” size unless otherwise approved by SAF/IEI. Congressional notification is also required.

#### **4-3.2 Two-Bedroom Modified House Construction Policy**

- Program MILCON and privatization replacement and new construction projects beginning in FY06 and beyond using the two-bedroom modified standard. Existing two-bedroom units meeting size standards and minimum functional area requirements for two-bedroom as outlined in this guide are considered adequate housing assets and are not affected. When functional deficiencies exist in existing two-bedroom units, the deficiencies do not justify bringing these units up to the two-bedroom modified standard. Fix only the necessary deficiencies to satisfy the two-bedroom standard.
- The two-bedroom modified standard may be incorporated into projects programmed prior to FY06 only if it can be done within the programmed amount and without reducing the project scope (number of units).
- Incorporate into privatization projects that have not entered step II in the acquisition phase. All changes in scope must follow the policy guidance in Paragraph 2-9.3.

#### **4-3.3 Five-Bedroom House Construction Policy**

- The AF does not program five-bedroom units for new construction. Where a requirement for a five-bedroom house exists, the requirement should be evaluated as part of the HCP development. Where it is cost effective, conversion of existing units to satisfy a five-bedroom requirement may only be accomplished with surplus units and must not create or increase a deficit in another bedroom type.

#### **4-3.4 General Officer's Quarters**

- All aspects of General Officer's Quarters occupancy and upkeep are contained in the GOQ Resident's Handbook, latest edition. The handbook covers furnishings, home and grounds maintenance, minor alterations, and cost reporting and allowances for such expenses, and is a supplement to Air Force Instruction (AFI) 32-6003, General Officer Quarters.
- The standards and policies provided in this guide are applicable to all GOQ projects and supplement the Air Force GOQ Standards for Planning, Programming and Design. For specific GOQ standards and policies, refer to Air Force GOQ Standards for Programming, Design and Construction, latest edition.
- For finish materials, refer to Table 4-39: GOQ Authorized Allowable Finish Materials.

#### **4-3.5 Chief Master Sergeant (CMSgt) Prestige Family Housing Policy**

This policy provides authority, policy, and guidance for installation commanders to establish requirements, define local installation standards that fit within Air Force criteria, and develop a program to upgrade existing or create new Prestige Housing suitable for Air Force Chiefs.

These long-range design and construction standards are essential to the future development of quality Prestige Housing for all E-9s. Requirements should be developed through the Installation Housing Community Plan and executed with the MFH MILCON and Privatization investment program. There will be no change in assignment processes and no additional operating expenses should be incurred.

The following guidance provides the essential elements in determining Prestige Housing programming requirements:

- The intent of this policy is to designate all E-9 housing as Prestige Housing. Size standards should be in accordance with the SECAF and CSAF approved Military Family Housing Size Standards and implementation policy (see 4.3.1 and Table 4-1). For replacement/new construction, units designated for the Command Chiefs (ISNCO E9) on a military installation may be increased by an additional ten percent of the largest sized E-9 house at the installation, not to exceed the programming “Benchmark” size of Replacement/New construction (1940 NSF / 2410 GSF).
- The Housing Requirements and Market Analysis (HRMA) determines maximum on-base E-9 Prestige Housing requirements. Commanders must carefully review and validate those designated E-9 positions at each installation since they significantly influence Prestige Housing requirements.
- Prestige housing may be detached single-family or attached multi-family type housing, 3- or 4-bedroom/2 baths (powder room at first story if 2-story), with up to 2-car garages (determined by site conditions, cost constraints and local market trends). Size limits for combined outdoor living spaces (patios, decks and porches) shall not exceed the maximum of 250 SF and should be a minimum of 120 SF.
- Prestige housing, based on the installation commander’s approved key and essential (K&E) E-9 positions, shall be a designated 4-bedroom unit.
- Air conditioning for Prestige Housing is authorized when justified by climatic conditions in accordance with this guide and local market housing trends.
- Prestige Housing must meet all guidance and standards in this Guide.
- For finish materials, refer to Table 4-38: Authorized Allowable Finish Materials.

TABLE 4-1: MFH UNIT SIZE STANDARDS

Pay Grade	No. Bdrms.	Improvement Minimums		Replacement / New Construction Minimums		Replacement / New Construction Benchmark		Replacement / New Construction Maximums		Garages	
		NSF	GSF	NSF	GSF	NSF	GSF	NSF	GSF	Detached Units	Attached Units
JENL (E1-E3)	2	870	1,080	950	1,180	1,080	1,340	1,210	1,500	2 car	1-2 car
	2 Modified	980	1,220	1,070	1,330	1,180	1,480	1,300	1,630	2 car	1-2 car
	3	1,100	1,370	1,200	1,490	1,310	1,630	1,420	1,760	2 car	1-2 car
	4	1,230	1,530	1,350	1,670	1,570	1,950	1,790	2,220	2 car	1-2 car
	5	1,420	1,760	1,550	1,920	1,850	2,300	2,150	2,670	2 car	1-2 car
CGO (O1-O3)	2	870	1,080	950	1,180	1,200	1,490	1,440	1,790	2 car	1-2 car
	2 Modified	1,050	1,300	1,150	1,420	1,350	1,670	1,540	1,920	2 car	1-2 car
	3	1,230	1,530	1,350	1,670	1,500	1,860	1,650	2,050	2 car	1-2 car
	4	1,330	1,650	1,450	1,800	1,730	2,150	2,020	2,500	2 car	1-2 car
	5	1,420	1,760	1,550	1,920	2,020	2,510	2,490	3,090	2 car	1-2 car
FGO (O4-O5)	3	1,280	1,590	1,400	1,740	1,630	2,020	1,850	2,300	2 car	1-2 car
	4	1,420	1,760	1,550	1,920	1,860	2,310	2,180	2,700	2 car	1-2 car
ISNCO (E9)	4	1,490	1,850	1,620	2,010	1,940	2,410	2,180	2,700	2 car	1-2 car
SO (O6)	4	1,560	1,930	1,700	2,110	2,030	2,520	2,350	2,920	2 car	1-2 car
ICO SO (O6)	4	1,710	2,120	1,870	2,320	2,230	2,770	2,350	2,920	2 car	1-2 car
GO (O7+)	4	1,920	2,380	2,100	2,600	2,690	3,330	3,270	4,060	2 car	1-2 car
SCP GO (O7+)	4	2,110	2,620	2,310	2,860	2,960	3,660	3,270	4,060	2 car	1-2 car
<b>REPLACEMENT / NEW CONSTRUCTION RANGE</b>											
<b>IMPROVEMENT RANGE</b>											

**TABLE 4-1: MFH UNIT SIZE STANDARDS (continued)**

**GROSS FLOOR AREA:**

All interior spaces (finished and unfinished) including full height, 7'-0" and above ceiling height, attics and basements within the exterior faces of exterior walls and center line of party walls (in multiplex units) of housing units with the following areas of exclusion:

- Carports and Garages
- Exterior bulk storage (detached from the conditioned space of the house), up to the maximum allowance for exterior storage for the grade and bedroom type, See Tables 4-6 to 4-14 and Footnote \*5
- Exterior mechanical rooms (detached from the conditioned space of the house), sized only for mechanical equipment, See Tables 4-6 to 4-14 and Footnote \*7
- Trash enclosures
- Porches, open or closed, which are not heated or cooled and which retain the basic characteristics of a porch
- Terraces, patios, decks, balconies, and entrance stoops

**NET FLOOR AREA:**

The space within the interior faces of exterior walls and party walls of living units, with the following areas of exclusions:

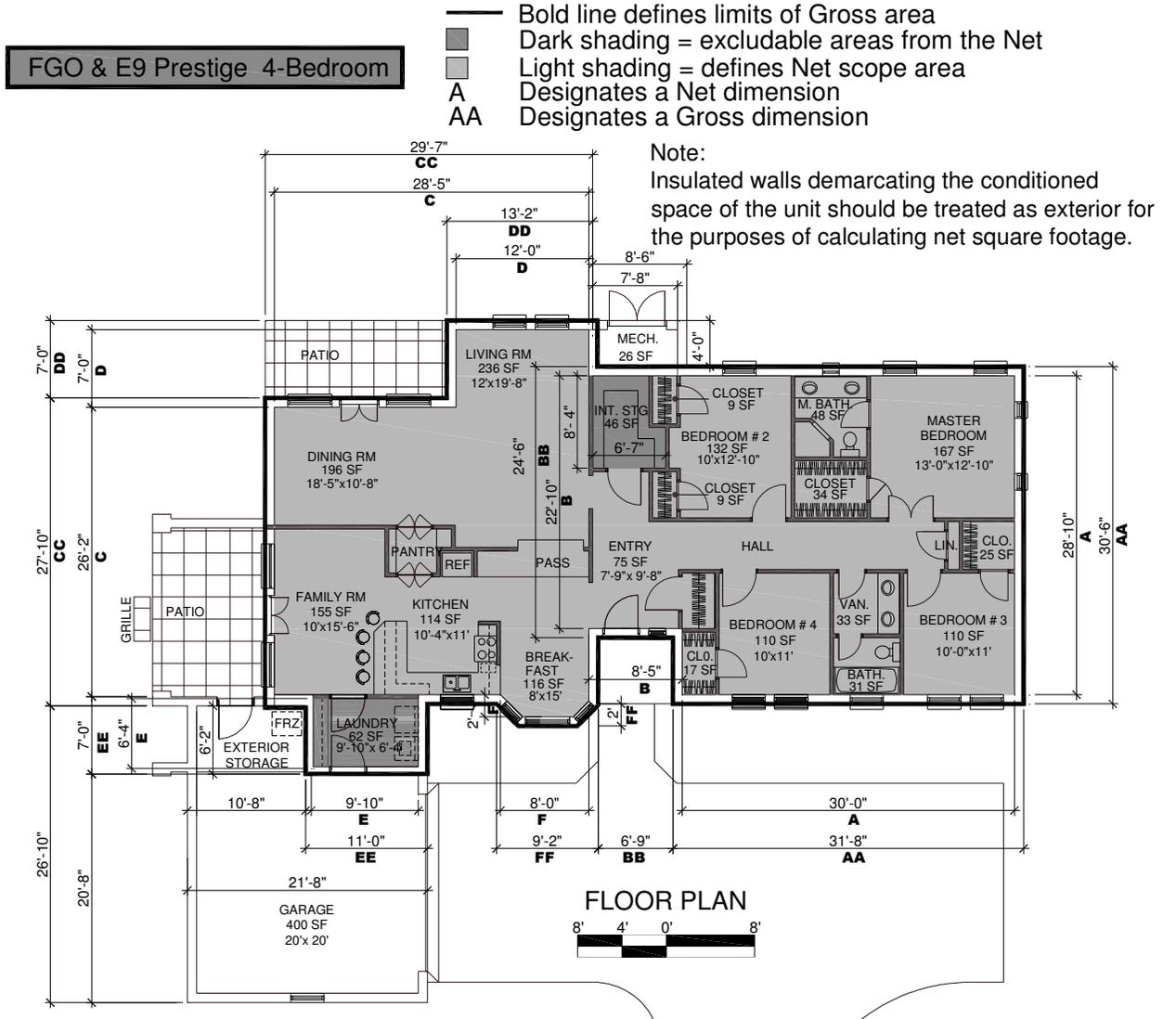
- Carports and Garages
- Exterior bulk storage up to the maximum allowance for exterior storage for the grade and bedroom type, See Tables 4-6 to 4-14 and Footnote \*5
- Interior bulk storage up to the maximum allowance for interior storage for grade and bedroom type, See Tables 4-6 to 4-14 and Footnote \*4
- Trash enclosures
- Porches open or enclosed, which are not heated or cooled and which retain the basic characteristics of a porch
- Terraces, patios, decks, balconies, and entrance stoops
- Utility Rooms/Laundry Rooms and/or washer and dryer space, if not located in separate utility or laundry room, up to the maximum allowance indicated in Tables 4-6 to 4-14
- Stairways on each floor and open space to below (including intermediate landings between floors)
- Stair landing at each floor level above the first floor (not to exceed 10 square feet per floor)
- Unfinished space under stairs
- Unfinished attic space
- Unfinished basement space
- Common stairways, halls, and entries in multi-family dwellings.
- Areas required solely for installed solar energy systems, including collection and storage equipment and mass walls as well as interior spaces required by and designed specifically for passive solar energy systems
- Increase required to meet accessibility standards (not to exceed 75 SF). Additional square footage over the allowance is countable against the net and gross.
- Mechanical rooms and chases
- Fireplaces where applicable

**Notes:**

1. Detached homes are authorized 2-car carports/garages; attached homes are authorized 1 or 2 car carports/garages. Number of carports/garages are based upon site and funding allowances for all unit types.
2. For Required Functional Areas, functional area allowances and more detailed exclusionary guidelines, refer to Paragraph 4-9.1, Tables 4-6 to 4-14, and accompanying footnotes.
3. Finished rooms with sloped ceilings must have a ceiling height of not less than 7'-0" for at least one-half of their square footage.
4. The portions of finished rooms with sloped ceilings, where portions of the ceiling height measure less than 5'-0" in height, shall not be countable against the net square footage.

**Figure 4-1: Net and Gross Area Calculations - Single Story**

(Mechanical Room and Exterior Storage excluded from Gross SF, see accompanying footnotes \*5 & \*7 to Functional Area Tables 4-6 through 4-14.)  
 Example of the Net and Gross area calculations for a single story "Benchmark" size standard for Field Grade Officer and E9 Prestige 4-Bedroom unit.  
 See Tables 4-6 through 4-14 for scope variations of functional areas by grade.



Total Gross		
AA	31'-8" x 30'-6"	= 966 SF
BB	6'-9" x 24'-6"	= 165 SF
CC	29'-7" x 27'-10"	= 823 SF
DD	13'-2" x 7'-0"	= 92 SF
EE	11'-0" x 7'-0"	= 77 SF
FF	9'-2" x 2'-0"	= 18 SF
(Less corners) 2'-0" x 2'-0" x 2 x 1/2 = - 4 SF		
<b>Total Gross</b>		<b>2,137 SF</b>
Garage	21'-8" x 20'-8"	= 448 SF
Ext. Stg	10'-8" x 6'-2"	= 66 SF
Mech. Rm.	8'-6" x 4'-0"	= 34 SF

"Benchmark" 2,310 SF

Total Net		
A	30'-0" x 28'-10"	= 865 SF
B	8'-5" x 22'-10"	= 192 SF
(Less Int. Stg.) 6'-7" x 8'-4" = - 46 SF		
C	28'-5" x 26'-2"	= 744 SF
D	12'-0" x 7'-0"	= 84 SF
E	9'-10" x 6'-4"	= 62 SF
(Less Laundry) 9'-10" x 6'-4" = - 62 SF		
F	8'-0" x 2'-0"	= 16 SF
(Less corners) 2'-0" x 2'-0" x 2 x 1/2 = - 4 SF		
<b>Total Net</b>		<b>1,851 SF</b>

"Benchmark" 1,860 SF

**Figure 4-2: Net and Gross Area Calculations - Two Story**

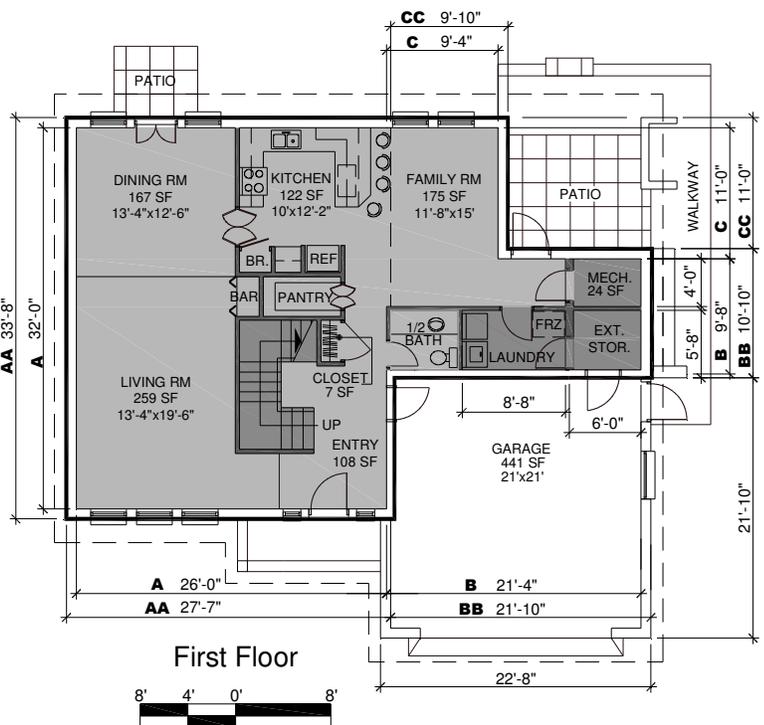
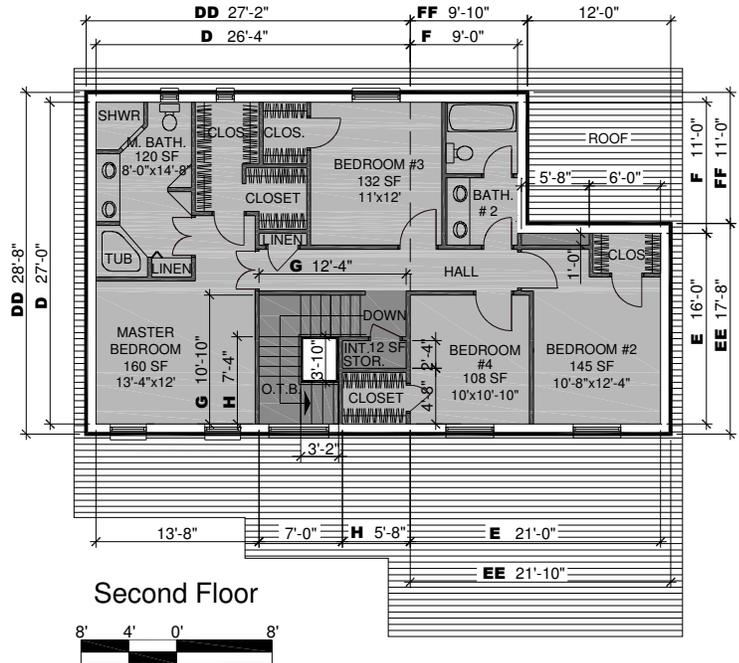
(Mechanical Room and Exterior Storage included in Gross SF, see accompanying footnotes \*5 & \*7 to Functional Area Tables 4-6 through 4-14.)  
 Example of the Net and Gross area calculations for a two story "Benchmark" size standard for SO (O6) 4-Bedroom Unit.  
 See Tables 4-6 through 4-14 for scope variations of functional areas by grade.

SO (O6)

<b>Total Gross</b>	
Second Floor	
DD	27'-2" x 28'-8" = 779 SF
(Less open to below)	3'-2" x 3'-10" = - 12 SF
EE	21'-10" x 17'-8" = 386 SF
FF	9'-10" x 11'-0" = 108 SF
<b>Subtotal Second Floor</b>	<b>1,261 SF</b>
First Floor	
AA	27'-2" x 33'-8" = 915 SF
BB	21'-10" x 10'-10" = 236 SF
CC	9'-10" x 11'-0" = 108 SF
<b>Subtotal First Floor</b>	<b>1,259 SF</b>
<b>Total Gross</b>	<b>2,520 SF</b>
"Benchmark" 2,520 SF	

<b>Total Net</b>	
Second Floor	
D	26'-4" x 27'-0" = 711 SF
E	21'-0" x 16'-0" = 336 SF
F	9'-0" x 11'-0" = 99 SF
(Less Open to Below and 10 SF Landing)	G-H
G	12'-4" x 10'-10" = -134 SF
H	5'-8" x 7'-4" = 42 SF
(Less Interior Storage)	5'-4" x 2'-4" = - 12 SF
(Less interior chase)	5'-8" x 1'-0" = - 6 SF
<b>Subtotal Second Floor</b>	<b>1,036 SF</b>
First Floor	
A	26'-0" x 32'-0" = 832 SF
(Less under stair run)	13'-4" x 4'-0" = - 53 SF
B	21'-4" x 9'-8" = 206 SF
(Less Laundry)	8'-8" x 5'-4" = - 46 SF
(Less Mech. Room)	6'-0" x 4'-0" = - 24 SF
(Less Ext. Storage)	6'-0" x 5'-8" = - 34 SF
C	9'-4" x 11'-0" = 103 SF
<b>Subtotal First Floor</b>	<b>984 SF</b>
<b>Total Net</b>	<b>2,020 SF</b>
"Benchmark" 2,030 SF	

— Bold line defines limits of Gross area  
 ■ Dark shading = excludable areas from the Net  
 ■ Light shading = defines Net scope area  
 A Designates a Net dimension  
 AA Designates a Gross dimension



#### 4-4 DESIGN STANDARDS

The guidelines in the following sections define the minimum level of housing quality acceptable to the Air Force. This guidance is intended to assist housing project managers and design professionals with developing “whole house” improvement, new, replacement and privatized projects:

- For new Family Housing constructed with appropriated funds, the design requirements represent what is expected in acceptable housing. Designs shall comply with the standards of this Guide and should reflect nearby neighborhoods that exemplify local quality of life expectations.
- The intent of Build-Lease (10 U.S.C. 2835, also known as Section 801), Rental-Guarantee (10 U.S.C. 2836, also known as Section 802), and Land Out-Lease Housing (10 U.S.C. 2667) programs is to provide housing without applying traditional MILCON. Consequently, those programs rely primarily on local codes and functionality standards to establish the quality of the housing. Build-Lease and Rental-Guarantee projects use a Statement of Work developed by the DoD for all military branches. Some of the requirements in this Guide are not specifically included in the DoD Statement of Work because proposals are expected to offer housing designs that are marketable in the private sector. However, while the Air Force guidelines in this document are not contractual requirements, they should be used as a basis to determine the acceptability of proposed designs within the maximum net floor areas authorized.
- Table 4-1 presents the programmed net floor area by number of bedrooms for each pay grade. Figures 4-1 and 4-2 provide sample calculations for determining the net floor area. The AF net and gross area calculations follow industry standards as established in *American National Standard for Single-Family Residential Buildings, Square Footage – Method for Calculating: ANSI Z765*.
- Public Law 102-522, *Fire Administration Authorization Act of 1992*, requires that leased housing comply with the fire protection criteria specified in Paragraph 4-18.1, Smoke Detector and Carbon Monoxide Alarms, and Paragraph 4-18.2, Sprinkler Protection.
- In the revitalization of existing units, regardless of the funding method used, the project constraints may make full compliance with all of the requirements of these design criteria impractical, particularly regarding minimum sizes, areas, and dimensions. In some cases, sound professional judgment may indicate that a minor deviation is acceptable and preferable to a solution in which the additional benefits derived from full compliance would not justify the additional work and extra cost required to achieve such compliance. These adjustments should become part of the HCP concept development.
- In general, the guidelines in this document establish a baseline level of quality for the entire Air Force, regardless of the housing type, project size, or funds involved.

- Modular homes must meet Air Force standards of construction, material, and space and be constructed on permanent foundations. When contractors submit modular home proposals meeting Air Force standards, the Air Force will review these proposals competitively along with other options.
- It is not the intent of this guide to discourage new or non-traditional design and construction standards and techniques. In the interest of achieving high quality residential environments with maximum cost efficiency, the Air Force is open to new and innovative design and construction standards and techniques to achieve this end. Therefore, modular, pre-manufactured, or composite systems construction is encouraged if they can address and meet the intent of the guidelines in this document.

#### **4-4.1 The Air Force “Standard House”**

Air Force housing costs and designs are based on a “Standard House” concept consisting of the characteristics indicated in this section. The AF Standard House is intended to be a quality focused, functionally well designed, energy efficient home. The AF Standard House includes all the following features and is the basis for the project budget and scope for all MFH projects.

Exteriors of the AF “Standard House” have the following features:

- Slab on grade frame construction with vinyl or metal siding and limited stucco/brick architectural accents.
- 25 - 30 year asphalt shingle roofs with typically 3- or 4- in 12 roof pitches.
- Energy efficient vinyl clad windows and insulated energy efficient exterior doors.

Interiors of the AF “Standard House” have the following features:

- Kitchens contain plastic laminate countertops and cabinets in accordance with (IAW) Paragraph 4-9.6.8.
- Bathrooms contain cabinets and plastic laminate or formed cultured marble vanity tops IAW Paragraph 4-9.6.12.
- Ceiling heights of the AF Standard House are typically 8 feet. Ceiling heights of 9 feet are acceptable if cost allows.
- Hollow core interior doors.
- Wall finishes are typically paint, with tile around the bathtub (if not fiberglass tub surround).
- Floor finishes are typically carpet with ceramic tile and vinyl in appropriate rooms IAW Paragraph 4-14.1.

The lot design of the AF “Standard House” has concrete patios and walkways and either concrete or asphalt driveways. Landscaping consists of sod in the yards and foundation plantings.

Mechanical (HVAC) systems in the AF “Standard House” will contain a single zone for non-GOQ single story houses and two zones for all GOQ’s and all two-story houses.

Electrical systems in the AF “Standard House” are IAW the design criteria in Paragraph 4-15.1.

The standard for AF housing allows the construction of single family units, attached multiplex units (2-6 attached units), and, if space is limited, a maximum of 8 attached units as defined by rank and number of bedrooms in Table 3-3: Unit Configuration Criteria on page 67.

The AF programs, budgets, and designs new construction and replacement housing to the “Replacement/New Construction Benchmark”, indicated on Table 4-1. During the execution phase (i.e., construction) units are acceptable at any size within the “Replacement/New Construction Minimums” and the “Replacement/New Construction Maximums” listed in Table 4-1 with the following qualifications:

- Project scope is defined by number of units programmed and all required unit amenities including neighborhood infrastructure and community as programmed
- All amenities must be included as programmed.
- The unit size may be under the “Benchmark” but not below the minimum.
- The unit size may be over the “Benchmark” only if within the scope and programmed amount. (Requires prior AF/ILE approval.)

#### **4-4.2 Guidelines for Special Construction Justification**

Upgrades to the standard house and/or upgrades to materials shall be justified based on climate, specific soils conditions, force protection, and/or historic requirements as coordinated with the SHPO.

Architectural compatibility is not sufficient justification for special construction. Architectural compatibility can be achieved with the standard house through good design.

Justification must be validated during the HCP charrette:

- The installation must bring proper justification for special construction or conditions to the HCP design charrette that were not identified during the previous site visit.
- The HCP contractor will verify justification information.
- The MAJCOM and Air Staff will validate the need for special construction or conditions at the charrette.
- If the special construction is validated, the HCP contractor will adjust those costs in the HCP.

## **4-5 CODES AND STANDARDS**

While all installations must comply with this guide, it is recognized that zoning regulations, building codes, and practices in overseas (foreign) locations are different in many cases than those encountered in CONUS installations. Zoning regulations, local building codes, and practices in overseas (foreign) locations should be incorporated except where doing so will adversely affect life safety, fire protection, or accessibility issues. MAJCOMs with overseas (foreign) installations are responsible for approving any deviations concerning codes and standards from this guide for overseas (foreign) installations.

To ensure Family Housing maintains parity with the local community, Installations must adopt all applicable local building codes. When Air Force neighborhoods are located outside the jurisdiction of a local code, Installations must adopt all applicable model codes (IBC, IRC, NFPA 5000, etc.) that are accepted within the geographic area of the project. In the event of a conflict between local or model codes and this Guide, the most restrictive applies. Privatized projects shall conform to the adopted local code having jurisdiction.

There are construction materials and practices (other than those listed in the IRC code) that are adequate for the purposes intended or that apply to the region typically served by the relevant model code. All viable alternatives require individual consideration by the design professional.

The standards for the design and construction in the codes listed in Appendix B, serve as the basis for criteria applicable to Air Force Family Housing. In general, local codes will take precedence. If no local code exists, the project will be governed by the next higher level of applicable codes. For example, if no building code governs, the International Building Code (IBC) will govern.

### **4-5.1 Metric Measurements**

For guidance concerning the application of metric measurements as it pertains to this guide and AF Family Housing projects, refer to Paragraph 2-8 of this guide.

## **4-6 LOT DESIGN**

Housing planners and designers must ensure that lot designs conform to the standards or requirements stated in the Base Comprehensive Plan and the Housing Community Profile. Lot design features are intended to be for the exclusive use of a particular housing unit. All items in lot design are an integral part of house design and are to be included in the unit cost. Utility laterals are to be considered part of the lot.

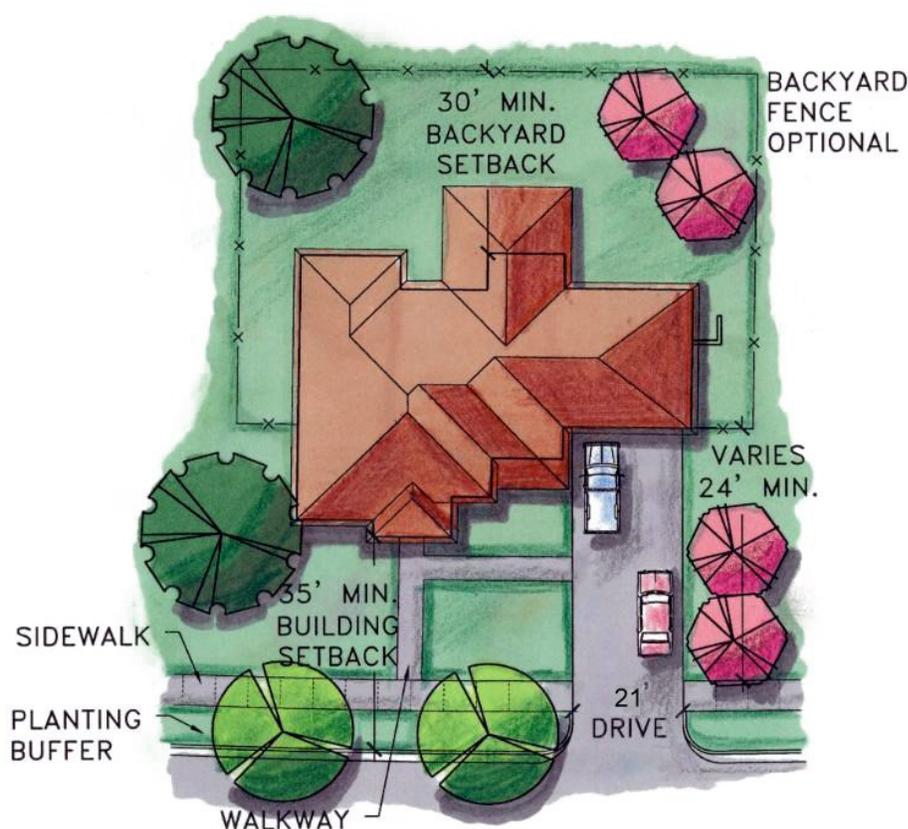
Local zoning regulations do not have jurisdiction on AF land when planning new projects; however, when possible, be a “good neighbor” and follow local standards. Prior to laying out new sites, survey local communities with similar housing types to the one being planned to observe how these projects addressed site design issues. When site allows, base parameters of unit site design on single story, single family homes.

However, be conscious of density since extreme low density will drive higher cost. Lot size is dependant of available land, size and type of unit, and footprint of configuration.

When the site allows provide standard minimums for unit separation, setbacks and backyards as shown in Figure 4-3. The setback from the back of the street curb to the garage is to be a minimum of 35 feet including a 5-foot grass buffer or a 6-foot planted buffer, between the street and the 5-foot sidewalk. If the desired 5-foot sidewalk is not achievable, a 4-foot sidewalk is allowed if a turnaround area is provided to meet ADA requirements. If space is not available for a buffer consider a 6-foot sidewalk adjacent to curb. Separation between units is to be a minimum of 20 feet. Unit backyards are to be a minimum of 30 feet in depth.

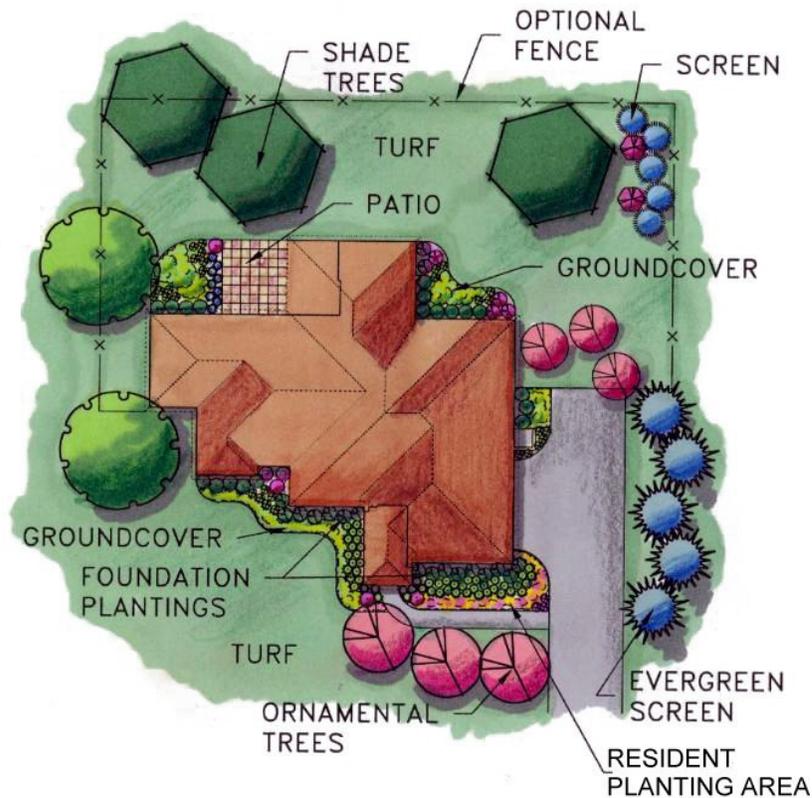
For additional information, reference Paragraph 3-9.

**Figure 4-3: Typical Lot Layout**



#### 4-6.1 Individual House Lot Landscape Design

In this section, considerations refer to landscaping such as trees, shrubs, groundcover, and turf directly associated with the Family Housing unit. Landscaping stabilizes the soil adjacent to the unit, provides shade, can reduce heating and cooling loads, and can enhance the aesthetic quality of the unit and the surrounding neighborhood thus improving the quality of life for the residents. See *EPA Cooling Our Communities, A Guidebook On Tree Planting and Light-Colored Surfacing* (available from Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15220-7954; Reference GPO, Document # 055-000-00371-8). Refer to Figure 4-4.

**Figure 4-4: Typical Unit Landscape Plan**

- Choose plants for their durability, for their low water requirements and for their ability to add beauty and diversity to the unit landscape.
- Provide a unit conceptual landscape design: shrubs, groundcover, turf, and trees. Undisturbed areas may remain in their natural state.
- Provide landscaping to control erosion and dust, to prevent muddy areas around housing units, to provide necessary visual/privacy screening, and to soften the visual environment.
- Provide foundation planting that is appropriate to the local climate conditions, properly placed, and visually anchors the building to the ground by providing a transition between the vertical walls of a building and the horizontal line of the ground plane. Screen the foundation without causing damage to the foundation walls and slabs or utility lines.
- Select plant materials that are hardy, appropriate to the locale, and will not result in excessive maintenance or water costs. When possible use plant material that is native or well adapted and follows Xeriscape planting principles.
- Use landscaping to help individualize the unit, and to provide a sense of privacy and enclosure to the patio areas.
- Do not use poisonous plant material in residential neighborhood areas.

#### 4-6.2 Individual House Lot Lawn Irrigation Systems

To reduce irrigation requirements in arid and semi-arid climates, Xeriscape principles should be used to the maximum extent practical. Consider implementing Xeriscape water saving practices at all installations for sustainability. Reclaimed-water or captured-rainwater systems should be used in lieu of potable water. If potable water is used, provide anti-siphon/backflow prevention devices.

Lawn irrigation systems may be included for Family Housing units where the following conditions exist:

- Any yard size for personnel, regardless of rank, where the average annual rainfall is less than 20 inches as defined by Air Force Combat Climatology Center (AFCCC). If AFCCC data is not available, then use National Weather Service (NWS) and National Oceanic and Atmospheric Administration (NOAA); see Table 4-2 *Arid and Semi-Arid Climates Approved Installation Listing*.

**OR**

- The unit's yard is half an acre or greater (lot size less footprint of unit), regardless of rank.

Lawn irrigation systems for GOQ's must be approved by SAF/IEI prior to installation, regardless of criterion met or fund sources used.

Cost to maintain and repair the irrigation system within 50 feet of GOQ's must be included in the GOQ Annual Cost Report and applied against the \$35,000 operation, maintenance and repair threshold. For non-GOQ's, the cost for major maintenance and repair of the irrigation system will be applied against the \$20,000 maintenance and repair threshold.

Irrigation systems will typically be installed under the whole-house improvement (P-713) and the new construction/replacement (P-711) programs when revitalizing inadequate units. Installations may also consider using the MFH O&M Minor Alteration (P-722) program; however, this non-funded requirement must be taken out of the existing budget to "keep good units good." When P-722 funds are used, Minor Alteration limits will also apply.

Installations may not violate approval authority levels, improvement cost limits, or maintenance and repair thresholds. Lawn irrigation systems provided by housing privatization are not constrained by this policy. No additional or "set aside" funds will be provided to install irrigation systems. The new maintenance costs will have to be identified in MAJCOM inputs to future Family Housing Master Plans (FHMP).

Bases and MAJCOMs must use prudence when evaluating whether or not to install irrigation systems for individual Military Family Housing units. At locations where extreme cold weather is prevalent throughout the winter, it may not be prudent to invest in sprinkler systems even though bases may meet the rainfall conditions.

**Table 4-2: Arid and Semi-Arid Climates Approved Installation Listing**

Installation	Nearest City with Rainfall Data	State	Average Annual Rainfall in Inches *
Luke AFB	Glendale	AZ	8
Davis-Monthan AFB	Tucson	AZ	12
Travis AFB	Fairfield	CA	19.2
Vandenberg AFB	Lompoc	CA	14.5
Edwards AFB	Mojave	CA	6
Peterson AFB	Colorado Springs	CO	16.2
Schriever AFB	Colorado Springs	CO	16.2
USAF Academy	Colorado Springs	CO	16.2
Buckley AFB	Aurora	CO	15.4
Hickam AFB	Honolulu	HI	17.2
Mountain Home AFB	Pocatello	ID	12.1
Malmstrom AFB	Great Falls	MT	15.2
Minot AFB	Minot	ND	17.4
Grand Forks AFB	Grand Forks	ND	19.5
Kirtland AFB	Albuquerque	NM	8.9
Cannon AFB	Clovis	NM	17.5
Holloman AFB	Alamogordo	NM	11.2
Nellis AFB	Las Vegas	NV	4.2
Ellsworth AFB	Rapid City	SD	16.9
Laughlin AFB	Del Rio	TX	18.7
Hill AFB	Ogden	UT	17.6
Fairchild AFB	Spokane	WA	16.5
FE Warren AFB	Cheyenne	WY	14.6

\*Data from World Climate Organization, National Weather Service, or Air Force Combat Climatology Center. All other installations measured rainfall amounts greater than 20 inches per year. For additional information refer to references listed in the appendices.

#### 4-6.3 Grading/Drainage

Proper grading of the soil around a housing unit will allow surface water to drain away from the foundation, driveway and walkways. This is critical in minimizing moisture penetration through the foundation walls into basements, crawl spaces, and under slabs.

- Provide gutters and downspouts for all roof areas except those in severe northern climates. Place splash blocks under downspouts that are not connected to storm drains.
- Grade slopes away from the house in all directions for a minimum of 5 feet at 5 percent grade.

- Runoff from a unit must not cause drainage damage to other units such as ponding or erosion. A surface swale between two units shall be no closer than 10 feet to any unit.
- Ensure that foundation-planting beds are designed to positively drain so that water will not pond next to the foundation wall or on walkways.

#### **4-6.4 Walkways**

Walkways that connect the common neighborhood sidewalks to the front door and walkways that connect from the driveway to the front door are unit walkways. Walkways within the unit lot provide pedestrian access to and from housing units, and to public/community sidewalks. These walkways are often an afterthought. It is important that they are considered as an integral part of the unit lot design.

- Provide unit walkways with a minimum width of 4 feet to all unit entries and driveways.
- Provide paved access between the house, trash container locations, and roadside pick-up locations. Use the driveway to accommodate this requirement where ever possible.
- Design walkways to conform to the ADAAG or UFAS (most restrictive shall apply).
- Design walkways for site conditions such as soils, weather, proper drainage, etc.
- Provide proper joint types at required locations.

#### **4-6.5 Driveways/Parking**

Driveways serve a dual purpose by providing both automobile access to a garage or carport and space for parking. The design of the driveway or parking area can also affect the appearance of the house and the neighborhood. An individual parking pad provides off-street parking for one or two automobiles. Garages and carports are covered in Paragraph 4-8.1 of this Guide.

- Provide driveways with a minimum width of 12 feet for single car garages and 21 feet for double car garages.
- When the driveway is used to provide off-street parking for the unit, provide a minimum length of 24 feet from the edge of the neighborhood sidewalk along the street to the garage to accommodate the parked car.
- Driveway typically is to be constructed of 4-inch reinforced concrete.
- Allow for proper surface drainage across driveway.
- Locate driveway with respect to housing unit and street access.
- Avoid driveways located on collector streets.

#### 4-6.6 Trash Enclosure

External trash enclosures provide an area for the placement of household trash for subsequent pick-up by a trash collection service. They should also effectively screen potentially unsightly trash accumulation.

- Provide each living unit with an area large enough for recycling containers and two refuse containers of a size used at the installation. Locate the area convenient to the trash pick-up point. Provide paved access for the resident.
- Acceptable trash enclosure materials include wood fencing, brick masonry, and decorative concrete masonry units (CMU). Consider the overall architectural environment when designing the enclosure. Stress functionality and simplicity.
- Provide enclosures to screen refuse that might be visible from the street, common area, or other living units. Enclosures may be incorporated into carports or garage exteriors, or a garage may substitute for an enclosure.
- If "dumpster" type trash enclosures are used to support a number of Family Housing units rather than individual trash containers, locate the dumpsters in an area that would be the least offensive to the housing residents, is convenient for pick-up service, and is adequately screened. Dumpsters should be animal-proofed with regards to the regional types of nuisance animals.
- Dumpster areas should also be able to accommodate recycling bins.

#### 4-6.7 Outdoor Living Spaces, Patios/Balconies/Ground-Level Decks

- The outdoor living spaces are unconditioned and include patios, enclosed patios, decks, lanais, balconies, porches (covered, screened, or enclosed), and breezeways (converted to enclosed patios). Front entry porches, which are defined as only part of the main entry of the house and are not enclosed, are not counted against the combined outdoor living spaces unless they are increased in size and function or are connected to another interior or exterior living area. Front entry porches shall clearly be an entry feature of the house, no more than 5 feet deep, and part of the architectural style of the house. Refer to Table 4-3 for outdoor living space size allowances.
- Patios or decks provide the occupants of ground-level units with a private outdoor living area to augment interior living spaces. Most of the considerations that apply to other exterior features also apply to patios and ground-level decks.
- Balconies are a method of providing additional living space and access to outdoor space for units located entirely above the ground floor. Balconies should provide functions similar to patios but on a smaller scale. Balconies can be a source of maintenance problems if they are not carefully considered in the design process.

- For each living unit that opens to the exterior at ground level, provide a concrete patio with a minimum area of 120 square feet and a minimum front-to-back dimension of 8 feet. A raised deck of the same size, constructed of weather-resistant and slip-resistant materials, is an acceptable alternative to the concrete patio when warranted because of finished grade conditions. Consider using recycled synthetic materials for raised decks in lieu of wood.
  - Screen patios/decks from streets, common areas, and adjacent living units with a combination of walls, fencing, or planting.
  - Provide direct access from the living room, dining room, or family room.
  - Provide deck rails as required by local code.
  - Ensure the patio or deck elevation (floor height) is a minimum of 4 inches below the floor of an adjoining house or storage space. If the drop is more than 7 inches, provide steps with proper stair design.
  - Where concrete patios adjoin the house, seal the joint between the house and the slab but allow for differential settlement between the patio slab and the house foundation.
  - Slope all patios and decks a minimum of ¼-inch per foot away from the house and ensure level surfaces to prevent ponding.
  - Ensure all wood members are pressure treated to withstand exposure to the local elements for at least 2 years. Coordinate with arsenic-restrictions on pressure-treated wood. Consider using recycled synthetic materials for raised decks in lieu of wood.
  - It is desirable, but not mandatory, that the patios have roof protection from sun and rain. It is also desirable that the patio be wrapped on at least one end by other structures (house, garage, or storage).
- For each living unit located entirely above the ground floor, provide a balcony with a minimum area of 40 square feet and a minimum front to back dimension of 6 feet.
  - If feasible, try to locate balconies within the building structure but outside the interior living space envelope. Where balconies are provided over interior livable space, ensure proper drainage and water proofing are provided.
  - Construct exterior/cantilevered balconies using solid decks with an impervious surface (e.g., lightweight concrete), sloped to drain to the outer edge.
  - Consider placing the balcony to allow direct access from the living room, dining room, or family room.

- Design the balcony to the local code but in no way less than the most recent edition of the IBC.
- Design the railings in compliance with either the local code or the IBC, whichever is more stringent.
- Ensure all steel/metal members are primed and painted with primers/paints specifically designed for application to metals and that can withstand exposure to the local elements for at least two years.
- In general, for all exterior features (balconies, railings, stair components, etc.), provide priming and paint to withstand local weather extremes for at least two years.
- Provide appropriate lighting and Ground Fault Circuit Interrupter (GFCI) duplex receptacles with “While in Use” weatherproof enclosures.

**Table 4-3: Combined Outdoor Living Space Size Allowances**

Grade	Minimum (SF)	Maximum (SF)
JENL/JNCO	120	150
SNCO/CGO	120	200
FGO/E9 Prestige/ISNCO (E9)	120	250
SO/ICO SO	120	300
GO/SCP GO	120	350

**4-6.8 Fences**

**4-6.8.1 Backyard Fencing**

Backyard fencing is at the discretion of each installation. Each installation that desires backyard fencing shall establish a standard in their HCP for height, materials, and location around the housing unit to ensure a cohesive image for each neighborhood. Backyard enclosures are recommended to be limited to a 4-foot high fence.

**4-6.8.2 Privacy Fence**

A portion of the outdoor living area should have the opportunity to be made private by providing privacy fences and screens. This provides a private space for individual or family activities.

- The private outside area can be partially or completely enclosed by a privacy screen depending on the type of housing.
- Provide visual screening by using structural walls or fencing with materials that will provide maximum privacy to residents.
- Acceptable materials include wood fencing (various designs), brick masonry, synthetic, or decorative CMU.

- For attached units, consider full-yard privacy fencing.
- Provide privacy fences with a maximum height of 6 feet.
- Consider landscaping or planting as a substitute for part or all of the screening.
- Do not use lumber that has been treated with Copper Arsenic (CA).

#### **4-6.9 Exterior Storage Area Size Allowances**

Exterior storage areas for larger bulk items augment indoor storage and can be used for items normally used outdoors. This storage area may be located in the garage or carport, or in a storage room within or attached to the house. Provide access to these storage areas from the exterior of the housing unit. Refer to Table 4-4 for exterior storage size allowances.

- Avoid locating exterior storage in separate sheds when locating exterior storage for each unit in a single space. Exterior storage should be incorporated as an integral part of the house design.
- Exclude exterior storage from the authorized net gross and floor areas. The area exceeding the “Maximum” allowance will be counted into the gross and net square footage calculations. Refer to Table 4-4. The exterior storage areas shall comply with the following requirements:
  - Provide walk-in storage areas with a minimum depth (front to back) of 4 feet clear for exterior storage. Provide an outside service door opening wide enough to accommodate lawn mowers and typical lawn tools unless located in garage.
  - Locate the outside service door conveniently to the outdoor living and lawn areas. Provide paved access to the door.
  - Provide a switch-controlled light at the outside service door.
  - Provide 18-inch deep, heavy-duty shelving adequately supported.
  - Provide natural ventilation with insect-proof louvers in exterior doors or walls to vent humidity and flammable gases.
  - Pre-engineered storage structures are highly discouraged in improvement projects and are not acceptable in Replacement/New Construction projects unless it is the only viable solution to satisfy exterior storage requirements. Where these instances occur, the exterior aesthetics of the structure must be compatible with the design and architecture of the unit.

**Table 4-4: Exterior Storage Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	24	30	35	30	35	40
	2 Modified	24	30	35	30	35	40
	3	35	40	45	40	45	50
	4	35	40	50	40	50	60
	5	35	40	60	40	60	75
SNCO & CGO	2	24	30	40	30	40	55
	2 Modified	24	30	40	30	40	55
	3	40	45	50	45	50	55
	4	40	45	60	45	60	70
	5	40	45	70	45	70	90
FGO & E9 Prestige	3	40	45	55	45	55	65
	4	45	50	70	50	70	80
ISNCO (E9)	4	45	55	75	55	75	80
SO (O6)	4	45	60	80	60	80	90
ICO SO (O6)	4	45	60	85	60	85	90
GO (O7+)	4	100	100	100	100	100	100
SCP GO (O7+)	4	100	100	100	100	100	100

**4-7 FOUNDATION AND BUILDING EXTERIOR**

**4-7.1 Foundation**

The purpose of the foundation is to transfer the building’s structural loads to the surrounding soil. There are two foundation types that are typically used (but not limited to) Family Housing foundation wall systems (concrete block or poured concrete), or slab-on-grade with thickened slab edges (composite slab).

**Design Criteria**

- All AF housing must be built on permanent foundations.
- Extend the top of the foundation 8 inches above finished grade.
- Do not use foundation insulation material containing urea-formaldehyde.
- Seal foundations thoroughly and completely against moisture penetration.
  - When basements are part of the unit design, adequate waterproofing and subsurface drainage shall be provided to eliminate moisture penetration into the basement through the foundation walls or the basement floor slab.

- In areas with excessive radon levels, ensure that the foundation acts as a barrier to prevent radon gas in the soil from entering the living area of the house. Evaluate the option of providing a radon exhaust system.
- Ensure adequate reinforcement of concrete and masonry components to prevent or minimize cracking.
- Ensure all holes and cracks in the structure and around all penetrations through floors and walls not required for ventilation are sealed with appropriate materials.
- Provide vapor barriers under all concrete floor slabs on grade. Provide foundation insulation in cold climates.
- Provide adequate natural ventilation of crawl spaces. Cover crawl space floors with a tightly sealed, continuous barrier. Seal walls between the crawl space and the interior space in the living unit.
- Provide floor insulation in crawl spaces according to the guidelines in the *Design Guide for Energy Efficient Revitalization of Military Family Housing for Improvement and New Construction*, developed by the National Association of Home Builders (NAHB) Research Center and Oak Ridge National Laboratory. Ideally, to help keep pipes in the crawl space from freezing, insulate the foundation wall and put a vapor barrier on the ground as opposed to insulating the floor.
- Ensure foundations for exterior masonry veneer walls include a brick lug (minimum of 1 course below finish floor).
- Provide adequate water stops for foundation wall conditions where water infiltration due to hydrostatic pressure has a potential for occurrence.
- Ensure testing for soil strength and expansive soil characteristics is conducted on existing soils before construction and report findings to base authorities.

#### 4-7.2 Roof

The roof structure provides the structural "skeleton" for the loading associated with roofing materials (dead loads) and snow and wind (live loads). The roof is commonly framed with either individual structural members ("stick built") or prefabricated trusses. The Air Force policy is to use sloped roofs for ease of maintenance and systems upgrades and for providing a residential scale to the neighborhood.

Provide standardized roofing materials and systems, such as: 25-year asphalt shingles, 15 pound felt, and plywood or compressed fiberboard sheathing. Attic floor shall be insulated where attic space is unconditioned. If attic is conditioned, insulate under the sloped roof with batt, board, or spray on insulation. For minimum attic insulation see Energy Star Home ratings.

Provide roof flashing at the juncture or change in direction of materials. It is typically composed of sheet metal (e.g., aluminum, galvanized steel, or copper), roofing felts, or asphalt sheets. The most common locations of roof flashing are at the intersection of the

roof and chimney, at the intersection of the roof and walls extending above the roof, and at the intersection (or valley) of two roof sections. Vents and other rooftop equipment are also flashed at their penetrations through the roof.

Roof overhangs (eaves, soffits, and fascias) protect the walls from sun, rain, ice, or snow and divert water away from the foundation. In warmer climates, extended overhangs can shade walls and windows from the summer sun. In cold climates, overhangs can be reduced to let more sunlight warm the exterior walls and enter the interior of the unit.

Roof slopes should be consistent with FH criteria outlined in the bases' architectural compatibility standards criteria manual.

## **Design Criteria**

### **Roof Slopes and Overhangs**

- With the exception of overseas (foreign) installations with different local standards, design roof slopes to a minimum of 4 in 12 in new or replacement construction and in whole-house improvement projects when existing roof structure shows signs of failure or deterioration.
- Cover roof slopes of 4 in 12 or steeper with 235 pound asphalt shingles or 215 pound tabbed fiberglass reinforced asphalt shingles.
- Cover existing slopes over 2 in 12 and less than 4 in 12 with either shingles or built-up roofing, if installation techniques are in full compliance with manufacturer's recommendations and applicable codes.
- Evaluate the use of overhangs to minimize or maximize exposure to the sun (solar gain) and other elements.

### **Roof Coverings**

- Do not use other roof covering materials (i.e., metal, slate, clay, or concrete tile) except when dictated by local conditions and Installation architectural compatibility standards when justified or supported by an economic analysis that has considered less costly alternatives. However, use cost effective materials that are compatible with the historic theme of the Family Housing units.
- Avoid wood shingles in new construction.
- Where metal roofs are installed, ensure adequate sound attenuation is used to minimize the sound from rain and outside noise.
- In very cold climates, do not use shingles on existing roofs with a slope of less than 3 in 12.
- Coordinate roof covering colors and textures to harmonize with other house and neighborhood colors. The type and color of roofing contributes significantly to the overall appearance of the neighborhood and the "curb appeal" of the house.

### **Maintenance Design Criteria**

- Always employ gutters except in severe northern climates, and consider using gutter guards, such as insect/bird screens or those employing molecular attraction to capture water while shedding airborne leaf and other debris.
- Base the roof overhang design on the local climate.
- Place splash blocks under all downspouts that are not connected to the storm drain system. Ensure that the water discharge is not directed onto a walkway or toward the foundation.
- Do not use soffits, fascia, and gutter materials that require field painting and intensive cyclical maintenance.

### **Attic Ventilation and Insulation**

- Provide attic vents, including soffit vents, ridge vents, and gable vents to allow for ventilation of attic spaces. Use gravity ventilators with v-shaped outer vanes and no moving parts when possible. Do not use wind turbine vents.
- Provide for a continuous flow of ventilation air to enter the attic space from the eaves or end wall and rise through heating to exit at the dormer, gable, or ridge vents.
- Ensure that all shed or wall-braced roofs maintain the same ventilation requirements as standard roofs. In cathedral or vaulted ceiling conditions, include insulation venting where the ceiling insulation is compressed between the underside of the roof and the topside of a raised or sloped ceiling fastened to the roof rafters and joists.
- Provide wasp and bird screening with all vents, regardless of type.
- In some regions, attic venting may not be desirable. When considering attic venting systems, designers and engineers should consult and follow local practices.
- Make sure that plumbing vents and exhaust fans do not vent into the attic, but penetrate the roof. Ensure these penetrations extend above the roof per local building codes. Also ensure they have adequate flashing. Ensure that attic spaces are capable of access by contractors who must service or replace materials and service lines installed between ceiling and the roof. Generous crawl spaces are mandatory where known attic service area vent penetrations exist.
- Provide ceiling and/or roof insulation as the design warrants.

- Consider using radiant barriers in the roof system. Recent research has indicated that attic temperatures in the summertime can be reduced by 20 °F in warm climates. This can be accomplished with a reflective surfacing of the roof sheathing or of batt insulation applied between rafters.
- Provide a minimum of 4-inch vertical wall flashing where lower roofs adjoin into walls or parapets.

#### 4-7.3 Exterior Wall Structure

The purpose of exterior walls is to transmit roof and floor loads to the foundation. The exterior walls should be designed for the roof and or floor loads along with provisions for wind loads and earthquake loads in seismic areas. In traditional residential construction, the exterior wall is commonly framed with wood studs. However special conditions may require other construction such as metal studs, solid masonry, reinforced concrete or load bearing brick. Design of the exterior wall should be in accordance with the design parameters of the local environment.

In traditional residential construction, the exterior wall is commonly framed with 2 x 4 inch wood studs spaced 16 inches on center. However, 2 x 6 inch studs spaced 24 inches on center are structurally acceptable and enable increased insulation where needed. If funds permit, the spacing should remain at 16 inches on center when utilizing 2 x 6 inch studs to better resist impact damage to the interior Gypsum Wall Board (GWB) wall finish.

Some units are built of solid masonry, usually 8 x 8 x 16 inch concrete block, which requires specialized installation and application. In rarer situations, load-bearing brick, adobe blocks, or possibly light-gauge steel is used.

Exterior finish materials provide an attractive means of protecting the building from all weather conditions. Acceptable materials include brick, masonry, wood, metal, cementitious and vinyl siding, or stucco. Exposed, painted, or bare conventional concrete masonry units are not acceptable. However, decorative CMU (e.g., split face) can be used. Fire resistant materials should be used in areas subject to frequent droughts or high fire danger.

Exterior Insulation Finish Systems (EIFS) are increasingly popular and economical to use as a finish material. Consider this option if warranted by local conditions. Provide a "Hard Coat" (PM) application EIFS in reachable areas subject to vandalism. Standard thin coat (PB) application surface finish may be used above window head height. Both are fiberglass reinforced acrylic polymers with integral color, mildewcide, and aggregate additives.

Both have great impact resistance and durability but the thinner finishes can be pierced by sharp objects and should be avoided in locations where this is a likely occurrence such as below the second floor line. **CAUTION:** These systems have been found to be a large contributor to mold growth in newer facilities.

Wall systems must be designed to prevent accumulation or condensation of moisture within a wall. A moisture/vapor diffusion analysis in accordance with (IAW) American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) should be mandated. Wall systems, under winter and summer design conditions, shall either not have a plane of condensation or shall be designed with the capability to drain, evaporate and vent moisture to the exterior.

### Design Criteria

- Use acceptable finish materials and quality specifications for the exterior wall construction. Acceptable materials for Family Housing are:
  - Brick masonry
  - Stucco
  - Solid vinyl siding
  - Fiber reinforced cementitious siding boards
  - Glazed concrete masonry
  - Factory-finished or vinyl-clad steel or aluminum siding
  - Architectural concrete masonry
  - EIFS or other insulated composite wall systems consisting of an insulation core, reinforcing mesh or fabrics, and a cementations exterior finish. Ensure that EIFS are installed by industry certified applicators and that manufacturer's recommendations for joint sealing and flashing are followed.
- Avoid materials requiring field finishing (painting, staining, sealing, etc.).
- Avoid aluminum siding in regions subject to hailstorms. Vinyl siding is an acceptable alternative.
- Provide wall insulation
- Specify non-ozone-depleting chemical (ODC) insulating materials.
- Always provide a vapor barrier on the warm side of the insulation in exterior walls.
- Design shall include proper spacing of control joints.

#### 4-7.4 Exterior Windows and Doors

Windows serve to admit natural light and ventilation to the house and offer a means of egress in the event of a fire. At the same time, windows should provide security and add to energy efficiency.

Exterior doors provide entry to and exit from the house while facilitating energy efficiency and security.

Windows and doors should be compatible with the overall house style and design.

Windows and doors come in a variety of materials and assemblies, and a fair amount of time is required to understand and select the most effective option.

**Windows – Design Criteria**

- Windows shall be certified by the National Fenestration Rating Council (NFRC).
- Windows above the first floor shall have the operable sections that tilt in or are removable for cleaning purposes.
- Use energy-efficient windows (insulating type, low E glass, double or triple glazing, storm windows, thermal breaks, weather-stripping, etc.) per the performance criteria in Table 4-5:

**Table 4-5: Window Thermal Performance**

Weather Region*	Max Window U-Factor	Max Window SHGC	Min. Window VT	Max. Window AL
1	0.36	0.52	0.53	0.20
2	0.36	0.52	0.53	0.20
3	0.33	0.40	0.53	0.25
4	0.33	0.40	0.53	0.25
5	0.33	0.40	0.53	0.25
6	0.50	0.45	0.60	0.20
7	0.50	0.45	0.60	0.20

NOTE: Enhanced performance windows with selective coatings should be specified where cost effective.

\* See the International Energy Conservation Code (IECC)

**ABBREVIATIONS:**

- U-Factor: Thermal Transmittance
- SHGC: Solar Heat Gain Coefficients
- VT: Visible Transmittance
- AL: Air Leakage

- Provide at least one window in each bedroom that complies with NFPA 101 for emergency egress:
  - Width: At least 20 inches clear opening
  - Height: At least 24 inches clear opening
  - Area: At least 5.7 square feet clear opening
  - Sill Height: Not higher than 44 inches above the floor although 32 inches is preferred

- Provide removable screens for operable windows. Screens shall be non-ferrous and of window manufacturer's standard design. Aluminum screens shall comply with American Architectural Manufacturer's Association (AAMA) 1002.10.
- Provide locks on all windows.
- Consider use of vinyl clad wood windows: Window and Door Manufacturer's Association (WDMA) I.S.2-87/Grade R15 or all vinyl windows: AAMA-101V-86/Grade R15. Consider using sustainable composite window types when they are shown to be cost effective through life cycle costing. Local climatic conditions may require the use of a specific window type.
- Windows with integral horizontal blinds can be specified where cost effective.
- Specify windows that are manually operated. Avoid cranking mechanisms except in units designed for accessibility.
- Consider the energy impact and passive solar performance in the placement and size of windows.
- Maximize the amount of natural light in the living areas where not impacting energy consumption. Consider using energy efficient skylights (where practicable) when roof slope is at least 3 in 12 inches. Consider the impact of the skylight to the elevation of the house, solar gain in hot climates, and potential for roof leakage.

### **Doors – Design Criteria**

- Consider steel insulated exterior doors and frames for increased energy, security, and to maximize low maintenance performance.
- Consider the use of fiberglass doors and frames or other non-corrosive materials in corrosive environments.
- Provide factory applied weather-stripping gaskets and seals on all exterior doors. Limit infiltration to 0.25 CFM/SF in accordance with ASTM E283.
- Provide a wide-angle viewer at 60 inches above the finished floor on doors without windows or sidelights.
- For patios, use swinging doors that are less costly in terms of maintenance and are easier to repair. Use doors with good insulating characteristics.
- Provide dead-bolt locks on all entry doors. Provide security bars or other secondary locking devices on sliding patio doors.
- Provide a door chime or knocker at the front entrance.
- Consider using secondary doors at front entrances that will accept a fully glazed panel or a screen.

- Select door styles that complement the architectural style of the house (e.g., avoid a colonial door on a contemporary/modern design).
- Glazing provided at exterior doors and/or sidelights shall match criteria for windows glazing in previous section.
- Provide a corrosion resistant finish at harsh coastal locations.

#### **4-7.5 Hardware**

Conform to the American National Standards Institute (ANSI) standards listed and requirements specified herein.

##### **Design Criteria**

- Hinges: Builders Hardware Manufacturer's Association (BHMA) 101, 4½ by 4½ inches (1½ pair) at exterior doors, 3½ by 3½ inches at interior doors.
- Locks and Latches: BHMA 601, series 4000, grade 2 at exterior doors, grade 2 or 3 at interior doors. Provide trim of wrought construction.
- Auxiliary Locks: BHMA 501, series 4000, grade 2, provide trim or wrought construction.
- Interconnected Lock and Latch: BHMA 611, grade 2, provide trim of wrought construction.
- Lock Cylinders: Cylinders shall have six pin tumblers. Cylinders shall have interchangeable cores, which are removable by a control key. Provide a master keying system compatible with existing installation system. Locks within each family unit, including exterior storage and garage door(s), shall be keyed alike. Contractor shall provide one extra set of cores for each 25 units.
- Keys: Furnish four keys for each key change and for master key system and control key.
- Closers: BHMA 301, series C02000, grade 2 at garage/carport to unit door.
- Closet Doors: Clothes closet sliding doors shall be provided with top door guides.
- Door Stops: Stops shall be provided for all doors. Wall mounted stops shall be rubber ball type, mounted at door handle height. Hinge type stops shall be provided where two adjacent doors are located in a common corner. Wall base and door mounted stops are prohibited.
- Dead Bolts: Exterior doors shall be provided dead bolts of matching finish, single master keyed to rest of house.

- Exterior hinged doors shall have 1½ pair of hinges with non-removable pins (NRP), lockset BHMA 601 and auxiliary lock BHMA 501 or interconnected lock and latch BHMA 611, and viewer mounted at eye level, at entrance door only.
- Exterior storage door shall have 1½ pair of hinges and lockset BHMA 601.
- Interior doors shall have one pair of hinges and latch set BHMA 601, with F75 or F76 operations.
- Garage doors shall have keyed bar lock.
- Garage door auxiliary items for reinforcement shall be provided in hurricane prone areas.
- Doors in fire-rated walls and unit-to-garage/carport doors shall have 1½ pair of ball bearing hinges, lockset BHMA 601 and auxiliary lock BHMA 501 or interconnected lock and latch BHMA 611 and closer BHMA 301.
- Garage side doors shall have 1½ pair of hinges and lockset BHMA 601.

#### **4-7.6 Main Entry**

Entry porches should provide safe, convenient access into the house. They should be well lighted and protected from the elements. An entry porch should be considered an entry feature and should add both identity and “curb appeal” to the housing unit. Entry porches or stoops are typically constructed of concrete, may have one or more steps, and may be covered with a roof projection. Like balconies, entry porches can be a source of costly maintenance problems if not carefully considered in the design process.

#### **Design Criteria**

- Design main entries to provide a sense of identity to each home. Remember that the visual impact from the street (curb appeal) and from the front entrance is extremely important.
- Locate all unit identification so that it is clearly visible from the street.
- Slope the porch stoop ¼-inch per foot away from the house to provide positive drainage. Eliminate depressions in the surface that cause ponding.
- Provide porch surface materials that have high slip resistance.
- Conform to the Uniform Federal Accessibility Standard (UFAS) for stair design requirements. Generally, tread depths of less than 11 inches; riser heights of more than 7 inches, and stair widths of less than 3 feet are unacceptable. Slope the tread from the rear to the front. The rear of the tread cannot be more than ¼-inch higher than the front of the tread.
- Provide railings on both sides of steps and around the landings. Ensure the railing has intermediate rails/patterns such that a 4-inch sphere cannot pass through.

- If a covered entry/porch is not a part of the design, protect the entry area with a minimum 3-foot overhang.
- Provide adequate lighting so that no areas of the entry are left dark. This lighting should be photocell controlled and should be part of the overall exterior lighting scheme. Also provide a means for visitors to signal their arrival at the main entry (door bell, chime, buzzer, etc.).
- Eliminate all “blind spots” in the entryway.
- Provide mailboxes that meet the criteria of the local U.S. Postal Service and enhance the aesthetic quality of the streetscape.
- In areas with winter design temperatures (97.5 percent) of -10 degrees Fahrenheit (-23 degrees Celsius) or less, arctic entries should be provided in foyers to prevent heat loss. The maximum area for arctic entries not counted against the net floor area of the house is 30 square feet.

#### **4-7.7 Exterior Stairs**

Although not an optimal configuration, especially in colder climates, exterior stairs can be used to provide access to living units located above the ground level. Certain considerations must be addressed if exposed exterior stairs are used; in general, they are very similar to the considerations for balconies and entry porches.

##### **Design Criteria**

- Shelter all exterior stairs from wind and precipitation. This is especially important in cold climates where ice build-up results in a safety problem. To prevent ice build-up, do not use open-riser designs.
- Make treads and landing surfaces slip resistant. Ensure that slip resistance is a characteristic of the surfacing material; do not adhere non-slip strips to a slippery tread or landing surface.
- Conform to local building codes and the Life Safety Code for stair/tread dimensions.
- Slope landings 1/4-inch per foot to prevent ponding.
- Provide railings on both sides of the stairs and at landings. Ensure the railings have intermediate rails or patterns such that a 4-inch sphere cannot pass through. Provide a railing of at least 36 inches in height measured vertically from the nosing (front edge) of the treads.
- At a minimum, provide light fixtures to provide a minimum one-foot candle average on the stair treads, and operated automatically by a photocell based on outdoors light levels.

- Design the stairs to permit the movement of queen-size bed box springs and other bulky furniture items.
- Ensure all wood members are pressure treated and designed to withstand extended exposure to local weather extremes.
- Ensure all steel/metal components are primed and painted to withstand local weather extremes.

## **4-8 EXTERIOR STRUCTURES**

### **4-8.1 Garage/Carport**

Garages and carports provide sheltered, off-street automobile parking. Most garages provide miscellaneous storage, while some carports have built-in storage space overhead or in bins or closets. The off-street covered parking policy is as follows:

- Up to a two-car garage or carport (20 feet 10 inches wide by 22 feet 4 inches deep maximum clear dimensions) is authorized. For attached units, the number of garages (1 vs. 2) should be in direct relationship to the type of construction and site constraints.
- Single-car garages or carports should be sized 12 feet 8 inches by 22 feet 4 inches, maximum clear dimensions.
- Garages are not required for improvement projects when site constraints exist and when construction is cost prohibitive and/or results in loss of units.
- Exterior storage can be included in the garage or carport as long as the total maximum exterior storage allowance is not exceeded. The maximum clear dimensions may be increased when exterior storage is included in the garage or carport. Provide 18-inch deep, heavy-duty shelving.
- Arctic installations (Eielson AFB, Elmendorf AFB, F.E. Warren AFB, Grand Forks AFB, Minot AFB, Malmstrom AFB, and Cavalier AFS) may consider heated garages if that is a common residential construction practice in the local area.

### **Design Criteria**

#### **Design and Layout**

- Do not combine the main and service entries of the housing unit.
- Provide attached garages for each single family living unit whenever possible. If garages cannot be attached, locate them as close as possible to the kitchen and service area of the house. Garages are especially critical in areas where the winter temperature reaches -10 °F or colder, or where constant exposure to salt air or high winds require enclosed shelters.
- Combine the exterior storage with the carport or garage, if possible.

- Design garages and carports to complement the architectural features and materials of the house.
- Where site conditions allow, provide a walk-through garage so residents can route yard maintenance equipment from the front yard to the rear yard.

### **Construction**

- Design the garage/carport such that the floor slab is a minimum of 4 inches below the floor of an adjoining house or storage space. Where the drop is greater than 7 inches, provide appropriate stair design. Slope the slab toward the garage/carport opening for positive drainage.
- For attached garages, provide a 1-hour rated firewall as a minimum between the house and garage, and between adjacent garages. Consult the locally accepted building code.
- Where exterior storage is included in carports, provide lockable storage with a door width of at least 36 inches. Install shelves and a wall-switch-controlled light fixture.
- Where carports or garages of adjoining units share a common roof, provide a fire separation between the residents' spaces with a floor to ceiling, full parking space length partition. Cover the partition with finished materials on each side.
- For garages not directly attached to units, provide a 36-inch passage door from the garage to the exterior in addition to the roll-up vehicle door.

### **Hardware and Accessories**

- For attached garages or carports, provide a light switch with pilot lamp inside the living unit in addition to the switch in the parking area.
- Consider using motion-sensitive lighting for convenience and security.
- Provide a minimum of one GFCI duplex convenience outlet in each garage or carport per parking space.
- Provide garage door locking hardware that provides safe and easy operation. The door should be operable by adults with limited physical strength. Provide weather-stripping for garage and service doors when they are attached to the housing unit.
- Provide a ceiling mounted, 125 volt duplex receptacle, 8'-7" (verify dimension) from the garage door centered on the door for an occupant purchased or future Government purchased garage door operator. Also provide a low-voltage cable from the ceiling outlet to an electrical box located near the door leading to the interior of the unit. Coordinate installation location with manufacturer's recommendations and open door clearances.

- Provide glass lights in upper panel of door for daytime non-task lighting.
- Consider insulated panels in non-glazed garage door panels for quieter operation and improved heat control. Also consider local climatic conditions.

#### 4-9 INTERIOR PLAN REQUIREMENTS

This section indicates the functional area size allowances, relationships, and criteria for all of the functional spaces.

##### 4-9.1 Implementation Policy for Functional Area Size Allowances

This section contains the Implementation Policy for the Functional Area Size Allowances by Grade and Bedroom presented in Tables 4-6 through 4-14. The tables represent the desired allowable range of area square footages within the AF size standards for both improvement and replacement/new construction projects (shown in Table 4-1) for each functional space based on the occupancy grade and bedroom composition. The functional area ranges are denoted by the categories “Minimum”, “Benchmark”, and “Maximum” for the “Replacement/New Construction Range”; where the “Benchmark” represents the desired functional size of that range which the AF budgets to and is intended to provide a well-proportioned “Benchmark” sized house. Similarly, the functional area ranges are denoted by “Minimum”, “Target”, and “Maximum” for the “Improvement Range”, where the “Target” represents the desired functional size of that range when it can be achieved cost effectively, within project funds, and maintains the overall proportions of the house. Units meeting all functional area net and gross size minimums are considered to meet AF standards. The sizes indicated in these tables are inside clear area square footages for each functional space. The “Other Net” and “Other Gross” figures indicated are additional allocations to arrive at a Unit Total Net and Total Gross square footage for the housing unit. These “Other Net” and “Other Gross” allocations are provided as a guide; however, the designer should strive to minimize these allowances to maximize the efficiency of the design.

**The Improvement Range in Tables 4-6 through 4-14 shall be utilized for all Privatized and MILCON improvement projects.** All required functional areas must be provided and meet the minimum “Functional Area Size Allowances” as indicated in these tables, unless there are structural constraints that make it cost prohibitive to achieve.

The minimum of each functional area shall be utilized to evaluate the need assessment in the HCP process for existing Military Family Housing being considered for investment projects. However, occasionally while developing improvement design solutions, planners and designers may encounter existing conditions where replacing, realigning or additions to existing walls and/or features may be cost prohibitive due to structural constraints, historical relevance, unforeseen conditions or other factors.

Designers, Programmers and Constructors should carefully consider the cost impacts of such conditions and use sound professional judgment in determining appropriate **cost efficient design solutions** to meet the functional requirements for a given project. Sometimes the design and construction solution for improvement projects may require a functional area to remain with slight deficiencies due to cost impact versus value added. The "Target" functional area size is the typical desired when it is cost effective and/or it can be achieved within project funding either through conversions, redesignations, or additions when planning or designing an improvement project. Units meeting all functional area minimums should not be increased in size just to reach the overall "Target" size of the unit or individual functional area. Additions to existing units rarely require an increase to reach the functional area "Maximum" of the "Improvement Range" (Replacement/New Construction Range "Benchmark") of Tables 4-6 through 4-16. When additions or interior wall changes are required to meet a functional deficiency, the designer or planner shall use prudent and sound judgment and add the square footage necessary to solve that deficiency to meet the minimum size of the functional area. When an addition is necessary in an existing house, the addition should be designed to meet all functional deficiencies but shall not exceed the "Improvement Target" on Table 4-1. Any improvement unit design that requires an addition beyond the "Improvement Target" must be fully justified in the HCP. When there are existing units that do not meet the minimum GSF but through efficient design meet all functional area requirements and total NSF minimums, these units shall be considered to meet AF standards and additions shall not be considered. **See Improvement Policy Paragraph 4-3.1.**

**The Air Force objective for all Privatized and MILCON replacement and new construction** of Air Force Military Family Housing is for these projects to be programmed, designed, and constructed to meet the Unit Total Gross and Total Net "Replacement / New construction Benchmark" square footages in **Table 4-1**. Although it is desirable for each individual functional area to meet its "Benchmark" allowance as indicated in **Tables 4-6 through 4-14**, it is recognized that for the sake of good design there may be instances where it is necessary to approach some of the individual functional area maximums indicated in these tables to meet this objective. Therefore, and if affordable within the project funding, the full functional area range as shown in these tables may be used as long as the Total Net and Total Gross "Benchmark" size house is not exceeded and caution is used so as to avoid negative impacts to other functional areas. However, at a minimum, all required functional areas must be provided and meet or exceed the functional area square footage minimums indicated in Tables 4-6 thru 4-14.

Design proposals exceeding the overall size "Benchmark" square footages for Total Net and Total Gross have to be approved by AF/ILE. Design proposals exceeding the overall size "Maximum" square footages for Unit Total Net and Total Gross have to be approved by SAF/IEI; refer to **Table 4-1 and Implementation Policy, Paragraph 4-3.**

Table 4-6 to 4-14 also serve as a guide for evaluation of proposals and/or designs with larger and smaller "Benchmark" size house to always assure a well proportioned size house. Adherence to these tables will assure a consistent well designed house for all sizes within the "Replacement/New Construction Range".

#### **4-9.2 Two-Bedroom Modified Unit**

The two-bedroom modified standard adds a room with closet and a  $\frac{3}{4}$  size bathroom to the current two-bedroom configuration to enhance housing unit functionality. The additional room provides flexible living space for residents and will be designed to serve as a bedroom or den.

- The  $\frac{3}{4}$  bath contains a vanity sink, toilet and shower.
- See Table 4-7 for the allowable range of area square footages for each functional space (additional room,  $\frac{3}{4}$  bath) along with the unit total.

#### **4-9.3 Five-Bedroom Unit**

The AF does not program five-bedroom units for new construction. Where a requirement for a five-bedroom house exists, the requirement should be evaluated as part of the HCP development. Where it is cost effective, conversion of existing units to satisfy a five-bedroom requirement may only be accomplished with surplus units and must not create or increase a deficit in another bedroom type.

#### **4-9.4 General Officer's Quarters**

All aspects of General Officer's Quarters (GOQ) occupancy and upkeep are contained in the GOQ Resident's Handbook, last issued in August 2002. The handbook covers furnishings, home and grounds maintenance, minor alterations, and cost reporting and allowances for such expenses, and is a supplement to Air Force Instruction (AFI) 32-6003, General Officer Quarters.

The standards and policies provided in this guide are applicable to all GOQ projects and supplement the Air Force GOQ Standards for Planning, Programming and Design. For specific GOQ standards and policies, refer to Air Force GOQ Standards for Programming, Design and Construction, last issued in August 2002.

For finish materials, refer to Table 4-39: GOQ Authorized Allowable Finish Materials.

#### **4-9.5 Chief Master Sergeant (CMSgt) Prestige Family Housing Policy**

This policy provides authority, policy, and guidance for installation commanders to establish requirements, define local installation standards that fit within Air Force criteria, and develop a program to upgrade existing or create new Prestige Housing suitable for Air Force Chiefs.

These long-range design and construction standards are essential to the future development of quality Prestige Housing for all E-9s. Requirements should be developed through the Installation Housing Community Plan and executed with the MFH MILCON and Privatization investment program. There will be no change in assignment processes and no additional operating expenses should be incurred.

The following guidance provides the essential elements in determining Prestige Housing programming requirements:

- The intent of this policy is to designate all E-9 housing as Prestige Housing. Size standards should be in accordance with the SECAF and CSAF approved Military Family Housing Size Standards and implementation policy (see 4.3.1 and Table 4-1). For replacement/new construction, units designated for the Command Chiefs (ISNCO E9) on a military installation may be increased by an additional ten percent of the largest sized E-9 house at the installation, not to exceed the programming “Benchmark” size of Replacement/New construction (1940 NSF / 2410 GSF).
- The HRMA determines maximum on-base E-9 Prestige Housing requirements. Commanders must carefully review and validate those designated E-9 positions at each installation since they significantly influence Prestige Housing requirements.
- Prestige housing may be detached single-family or attached multi-family type housing, 3- or 4-bedroom/2 baths (powder room on first story if 2-story), with up to 2-car garages (determined by site conditions, cost constraints and local market trends). Size limits for combined outdoor living spaces (patios, decks and porches) shall not exceed the maximum of 250 SF and should be a minimum of 120 SF.
- Prestige housing for all installation commanders approved key and essential (K&E) E-9 positions shall be a designated 4-bedroom unit.
- Air conditioning for Prestige Housing is authorized when justified by climatic conditions in accordance with this guide and local market housing trends.
- Prestige Housing must meet all guidance and standards in this Guide.
- For finish materials, refer to Table 4-38: Authorized Allowable Finish Materials.

**Table 4-6: Two Bedroom Units - JENL, JNCO, SNCO, & CGO  
Range of Functional Areas by Grade and Bedroom**

Functional Area Size Allowances (SF) JENL & JNCO 2-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	150	160	170	160	170	180
Dining Room	100	110	120	110	120	130
Kitchen	90	100	110	100	110	120
Secondary Dining	20	30	40	30	40	55
Master Bedroom	150	155	160	155	160	170
Bedroom 2	130	135	145	135	145	150
Bedroom 3	-	-	-	-	-	-
Bedroom 4	-	-	-	-	-	-
Bath 1	40	45	55	45	55	60
1/2 Bath *1	24	30	35	30	35	40
Family Room	-	-	-	-	-	-
Closets - Bdrms./Linen	24	30	35	30	35	40
Entry/Foyer & Closet	35	40	45	40	45	50
Other Net *2	107	115	165	115	165	215
<b>Total NSF</b>	<b>870</b>	<b>950</b>	<b>1,080</b>	<b>950</b>	<b>1,080</b>	<b>1,210</b>
Laundry *3	30	35	40	35	40	45
Interior Storage *4	24	30	35	30	35	40
Exterior Storage *5	24	30	35	30	35	40
Other Gross *6,*7	132	135	150	135	150	165
<b>Total GSF</b>	<b>1,080</b>	<b>1,180</b>	<b>1,340</b>	<b>1,180</b>	<b>1,340</b>	<b>1,500</b>
Functional Area Size Allowances (SF) SNCO & CGO 2-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	150	160	180	160	180	210
Dining Room	100	110	130	110	130	150
Kitchen	90	100	130	100	130	160
Secondary Dining	20	30	60	30	60	70
Master Bedroom	150	155	165	155	165	190
Bedroom 2	130	135	150	135	150	160
Bedroom 3	-	-	-	-	-	-
Bedroom 4	-	-	-	-	-	-
Bath 1	40	45	55	45	55	65
1/2 Bath *1	24	30	35	30	35	40
Family Room	-	-	-	-	-	-
Closets - Bdrms./Linen	24	30	40	30	40	50
Entry/Foyer & Closet	35	40	45	40	45	50
Other Net *2	107	115	210	115	210	295
<b>Total NSF</b>	<b>870</b>	<b>950</b>	<b>1,200</b>	<b>950</b>	<b>1,200</b>	<b>1,440</b>
Laundry *3	30	35	40	35	40	55
Interior Storage *4	24	30	40	30	40	55
Exterior Storage *5	24	30	40	30	40	55
Other Gross *6,*7	132	135	170	135	170	185
<b>Total GSF</b>	<b>1,080</b>	<b>1,180</b>	<b>1,490</b>	<b>1,180</b>	<b>1,490</b>	<b>1,790</b>

\* See page 151 for notes pertaining to Functional Area Tables.

**Table 4-7: Two Bedroom Modified Units - JENL, JNCO, SNCO, & CGO  
Range of Functional Areas by Grade and Bedroom**

Functional Area Size Allowances (SF)						
JENL & JNCO 2-Bedroom Modified House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	150	160	170	160	170	180
Dining Room	100	110	120	110	120	130
Kitchen	90	100	110	100	110	120
Secondary Dining	20	30	40	30	40	55
Master Bedroom	150	155	160	155	160	170
Bedroom 2	130	135	145	135	145	150
Bedroom 3 / Den	90	100	110	100	110	120
Bedroom 4	-	-	-	-	-	-
Bath 1	40	45	55	45	55	60
3/4 Bath	35	40	45	40	45	50
Family Room	-	-	-	-	-	-
Closets - Bdrms./Linen	30	35	40	35	40	45
Entry/Foyer & Closet	35	40	45	40	45	50
Other Net *2	110	120	140	120	140	170
<b>Total NSF</b>	<b>980</b>	<b>1,070</b>	<b>1,180</b>	<b>1,070</b>	<b>1,180</b>	<b>1,300</b>
Laundry *3	30	35	40	35	40	45
Interior Storage *4	24	30	35	30	35	40
Exterior Storage *5	24	30	35	30	35	40
Other Gross *6,*7	162	165	190	165	190	205
<b>Total GSF</b>	<b>1,220</b>	<b>1,330</b>	<b>1,480</b>	<b>1,330</b>	<b>1,480</b>	<b>1,630</b>
Functional Area Size Allowances (SF)						
SNCO & CGO 2-Bedroom Modified House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	150	160	180	160	180	210
Dining Room	100	110	130	110	130	150
Kitchen	90	100	130	100	130	160
Secondary Dining	20	30	60	30	60	80
Master Bedroom	150	155	165	155	165	190
Bedroom 2	130	135	150	135	150	160
Bedroom 3 / Den	90	100	110	100	110	120
Bedroom 4	-	-	-	-	-	-
Bath 1	40	45	55	45	55	65
3/4 Bath	35	40	45	40	45	50
Family Room	-	-	-	-	-	-
Closets - Bdrms./Linen	30	35	45	35	45	50
Entry/Foyer & Closet	35	40	45	40	45	50
Other Net *2	180	200	235	200	235	255
<b>Total NSF</b>	<b>1,050</b>	<b>1,150</b>	<b>1,350</b>	<b>1,150</b>	<b>1,350</b>	<b>1,540</b>
Laundry *3	30	35	40	35	40	55
Interior Storage *4	24	30	40	30	40	55
Exterior Storage *5	24	30	40	30	40	55
Other Gross *6,*7	172	175	200	175	200	215
<b>Total GSF</b>	<b>1,300</b>	<b>1,420</b>	<b>1,670</b>	<b>1,420</b>	<b>1,670</b>	<b>1,920</b>

\* See page 151 for notes pertaining to Functional Area Tables.

**Table 4-8: Three Bedroom Units - JENL, JNCO, SNCO, & CGO  
Range of Functional Areas by Grade and Bedroom**

Functional Area Size Allowances (SF) JENL & JNCO 3-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	150	160	170	160	170	180
Dining Room	100	110	120	110	120	130
Kitchen	90	100	110	100	110	120
Secondary Dining	20	30	40	30	40	55
Master Bedroom	150	155	160	155	160	170
Bedroom 2	130	135	145	135	145	150
Bedroom 3	90	100	110	100	110	120
Bedroom 4	-	-	-	-	-	-
Master Bath	40	45	55	45	55	60
Bath 2	40	45	50	45	50	55
1/2 Bath *1	24	30	35	30	35	40
Family Room	100	110	120	110	120	130
Closets - Bdrms./Linen	30	35	40	35	40	45
Entry/Foyer & Closet	35	40	45	40	45	50
Other Net *2	101	105	110	105	110	115
<b>Total NSF</b>	<b>1,100</b>	<b>1,200</b>	<b>1,310</b>	<b>1,200</b>	<b>1,310</b>	<b>1,420</b>
Laundry *3	35	40	45	40	45	50
Interior Storage *4	35	40	45	40	45	50
Exterior Storage *5	35	40	45	40	45	50
Other Gross *6,*7	165	170	185	170	185	190
<b>Total GSF</b>	<b>1,370</b>	<b>1,490</b>	<b>1,630</b>	<b>1,490</b>	<b>1,630</b>	<b>1,760</b>
Functional Area Size Allowances (SF) SNCO & CGO 3-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	150	160	180	160	180	210
Dining Room	110	120	130	120	130	150
Kitchen	100	110	130	110	130	140
Secondary Dining	30	40	60	40	60	80
Master Bedroom	150	160	170	160	170	180
Bedroom 2	130	140	150	140	150	160
Bedroom 3	90	100	110	100	110	120
Bedroom 4	-	-	-	-	-	-
Master Bath	40	45	55	45	55	60
Bath 2	40	45	50	45	50	55
1/2 Bath *1	24	30	35	30	35	40
Family Room	110	120	130	120	130	140
Closets - Bdrms./Linen	30	40	45	40	45	50
Entry/Foyer & Closet	40	45	50	45	50	55
Other Net *2	186	195	205	195	205	210
<b>Total NSF</b>	<b>1,230</b>	<b>1,350</b>	<b>1,500</b>	<b>1,350</b>	<b>1,500</b>	<b>1,650</b>
Laundry *3	40	45	50	45	50	55
Interior Storage *4	40	45	50	45	50	55
Exterior Storage *5	40	45	50	45	50	55
Other Gross *6,*7	180	185	210	185	210	235
<b>Total GSF</b>	<b>1,530</b>	<b>1,670</b>	<b>1,860</b>	<b>1,670</b>	<b>1,860</b>	<b>2,050</b>

\* See page 151 for notes pertaining to Functional Area Tables.

**Table 4-9: Three Bedroom Units - FGO & E-9 Prestige  
Range of Functional Areas by Grade and Bedroom**

Functional Area Size Allowances (SF)						
FGO & E9 Prestige 3-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	170	180	210	180	210	230
Dining Room	130	140	150	140	150	170
Kitchen	110	120	140	120	140	160
Secondary Dining	40	50	80	50	80	100
Master Bedroom	160	170	180	170	180	200
Bedroom 2	140	150	160	150	160	180
Bedroom 3	100	110	130	110	130	140
Bedroom 4	-	-	-	-	-	-
Master Bath	40	45	60	45	60	75
Bath 2	40	45	55	45	55	65
1/2 Bath *1	24	30	35	30	35	40
Family Room	120	130	150	130	150	170
Closets - Bdrms./Linen	40	45	55	45	55	65
Entry/Foyer & Closet	40	45	55	45	55	65
Other Net *2	126	140	170	140	170	190
<b>Total NSF</b>	<b>1,280</b>	<b>1,400</b>	<b>1,630</b>	<b>1,400</b>	<b>1,630</b>	<b>1,850</b>
Laundry *3	40	45	55	45	55	65
Interior Storage *4	40	45	55	45	55	65
Exterior Storage *5	40	45	55	45	55	65
Other Gross *6,*7	190	205	225	205	225	255
<b>Total GSF</b>	<b>1,590</b>	<b>1,740</b>	<b>2,020</b>	<b>1,740</b>	<b>2,020</b>	<b>2,300</b>

\* See page 151 for notes pertaining to Functional Area Tables.

**Table 4-10: Four Bedroom Units - JENL, JNCO, SNCO, & CGO  
Range of Functional Areas by Grade and Bedroom**

Functional Area Size Allowances (SF) JENL & JNCO 4-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	150	160	180	160	180	200
Dining Room	100	110	130	110	130	150
Kitchen	90	100	120	100	120	140
Secondary Dining	20	30	70	30	70	90
Master Bedroom	150	160	170	160	170	190
Bedroom 2	130	140	150	140	150	170
Bedroom 3	100	110	120	110	120	130
Bedroom 4	90	100	110	100	110	120
Master Bath	40	45	60	45	60	75
Bath 2	40	45	55	45	55	65
1/2 Bath *1	24	30	35	30	35	40
Family Room	100	110	130	110	130	150
Closets - Bdrms./Linen	35	40	55	40	55	65
Entry/Foyer & Closet	40	45	55	45	55	65
Other Net *2	121	125	130	125	130	140
<b>Total NSF</b>	<b>1,230</b>	<b>1,350</b>	<b>1,570</b>	<b>1,350</b>	<b>1,570</b>	<b>1,790</b>
Laundry *3	35	40	50	40	50	60
Interior Storage *4	35	40	50	40	50	60
Exterior Storage *5	35	40	50	40	50	60
Other Gross *6,*7	195	200	230	200	230	250
<b>Total GSF</b>	<b>1,530</b>	<b>1,670</b>	<b>1,950</b>	<b>1,670</b>	<b>1,950</b>	<b>2,220</b>
Functional Area Size Allowances (SF) SNCO & CGO 4-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	170	180	190	180	190	210
Dining Room	130	140	150	140	150	160
Kitchen	100	110	130	110	130	140
Secondary Dining	30	40	60	40	60	80
Master Bedroom	150	160	180	160	180	200
Bedroom 2	130	140	160	140	160	180
Bedroom 3	100	110	120	110	120	140
Bedroom 4	90	100	110	100	110	120
Master Bath	40	45	65	45	65	80
Bath 2	40	45	60	45	60	70
1/2 Bath *1	24	30	35	30	35	40
Family Room	110	120	140	120	140	180
Closets - Bdrms./Linen	35	40	60	40	60	65
Entry/Foyer & Closet	40	45	60	45	60	65
Other Net *2	141	145	210	145	210	290
<b>Total NSF</b>	<b>1,330</b>	<b>1,450</b>	<b>1,730</b>	<b>1,450</b>	<b>1,730</b>	<b>2,020</b>
Laundry *3	40	45	60	45	60	70
Interior Storage *4	40	45	60	45	60	70
Exterior Storage *5	40	45	60	45	60	70
Other Gross *6,*7	200	215	240	215	240	270
<b>Total GSF</b>	<b>1,650</b>	<b>1,800</b>	<b>2,150</b>	<b>1,800</b>	<b>2,150</b>	<b>2,500</b>

\* See page 151 for notes pertaining to Functional Area Tables.

**Table 4-11: Four Bedroom Units - FGO, E9 Prestige, & ISNCO (E9)  
Range of Functional Areas by Grade and Bedroom**

Functional Area Size Allowances (SF)						
FGO & E9 Prestige 4-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	170	180	220	180	220	250
Dining Room	140	150	180	150	180	200
Kitchen	130	140	160	140	160	190
Secondary Dining	40	50	90	50	90	120
Master Bedroom	160	170	190	170	190	210
Bedroom 2	140	150	170	150	170	190
Bedroom 3	100	110	130	110	130	150
Bedroom 4	90	100	110	100	110	120
Master Bath	40	45	70	45	70	90
Bath 2	40	45	65	45	65	80
1/2 Bath *1	24	30	35	30	35	40
Family Room	130	140	160	140	160	190
Closets - Bdrms./Linen	45	50	60	50	60	65
Entry/Foyer & Closet	40	45	60	45	60	65
Other Net *2	131	145	160	145	160	220
<b>Total NSF</b>	<b>1,420</b>	<b>1,550</b>	<b>1,860</b>	<b>1,550</b>	<b>1,860</b>	<b>2,180</b>
Laundry *3	45	50	70	50	70	80
Interior Storage *4	45	50	70	50	70	80
Exterior Storage *5	45	50	70	50	70	80
Other Gross *6,*7	205	220	240	220	240	280
<b>Total GSF</b>	<b>1,760</b>	<b>1,920</b>	<b>2,310</b>	<b>1,920</b>	<b>2,310</b>	<b>2,700</b>
Functional Area Size Allowances (SF)						
Installation Senior NCO (E9) 4-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	190	200	230	200	230	250
Dining Room	150	160	180	160	180	200
Kitchen	140	150	160	150	160	190
Secondary Dining	60	70	110	70	110	120
Master Bedroom	160	170	200	170	200	210
Bedroom 2	140	150	180	150	180	190
Bedroom 3	100	110	140	110	140	150
Bedroom 4	90	100	110	100	110	120
Master Bath	40	45	80	45	80	90
Bath 2	40	45	70	45	70	80
1/2 Bath *1	24	30	35	30	35	40
Family Room	140	150	170	150	170	190
Closets - Bdrms./Linen	45	50	60	50	60	65
Entry/Foyer & Closet	40	50	60	50	60	65
Other Net *2	131	140	155	140	155	220
<b>Total NSF</b>	<b>1,490</b>	<b>1,620</b>	<b>1,940</b>	<b>1,620</b>	<b>1,940</b>	<b>2,180</b>
Laundry *3	45	50	75	50	75	80
Interior Storage *4	45	55	75	55	75	80
Exterior Storage *5	45	55	75	55	75	80
Other Gross *6,*7	225	230	245	230	245	280
<b>Total GSF</b>	<b>1,850</b>	<b>2,010</b>	<b>2,410</b>	<b>2,010</b>	<b>2,410</b>	<b>2,700</b>

\* See page 151 for notes pertaining to Functional Area Tables.

**Table 4-12: Four Bedroom Units - SO & SO (ICO)  
Range of Functional Areas by Grade and Bedroom**

Functional Area Size Allowances (SF)						
SO 4-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	200	210	240	210	240	280
Dining Room	160	170	190	170	190	210
Kitchen	140	150	170	150	170	200
Secondary Dining	60	70	110	70	110	140
Master Bedroom	160	170	200	170	200	210
Bedroom 2	140	150	180	150	180	200
Bedroom 3	100	110	140	110	140	160
Bedroom 4	100	110	120	110	120	140
Master Bath	40	45	80	45	80	90
Bath 2	40	45	70	45	70	80
1/2 Bath *1	24	30	35	30	35	40
Family Room	140	150	180	150	180	220
Closets - Bdrms./Linen	45	50	60	50	60	75
Entry/Foyer & Closet	45	50	60	50	60	75
Other Net *2	166	190	195	190	195	230
<b>Total NSF</b>	<b>1,560</b>	<b>1,700</b>	<b>2,030</b>	<b>1,700</b>	<b>2,030</b>	<b>2,350</b>
Laundry *3	45	55	70	55	70	90
Interior Storage *4	45	55	70	55	70	90
Exterior Storage *5	45	60	80	60	80	90
Other Gross *6,*7	235	240	270	240	270	300
<b>Total GSF</b>	<b>1,930</b>	<b>2,110</b>	<b>2,520</b>	<b>2,110</b>	<b>2,520</b>	<b>2,920</b>
Functional Area Size Allowances (SF)						
SO (Installation Commanding Officer) 4-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	220	230	270	230	270	280
Dining Room	180	190	200	190	200	210
Kitchen	150	160	190	160	190	200
Secondary Dining	80	90	130	90	130	140
Master Bedroom	160	170	200	170	200	210
Bedroom 2	140	150	190	150	190	200
Bedroom 3	120	130	150	130	150	160
Bedroom 4	110	120	130	120	130	140
Master Bath	40	50	85	50	85	90
Bath 2	40	50	75	50	75	80
1/2 Bath *1	24	30	35	30	35	40
Family Room	150	160	210	160	210	220
Closets - Bdrms./Linen	45	60	70	60	70	75
Entry/Foyer & Closet	45	60	70	60	70	75
Other Net *2	206	220	225	220	225	230
<b>Total NSF</b>	<b>1,710</b>	<b>1,870</b>	<b>2,230</b>	<b>1,870</b>	<b>2,230</b>	<b>2,350</b>
Laundry *3	45	55	80	55	80	90
Interior Storage *4	45	55	80	55	80	90
Exterior Storage *5	45	60	85	60	85	90
Other Gross *6,*7	275	280	295	280	295	300
<b>Total GSF</b>	<b>2,120</b>	<b>2,320</b>	<b>2,770</b>	<b>2,320</b>	<b>2,770</b>	<b>2,920</b>

\* See page 151 for notes pertaining to Functional Area Tables.

**Table 4-13: Four Bedroom Units - GO & GO (SCP)  
Range of Functional Areas by Grade and Bedroom**

Functional Area Size Allowances (SF)						
GO 4-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	240	250	320	250	320	380
Dining Room	200	210	290	210	290	340
Kitchen	160	170	200	170	200	240
Secondary Dining	100	110	140	110	140	180
Master Bedroom	170	180	210	180	210	240
Bedroom 2	150	160	180	160	180	220
Bedroom 3	130	140	160	140	160	180
Bedroom 4	120	130	140	130	140	160
Master Bath	50	65	100	65	100	160
Bath 2	50	60	85	60	85	120
1/2 Bath *1	24	30	35	30	35	40
Family Room	180	200	290	200	290	340
Closets - Bdrms./Linen	50	60	140	60	140	200
Entry/Foyer & Closet	50	60	100	60	100	140
Other Net *2	246	275	300	275	300	330
<b>Total NSF</b>	<b>1,920</b>	<b>2,100</b>	<b>2,690</b>	<b>2,100</b>	<b>2,690</b>	<b>3,270</b>
Laundry *3	60	70	100	70	100	120
Interior Storage *4	100	100	100	100	100	100
Exterior Storage *5	100	100	100	100	100	100
Other Gross *6,*7	200	230	340	230	340	470
<b>Total GSF</b>	<b>2,380</b>	<b>2,600</b>	<b>3,330</b>	<b>2,600</b>	<b>3,330</b>	<b>4,060</b>
Functional Area Size Allowances (SF)						
GO (Special Command Position) 4-Bedroom House						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	280	300	360	300	360	380
Dining Room	260	280	320	280	320	340
Kitchen	180	190	220	190	220	240
Secondary Dining	110	120	160	120	160	180
Master Bedroom	170	180	220	180	220	240
Bedroom 2	150	160	200	160	200	220
Bedroom 3	130	140	160	140	160	180
Bedroom 4	120	130	140	130	140	160
Master Bath	50	65	120	65	120	160
Bath 2	50	60	100	60	100	120
1/2 Bath *1	24	30	35	30	35	40
Family Room	220	240	320	240	320	340
Closets - Bdrms./Linen	50	65	180	65	180	200
Entry/Foyer & Closet	50	65	120	65	120	140
Other Net *2	266	285	305	285	305	330
<b>Total NSF *8</b>	<b>2,110</b>	<b>2,310</b>	<b>2,960</b>	<b>2,310</b>	<b>2,960</b>	<b>3,270</b>
Laundry *3	65	75	100	75	100	120
Interior Storage *4	100	100	100	100	100	100
Exterior Storage *5	100	100	100	100	100	100
Other Gross *6,*7	245	275	400	275	400	470
<b>Total GSF *8</b>	<b>2,620</b>	<b>2,860</b>	<b>3,660</b>	<b>2,860</b>	<b>3,660</b>	<b>4,060</b>

\* See page 151 for notes pertaining to Functional Area Tables.

**Table 4-14: Five Bedroom Units - JENL, JNCO, SNCO, & CGO  
Range of Functional Areas by Grade and Bedroom**

Functional Area Size Allowances (SF)						
JENL & JNCO 5-Bedroom House *10						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	150	160	180	160	180	210
Dining Room	100	110	130	110	130	160
Kitchen	90	100	120	100	120	150
Secondary Dining	20	30	70	30	70	100
Master Bedroom	150	160	170	160	170	190
Bedroom 2	130	140	150	140	150	170
Bedroom 3	110	120	130	120	130	140
Bedroom 4	100	110	120	110	120	130
Bedroom 5	90	100	110	100	110	120
Master Bath	40	45	60	45	60	75
Bath 2	40	45	55	45	55	65
1/2 Bath *1	24	30	35	30	35	40
Family Room	100	110	130	110	130	150
Closets - Bdrms./Linen	40	45	55	45	55	65
Entry/Foyer & Closet	40	45	55	45	55	65
Other Net *2	196	200	280	200	280	320
<b>Total NSF</b>	<b>1,420</b>	<b>1,550</b>	<b>1,850</b>	<b>1,550</b>	<b>1,850</b>	<b>2,150</b>
Laundry *3	35	40	60	40	60	75
Interior Storage *4	35	40	60	40	60	75
Exterior Storage *5	35	40	60	40	60	75
Other Gross *6,*7	235	250	270	250	270	295
<b>Total GSF</b>	<b>1,760</b>	<b>1,920</b>	<b>2,300</b>	<b>1,920</b>	<b>2,300</b>	<b>2,670</b>
Functional Area Size Allowances (SF)						
SNCO & CGO 5-Bedroom House *10						
Required Functional Area	Improvement Range			Replacement/New Constr. Range		
	Minimum	Target	Maximum	Minimum	Benchmark	Maximum
Living Room	170	180	200	180	200	250
Dining Room	130	140	160	140	160	220
Kitchen	100	110	150	110	150	200
Secondary Dining	30	40	80	40	80	120
Master Bedroom	150	160	180	160	180	200
Bedroom 2	130	140	160	140	160	180
Bedroom 3	110	120	130	120	130	140
Bedroom 4	100	110	120	110	120	130
Bedroom 5	90	100	110	100	110	120
Master Bath	40	45	65	45	65	90
Bath 2	40	45	60	45	60	80
1/2 Bath *1	24	30	35	30	35	40
Family Room	110	120	140	120	140	200
Closets - Bdrms./Linen	40	40	60	40	60	80
Entry/Foyer & Closet	40	45	60	45	60	80
Other Net *2	116	125	310	125	310	360
<b>Total NSF</b>	<b>1,420</b>	<b>1,550</b>	<b>2,020</b>	<b>1,550</b>	<b>2,020</b>	<b>2,490</b>
Laundry *3	40	45	70	45	70	90
Interior Storage *4	40	45	70	45	70	90
Exterior Storage *5	40	45	70	45	70	90
Other Gross *6,*7	220	235	280	235	280	330
<b>Total GSF</b>	<b>1,760</b>	<b>1,920</b>	<b>2,510</b>	<b>1,920</b>	<b>2,510</b>	<b>3,090</b>

\* See page 151 for notes pertaining to Functional Area Tables.

## Notes:

- \*1. The additional 1/2 bath is authorized for 2 story units except for 2 Bedroom Modified unit types. For single story GOQ's with special official entertainment requirements, an ADA accessible 1/2 bath is also authorized to serve the entertainment areas. Refer to Table 4-32, Schedule of Bathrooms, for authorized number of bathrooms based on number of bedrooms and rank. For single story plans, the allowable square footages indicated in tables 4-6 through 4-14 for 1/2 Baths shall be re-allocated to the other functional areas. The total gross and net square footages shall not be decreased.
- \*2. Other Net Square Footages include: Interior walls, circulation spaces, halls, interior storage (see note \*4).
- \*3. It may be elected to provide a laundry closet in lieu of a laundry room. If a laundry closet is provided, the minimum functional area is 16 SF.
- \*4. Interior storage is excluded from the net square footage but not the gross square footage. However, where interior storage area exceeds the allowable maximum, the additional area over the indicated maximum must be counted against the net and gross square footage.
- \*5. Detached exterior storage is excluded from the net and gross square footage. However, where exterior storage area exceeds the allowable maximum, the additional storage area over the indicated maximum must be counted against the gross square footage. Attached exterior storage with access from the interior of the house becomes an integral part of the conditioned envelope and always counts as part of the gross square footage.
- \*6. Other gross square footage includes: Interior & exterior walls, circulation spaces, corridors, halls, finished attic spaces, interior storage, exterior storage (see note \*5), mechanical rooms (see note \*7), chases, stairways, stairlandings & intermediate landings, fireplaces, finished and unfinished basement space.
- \*7. Detached exterior mechanical rooms (sized solely to house the mechanical equipment) are excludable from the gross square footage. Detached is defined as a room contained outside the exterior insulated envelope of the house with exterior access only where no openings through the conditioned envelope of the unit is required. Attached exterior mechanical room with access from the interior of the house becomes an integral part of the conditioned envelope and always counts as part of the gross square footage.
- \*8. The 10% authorized allowance over the "Benchmark" Total Unit Net and Gross square footages for Special Command Position General Officer Quarters (SCP GOQ's) has already been included in the Required Functional Area size allowances in this Table. An Aide's Room and Bath Area is not always a required functional area, however, when required, it is provided within the 10% allowance already included. In instances where an Aide's Room and Bath Area are necessary or warranted, it will be necessary for the designer/planner to decrease the net and gross square footages of other required functional areas indicated in this Table to accommodate this additional functional area requirement within the Total Unit Net and Gross square footage. However, in such cases, at no time shall any of the Required Functional Areas listed be adjusted lower than the Functional Area Minimums indicated in this Table.
- \*9. For arctic locations, refer to paragraphs 4-3.4 and 4-10 for information on Arctic Recreation Rooms.
- \*10. Refer to paragraph 4-3.6 for the AF five bedroom policy.
- \*11. Northern tier states are authorized an additional 300 square feet for arctic entries and recreational rooms. Refer to paragraph 4-3.3 and 4-10.

## 4-9.6 Functional Area Relationships and Criteria

### 4-9.6.1 General Arrangement

This section provides a general description of the functional areas and their spatial relationship to each other desired in AF Family Housing. Paragraphs 4-9.6.2 thru 4-9.6.17 provides a detailed space-by-space analysis and criteria of each of these various functional areas. Regardless of the configuration, minimum square footage requirements for each functional area shall be met. The minimum area of each functional area is the total area within the walls from the point of entry of that functional area.

#### 4-9.6.1.1 Design Criteria

- Provide minimum ceiling heights of 8 feet except for special circumstances in halls, baths, and alcoves and in no case less than 7 feet (except interior spaces with sloped ceilings). For ceilings that are higher than 9 feet, consider sloped ceilings and scissor trusses for reduced energy consumption and added livability.
  - For sloped ceilings, not more than 50 percent of the required floor area of a room or space is permitted to have a sloped ceiling less than 7 feet in height with no portion of the required area less than 5 feet in height.
- Fireplaces are prohibited in all non GOQ AF family housing due to issues of initial and life cycle costs, energy efficiency, fire safety, and maintenance. However, existing fireplaces can be left in place. One fireplace is allowed for a GOQ. For specific guidance on fireplaces, refer to AF GOQ standards.
- Provide rooms that meet the minimum wall dimension for each functional area as indicated in the Guide. Minimum dimensions indicated in this Guide are intended to apply to major adjacent walls (perpendicular to each other). Entry alcoves or room niches shall not encroach into or reduce the minimum dimension indicated.
- For new construction provide a combination ceiling fan and light fixture unit for the family room, den, and master bedroom only.

#### 4-9.6.1.2 Design Criteria (Spatial)

- Consider A-E, MAJCOM, DoD, or in-house comprehensive interior design services to provide suggested furniture layouts and efficient circulation patterns.
- Centrally locate and arrange circulation space to serve as many functional areas as possible without the need for a number of extended hallways.
- Consider furniture placement in each habitable room to accommodate at least two furniture arrangements to serve the typical family in that type of house. Consider the placement of windows, doors, electrical outlets and switches, and HVAC supply and return registers in furniture arrangements. Consider the vertical as well as the horizontal dimension of the rooms.

- Provide a minimum ceiling height of 8 feet in all Family Housing units unless unique conditions warrant variance. Halls, baths, and utility rooms may warrant a variance; however, low ceilings in these areas should be avoided if possible.
- Provide acoustical separation between living units as noted below:

#### 4-9.6.1.3 Design Criteria (Party Floor/Ceiling System)

- Party floors separating different dwelling units shall have a topping slab of a minimum 1½-inch lightweight concrete. Party floors shall have a minimum one-hour fire resistance rating, in accordance with ASTM E-119. Floor/ceiling construction between dwelling units (party floors) shall be designed to provide the following sound transmission ratings in accordance with ASTM E90 and E492:
  - Sound Transmission Class – STC-52
  - Impact Isolation Class – IIC-60\*
  - Floors between dwelling units and garages – STC-50

\*Note: A minimum IIC-52 is acceptable at party floor when a bathroom, kitchen or utility room is located directly above a bathroom, kitchen or utility room.

- The Contractor shall provide certified proof of performance field-testing that each floor and floor/ceiling system complies with required sound attenuation levels. The Contractor shall field test a minimum of two units of each unit type constructed. Tests for airborne sound shall be made in compliance with ASTM E336. Tests for impact sound shall be made in compliance with ASTM E1007.
- In cases where the field tested performance of the systems does not meet the designed performance, the maximum acceptable difference between field tests and sound transmission ratings shall be 2 decibels (dB) for airborne sound ratings and 5 dB for impact sound ratings.
- The Contractor shall be responsible for correcting any floor systems found inadequate, as well as for performing additional required testing. The Contracting Officer may require additional field-testing if it is determined that the quality of construction warrants additional testing.

#### 4-9.6.1.4 Design Criteria (Sound Attenuated Wall Systems)

- Provide acoustical sound insulation in walls and floor/ceiling assemblies in accordance with ASTM E90 as follows:
  - Walls between living units and garage/habitable space demising wall: STC = 50
  - Floor/ceiling assemblies between living units: STC = 52

- Walls between bathrooms to bathrooms or between bathrooms to living space, not less than: STC = 42
- Walls between adjacent bedrooms: STC = 37
- Party walls between living units: STC = 52 The Contractor shall provide certified proof-of-performance field-testing that each wall system complies with required sound attenuation levels. The Contractor shall field test a minimum of two units of each unit type constructed. Tests for airborne sound shall be made in compliance with ASTM E336.
- In cases where the field tested performance of the systems does not meet the designed performance, the maximum acceptable difference between field tests and sound transmission ratings shall be 2 dB for airborne sound ratings and 5 dB for impact sound ratings.
- The Contractor shall be responsible for correcting any wall systems found inadequate, as well for performing additional required testing. The Contracting Officer may require additional field-testing if it is determined that the quality of construction warrants.
- The Contractor shall require a dew point analysis of the wall system to determine the need/location of the vapor barrier. This analysis is to be performed by a registered engineer or architect.

#### 4-9.6.2 Foyer

The foyer is the principal point of entry to and from the housing unit. It provides the first impression. Layout or modify this space so it is clear to the guests which spaces are private and which are public. Refer to Table 4-15 for foyer size allowances.

#### Design Criteria

- Locate the foyer adjacent to the living room but provide access from it to the kitchen, the hall, or the stairs leading to the sleeping areas without having to pass through the living room.
- Provide a minimum of 5 feet 4 inches (front to back) by 6 feet 6 inches (side to side) entry vestibule, including coat closet. Size space to accommodate entry/exit functions (removing/putting on coats, hats, etc.) and storage of such clothing.
- Provide a minimum 2 feet 0 inches deep by 3 feet wide coat closet. When foyer size allows, a 5 foot width is desirable. Obtain approval to reduce this width in order to locate under stairs.
- Provide a main entrance door with a minimum width of 3 feet.
- Provide a switched light in the entry.
- Provide doorstops to prevent doors from damaging adjacent walls.

- Use flooring made of a durable, moisture-impervious, and slip-resistant material.
- In arctic areas (Eielson AFB, Elmendorf AFB, Grand Forks AFB, Minot AFB, Malmstrom AFB, F.E. Warren AFB and Cavalier AFS), up to 30 square feet for air-lock entries in foyers should be provided. This 30 SF is part of the 300 SF arctic allowances and does count towards the net square footage. See net square footage exclusions in Table 4-1.
- Provide adequate lighting.

**Table 4-15: Entry/Foyer & Closet Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	35	40	45	40	45	50
	2 Modified	35	40	45	40	45	50
	3	35	40	45	40	45	50
	4	40	45	55	45	55	65
	5	40	45	55	45	55	65
SNCO & CGO	2	35	40	45	40	45	50
	2 Modified	35	40	45	40	45	50
	3	40	45	50	45	50	55
	4	40	45	60	45	60	65
	5	40	45	60	45	60	80
FGO & E9 Prestige	3	40	45	55	45	55	65
	4	40	45	60	45	60	65
ISNCO (E9)	4	40	50	60	50	60	65
SO (O6)	4	45	50	60	50	60	75
ICO SO (O6)	4	45	60	70	60	70	75
GO (O7+)	4	50	60	100	60	100	140
SCP GO (O7+)	4	50	65	120	65	120	140

**4-9.6.3 Living Room**

The living room traditionally was the principal activity space for the family. With the addition of larger kitchens and family recreation rooms, living rooms have been relegated to more formal or even ceremonial functions with respect to the family and entertaining guests. Refer to Table 4-16 for living room size allowances.

**Design Criteria**

- The minimum dimension is 12 feet 0 inches for SO and above units, and 11 feet 6 inches for FGO and below units.
- Consider the available natural light, ventilation sources, and exterior view in laying out or modifying existing spaces.

- Layout the space or modify existing spaces to work in conjunction with the dining room.
- Minimize having to traverse the living room to access other areas of the house.
- Provide the ability to accommodate two different furniture arrangements.

**Table 4-16: Living Room Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	150	160	170	160	170	180
	2 Modified	150	160	170	160	170	180
	3	150	160	170	160	170	180
	4	150	160	180	160	180	200
	5	150	160	180	160	180	210
SNCO & CGO	2	150	160	180	160	180	210
	2 Modified	150	160	180	160	180	210
	3	150	160	180	160	180	210
	4	170	180	190	180	190	210
	5	170	180	200	180	200	250
FGO & E9 Prestige	3	170	180	210	180	210	230
	4	170	180	220	180	220	250
ISNCO (E9)	4	190	200	230	200	230	250
SO (O6)	4	200	210	240	210	240	280
ICO SO (O6)	4	220	230	270	230	270	280
GO (O7+)	4	240	250	320	250	320	380
SCP GO (O7+)	4	280	300	360	300	360	380

**4-9.6.4 Family Room**

The family room has become the focus of activities for families, especially if located adjacent to the kitchen. This space is decidedly informal and is the location for most family activities during weekday evenings and weekends. Refer to Table 4-17 for family room size allowances.

**Design Criteria**

- Provide a minimum floor area of 100 square feet with a minimum dimension of 10 feet 0 inches for SO and above units, and 9 feet 0 inches for FGO and below units.
- In new construction, locate the family room adjacent to the kitchen. In existing units, it is desirable to locate the family room adjacent to the kitchen if space allows and it can be designed cost efficiently.

- Family rooms are not authorized for two bedroom and two-bedroom modified units. For flexibility in these units, consider providing a great room by combining the living and dining rooms or situate the kitchen in between the living and dining rooms. Provide direct access between the kitchen and dining room.
- Consider the kitchen, family room, and outdoor living space as a planning unit in the new designs, or consider modifications to existing units that will allow this relationship to occur.
- Maximize daylight in this space. Take advantage of views.
- Design this space or modify it to accommodate at least two different furniture layouts.
- Provide visual and acoustical separation between the family room and formal living areas (i.e., living and dining rooms) in larger units, facilitating the possibility of a great room concept with the kitchen.
- Provide an exterior door to the patio or balcony.
- Consider ceramic tile/quarry tile flooring.
- Provide a combination ceiling fan and light fixture unit.

**Table 4-17: Family Room Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	-	-	-	-	-	-
	2 Modified	-	-	-	-	-	-
	3	100	110	120	110	120	130
	4	100	110	130	110	130	150
	5	100	110	130	110	130	150
SNCO & CGO	2	-	-	-	-	-	-
	2 Modified	-	-	-	-	-	-
	3	110	120	130	120	130	140
	4	110	120	140	120	140	180
	5	110	120	140	120	140	200
FGO & E9 Prestige	3	120	130	150	130	150	170
	4	130	140	160	140	160	190
ISNCO (E9)	4	140	150	170	150	170	190
SO (O6)	4	140	150	180	150	180	220
ICO SO (O6)	4	150	160	210	160	210	220
GO (O7+)	4	180	200	290	200	290	340
SCP GO (O7+)	4	220	240	320	240	320	340

**4-9.6.5 Den**

The den is intended to serve as an auxiliary flexible living space that can be utilized as a third bedroom or a study in two-bedroom modified units. Refer to Table 4-18 for den size allowances.

**Design Criteria**

- Provide a minimum floor area of 90 square feet with a minimum dimension of no less than 9 feet.
- Provide a closet with a minimum floor area of 6 square feet and a minimum width of no less than 3 feet.
- Locate the Den adjacent to the living room. Consider French doors to create spatial separation from the living room.
- Provide a window for natural lighting and emergency secondary egress when space is utilized as a third bedroom.
- Design the space to accommodate at least two different furniture layouts since space may be utilized as a third bedroom.
- Provide a combination ceiling fan and light fixture unit.

**Table 4-18: Den Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	-	-	-	-	-	-
	2 Modified	90	100	110	100	110	120
	3	-	-	-	-	-	-
	4	-	-	-	-	-	-
	5	-	-	-	-	-	-
SNCO & CGO	2	-	-	-	-	-	-
	2 Modified	90	100	110	100	110	120
	3	-	-	-	-	-	-
	4	-	-	-	-	-	-
	5	-	-	-	-	-	-

**4-9.6.6 Great Room**

In locales and communities where casual life styles are commonplace, a great room may be warranted. The purpose of this space is to provide an area that can comfortably support all the activities of a daytime family living together within full communication and visual range of each other.

When a great room is desired, this shall be accomplished by combining the living room, dining room and family room (in three bedrooms and above) functions and functional area allowances. The great room shall not be considered as a separate room. Refer to Table 4-19 for great room size allowances. Physical and visual separations are generally created with furnishings, cabinetry, and screening amenities.

**Table 4-19: Great Room Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	250	270	290	270	290	310
	2 Modified	250	270	290	270	290	310
	3	350	380	410	380	410	440
	4	350	380	440	380	440	500
	5	350	380	440	380	440	520
SNCO & CGO	2	250	270	310	270	310	360
	2 Modified	250	270	310	270	310	360
	3	370	400	440	400	440	500
	4	410	440	480	440	480	550
	5	410	440	500	440	500	670
FGO & E9 Prestige	3	420	450	510	450	510	570
	4	440	470	560	470	560	640
ISNCO (E9)	4	480	510	560	510	560	640
SO (O6)	4	500	530	610	530	610	640
ICO SO (O6)	4	550	580	680	580	680	710
GO (O7+)	4	620	660	900	660	900	1060
SCP GO (O7+)	4	760	820	1000	820	1000	1060

**4-9.6.7 Open Plan Concept**

In some locales an open plan concept may be warranted or desired due to the local style of living. An open plan concept combines the functions and functional area allowances of the living room and family room in conjunction with the kitchen.

Open plan concepts are characterized by no physical separations. Visual separations are usually incorporated with furnishings or screening amenities.

**4-9.6.8 Kitchen/Secondary Dining Area**

The kitchen provides an area for food preparation and storage, eating, after-meal cleanup, utensil and general storage, and other miscellaneous activities. Provide a kitchen layout that is both functional and practical. For New/Replacement units, provide secondary eating areas in the form of a breakfast bar or a space for a table. In existing units, secondary eating areas are allowed when they can be designed within the existing layout and are cost effective. Locate the kitchen adjacent to the dining room and family room with direct access to each. Provide a controllable visual separation between the kitchen and all formal living areas. Where possible, provide access to the

garage, carport, detached parking structures, and utility/exterior service areas from the kitchen. Refer to Tables 4-20 and 4-21 for kitchen and secondary dining area size allowances.

## Design Criteria

### Layout

- Provide a water- and slip-resistant surface, such as resilient sheet vinyl (which meets the appropriate specification criteria). Provide vinyl or wood baseboards that complement the cabinet and counter materials and finishes.
- An industry standard requires a minimum of 42 inches of space between base cabinets and an opposing wall or cabinets. For new construction and renovation, provide 4 feet of clearance space, where possible.
- Provide both overall and task lighting in addition to natural lighting. Maximize natural light. Task lighting should be fluorescent, under-cabinet type or incandescent recessed, ceiling-mounted lights. Recessed fixtures shall be “insulation in contact” (IC) rated. Halogen (incandescent) lamps may be used for special and limited applications if approved by MAJCOM and Installation.
- Consider including an island, if feasible, to allow for more storage, work surface space and a more efficient layout. When islands are provided, ensure a minimum of 36 inches between island and adjacent cabinets for the predominate working side of the island and 32 inches for the non-working side.
- Provide adequate space for a resident-owned freezer, but not necessarily in the kitchen. Also consider providing freezer space in the laundry room, the storage areas, or the garage. (If the annual heating degree-days exceed 4,000, locate the freezer space within the housing unit's heated envelope). Provide a 125V convenience outlet.
- Provide visual access to outdoor living/play areas.
- Provide a secondary eating area in or adjacent to the kitchen. This secondary eating area may be in direct sight of food preparation areas but not in direct sight of a bathroom. Make this area accessible to less formal spaces such as the family/recreation room or outside living spaces, if possible.
- Do not provide direct access to a bathroom from the kitchen.

Table 4-20: Kitchen Area Size Allowances

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	90	100	110	100	110	120
	2 Modified	90	100	110	100	110	120
	3	90	100	110	100	110	120
	4	90	100	120	100	120	140
	5	90	100	120	100	120	150
SNCO & CGO	2	90	100	130	100	130	160
	2 Modified	90	100	130	100	130	160
	3	100	110	130	110	130	140
	4	100	110	130	110	130	140
	5	100	110	150	110	150	200
FGO & E9 Prestige	3	110	120	140	120	140	160
	4	130	140	160	140	160	190
ISNCO (E9)	4	140	150	160	150	160	190
SO (O6)	4	140	150	170	150	170	200
ICO SO (O6)	4	150	160	190	160	190	200
GO (O7+)	4	160	170	200	170	200	240
SCP GO (O7+)	4	180	190	220	190	220	240

Note: Larger kitchens may be required for GO (SCP) due to entertainment requirements and allowances. For additional information refer to the GOQ guide.

Table 4-21: Secondary Dining Area Size Allowances

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	20	30	40	30	40	55
	2 Modified	20	30	40	30	40	55
	3	20	30	40	30	40	55
	4	20	30	70	30	70	90
	5	20	30	70	30	70	100
SNCO & CGO	2	20	30	60	30	60	70
	2 Modified	20	30	60	30	60	80
	3	30	40	60	40	60	80
	4	30	40	60	40	60	80
	5	30	40	80	40	80	120
FGO & E9 Prestige	3	40	50	80	50	80	100
	4	40	50	90	50	90	120
ISNCO (E9)	4	60	70	110	70	110	120
SO (O6)	4	60	70	110	70	110	140
ICO SO (O6)	4	80	90	130	90	130	140
GO (O7+)	4	100	110	140	110	140	180
SCP GO (O7+)	4	110	120	160	120	160	180

### Cabinets

- Refer to Table 4-22 for minimum cabinet storage size allowances.
- Provide kitchen cabinets that meet the requirements of the National Kitchen Cabinet Association. Obtain cabinets that are standard, factory-manufactured products of modular kitchen cabinet suppliers. Ensure the finishes of the exposed surfaces are a natural or stained finish on solid hardwood or hardwood plywood or a plastic laminate on plywood substrate.
- Consider using 42-inch high cabinets to maximize kitchen storage space.
- Do not allow the use of the following:
  - Top mounted center drawer guides
  - Particleboard core for frame members, doors, drawer fronts, or any member requiring screw-holding capability
  - Materials that use urea-formaldehyde binders
- In addition to cabinets prescribed herein, whenever possible, include pantry closets (in or adjacent to the kitchen) for the storage of packaged foods and house-cleaning equipment and supplies.

**Table 4-22: Cabinet Size Allowances**

Item	Minimum Depth	ENL/CGO 2/2 Modified BR Units	ENL/CGO/FGO 3/4/5 BR Units	SGO/GO 4 BR Units
Wall Cabinet Shelving	12"	24 SF	28 SF	30 SF
Base Cabinet Shelving	24"	24 SF	28 SF	30 SF
Drawers	24"	12 SF	14 SF	18 SF

**Countertops**

- The required minimum total area of countertop space (exclusive of sink and range space) is shown in Table 4-23.
- Provide countertops that harmonize in color and design with the cabinets, the appliances, and the floor covering.
- Ensure the minimum vertical separation between the countertop and wall cabinets is 1 foot 6 inches.
- Do not use butcher-block laminate or ceramic tile for countertops.
- Consider using 42-inch high cabinets to maximize kitchen storage space.
- Provide countertop space for a resident-owned microwave oven. Locate the space near the normal food preparation area, but not in conflict with countertop spaces noted hereafter.
- Provide a countertop with a minimum width of 15 inches on each side of the range and sink and on one side of the refrigerator (adjacent to the opening side of the refrigerator door).

**Table 4-23: Countertop Space Allowances**

Grade and Bedrooms	Countertop Area (SF)
ENL/CGO: 2/2 Modified-BR Units	18 (Approximately 7.25 linear feet)
ENL/CGO/FGO: 3/4/5-BR Units	20 (Approximately 8.33 linear feet)
SGO/GO: 4-BR Units	22 (Approximately 9.33 linear feet)

## Appliances and Fixtures

- Provide energy-efficient kitchen appliances, to include a refrigerator, dishwasher, microwave, garbage disposal, range, and a range hood ducted to the exterior or space saver microwave/exhaust hood over range. Consider using Energy Star rated appliances. Washers and dryers are not provided for CONUS installations.
- Ensure the kitchen range, range hood, refrigerator, sink, and dishwasher harmonize in color and design with the kitchen decor.
- Provide a double kitchen sink with sprayer attachment.
- Mount ovens/ranges with anchor clips, as appropriate, to prevent item from tipping over.
- Provide a standard 30-inch residential range with oven.
- Provide gas or electric ranges depending on the most cost-effective utility in the locality. Specify range controls at the back of the range rather than the front to prevent small children from turning on the burners (see Paragraph 4-13, Accessibility, for policy variation).
- Do not locate the range adjacent to the refrigerator or directly in a corner of the kitchen.
- For new construction, ensure range exhaust hood is vented directly to the outside. For existing units, provide a range exhaust hood that is vented directly to the outside only when doing major kitchen renovations.
- Consider range hoods with fan sound levels of 4 sones or less at high speed.
- Do not provide range hood extinguishers.
- Provide refrigerators with two doors with automatic icemakers. Refer to Table 4-24 for refrigerator size allowances.

**Table 4-24: Refrigerator Size Allowances**

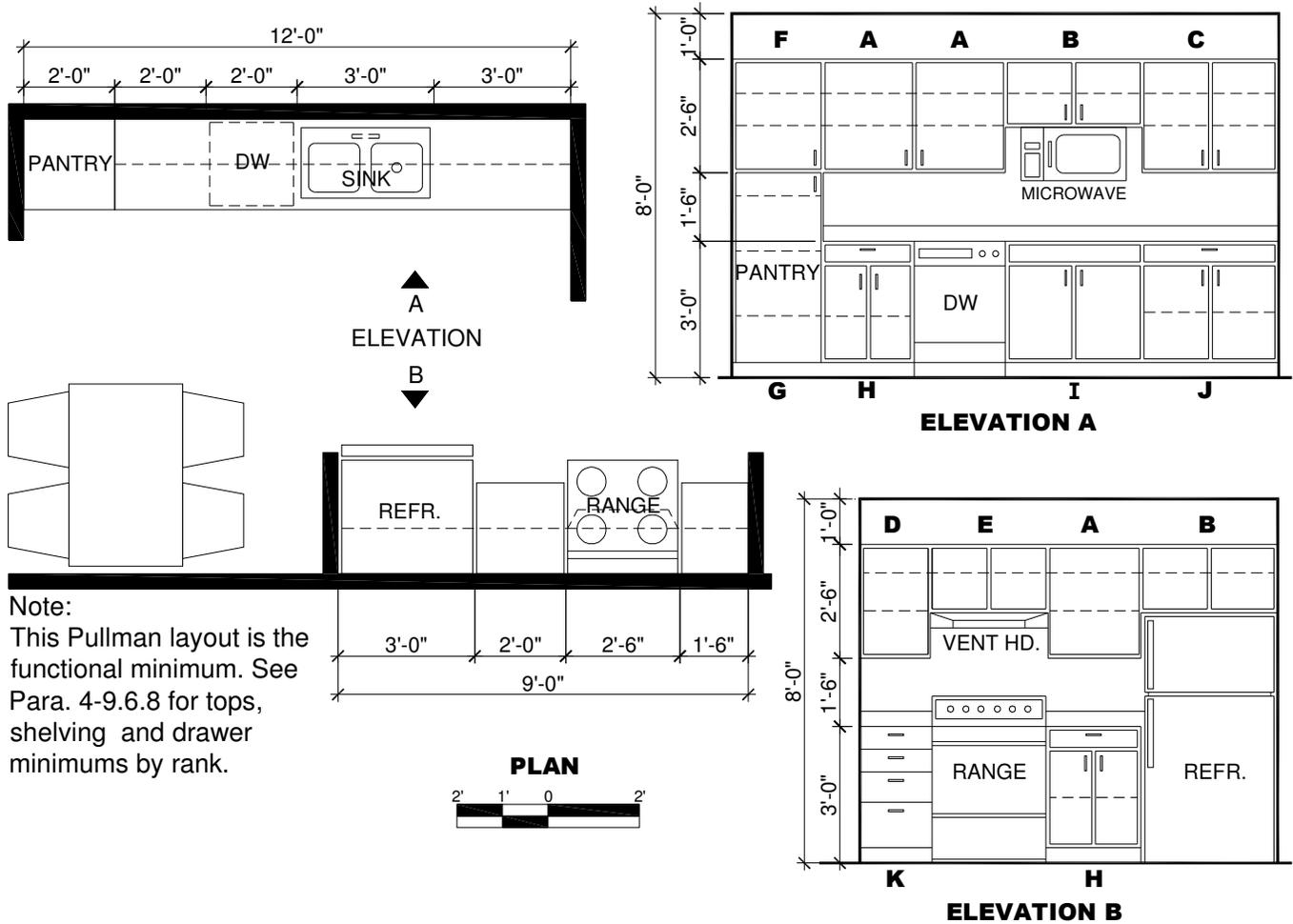
Number of Bedrooms	Refrigerator Size (Cu Ft)
2, 2 Modified	18 - 20
3	20 - 24
4, 5	25 - 27

- Provide heavy-duty metal valve shut-off control box for refrigerator icemaker connection.

- Select dishwashers for under-the-counter installation with a drain, air gap, racks, spraying system, and detergent dispenser. Dishwashers must be insulated and have three washer arms/levels. Install dishwashers adjacent to the kitchen sink. Set water heater boosters, if required, at 140 °F.
- Provide a water-hammer arrestor for dishwashers.
- Provide an under-sink, continuous feed,  $\frac{3}{4}$ -horsepower (HP), minimum sound insulated, garbage disposal. Provide an electrical switch for the disposal adjacent to the sink.
- Provide ample (minimum of two dedicated 20-amp small appliance branch circuits) with GFCI duplex receptacles above the countertop to accommodate a variety of small appliances

Refer to the GOQ Guide for additional information regarding appliances for GOQ's.

**Figure 4-5: Sample Kitchen Cabinet Calculations (Pullman Design)**



Base Cabinet Shelving Area:

Cabinet	QTY	Width	# Shelves		LF Shelves		Shelf Area (SF)
			16"	24"	16"	24"	
G	1	2'-0"	-	4	-	8'-0"	16.0
H	2	2'-0"	-	2	-	4'-0"	16.0
I	1	3'-0"	1	1	3'-0"	3'-0"	10.5
J	1	3'-0"	1	1	3'-0"	3'-0"	10.5
K drawers	1	1'-6"	-	-	-	-	-
<b>Total Shelf Area, Base Cabinets</b>							<b>53.0 SF</b>

Drawer Area:  
Cabinets (H+J+K+H)  
Total: 13'-0" LF X 1'-6" Deep = 19.5 SF

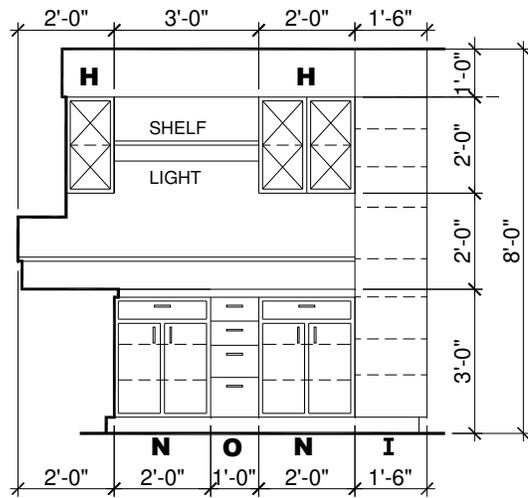
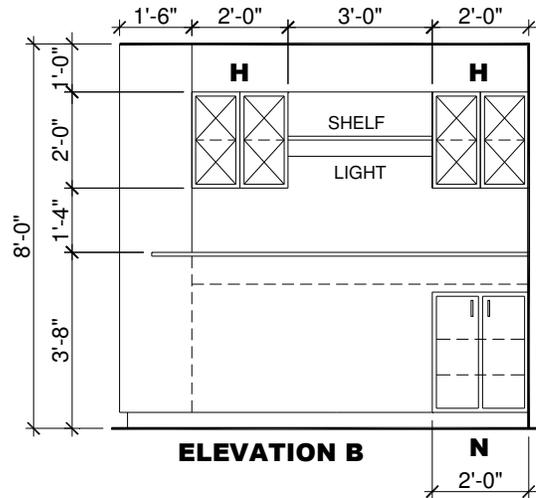
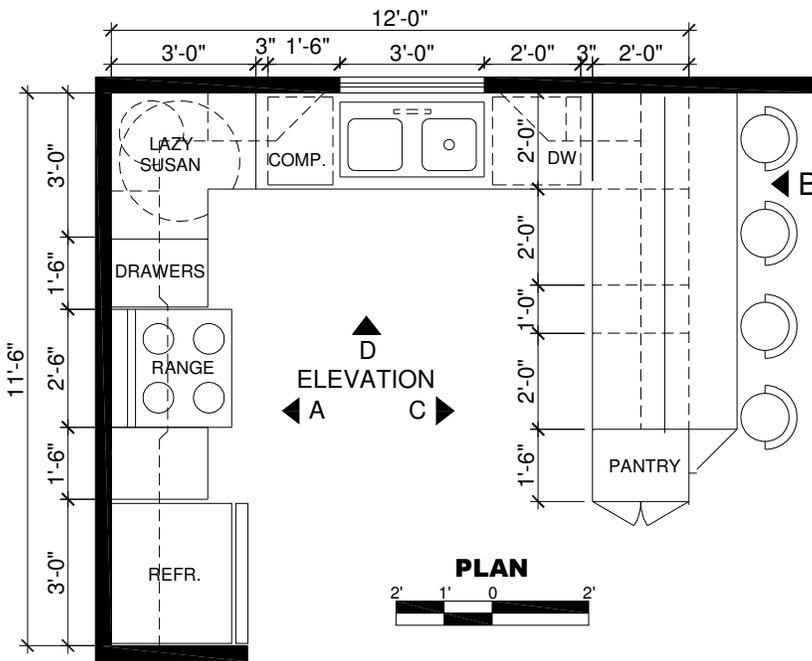
Wall Cabinet Shelving Area:

Cabinet	QTY	Width	# Shelves	LF Shelves		Shelf Area (SF)	
				12" Deep	24" Deep		
A	3	2'-0"	3	6'-0"	-	18.0	
B	2	3'-0"	2	6'-0"	-	12.0	
C	1	3'-0"	3	9'-0"	-	9.0	
D	1	1'-6"	3	4'-6"	-	4.5	
E	1	2'-6"	2	5'-0"	-	5.0	
F	1	2'-0"	3	-	6'-0"	12.0	
<b>Total Shelf Area, Wall Cabinets</b>							<b>60.5 SF</b>

Counter Top Area:  
Cabinets (H+DW+I+J+K+H)  
Total: 13'-6" LF X 2'-0" Deep = 27.0 SF

Note:  
Built-in M/W above stove or cabinet

Figure 4-6: Sample Kitchen Cabinet Calculations ("U" Shape W/ Bar Design)



Base Cabinet Shelving Area:

Cabinet	Qty	Width	# Shelves			LF Shelves			Shelf Area (SF)
			16"	18"	24"	16"	18"	24"	
J	1	1'-6"	1	-	1	1'-6"	-	1'-6"	5.0
K drawers	1	1'-6"	-	-	-	-	-	-	-
L carousel	1	3'-0"	-	-	3	-	-	-	16.3
M	1	3'-0"	1	-	1	3'-0"	-	3'-0"	10.0
N	3	2'-0"	2	-	1	12'-0"	-	6'-0"	28.0
O drawers	1	1'-0"	-	-	-	-	-	-	-
I	1	2'-0"	-	8	-	-	16'-0"	-	24.0

**Total Shelf Area, Base Cabinets 83.3 SF**

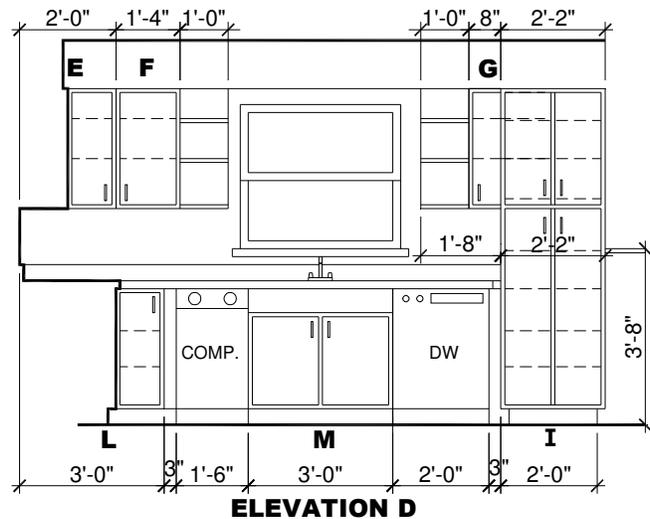
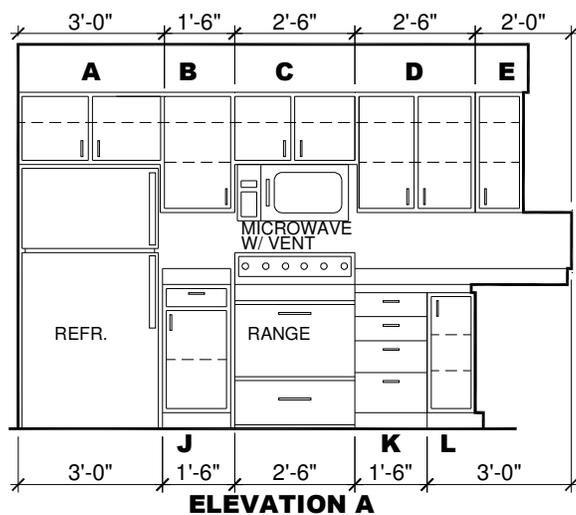
Wall Cabinet Shelving Area:

Cabinet	Qty	Width	# Shelves	LF Shelves	Shelf Area (SF)
				12" Deep	
A	1	3'-0"	2	6'-0"	6.0
B	1	1'-6"	3	4'-6"	4.5
C	1	2'-6"	2	5'-0"	5.0
D	1	2'-6"	3	7'-6"	7.5
E carousel	1	2'-0"	3	-	5.7
F	1	1'-4"	3	4'-0"	4.0
G	1	1'-8"	3	5'-0"	5.0
H	2	2'-0"	2	8'-0"	8.0
Shelf	1	3'-0"	1	3'-0"	3.0

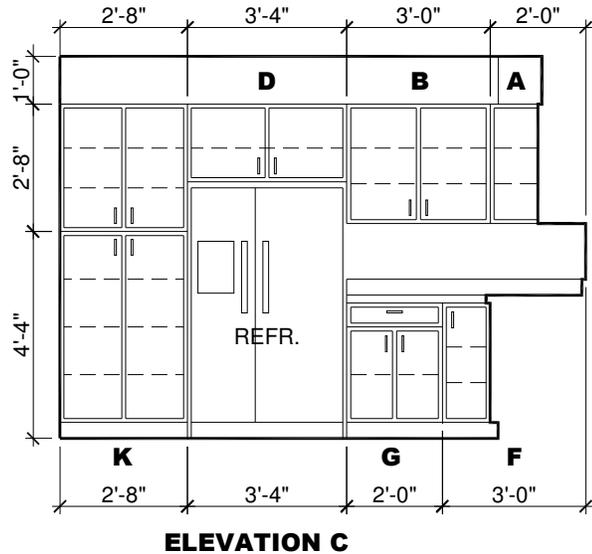
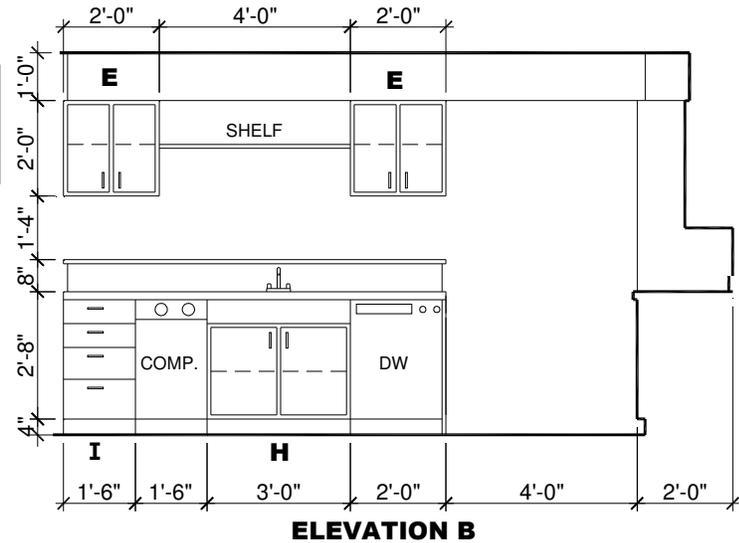
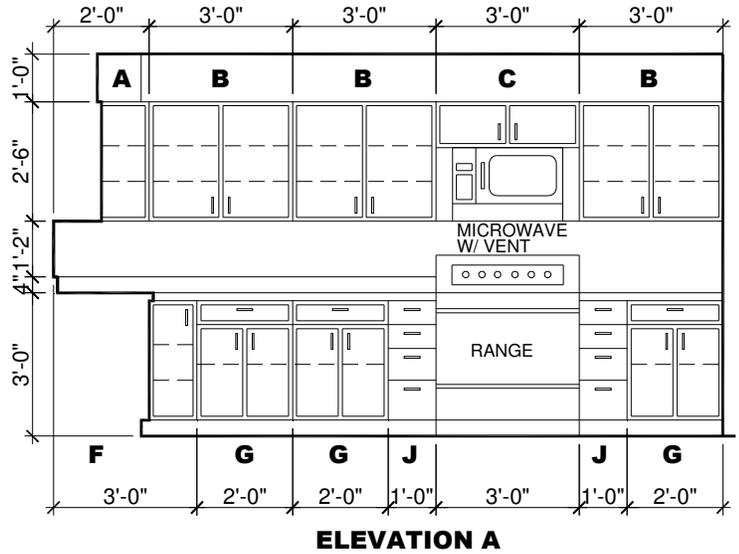
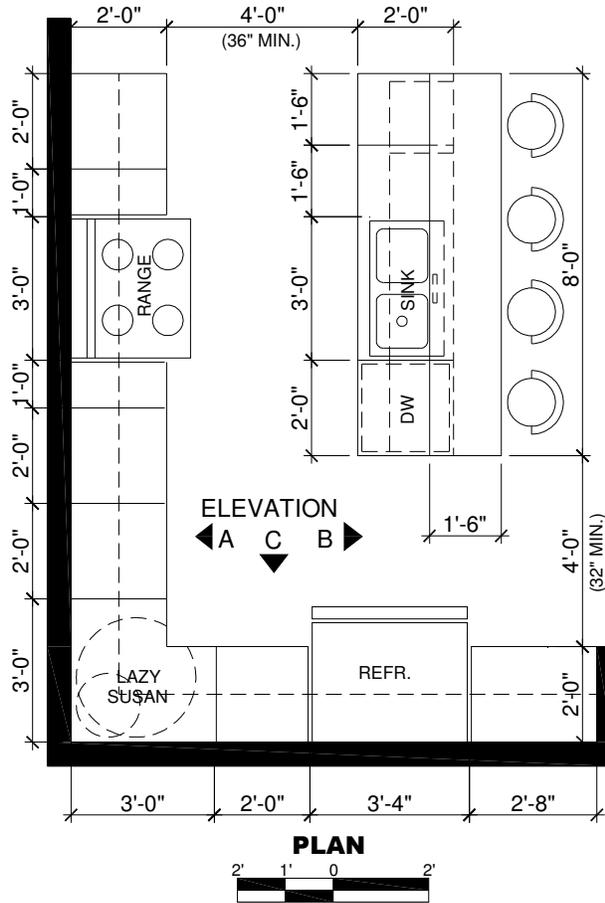
**Total Shelf Area, Wall Cabinets 48.7 SF**

**Drawer Area:**  
Cabinets (J+K+N+O)  
Total: 15'-6" LF X 1'-6" Deep = 23.3 SF

**Counter Top Area:**  
Cabinets (J+Dish+Compactor+K+L+M+N+O)  
Total: 21'-0" LF X 2'-0" Deep = 42.0 SF



**Figure 4-7: Sample Kitchen Cabinet Calculations (Island Type)**



Drawer Area:  
 Cabinets (G+I+J)  
 Total: 22'-0" LF X 1'-6" Deep = 33.0 SF

Counter Top Area:  
 Cabinets (F+G+H+I+J)  
 Total: 24'-8" LF X 2'-0" Deep = 49.3 SF

Base Cabinet Shelving Area:

Cabinet	Qty	Width	# Shelves		LF Shelves		Shelf Area (SF)
			16"	24"	16"	24"	
F carousel	1	3'-0"	-	3	-	-	16.3
G	4	2'-0"	1	1	8'-0"	8'-0"	26.7
H	1	3'-0"	1	1	3'-0"	3'-0"	10.0
I drawers	1	1'-6"	-	-	-	-	-
J drawers	1	1'-0"	-	-	-	-	-
K	1	2'-8"	-	7	-	-	37.3

**Total Shelf Area, Base Cabinets 90.3 SF**

Wall Cabinet Shelving Area:

Cabinet	Qty	Width	# Shelves	LF Shelves		Shelf Area (SF)
				12" Deep	36" Deep	
A carousel	1	2'-0"	3	-	-	5.7
B	4	3'-0"	3	-	36'-0"	36.0
C	1	3'-0"	1	-	3'-0"	3.0
D	1	3'-4"	2	-	6'-8"	6.7
E	2	2'-0"	2	-	-	8.0
Shelf	1	4'-0"	1	-	4'-0"	4.0

**Total Shelf Area, Wall Cabinets 63.4 SF**

**4-9.6.9 Dining Room**

The dining room provides a formal space for a variety of family-oriented and entertainment functions. Consider this space formal in character in comparison to family/recreation or kitchen dining/snack areas. The primary dining area may be a separate room. If so, size it such that it can accommodate a table and chairs for 6 persons plus a china closet and/or buffet. Do not provide direct access to bathrooms from the dining room. Direct the circulation pattern through the dining room along one wall instead of through the middle of the room. In some units, the primary eating area may be positioned at the end of the living room or offset from the living room forming an "L." Consider doors between living and dining areas where a more formal and private setting is desired. For finish material, refer to Table 4-38: Authorized Allowable Finish Materials and Table 4-39; GOQ Authorized Allowable Finish Materials. Refer to Table 4-25 for dining room size allowances.

**Design Criteria**

- Provide a dining room with a minimum dimension of 10 feet 0 inches for SO and above units, and 9 feet 0 inches for FGO and below units.
- Consider natural and artificial light and ventilation sources.
- Consider providing views to the exterior.
- Provide a dining room with a minimum floor area, in square feet, as follows:

**Table 4-25: Dining Room Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	100	110	120	110	120	130
	2 Modified	100	110	120	110	120	130
	3	100	110	120	110	120	130
	4	100	110	130	110	130	150
	5	100	110	130	110	130	160
SNCO & CGO	2	100	110	130	110	130	150
	2 Modified	100	110	130	110	130	150
	3	110	120	130	120	130	150
	4	130	140	150	140	150	150
	5	130	140	160	140	160	220
FGO & E9 Prestige	3	130	140	150	140	150	170
	4	140	150	180	150	180	200
ISNCO (E9)	4	150	160	180	160	180	200
SO (O6)	4	160	170	190	170	190	210
ICO SO (O6)	4	180	190	200	190	200	210
GO (O7+)	4	200	210	290	210	290	340
SCP GO (O7+)	4	260	280	320	280	320	340

#### 4-9.6.10 Bedrooms

Bedrooms, clearly, must accommodate restful sleep. However, recent housing trends have yielded bedrooms that acknowledge and facilitate other activities, such as quiet relaxation (reading, studying, and listening to music) as well as functioning as “dressing rooms” for everyday activities. Provide master bedroom plus one or more additional bedrooms in each Family Housing unit. Separate these sleeping areas from all other functional areas of the house, but locate bathrooms nearby. Provide access to the bathrooms from the bedrooms without passing through or within sight lines of other areas of the house. Provide a dedicated master bath for the master bedroom in units having three or more bedrooms. Size the master bedroom to accommodate a king-size bed and other furnishings. For finish material refer to Table 4-38 Authorized Allowable Finish Materials and Table 4-39: GOQ Authorized Allowable Finish Materials. Refer to Tables 4-26 thru 4-30 for bedroom size allowances.

#### Design Criteria

- Provide minimum bedroom dimensions as follows:
  - Master Bedroom: 11 feet 6 inches for SO and above units, and 10 feet 0 inches for FGO and below units
  - Bedroom #2: 10 feet
  - Bedroom #3, #4, & #5: 9 feet
- Provide separate access to each bedroom.
- Do not allow direct lines of sight into bedrooms from the living room, dining room, kitchen, or other living areas. For newly constructed or replacement units do not allow direct access into bedrooms from kitchen.
- Optimize bedrooms to the maximum extent to provide for functional flexibility. Provide space to accommodate a king-size bed in the master bedroom and twin beds to queen beds in other bedrooms. Check window, door, and closet locations to allow for furniture placement.
- Provide acoustical sound insulation in walls and floor/ceiling assemblies as indicated In Paragraphs 4-9.6.1.3 and 4-9.6.1.4.
- Provide a combination ceiling fan and light fixture unit.

**Table 4-26: Master Bedroom Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	150	155	160	155	160	170
	2 Modified	150	155	160	155	160	170
	3	150	155	160	155	160	170
	4	150	160	170	160	170	190
	5	150	160	170	160	170	190
SNCO & CGO	2	150	155	165	155	165	190
	2 Modified	150	155	165	155	165	190
	3	150	160	170	160	170	180
	4	150	160	180	160	180	200
	5	150	160	180	160	180	200
FGO & E9 Prestige	3	160	170	180	170	180	200
	4	160	170	190	170	190	210
ISNCO (E9)	4	160	170	200	170	200	210
SO (O6)	4	160	170	200	170	200	210
ICO SO (O6)	4	160	170	200	170	200	210
GO (O7+)	4	170	180	210	180	210	240
SCP GO (O7+)	4	170	180	220	180	220	240

**Table 4-27: Bedroom #2 Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	130	135	145	165	145	150
	2 Modified	130	135	145	135	145	150
	3	130	135	145	135	145	150
	4	130	140	150	140	150	170
	5	130	140	150	140	150	170
SNCO & CGO	2	130	135	150	135	150	160
	2 Modified	130	135	150	135	150	160
	3	130	140	150	140	150	160
	4	130	140	160	140	160	180
	5	130	140	160	140	160	180
FGO & E9 Prestige	3	140	150	160	150	160	180
	4	140	150	170	150	170	190
ISNCO (E9)	4	140	150	180	150	180	190
SO (O6)	4	140	150	180	150	180	200
ICO SO (O6)	4	140	150	190	150	190	200
GO (O7+)	4	150	160	180	160	180	220
SCP GO (O7+)	4	150	160	200	160	200	220

**Table 4-28: Bedroom #3 Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	-	-	-	-	-	-
	2 Modified	90	100	110	100	110	120
	3	90	100	110	100	110	120
	4	100	110	120	110	120	130
	5	110	120	130	450	130	140
SNCO & CGO	2	-	-	-	-	-	-
	2 Modified	90	100	110	100	110	120
	3	90	100	110	100	110	120
	4	100	110	120	110	120	140
	5	110	120	130	120	130	140
FGO & E9 Prestige	3	100	110	130	110	130	140
	4	100	110	130	110	130	150
ISNCO (E9)	4	100	110	140	110	140	150
SO (O6)	4	100	110	140	110	140	160
ICO SO (O6)	4	120	130	150	130	150	160
GO (O7+)	4	130	140	160	140	160	180
SCP GO (O7+)	4	130	140	160	140	160	180

**Table 4-29: Bedroom #4 Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	-	-	-	-	-	-
	2 Modified	-	-	-	-	-	-
	3	-	-	-	-	-	-
	4	90	100	110	100	110	120
	5	100	110	120	110	120	130
SNCO & CGO	2	-	-	-	-	-	-
	2 Modified	-	-	-	-	-	-
	3	-	-	-	-	-	-
	4	90	100	110	100	110	120
	5	100	110	120	110	120	130
FGO & E9 Prestige	3	-	-	-	-	-	-
	4	90	100	110	100	110	120
ISNCO (E9)	4	90	100	110	100	110	120
SO (O6)	4	100	110	120	110	120	140
ICO SO (O6)	4	110	120	130	120	130	140
GO (O7+)	4	120	130	140	130	140	160
SCP GO (O7+)	4	120	130	140	130	140	160

**Table 4-30: Bedroom #5 Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	-	-	-	-	-	-
	2 Modified	-	-	-	-	-	-
	3	-	-	-	-	-	-
	4	-	-	-	-	-	-
	5	90	100	110	100	110	120
SNCO & CGO	2	-	-	-	-	-	-
	2 Modified	-	-	-	-	-	-
	3	-	-	-	-	-	-
	4	-	-	-	-	-	-
	5	90	100	110	100	110	120

**Note:** The AF does not program five-bedroom units for new construction. Where a requirement for a five-bedroom house exists, the requirement should be evaluated as part of the HCP development. Where it is cost effective, conversion of existing units to satisfy a five-bedroom requirement may only be accomplished with surplus units and must not create or increase a deficit in another bedroom type.

**4-9.6.11 Closets**

Closets are utilitarian spaces intended to conveniently store everyday items such as clothing wear, shoes and other miscellaneous items. Closets should provide an adequate number of hanging rods and organizers (as required) to sufficiently store the items intended and be constructed of materials suitable to sustain the weight of these items. Closets should be located in such a way as to provide convenient access from the space they serve without interfering with the functional layout of the furniture for that space.

Provide minimum clear (face of wall) closet space dimensions as indicated in Table 4-31.

**Table 4-31: Minimum Closet Space Dimensions**

Bedroom #	Depth	Grades	Width (LF)
#1 Master	2'-0" (all grades)	ENL/CGO	6'-0"
		FGO/SGO	8'-0"
		GO	10'-0"
#2	2'-0" (all grades)	ENL/CGO	4'-0"
		FGO/SGO	6'-0"
		GO	6'-0"
#3/2 Modified	2'-0" (all grades)	ENL/CGO	3'-0"
		FGO/SGO	4'-0"
		GO	4'-0"
#4	2'-0" (all grades)	ENL/CGO	3'-0"
		FGO/SGO	3'-0"
		GO	3'-0"
Linen Closet	2'-0" (all grades)	ENL/CGO	2'-0"
		FGO/SGO	4'-0"
		GO	4'-0"

Note: All widths indicated are minimum acceptable lineal footage of single rod hanging space.

### Design Criteria

- Walk-in closet is desirable if space allows. Provide wall switched ceiling mounted luminaire.
- Maximize closet space by providing double closet rods and closet organizers. Ensure more than adequate structural support since it is common to overload hangar rods.
- If possible, install vinyl-coated steel wire shelving. Do not use sheet metal shelving. Include a shelf between 66 and 72 inches above the floor level. If the ceiling height exceeds 84 inches, consider including two shelves.
- Provide intermediate vertical support for closet shelving/hanging rods exceeding 4 feet in width.
- If space permits, use swinging doors rather than bi-fold doors.
- In humid areas provide louvered closet doors as a deterrent to mildew.
- In linen closets, provide a minimum of five full depth shelves. Consider the use of modular shelving to maximize closet space and versatility.
- A den is only applicable to the Two Bedroom Modified units.

#### 4-9.6.12 Bathrooms

The primary function of a bathroom is to provide for personal hygiene. However, recent housing trends put more emphasis on bathrooms as another space to relax and “escape” temporarily from the stresses of each day. It is important to keep these dual functions, utility and quality of life, in mind when renovating or designing new bathrooms. Locate bathrooms near the bedrooms and out of sight of the other areas of the house. In two-story units (except two-bedroom modified), provide a half-bath or powder room to serve the first floor. When a half-bath is provided on the main floor, consider accessibility to both guests and family activities. Open a half-bath to circulation space rather than to a living space. For finish materials, refer to Table 4-38: Authorized Allowable Finish Materials and Table 4-39: GOQ Authorized Allowable Finish Materials. Refer to Table 4-32 for the Schedule of Bathrooms and to Tables 4-33, 4-34, 4-35, and 4-36 for bathroom size allowances.

#### Layout

- The minimum size for any full bath shall be 5 feet by 8 feet.
- Provide at least one full bath with bathtub that is directly accessible from a hall without requiring passage through another room.
- Ensure each unit contains at least one full bath consisting of a water closet (toilet), lavatory (vanity sink), and a bathtub with an integral shower. A shower stall may be substituted for the bathtub in second full baths.
- Avoid placing bathtubs and showers under windows. If this is unavoidable due to space constraints, detail sills to provide positive drainage. Cover sills with water impervious materials.
- Ensure a half bath has a water closet and a lavatory.
- Provide direct access to the master bathroom from the master bedroom in three- and four-bedroom units.
- Do not allow direct lines of sight into bathrooms from or open directly from family living spaces.

#### Fixtures and Hardware

- Provide neutrally colored bathroom fixtures, preferably white or almond. Economically justify deviations from this guidance.
- Provide water-saving type water closets requiring a maximum of 1.6 gallons per flush.
- Provide bathtubs of the following types: enameled cast iron, porcelain enameled steel or solid acrylic.

- Install shower stalls of the following types: ceramic tile walls with ceramic tile floors; precast or pressure molded receptors; or gel-coated, glass fiber reinforced, polyester resin (ANSI Z124.1) with integral molded receptor and walls.
- Provide full height water-impervious wall surface material in all bathtub and shower enclosures.
- Provide flow-control devices on showerheads to limit water flow to a maximum of 2.5 gallons per minute at pressures between 20 and 60 pounds per square inch (PSI). Consider using water saving devices that further restrict water flow while still providing a powerful shower stream.
- Provide adequate hardware: shower curtain rods, shower doors, towel bars, soap dish, robe hook, toothbrush holder, medicine cabinet, toilet paper holder, and mirror. Do not provide soap dishes and toothbrush holders when countertop space is provided.
- Provide recessed or semi-recessed medicine cabinets with adjustable shelves.
- Use integral ceramic accessories as much as possible and ensure finish coordination between fixtures and tile.
- In full baths, install lavatories in countertops on vanity bases, with a minimum width of 30 inches. Countertops may be molded acrylic plastic laminate or cultured marble with integral bowl. If integral bowls are not provided, then bowls shall be vitreous china or of porcelain enamel on cast iron or steel. Provide two bowls in master bath if counter space allows.
- Provide full-height wall or door mirrors in master bath.
- In half baths, provide lavatories in vanities as above (preferred) or of vitreous china or porcelain enamel on cast-iron or steel (pedestal type). Do not use wall-hung lavatories.
- Provide the maximum amount of cabinetry/storage space possible within the bathroom.

### Construction

- Co-locate baths/wet (plumbing) walls as much as possible without degrading/sacrificing functionality or quality of living spaces.
- For new construction, provide proper mechanical/active ventilation. Do not vent bathrooms into attic spaces. Provide air backflow dampers for when fans are not operating. For existing units that have a window, provide mechanical ventilation only when a major renovation for the bathroom is done.
- Provide water and slip-resistant floor covering including ceramic tile, terrazzo, or seamless sheet vinyl.
- Do not use particleboard floor sheathing.

- Provide wall bases that match the chosen flooring (e.g., ceramic floor/ceramic base, etc.).
- Use water-resistant gypsum wallboard on all bathroom walls; use concrete backer board behind all ceramic tile wall applications in accordance with ETL 03-2 dated August 2003.
- Use semi-gloss latex or alkyd-based paint with mildewcide additive on wallboard, painted doors, windows sills, and trims in bathrooms.
- Provide good ambient light throughout at a minimum, and ensure that task lighting above the vanity mirror is provided.
- Provide a minimum of two, 20-amp duplex GFCI receptacles above the vanity countertop, but no higher than 4 feet above the floor. Provide at least one dedicated 20-amp branch circuit per bathroom. A GFCI duplex receptacle shall be within three feet of each basin per the National Electrical Code (NEC).
- Bathroom fans should be on a separate switch from lights so both can be operated independently or together.

**General**

- Provide durable, dependable, and simple fixtures and fittings. Ensure replacement parts are available with local suppliers.
- Emphasize durability and simplicity of design, materials, and finishes. For example, ensure all wood, metal, or ceramic finishes match and complement each other. For example, do not use brushed stainless steel towel hooks with polished stainless steel toilet paper holders.

**Table 4-32: Bathroom Allowances**

Number of Bedrooms	Number of Bathrooms	
	One Story	Two Story
2	1 (full)	1 ½
2 Modified	1 ¾	1 ¾
3, 4, 5	2 (full)	2 ½
GOQ	2 ½	2 ½
GOQ (SCP)	3 ½	3 ½

- Provide a half bath on a floor with no bedrooms
- A half bath equates to a powder room with a water closet and a lavatory
- A ¾ bath equates to a shower, water closet and lavatory
- For GOQ (SCP), where an aide’s room is required an additional bath is authorized and is part of the additional 10% square footage allowance.
- To accommodate the entertainment functions in GOQ’s, the half bath shall meet ADA accessibility guidelines and is included in the net square feet.

**Table 4-33: Master Bath Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	40	45	55	45	55	60
	2 Modified	40	45	55	45	55	60
	3	40	45	55	45	55	60
	4	40	45	60	45	60	75
	5	40	45	60	45	60	75
SNCO & CGO	2	40	45	55	45	55	65
	2 Modified	40	45	55	45	55	65
	3	40	45	55	45	55	60
	4	40	45	65	45	65	80
	5	40	45	65	45	65	90
FGO & E9 Prestige	3	40	45	60	45	60	75
	4	40	45	70	45	70	90
ISNCO (E9)	4	40	45	80	45	80	90
SO (O6)	4	40	45	80	45	80	90
ICO SO (O6)	4	40	50	85	50	85	90
GO (O7+)	4	50	65	100	65	100	160
SCP GO (O7+)	4	50	65	120	65	120	160

**Table 4-34: Half Bath Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	24	30	35	30	35	40
	2 Modified	-	-	-	-	-	-
	3	24	30	35	30	35	40
	4	24	30	35	30	35	40
	5	24	30	35	30	35	40
SNCO & CGO	2	24	30	35	30	35	40
	2 Modified	-	-	-	-	-	-
	3	24	30	35	30	35	40
	4	24	30	35	30	35	40
	5	24	30	35	30	35	40
FGO & E9 Prestige	3	24	30	35	30	35	40
	4	24	30	35	30	35	40
ISNCO (E9)	4	24	30	35	30	35	40
SO (O6)	4	24	30	35	30	35	40
ICO SO (O6)	4	24	30	35	30	35	40
GO (O7+)	4	24	30	35	30	35	40
SCP GO (O7+)	4	24	30	35	30	35	40

**Table 4-35 : 3/4 Bath Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	-	-	-	-	-	-
	2 Modified	35	40	45	40	45	50
	3	-	-	-	-	-	-
	4	-	-	-	-	-	-
	5	-	-	-	-	-	-
SNCO & CGO	2	-	-	-	-	-	-
	2 Modified	35	40	45	40	45	50
	3	-	-	-	-	-	-
	4	-	-	-	-	-	-
	5	-	-	-	-	-	-

**Table 4-36: Bath #2 Area Size Allowances**

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	-	-	-	-	-	-
	2 Modified	-	-	-	-	-	-
	3	40	45	50	45	50	55
	4	40	45	55	45	55	65
	5	40	45	55	45	55	65
SNCO & CGO	2	-	-	-	-	-	-
	2 Modified	-	-	-	-	-	-
	3	40	45	50	45	50	55
	4	40	45	60	45	60	70
	5	40	45	60	45	60	80
FGO & E9 Prestige	3	40	45	55	45	55	65
	4	40	45	65	45	65	80
ISNCO (E9)	4	40	45	70	45	70	80
SO (O6)	4	40	45	70	45	70	80
ICO SO (O6)	4	40	50	75	50	75	80
GO (O7+)	4	50	60	85	60	85	120
SCP GO (O7+)	4	50	60	100	60	100	120

**4-9.6.13 Laundry Room/Area**

The laundry area provides space for clothes washers and dryers and, in general, gives residents an organized utility/work station for miscellaneous housekeeping and maintenance tasks. Provide a laundry area large enough to accommodate a washer and dryer plus shelving or cabinets for storing laundry supplies out of sight of the entry, entertainment, and eating areas. If base cabinets with counters are not provided allow enough space for a folding table.

Do not locate the laundry area within a bathroom or kitchen. For finish materials, refer to Table 4-38: Authorized Allowable Finish Materials and Table 4-39: GOQ Authorized Allowable Finish Materials.

### Design Criteria

- Consider this space, along with the carport, garage, and kitchen, as a planning unit for “service” functions for the home.
- If possible, provide utility rooms. If laundry and interior storage are combined in a utility room, do not count this area in the calculation of net square footage. (Some maximums do apply. See Paragraph 4-9.6.14, Interior Storage.)
- Provide doors to all laundry rooms/spaces.
- When laundry closets are used, ensure they are sized to provide adequate wall and working clearances based on washer/dryer models commonly available. Do not “custom design” the laundry area for one specific model.
- Drain the washer through a 2-inch minimum standpipe with the mouth 3 feet above the floor. Provide a cleanout trap a minimum of 4 inches above the floor. Seal all floor penetrations.
- Provide water hammer arrestors.
- Vent the clothes dryer through an exterior wall (not into attics) with a 4-inch diameter vent terminating in a weatherproof wall jack with a back draft damper. Provide no more than 12 feet of run with no more than two 90-degree turns. Avoid vertical dryer vent runs, if possible. Ensure the dryer vent is accessible for cleaning.
- Do not discharge the dryer vent onto a balcony or patio, near entry doors, or near an air conditioner compressor unit.
- Provide at least one standard 125-volt AC receptacle, water supply connections with a single-lever shutoff for hot- and cold-water hoses, and an open drain for the washer. Ensure the use of a heavy-duty metal control box.
- Provide a 30-amp, 250-volt AC receptacle for an electric dryer. If gas dryers are desired, provide gas connection fittings and a 20-amp, 125-volt AC receptacle.
- Use water-resistant gypsum wallboard on all laundry room walls; use concrete backer board behind all ceramic tile wall applications.
- Use semi-gloss latex or alkyd-based paint on wallboard, painted doors, windows, and trims in laundry rooms.
- Provide vinyl-coated steel wire (modular) shelves or cabinets at least 12 inches deep above or adjacent to the appliances. Provide a minimum of 12 linear feet of shelving.

- Ensure there is a method to contain water overflows in laundry areas located on the second floor. Connect overflow drains to the wastewater system.
- Provide water- and slip-resistant floor covering, such as ceramic tile or seamless sheet vinyl.
- Provide baseboards to match the flooring material.
- Do not use particleboard floor sheathing.
- Provide adequate lighting and maximize available daylight.
- Ensure that at least one 20-amp, 125-volt AC duplex receptacle is conveniently located for using an ironing board.

#### **4-9.6.14 Interior Storage**

Storage space for larger bulk items is an essential and integral part of daily activities. Consider this when designing or modifying floor plans to ensure storage spaces are not “after thoughts” using “left over” spaces or other closet areas but rather elements designed to support the efficiency of the home. Refer to Table 4-37 for interior storage area size allowances.

#### **Design Criteria**

- Provide interior storage space for houses without basements or usable attic space. Provide the following interior storage space in addition to the exterior storage listed in Paragraph 4-6.9. Do not include interior storage in the net square foot calculations. The area exceeding the maximum allowance will be counted into the net square footage calculations.
- Provide vinyl-coated steel wire or wooden shelving. Do not use sheet metal or particleboard.

Table 4-37: Interior Storage Area Size Allowances

Range of Functional Area by Grade and Bedroom (SF)							
Grade	Number of Bedrooms	Improvement Range			Replacement/New Constr. Range		
		Minimum	Target	Maximum	Minimum	Benchmark	Maximum
JENL & JNCO	2	24	30	35	30	35	40
	2 Modified	24	30	35	30	35	40
	3	35	40	45	40	45	50
	4	35	40	50	40	50	60
	5	35	40	60	40	60	75
SNCO & CGO	2	24	30	40	30	40	55
	2 Modified	24	30	40	30	40	55
	3	40	45	50	45	50	55
	4	40	45	60	45	60	70
	5	40	45	70	45	70	90
FGO & E9 Prestige	3	40	45	55	45	55	65
	4	45	50	70	50	70	80
ISNCO (E9)	4	45	55	75	55	75	80
SO (O6)	4	45	55	70	55	70	90
ICO SO (O6)	4	45	55	80	55	80	90
GO (O7+)	4	60	70	90	70	90	100
SCP GO (O7+)	4	65	75	90	75	90	100

#### 4-9.6.15 Circulation

##### Hallways and Stairways

- Hallways, stairways, and stairwells are areas dedicated to circulation. Incorporate circulation into living spaces to minimize usable floor space lost to circulation. Stairs not only provide the function of allowing access between floors, they are also architectural features that deserve consideration in terms of how they can enhance the quality of the living space. They also must facilitate safety and accessibility.
- Design circulation areas to permit the movement of king and queen size beds and other bulky items of furniture:
  - Hallway and Stairway Width: 3 feet 0 inches minimum for existing units and 3 feet 4 inches minimum for New/Replacement units. (clear tread width)
  - Stairway Headroom: 7 feet 4 inches minimum
  - Stairway Treads: 10 inches minimum
  - Stairway Risers: 7 ¾ inches maximum

- Consider door locations in hallways with respect to movement radii or bulky furnishings. For finish materials, refer to Table 4-38: Authorized Allowable Finish Materials and Table 4-39: GOQ Authorized Allowable Finish Materials.

### **Design Criteria**

- Evaluate the stairway's potential to enhance the quality of the living space by making it an architectural feature, incorporating amenities such as book shelves in the wall supporting the stairs, or allowing increased natural light by locating windows in the stairwell.
- If possible, provide direct access from the entrance foyer to the stairway to the second floor without passing through any other room.
- Ensure open guardrails have intermediate rails or patterns such that a 4-inch sphere cannot pass through.
- In stairways of three or more steps, provide a handrail at least 33 inches but no more than 36 inches from the stairs, measured vertically from the nosing of the treads. The rail must accept a 300-pound lateral impact load. Carpeting, if used, should be securely anchored at the juncture of each tread and riser.
- Provide carpeting, if desired. Refer to Paragraph 4-14.2, Carpet Policy for additional guidance.

#### **4-9.6.16 Basements**

The Air Force does not allow basements for Family Housing unless special conditions are justified. This is due to the fact that, historically, the economic cost is higher than the benefit to the Air Force. For this document, a basement is defined as an unfinished and unconditioned space that is either above or below grade, but is located below the primary living level of the dwelling unit. For finish materials, refer to Table 4-38: Authorized Allowable Finish Materials and Table 4-39: GOQ Authorized Allowable Finish Materials.

AF/ILE will consider special cases where installations can justify providing basements based on life cycle costs related to climate and/or site conditions.

The base must provide documentation to AF/ILE, through the MAJCOM, that demonstrates:

- The climatic conditions support or dictate the use of a basement.
- Soil-bearing conditions are adequate for structural foundation support and expansive clay soils are not present. This documentation must be certified by a registered professional engineer from the local vicinity.
- Ensure head height clearances comply with all governing codes.
- Other rules governing the incorporation of basements are:

- The base, in the programming documents, must provide a separate line item cost to provide all basements in each project/phase.
- If habitable spaces that are ordinarily located on the main or secondary levels of the dwelling unit are located in a basement, they still must be calculated as part of the authorized net square footage for the dwelling unit and will also count towards the gross square footage requirements.
- Basements with a habitable space and every sleeping room shall have at least one operable emergency escape / rescue opening in addition to the required means of egress. When a sleeping room is provided in conjunction with the habitable space, the emergency escape / rescue opening must be provided in the sleeping room. For specific criteria concerning emergency escape / rescue openings, see Section R310 (Emergency Escape and Rescue Openings) of the International Residential Code, latest edition.
- An unfinished, unconditioned basement, if used for storage, laundry, and utilities, will not be calculated as part of the dwelling unit's authorized net square footage except for habitable rooms such as family or recreation rooms. However, the basement always counts towards the authorized gross square footage.
  - Basement used as habitable spaces are protected by the appropriate fire rated separations/assemblies and conform to the more restrictive of either the NFPA Life Safety Code or locally accepted building code requirements.
- All finished spaces in a basement must provide a required functional space.
- Finished space in a basement must meet all life and safety codes and count towards the allowable net square footage of the unit.
- Any existing finished space in a basement that does not meet life safety codes and that cannot feasibly be brought up to code must be returned to storage areas at time of renovation with appropriate finishes for such space.

#### 4-9.6.17 Attics

Normally, the Air Force does not allow finished or full height attics for new construction, replacement, or improvement projects in Family Housing. This is due to the fact that, historically, the economic cost is higher than the benefit to the Air Force. An attic, in this document, is defined as an area above the primary living areas, and easily accessible from the interior of the house, that provides living space of some kind.

- Existing Attics:
  - Finished spaces in attics must meet all life and safety codes and count towards the allowable Net Square Footage of the unit.
  - All finished spaces in an attic must provide a required functional space.
  - Any existing finished space in an attic that does not meet life and safety codes and that cannot feasibly be brought up to code must be returned to storage areas at time of renovation with appropriate finishes for such space.

#### 4-10 ARCTIC RECREATION ROOMS

Up to 300 square feet over “Benchmark” are allowed for an Arctic Recreation Room and an Arctic Entry. This additional allowance is solely dedicated to additional functional spaces designated as Recreation Room and Arctic Entries in arctic regions and is not limited by bedroom or unit type. This additional functional space is only authorized for Eielson AFB, Elmendorf AFB, F.E. Warren AFB, Grand Forks AFB, Minot AFB, Malmstrom AFB, and Cavalier AFS. This additional allowance cannot be used to increase the area of any other functional space of the unit.

- In terms of execution for the recreation room:
  - The Arctic Recreation Room shall be accommodated in the basement to take advantage of typical foundation construction in these areas. Provide proper egress.
  - In new and replacement construction, design this space so that it can maximize the use of daylight for family activities and solar gain to help decrease energy costs.
    - In renovation projects the Arctic Recreation Room requirements shall be accommodated in the basement where it exists.
- Size of Arctic Recreation Rooms shall be in direct relationship to the overall unit size within the allowable 300 SF.
- Finishes in the Arctic Recreation Room shall be conducive to the intended use as an indoor recreation space.

For finish materials, refer to Table 4-38: Authorized Allowable Finish Materials and Table 4-39: GOQ Authorized Allowable Finish Materials.

#### 4-11 FORCE PROTECTION AND SAFE HAVEN/SAFE ROOMS

Force protection requirements for planning and design of family housing and neighborhoods are determined by the local threat analysis or risk assessment. The designer and civil engineer should coordinate with the installation security forces to determine if there are any specific family housing force protection design requirements.

Since most of the Air Force Family Housing inventory is exempt from DoD Minimum Antiterrorism Standards, it is the community planning issues for military family housing that are most commonly driven by the force protection installation guide. Therefore, the design of Family Housing neighborhoods should be coordinated with the base's Installation Security Plan or comparable installation force protection plan based on the local risk assessment and, when feasible and cost effective, the stand off distance requirement should be met in new construction. *Reference the Air Force Installation Force Protection Guide* for more information.

Family housing structures with less than 12 units per building are exempted from the UFC 4-010-01 *for DoD Minimum Antiterrorism Standards for Buildings*. Family housing buildings with 12 units or more per building are to be designed in accordance with the UFC 4-010-01.

For specific security systems in a GOQ, coordinate with the installation security forces. Where a Safe Haven/Safe Room design is required in a GOQ due to a certain local risk assessment or threat assessment, the room is to be designed according to the functional requirements described in DoD 2000.12-H, *Protection of DoD Personnel and Assets from Acts of Terrorism*.

The intent of a Safe Haven or Safe Room design, when required, is to provide a minimum of 15 minutes of protection against a predetermined level of attack. The Safe Haven should be designed so that the time for the response team to arrive is shorter than the time it takes for the attackers to penetrate the room. Typically the requirement is met by reinforcing/shielding an existing closet or bathroom in the house. Typical criteria as outlined in C10.5 of DoD 0-2000.12-H is as follows:

- The safe haven should be established in an interior location, away from exterior walls and without windows. The size of the room should be such that it will allow a minimum of 10 square feet of space for each person who will occupy the room. The room should not be easily identifiable as a safe haven, and should be easily accessible by all individuals who may have a need to use it.
- The walls of the safe haven should be hardened to provide a penetration delay of 15 minutes. In some circumstances, additional hardening to achieve longer delay times may be necessary, as may be the case in certain overseas areas where U.S. response forces may not be able to reach isolated residences of DoD personnel requiring protection within 15 minutes of an alarm in the response force office.

- A solid wood door clad with 16-gauge galvanized steel on the exterior and 12-gauge steel on the interior using high-security bolt works and drop bolts is also recommended. When engaged, bolts secure the door to the jamb in all four directions – up, down, left, and right. Electrically operated deadbolts are acceptable provided that in the event of power failure, the bolts slide into their locked condition and provided that a backup power source with automatic switchover is available. The existence of a safe haven with high-security doors is worthless if terrorists can shut off power to the door and cause the door to close and lock tight before DoD assets to be protected can reach it.
- Safe havens should have only one door and no windows. In the event that a safe haven must be constructed from a room with a window, the window should be hardened to withstand penetration attacks for more than 15 minutes. Use of aesthetically acceptable metal grillwork, shutters, mesh, or decorative wrought iron can meet this requirement. In addition, the ballistic resistance of the window should be increased to a level sufficient to defeat 7.62 NATO ammunition.
- Hardening the ceilings and floors for safe havens may not always be required. Access to spaces above or below safe haven areas should be secured by grillwork, grates, or other hardening methods. Screwing steel-ply laminates to the joists above and below the safe haven will provide substantial resistance against penetration without creating aesthetic or cosmetic problems within the living space. In addition to these hardening techniques, the addition of a three-ply layer of 9-gauge steel, 3/4-inch plywood, and 9-gauge steel-ply barrier can increase ballistic protection and provide the desired 15-minute delay.
- Consider installing a main power switch in the safe haven to allow occupants in an emergency to interrupt power to the entire facility with the exception of emergency services circuits (such as emergency lighting, emergency communications, and emergency computer power supplies). Interruption of electrical service in the facility interferes with the use of power tools to gain access to individuals taking refuge in the safe haven. Furthermore, darkness can make it more difficult for the intruders to press their attack.

Permanently installed communications equipment within Safe Haven rooms such as cabling is to be funded through a Military Family Housing appropriation. Communications equipment that is readily removable from the Safe Haven room and is mission-required shall not be funded with Military Family Housing funds.

## **4-12 TORNADO AND HIGH WIND SHELTERS**

Tornado and wind shelters provide a temporary safe haven from the destructive forces of nature during occurrences of tornadoes, hurricanes, and other sources of high winds. The information contained in this section was derived from a publication called *"Taking Shelter From The Storm"*, second edition, March 2004 published by the Federal Emergency Management Agency (FEMA) and can be obtained at their website at [www.FEMA.gov](http://www.FEMA.gov).

The FEMA publication addresses shelters for tornadoes, hurricanes, and high winds. This section of the guide is directed primarily towards installations that are located within risk zones 3 and 4 as indicated in Figure 4-8. Since it is assumed that installations along coastal regions that are susceptible to hurricanes will evacuate all residents in base housing, it is not the intent of this section to require shelters for hurricane prone areas indicated as zone 5 in Figure 4-8. However, it is highly recommended that shelters for installations in-land from the coastline be considered because of the tornadoes spawned by these hurricanes.

### **4-12.1 Shelters**

#### **4-12.1.1 Replacement/New Construction MF Housing Projects**

All AF installations located within zone 3 or zone 4 indicated in Figure 4-8 shall provide shelters. Commands and installations located in zone 5 should consider providing shelters on an individual basis.

#### **4-12.1.2 Improvement MF Housing Projects**

All AF installations located within zone 3 or zone 4 indicated in Figure 4-8 shall provide shelters where it is determined feasible to incorporate them without jeopardizing the overall programmed project due to excessive costs to modify existing framing or foundation structures.



## 4-12.2 Shelter Types

Shelters may be basement type, aboveground type or in-ground type.

### Design Criteria

- Design and construct shelters in accordance with FEMA publication *“Taking Shelter From The Storm,”* second edition, March 2004.
- Size shelters to provide 5 square feet per person based on the following bedroom sizes:
  - 2-bedroom units: 4 persons
  - 2-bedroom modified units: 4 persons
  - 3-bedroom units: 5 persons
  - 4-bedroom units: 6 persons
  - 5-bedroom units: 7 persons
- Construct shelters of 8-inch reinforced concrete masonry or 8-inch reinforced concrete.
- Shelter walls, floors, and ceiling shall be separate from the structure of the home and independently supported.
- Shelters will be provided direct access from the house without requiring the occupants having to go outside into the unprotected environment.
- Typically, in-ground shelters can be economically provided as part of the garage structure. However, accesses to in-ground shelters shall not be placed where they can be blocked by vehicles or other normally occurring obstructions.
- Do not provide basement type or in-ground type shelters in areas prone to storm surge or having a high water table.
- Ensure adequate ventilation to the shelter from outside or above grade for instance where the occupants may be temporarily impeded from exiting the shelter due to debris following the occurrence. At a minimum, provide a 6-inch diameter metal duct direct to the exterior with the outside inlet faced down and the opening protected with metal bird/insect screen.
- Basement or in-ground shelters are preferred. In instances where these applications are not possible, the shelter shall be located as an interior room on the first floor.

- Regardless of shelter location, the access door to the shelter must be resistant to projectile impacts. Provide access doors that meet the criteria indicated in the FEMA publication referenced in this paragraph.

#### 4-12.2.1 Shelter Costs

The following indicated shelter costs are provided for programming purposes. These anticipated costs are probable costs and are provided as a range based on type of shelter. Costs may vary from these indicated due to local site conditions, shelter type and shelter construction.

- Anticipated shelter costs:
  - Basement (above ground): \$3,000 - \$5,000
  - Crawlspace (above ground): \$4,500 - \$6,000
  - Slab-on-Grade (above ground): \$3,500 - \$4,500
  - Slab-on-Grade (in-ground): \$2,000 - \$3,500

#### 4-13 ACCESSIBILITY

Access to Federal facilities by the disabled has been mandated by the ADA. This includes FH. The AF has set a planning and procurement goal of 5 percent of all housing inventory on an installation, as identified in the HCP, (with a minimum of one unit of each bedroom type/rank category) to be made adaptable for accessibility and to include pre-wiring for visual notification systems as required for persons with hearing impairments. New, replacement, and improvement projects might not require additional adaptable units beyond those already provided in the existing inventory of an installation (new, replacement, and improvement projects do not always require 5 percent accessible units). Accessible units should be single story unless there is a site or budgetary constraint. For housing units where official entertainment requirements are necessary (GOQ's), the public area of these units (family non-private spaces), are required to conform to accessibility requirements.

Family Housing units must be accessible not only to disabled people with wheelchairs, but also to disabled people who do not use wheelchairs, such as visually- and/or hearing-impaired persons. A minimum of 2 percent of each unit type, but not less than one unit, shall be made adaptable for accessibility to hearing-impaired persons.

It is important to become familiar with the guidelines and responses called for by the ADA in addressing all physically challenged persons. The UFAS provides excellent, comprehensive documentation, including clear diagrams and dimensions, for use in accessibility design. This document is available at no cost through the Federal Government Printing Office (GPO).

## Design Criteria

- In providing accessibility in common areas, recreational facilities, outdoor developed areas, and individual housing units, comply with criteria in the UFAS and in the latest version of the ADAAG.
- In the designs of new units and the renovation of existing units, consider incorporating features that would facilitate adaptation for accessibility at a later date. Examples of such features include the height of electrical switches, outlets, and other controls; the height of shelving and closet rods; opening widths; circulation patterns; the availability of accessible emergency egress; and the flexibility of the plan to permit modifications necessary to provide accessible kitchens and bathrooms.
- Refer to the Housing Community Profile to identify new construction requirements to accommodate persons with disabilities and the units that are most suitable for conversion.
- The net floor area of a unit may be increased by up to 75 SF as necessary to meet accessibility standards (see Table 4-1). Complete the necessary construction in a way that allows the house to be easily converted back when the family with the person with disabilities moves.
- Remember that a key aspect of accessible design is to provide an “accessible” path from parking areas to all areas of the dwelling.
- Once an accessibility requirement is identified, give the highest priority to the necessary modifications.

## Entry

- Design and construct common entrances to multi-unit facilities to be accessible to persons with disabilities.
- Provide ramps when necessary at entries. On some sites, provide ramps at side or back doors, which may be more easily adapted to be the primary accessible entry. Include handrails on ramps that exceed 72 inches in length. Slope ramps no greater than 1 in 12, with a 30-inch maximum rise. Provide ramps with a minimum width of 36 inches. Consult the UFAS.
- Design outdoor living areas with low thresholds and adequate turnaround space. Provide thresholds with a maximum height of 1/2 inch, with a beveled slope no greater than 1-inch in 2 inches.

## Interior Accessibility

- To ensure the unit is accessible, provide certain functions on the first floor, including entry, entertainment, food preparation, eating, sleeping, bathing, laundry, and storage.

- Provide wood or resilient flooring, or a very low-pile, dense-weave carpet to allow ease of movement. Provide controls, electrical outlets, and switches no more than 48 inches and no less than 15 inches from the floor. Provide accessible outdoor living spaces, such as patios, decks, and balconies, along with parking areas and walkways.
- Provide an entry door with a clear width of at least 32 inches when the door is open 90 degrees. Provide a minimum 60-inch diameter of clear space for the wheelchair inside the entrance. Provide lockset hardware (lever-handled, push-type, or U-shaped) mounted no higher than 48 inches.
- Provide for accessibility of all first-floor rooms. Ensure all corridors are at least 42 inches wide and door clear widths are 32 inches. Provide lever-handled door hardware. Consult the UFAS for required door clearances.
- Provide windows that are within easy reach and that are operable by one hand with less than 5 pounds of force. Use casement windows with either lever or crank opening mechanisms, with locking mechanisms placed within reach of a seated person.
- Consult the UFAS for comprehensive guidance, diagrams, and dimensions.

## **Bathrooms**

- Provide baths with adequate space for a person in a wheelchair to enter and close the door, use the fixtures, reopen the door, and exit. Ensure clear floor space is a minimum of 66 inches by 48 inches.
- Provide a toilet seat with a height of at least 15 inches and no more than 19 inches from the floor, with toilet paper dispenser positioned 19 inches from the floor.
- Provide a wall-hung lavatory without a vanity cabinet to accommodate wheelchair access. Mount the lavatory rim and lavatory countertop surface no higher than 34 inches and provide a clearance of at least 29 inches from floor to bottom of apron. Provide levered or push-type faucets. Provide clear floor space of 30 inches by 48 inches with 19 inches clear under the lavatory. Cover or insulate the hot water supply and drain pipes.
- Provide clear floor space, a circle with a minimum diameter of 60 inches, to facilitate wheel chair maneuverability. Allow 9 inches of the 60 inches to be accommodated under lavatory counters.
- Provide the necessary reinforcing for the installation of grab bars in appropriate locations per the UFAS.

- Provide a seat at the head-end of the bathtub. Also provide a shower spray unit with a hose length of at least 60 inches that can be used as a hand-held or fixed shower. Install an adjustable-height vertical bar that does not obstruct the use of the grab bars and that holds the shower spray unit during fixed shower use.
- Provide vanity bases only if they can be removed without the use of special tools or knowledge. Finish all flooring that is located beneath removable vanity bases.
- For SCP GOQ's the half bath serving the entertainment areas of the house must be accessible in accordance with UFAS.

### **Kitchen**

- Provide a minimum clear floor space of 30 inches by 48 inches in front of all appliances and 19 inches under sinks.
- Provide a minimum 60-inch clear width between cabinet fronts, counters, or walls in U-shaped kitchen areas.
- Provide kitchen sinks and the surrounding counters no more than 34 inches above the finished floor. Ensure one sink bowl is no more than 6½ inches deep with a levered or push-type faucet.
- Provide a kitchen sink with at least 30 linear inches of work surface adjacent to the sink. Consider counters designed for repositioning to a minimum height of 28 inches. Use either a single integral unit or separate components for the sink and work surfaces. Allow accessibility by a wheelchair resident to the base cabinets directly under the sink and counter work surface by ensuring these items are removable. Ensure that when the counter is lowered, the exposed sides and back of the adjacent cabinets are constructed of a durable, non-absorbent material finish. Finish all flooring located beneath the removable cabinets.
- Select a range with range-top controls that can be operated without reaching across burners.
- Provide either a side-by-side refrigerator/freezer or an over/under refrigerator/freezer that has at least 50 percent of the freezer space below 54 inches above the floor.
- Provide kitchen wall cabinets with lower shelves or drawer space at a height of no more than 48 inches. Mount handles as close to the bottom of the wall cabinet doors as possible and as high as possible on base cabinet doors.

### **Laundry**

- When laundry equipment is authorized, choose front-loading machines with controls on the front and with a minimum of 30 inches by 48 inches clear space in front of the equipment with the doors open.

## Tactile and Audible Design Criteria

- Ensure that the requirements for the visually- and hearing-impaired are also reviewed.
- Use the above points only to provide an outline for some of the key points of accessible design. It is imperative that the housing project manager and the design architect-engineer consult the ADA and UFAS in addressing accessibility requirements.

## 4-14 INTERIOR DESIGN

### 4-14.1 General Statement

When used correctly, colors, textures, and finishes create a warm, inviting, and flexible atmosphere for the Family Housing resident. By emphasizing durability, simplicity, and neutrality, families can maximize the use of their existing furnishings.

### Design Criteria

- Include interior design professionals in the selection of interior finishes, colors, equipment, and built-in furnishings to produce an integrated visual design theme.
- Select materials and finishes to achieve a balance between initial cost, maintenance cost, durability, appearance, and resident convenience and satisfaction. Emphasize neutral colors.
- Use GWB as the primary material for wall and ceiling finishes, and use water-resistant GWB in bathrooms, laundry areas, and other areas subject to high humidity or contact with water. Use fire-rated GWB to achieve fire-rated assemblies between adjacent units (see Paragraph 4-18.2, Sprinkler Protection, for additional guidance, local codes, and NFPA 101, *Life Safety Code*).
- Provide floor coverings of hardwood, sheet vinyl goods, carpet, or ceramic tile. Do not use carpet in kitchens, bathrooms, entry areas, or patios/porches exposed to weather elements because there is a high potential for maintenance and replacement costs resulting from spills, stains, and water damage.
- For ceramic tile, select the darkest complimentary grout color to coordinate with the tile color. Provide slip resistant tile at floor locations. Tile and grout shall be properly sealed to prevent excess soiling.
- If hardwood floors are specified, use low volatile organic compounds (VOC) vinyl impregnated or polyurethane finishes.
- Use high-quality vinyl composition tile with a through pattern for interior storage and utility rooms.
- See Paragraph 4-14.2, Carpet Policy, for information on carpet selection and acquisition.

- Provide a light stained or painted wood base throughout the living areas of the house. When using stained wood bases, specify a quality hardwood and stain to match the other wood finishes in the unit.
- Do not use sprayed-on acoustical ceiling finish in kitchens; bathrooms; powder rooms; or storage, service, utility, or other areas that require washing or are subject to damage.
- Paint interior surfaces with latex or alkyd-based paint. Paints shall have a VOC concentration of not more than 100 grams/liters (g/l).
- Use semi-gloss finish on walls and ceilings of kitchens, bathrooms, powder rooms, laundry and utility areas, painted doors, windows, and interior trim. In other areas, use satin or eggshell finish on walls and eggshell on ceilings. Apply clear or stained varnish on millwork.
- Do not use or specify paint containing lead.
- Do not use or specify asphalt or asbestos tile floor coverings or cushion back resilient floor coverings.
- Linoleum product floor covering may be used, but only high quality products will be acceptable.
- Do not use particleboard floor sheathing.
- Do not use exposed concrete masonry as an interior finish for Family Housing.
- Select from a neutral color palette to accommodate the varied furnishing styles of numerous residents over the life cycle of the material.
- Provide color boards for base approval and provide schedules in all contract documents to control contractor submittals.
- Provide generic furniture footprints, scaled appropriately, to demonstrate that rooms are functional.
- Select window coverings for residents' privacy.
- Provide traverse-type drapery rods or vertical blinds over all patio or atrium doors.
- Provide blinds for all windows. For windows 5 feet or more in width, blinds should be split into multiple sections. Include appropriate blocking for mounting.
- Sealants and adhesives shall have a VOC concentration of not more than 250 g/l and shall meet or exceed the VOC limits of the State of California's South Coast Air Quality Management District Rule #1168 and all sealants used as filler must meet or exceed the State of California's Bay Area Air Resources Board Reg. 8, Rule 51.

## 4-14.2 Carpet Policy

Carpeting is the most cost-effective way to finish floors in Family Housing. This section offers guidance to be used for selecting wall-to-wall carpeting for Air Force Family Housing. Unless unusual circumstances apply, carpeting should provide at least seven years of use in Family Housing. Comply with provisions of ETL 03-3, *Air Force Carpet Standard* dated 16 Apr 03.

### 4-14.2.1 Policy

- Install carpet only in authorized areas. Authorized areas include all living areas, except kitchens, baths, patios/porches, and areas exposed to the weather. Give special care to the entry area by using an impervious, slip-resistant material (tile) instead of carpet.
- For all carpet replacement, the installation commander must certify the carpet is no longer serviceable and requires replacement.
- In General Officer Quarters (GOQ's), waivers to the "7-year rule" must be approved by the MAJCOM/CV; no General Officer may approve a waiver for his/her own quarters or those senior to him/her.

### 4-14.2.2 Acquisition

- Remember that wall-to-wall carpeting, including padding, is an integral part of the housing unit. Accordingly, attribute the cost of its purchase and maintenance to the maintenance and repair costs for the house.

### 4-14.2.3 Selection

Select carpet to conform to the following construction specifications:

- Carpet should bear the Carpet and Rug Institute's "Green Label" for Indoor Air Quality (IAQ) testing and shall have a maximum VOC outgassing of 100 milligrams per square meter. Carpet specifications should allow the use of recovered materials when they meet the technical and aesthetic requirements. See the most current Engineering Technical Letter for Air Force Carpet Standards. Carpet shall be branded type 6.6 nylon, such as Antron or Solutia, 25-100 percent recycled fiber, minimum 26-ounce pile weight, 1/10 gauge for loop carpet and minimum 30-ounce, 1/10 gauge for cut pile construction. Carpet shall be a neutral color and be provided with a 10-year stain and soil protection warranty. Carpet shall be provided with integral urethane cushion, 0.125-inch thick, 18 pounds per cubic foot density or separate padding, 1/2-inch bonded urethane/vinyl, minimum 6-pound density.
- If a separate pad is used, carpet shall be installed with standard aluminum binder bars and plywood carpet grippers (tack strips). Carpet wear classification shall be "moderate."

- Carpet systems (carpet and cushion tested together, as they will be installed) shall have a minimum average critical radiant flux of 0.25 watts per square centimeters when tested in accordance with ASTM E 648 and Consumer Product Safety Commission (CPSC) 16 CFR 1630. Seam sealants shall be low-VOC.
- Fade Resistance standards: Provide carpet complying with ratings for the American Association of Textile Chemists and Colorists (AATCC) 16-1992 Colorfastness to light, for dark colors, a gray scale rating of 4 or better after 180 standard fading hours as compared to AATCC Gray Scale for evaluation of change in color.
- Static electricity build-up shall be permanently less than 3.5 KV, 70° F with 20 percent relative humidity as determined by AATCC Test Method 134, *Electrostatic Propensity of Carpets*.
- Provide a minimum tuft bind of 10 pounds per loop pile and 5 pounds for cut pile in accordance with ASTM D 1335.
- Ensure the carpet passes the Department of Commerce (DOC) FF 1-70 Pill Test (7 passes from 8 specimens) and the requirements of NFPA 101, *Life Safety Code*.
- For separate pad, provide 3/8 to 1/2-inch high-density polyurethane foam underlayment that meets HUD Use of Material Bulletin 72A HUD *Building Product Standard and Certification Program for Carpet Cushion*.
- Select carpet from a neutral palette. Do not use white and extremely pale tints. Avoid pattern carpet. Use only one carpet color throughout the housing unit.

#### 4-14.2.4 Installation

- Install carpeting according to the manufacturer's recommendations to ensure that warranties will be valid. Do not install carpeting over existing carpeting or existing padding. Carpet installer shall be a Certified Flooring Installer certified IAW ETL 03-3, *Air Force Carpet Standards*.

#### 4-14.3 Interior Thresholds

- Provide interior threshold of nonferrous material or finished hardwood where flooring materials or floor levels change.

#### 4-14.4 Other Flooring Materials

- Bamboo Flooring: Minimum 5/8-inch thickness, three-ply, provided with a factory finish and shall have a wear surface capable of multiple screenings and refinishing. Flooring hardness shall be a minimum 1200-psi, per ASTM D 1037.
- Composite Flooring: Minimum 15-year warranty, with glue-less locking tongue and groove floating floor system. Flooring shall be installed over padding, per manufacturer's specifications.

- Hardwood Flooring: Nominal 3/4-inch thickness, solid wood tongue and groove, nailed to plywood underlayment (glued to slab), finished with a minimum three coats low-VOC polyurethane.
- Resilient Floor Tile: 3/32-inch thickness, ASTM F 1006, *Standard Specification for Vinyl Composition Floor Tile*, Composition 1, Class 2 through pattern. Recycled content flooring is desirable.
- Sheet Vinyl Flooring: .080-inch gage and .050-inch wear thickness, ASTM F 1303, *Standard Specification for Sheet Vinyl Floor Covering with Backing*, Type II, Grade 1, Class A fibrous back. Flooring shall be installed as a monolithic material with seams welded or bonded for a seamless installation. Recycled content flooring is desirable.
- Stair Finishes: All interior stairs shall be stained hardwood with clear finish or softwood with carpeting.

#### 4-14.5 Finish Materials

The following table indicates a range of authorized allowable finish materials for different surfaces. Each MAJCOM and installation will determine what will be appropriate finishes based on material cost, budget constraints, and comparable residential construction in the local community.

**Table 4-38: Authorized Allowable Finish Materials  
JENL, JNCO, SNCO, E9 Prestige, CGO, FGO, and SO**

Room	Floor	Wall	Ceiling	Remarks
Foyer	QT, CT, HWF, BF, or CWF	PT-eggshell	PT-eggshell	3
Living Room	CPT, HWF, BF, or CWF	PT-eggshell	PT-eggshell	
Dining Room	CWF, CT, HWF, or BF	PT-eggshell	PT-eggshell	3
Family Room / Den	CPT, CT or SVF	PT-eggshell	PT-eggshell	
Kitchen	CT or SVF	PT-semi-gloss	PT-semi-gloss	3,4,5
Secondary Dining	CT or SVF	PT-eggshell	PT-eggshell	3
Utility/Laundry Areas	VCT or CT	PT-semi-gloss	PT-semi-gloss	1,3,4
Storage Closets	VCT, CT, or CPT	PT-semi-gloss	PT-semi-gloss	1,3
Master Bedroom	CPT	PT-eggshell	PT-eggshell	9
Master Bathroom	CT or SVF	PT-semi-gloss	PT-semi-gloss	3,5,6,9
Additional Bedrooms	CPT	PT-eggshell	PT-eggshell	9
Additional Bathrooms	CT, SVF	PT-semi-gloss	PT-semi-gloss	3,5,6,9
Basement	SCF or VCT	PT-semi-gloss	PT-semi-gloss	
Arctic Recreation Room	VCT, CT, HWF, BF, or CWF	PT-eggshell	PT-eggshell	1,3
Stairs	CPT, HWF, BF, or CWF	PT-eggshell	PT-eggshell	
Bulk storage	SCF or VCT	PT-semi-gloss	PT-semi-gloss	

#### NOTES:

1. Flooring depends on location/function of room.
2. Provide lightly stained or painted wood base throughout.
3. Provide slip resistant finish on tile.
4. Counter top finishes – High-grade laminate or solid surface material when budget allows
5. Cabinet finishes – High-grade laminate or wood
6. Lavatory finish – Cultured marble or other solid surface material when budget allows
7. Window coverings – Shades and/or blinds throughout
8. Interior doors – Hollow core with veneer throughout
9. Overseas (foreign) installations may have a more durable and cost-effective local option that may be substituted with MAJCOM/CE approval.

#### ABBREVIATIONS:

BF	= Bamboo Flooring	PT	= Paint
CPT	= Carpet	QT	= Quarry Tile
CT	= Ceramic Tile	SCF	= Sealed Concrete Flooring
CWF	= Composite Wood Flooring	SVF	= Sheet Vinyl Flooring
HWF	= Hard Wood Flooring	VCT	= Vinyl Composition Tile

#### 4-14.6 GOQ Finish Materials

The following table indicates a range of authorized allowable finish materials for different surfaces. Each MAJCOM and installation will determine what will be considered upgrade finishes. This table provides both basic and upgraded material selections for utilization, programs, and proposals. Where project funding allows, consider providing upgraded materials.

**Table 4-39: GOQ Authorized Allowable Finish Materials**

Room	Floor	Wall	Ceiling	Remarks
Foyer	CT, HWF, BF, GT, or CWF	WC/PT-eggshell	PT-eggshell	3, 9, 10
Living Room	CPT, HWF, BF, or CWF	WC/PT-eggshell	PT-eggshell	9, 10
Dining Room	CPT, HWF, BF, or CWF	WC/PT-eggshell	PT-eggshell	9, 10
Family Room / Den	CPT, CT, HWF, BF, or CWF	PT-eggshell	PT-eggshell	3, 9, 10
Kitchen	CT, HWF, BF, or CWF	PT-semi-gloss	PT-semi-gloss	3,4,5
Secondary Dining	CT, HWF, BF, or CWF	PT-eggshell	PT-eggshell	3, 9, 10
Utility/Laundry Areas	CT	PT-semi-gloss	PT-semi-gloss	3, 4
Storage Closets	CT, CPT, HWF, BF, or CWF	PT-semi-gloss	PT-semi-gloss	1,3
Master Bedroom	CPT	WC/PT-eggshell	PT-eggshell	9
Master Bathroom	CT	CT/PT-semi-gloss	PT-semi-gloss	3,5,6
Additional Bedrooms	CPT	PT-eggshell	PT-eggshell	
Additional Bathrooms	CT	CT/PT-semi-gloss	PT-semi-gloss	3,5,6
Basement	SCF or VCT	PT-semi-gloss	PT-semi-gloss	
Arctic Recreation Rm.	CPT or CT	PT-eggshell	PT-eggshell	1,3
Stairs	CPT, CWF, HWF, or BF	PT-eggshell	PT-eggshell	9
Bulk storage	SCF	PT-semi-gloss	PT-semi-gloss	

**NOTES:**

1. Flooring depends on location/function of room.
2. Provide lightly stained or painted wood base throughout.
3. Provide slip resistant finish on tile.
4. Counter top finishes – Solid surface material or granite/marble
5. Cabinet finishes – Wood
6. Lavatory finish – Solid surface material or granite/marble
7. Window treatments – Shades and blinds throughout and drapery/curtain rods
8. Interior doors – Hollow core with veneer throughout
9. Stained or painted chair rail with wall covering below
10. Stained or painted wood crown moldings

**ABBREVIATIONS:**

BF	= Bamboo Flooring	PT	= Paint
CPT	= Carpet	QT	= Quarry Tile
CT	= Ceramic Tile	SCF	= Sealed Concrete Flooring
CWF	= Composite Wood Flooring	SVF	= Sheet Vinyl Flooring
GT	= Granite Tile	VCT	= Vinyl Composition Tile
HWF	= Hard Wood Flooring	WC	= Wall covering

## **4-15 ELECTRICAL/PLUMBING/MECHANICAL SYSTEMS**

### **4-15.1 Electrical/Telephone/TV Systems/Computers**

The electrical system supplies electrical power to the outlets and appliances in the home.

Emphasis should be on the integration of, and most efficient and safe operation of these systems to yield the highest possible quality of living environment.

#### **Design Criteria**

##### **Exterior Service**

- Ensure electrical systems conform to the latest editions of the International Code Council Electrical Code, National Electrical Safety Code, and International Residential Code.
- Provide master-metered electrical service in the Family Housing area. Make provisions to facilitate the installation of individual electric meters at a later date by providing a blanked-off meter base installed in the service entrance at the appropriate location. Meter bases should not be placed in a visually accessible location.
- Ensure that service entrance conductors and equipment are rated at 150 amperes (minimum) for each living unit (200 amperes where heat pumps or air conditioning units are provided).

##### **Interior Service**

- Avoid installing any equipment in the attic that would require routine maintenance. If unavoidable, then provide a switched luminaire and GFCI duplex receptacle. Access must be provided to all components needing maintenance for any equipment installed in the attic space.
- Locate the service panel within the dwelling unit, easily accessible to the resident, but not in areas such as living rooms, dining rooms, bedrooms, or behind clothes in closets. Provide recessed, dead front, circuit breaker-type panels.
- Provide a convenience outlet behind gas ranges to supply power for the range clock, timer, and lights.
- Provide separate, dedicated branch circuits in each living unit for all permanently installed equipment and appliances (where applicable): air conditioner, heat pump, furnace, water heater (electric), range (electric), dishwasher, garbage disposal, clothes washer, clothes dryer (electric), microwave, and small appliances (minimum of two circuits in the kitchen/dining room area).

- Provide weatherproof, while in use, GFCI duplex convenience outlets, a minimum of one in garages/carports, patios/balconies, and near the front and rear entrances.
- Provide GFCI duplex receptacles in the bathroom, kitchen, in laundry room areas, and all receptacle locations within six feet of a water source, as well as other high-risk areas, as determined by the architect/engineer and current codes.
- Install conductors that conform in size with local code. As a minimum, use #12 AWG copper.
- Provide proper bracing for ceiling junction boxes to support ceiling fans in all bedrooms, living room, dining room, and family room.
- Provide receptacles for water softener, alternate refrigerator and freezer locations. If located in the garage then provide GFCI receptacles.
- All receptacles being fed by a GFCI receptacle shall be located in the same room as the GFCI.

### Lighting

- Provide lighting that is not only efficient and economical but that is simple in design and is in keeping with the architectural character of the unit. Refer to Table 4-40 for lighting fixture guidelines.
- Consider using fluorescent lamps, especially in kitchens, baths, laundry rooms, garages, and storage rooms. Fluorescent luminaires shall have electronic ballasts with high power factor and an "A" sound rating. Lamps shall have a minimum Color Rendering Index of 85 and minimum Color Temperature of 3500K. Recessed luminaires shall be IC rated.
- Provide exterior lighting, controlled from inside the living unit, at each exterior door and in the carport or garage. Ensure adequate lighting levels to promote safety and security. Photocells may be used but shall be manually switched.
- At a minimum, provide permanently installed wall-switched, ceiling or wall mounted light fixtures in the kitchen, dining room, bedrooms, walk-in closets, bathrooms, halls, stairs, garage, storage areas, and utility rooms.
- For new construction provide a ceiling fan with light fixture combination unit for the family room, den, and master bedroom only.
- Pre-wire the living room and all of the other bedrooms for a ceiling-mounted fan and ceiling light with wall switches.
- In addition to general area lighting in the kitchen, provide under-cabinet task lighting, to include the sink area, if needed. A luminous type ceiling probably would not need task lighting.

- In each habitable room without wall mounted or ceiling light fixtures (including each bedroom), in addition to master bedroom ceiling fan light fixtures, provide a wall-switched control for one-half of a duplex outlet in two separate locations within the room.
- Provide three and four way lighting switches at the ends of the hallways and at doors to pass through rooms.

**Table 4-40: Lighting Fixtures**

Room	Wall (W) or Ceiling (C)	Lamp Type		
		Most Efficient	Least Efficient	Control Device
Living room	N/A	N/A	N/A	Switched outlets
Dining room	C	CF	H, I	Dimmer on chandelier
Family room / Den	C	FL, CF	H, I	3-way switches
Hall	C or W	CF	H, I	3-way switches
Bath	W	FL, CF	H, I	Switch
Kitchen	C & W	FL, CF	H, I	Switch (es)
Utility room	C	FL, CF	H, I	Switch
Storage	C or W	FL, CF	H, I	Switch
Stairs	C or W	FL, CF	FL indirect wall	3-way switches
Hall upstairs	C or W	CF	H, I	3-way switches
Bedrooms	C and/or W	CF, hidden FL wall <sup>1</sup>	H, I	Switch (es)
Basement, unfinished	C	FL <sup>1</sup>	H, I	Switch (es)
Attic	C	FL	I	Switch
Outdoor	W	CF <sup>2</sup>	H	Switch
Outdoor storage	C	FL	I	Switch
Garage	C	CF <sup>2</sup> , FL <sup>1</sup>	H	Switch

FL = fluorescent, CF = compact fluorescent, H = halogen, I = incandescent

1. T8, 48 in., 32 watt

2. If the temperature does not fall below 0 °F and the lamp is enclosed by the light fixture, use a 20-watt screw base compact fluorescent with electronic ballast.

### Telephones/CATV/Computers

- Provide prewired, flush mounted simplex telephone jacks (8 pin, RJ-45) in the kitchen, and the living, dining, and arctic rooms. Provide two prewired, flush mounted simplex telephone jacks (8 pin, RJ-45) located on opposite walls in all bedrooms, den, and family room. The minimum communication cable shall be 4 pair, category 5 UTP (unshielded twisted pair).
- Provide prewired flush-mounted television antenna jacks in all bedrooms and the family, living, and arctic rooms. CATV wiring must be 75-ohm coaxial cable terminated with type "F" connectors and jacks.
- Provide a TV antenna-mounting bracket in the attic with cable to the demarcation junction box.

- Provide a multimedia (telephone, data, video, CATV, etc.) enclosure with a duplex receptacle, modular 110 blocks, splitters, etc. for terminations and cross-connection of all multimedia cables. Locate this enclosure inside the house and close to the service provider demarcation point with empty conduit.
- All jacks and wiring shall comply with Telecommunications Industry Association/Electronic Industries Alliance ANSI/TIA – 570-B, *Residential Telecommunications Infrastructure Standard*.
- Provide one additional communications outlet with a 3/4-inch empty conduit wall stubups and junction boxes in accessible ceiling space in all bedrooms, living and family rooms of GOQ's and SOQ's.
- Refer to ETL 02-12, *Communications and Information System Criteria for Air Force Facilities* located at <http://www.afcesa.af.mil/library/index.asp> for additional information.

#### 4-15.2 Plumbing Systems

The water supply system must provide a safe and efficient source of hot and cold water for cooking, drinking, and providing personal hygiene. Plumbing fixtures and fittings are covered in Paragraph 4-9.6.12, Bathrooms. Comply with applicable local requirements.

##### Design Criteria

- For guidance with respect to Air Force Family Housing potable water systems, refer to Air Force Instruction (AFI) 32-1067, *Water Systems*, locate at <http://www.e-publishing.af.mil/pubfiles/af/32/afi32-1067/afi32-1067.pdf>.
- Provide a master meter to monitor water consumption within Family Housing projects.
- For new construction and whole house renovations, provide adequate space for future installation of individual water meters. For privatization projects, provide individual water meters for all services.
- For basic design criteria, refer to <http://www.huduser.org/Publications/PDF/hvac.pdf>.
- Perform all necessary pressure and capacity calculations to ensure adequate sizing of water and sewer piping.
- For water supply and distribution, provide a stop and waste valve with a drain inside the house on the water supply line entering each housing unit. Locate the valve in a utility or service area, closet, cabinet, or other area that is separated from the living area but offers easy access by the resident.
- Provide cold water supply cutoff valve to each hot water heater.
- Provide hot and cold water supply cutoff valve for each fixture.

- Design water supply piping to eliminate water hammer.
- Provide hose bibbs in easily accessible locations at the front and rear of each ground-floor living unit. Install anti-siphon devices on all hose-bibbs. In areas subject to freezing, provide frost-proof hose bibbs as well as interior shutoff valves. Isolate hose bibbs from the house service to facilitate initial or follow-on installation of water softener in hard water areas.
- In each living unit, provide a storage-type water heater with a pressure-temperature relief valve and drain. Ensure gas and electric water heaters have factory-preset adjustable thermostats to limit water temperature to 120 °F to 130 °F (49 °C to 54 °C) maximum. Install storage tanks with minimum capacities (gallons) according to Table 4-41: Hot Water Heater Size Allowances.

**Table 4-41: Hot Water Heater Size Allowances**

Fuel	2/2 Modified-BR	3-BR	4- to 5-BR
Gas	30	40	50
Electric	40	52	80

- If economic and/or efficiency gains can be realized, install a tankless type water heater in lieu of the storage type. Equip all gas water heaters with American Gas Association (AGA) approved ignition devices, including electronic pilotless ignition.
- Provide plumbing access panels for all bathtubs/showers.
- Provide accessible clean outs for wastewater lines.
- Verify acceptable supply and wastewater piping materials based on local codes. Use piping and solder complying with the Safe Drinking Water Act.
- Provide proper venting for all wastewater lines.
- To the maximum extent possible, locate vents in the rear of the housing units.
- Provide drains for air conditioning condensation, high-efficiency furnace condensation, humidifier overflow, and the water heater drain and relief valve.
- Drain the clothes washer through a trapped, 2-inch minimum diameter standpipe, with the top of the pipe 3 feet above floor and the bottom of the trap a minimum of 4 inches above floor.
- Ensure that the water supply system valve conforms to the International Plumbing Code (IPC).
- Provide cleanouts for sewer lateral lines. Provide a box with a hinged cover in outdoor locations.

### 4-15.3 Heating System

The heating system must emphasize efficiency, ease of maintenance, durability, and the ability to provide a comfortable living environment.

#### Design Criteria

Select heating systems appropriate for the local climate and based on the lowest life-cycle cost of available fuels that are appropriate for residential heating. Consider the fuel requirements of other appliances, equipment, and systems (e.g., cooling, domestic water heating, and cooking). Executive Order (EO) 13123 mandates all appliances and energy consuming equipment have an Energy Star rating or be within the top 25% or energy efficiency for that product.

- Consider water or ground source heat pump systems for the heating/cooling system with heat recovery for domestic hot water where adequate land and geological conditions exist. Air source heat pumps should be considered in moderate climates. Heat pumps must use hydro fluorocarbon (HFC) refrigerants. Other acceptable alternatives may include hydronic, baseboard heat, radiant heat systems, or electric heat systems.
- Plan for an indoor design temperature for new or retrofit heating systems to be within winter comfort zone per ASHRAE Standard 55.
- Design the system in accordance with ASHRAE Standards 90.2, *Energy Efficient Design of Low-Rise Residential Buildings*.
- Furnace or heat pump units shall not be installed in attics.
- Equip gas-fired furnaces with AGA approved ignition devices, including electronic pilot-less ignition.
- Ensure an adequate supply of combustion air from outside the building for all fuel burning furnaces and domestic water heaters. Designs shall comply with NFPA 54.
- Do not provide portable room heaters, floor furnaces, or floor heat lamps.
- Do not use under-floor ductwork within or below the floor slab due to the danger of pesticide contamination.
- Ensure that duct systems are installed based on Sheet Metal & Air Conditioning Contractors National Assoc., Inc. (SMACNA) standards and that they are balanced for optimum performance. Duct systems must have rebalance capability.
- Use timer or setback thermostats to the maximum extent practicable.

- On heat pumps, provide setback thermostats that facilitate gradual increases in temperature at the end of the setback period to minimize electrical consumption of resistance heating elements.
- Do not use a fireplace as a means of heating a FH unit.
- Fireplaces are authorized for GOQ's. Existing fireplaces can be left in place.
- Ensure heating units are adequately sized and heat is evenly distributed. In cooling dominated climates, for systems that the furnace provides air flow for air conditioning, the determining criteria for furnace size will be system airflow for cooling.
- Ensure efficient ducting layout and size air outlet devices based on Noise Criteria 35 or less per ASHRAE *Handbook of Fundamentals*.
- Provide sealed ductwork to minimize air leakage. Test ductwork leakage per SMACNA *HVAC Duct Leakage Test Manual*.
- Insulate all ductwork in accordance with ASHRAE Standard 90.2.

#### 4-15.4 Air Conditioning System

The emphasis for the cooling system must be on efficiency, ease of maintenance, durability, and the ability to provide a comfortable living environment.

##### Design Criteria

- Air conditioning units shall conform to the International Mechanical Code and ASHRAE 90.2, *Energy Efficient Design of Low-Rise Residential Buildings*.
- Plan for an indoor design temperature of 78 °F (26 °C) for new or retrofit air conditioning.
- As a guide, provide air conditioning in areas where the ambient temperature during the year (as indicated in UFC 3-400-2, *Engineering Weather Data*) is:
  - 67 °F (20 °C) wet bulb for 800 or more hours, and
  - 80 °F (27 °C) dry bulb for 650 or more hours.
- Balance the above criteria with actual local climatic conditions.
- Air conditioning may be considered if a significant number of similar houses in the private sector community are air-conditioned.
- In new or renovated housing units, do not rely on window or through-the-wall units to provide air conditioning.

- Ensure that all air conditioning systems up to 65,000 BTU per hour deliver a seasonal energy efficiency ratio (SEER) of not less than 13 BTUH per watt input, as recommended by Federal Energy Management Program (FEMP). EO 13123 mandates all energy consuming equipment have an Energy Star rating or be within the top 25% or energy efficiency for that product.
- Obtain values for SEER and Heating Season Performance Factor from the most recent Directory of Certified Unitary Air Conditioners and Heat Pumps published by the Air Conditioning and Refrigeration Institute (ARI).
- Determine the cooling capacity of air conditioners and heat pumps at ARI Cooling Rating conditions.
- Use a common programmable (with timer or setback) thermostat to provide temperature control by the resident in both heating and cooling modes.
- Select only systems with HFC refrigerants.
- Replace ODC equipment with equipment using HFC refrigerants at the end of its useful life.
- Ensure cooling systems are adequately sized and air is evenly distributed. System components containing cooling coils shall not be installed in attics. Cooling coil drain pans must be piped with drains and drains must be sloped drain to the exterior without wetting the house exterior.
- Ensure efficient ducting layout and size air outlet devices based on Noise Criteria 35 or less per ASHRAE *Handbook of Fundamentals*.
- Provide adequately sealed ductwork to minimize air leakage. Test ductwork leakage per SMACNA *HVAC Duct Leakage Test Manual*.
- Insulate all ductwork in accordance with ASHRAE Standard 90.2.

## **4-16 SUSTAINABLE DEVELOPMENT**

### **4-16.1 Sustainable Development**

The benefits, requirements, and principles of sustainable development are discussed in Paragraph 3-4. Specific strategies for making family housing projects more sustainable are described in the MFH UFC 4-711-01, *Design: Family Housing* and the *Joint Service Sustainable Development Rating System* for family housing. The UFC and accompanying Rating System will be available from the Whole Building Design Guide web site, [www.wbdg.org](http://www.wbdg.org), once they are completed. A brief summary of these strategies follows.

#### 4-16.2 Recommended Strategies and Technologies

Sustainable development strategies for family housing are broken out into six categories: Site Elements, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality, and Innovation & Design Process. These categories correspond to the LEED criteria, but the strategies described in the UFC and the Rating System have been tailored to fit MFH construction.

#### 4-16.3 Rating System Elements

- Site Elements outlined in the UFC and Rating System encourage the design team to consider reuse of existing infrastructure, reduction of heat islands, planning for transportation linkages, site disruption and erosion control measures, Xeriscaping, design for appropriate solar access, and light pollution reduction.
- Water Efficiency elements consider native plant use, rainwater catchments, irrigation system design, on-site storm water recharge, and water conservation measures. Also see Paragraph 4-17.1, Water Conservation.
- Energy & Atmosphere elements address the building envelope design, HVAC and domestic hot water system design, and building electrical design and appliances. The Energy Star® program plays a key role; see Paragraph 4-19, Energy.
- Materials & Resources elements include waste management and recycling; optimum value engineering framing techniques; the use of recycled-content, bio-based, and locally produced materials; use of certified wood; and selection of materials that are durable and require less maintenance. Also see Paragraph 4-17.11, Recycled/Recyclable Materials.
- Indoor Environmental Quality elements describe material selection and HVAC design practices to eliminate toxins and provide effective ventilation. Also see Paragraph 4-17.2, Indoor Air and Environmental Quality.
- Innovation & Design Process elements offer extra Rating System credits for design teams that employ LEED certified design professionals, and/or include innovative design solutions that enhance the sustainability of the finished homes.

#### 4-16.4 Material Resources

Think carefully about all materials that will be used on the project and prudently examine trade-offs between initial cost and life-cycle costs. References for material selection include the Whole Building Design Guide, Building Materials section at <http://www.wbdg.org/design/index.php?cn=2.8.4&cx=0> and the NIST “Building for Environmental and Economic Sustainability (BEES)” software, <http://www.bfrl.nist.gov/oae/software/bees.html>.

## 4-17 ENVIRONMENTAL CONCERNS

### 4-17.1 Water Conservation

Employ as many strategies as possible to reduce the use of potable water for:

- Landscape watering, car washing or other exterior uses
- Sanitary waste removal
- Domestic water use

The average American family of four uses over 100,000 gallons of water per year just for domestic in-house water consumption. This translates roughly to 100 gallons per day per person.

- Consider the amount of water run each day through the hot water line to the kitchen sink, the dishwasher, the showers/tubs and the washer while the line is heating and cold (instead of hot) water is delivered at the tap. Consider the water saved vs. energy loss by looping the hot water line with an insulated sheath in conjunction with a small low-energy consuming pump. This is an extremely small expense (both initially and operationally) to realize an estimated 5 to 7% reduction in “in-house” water consumption (equivalent to 5,000 to 7,000 gallons/year).
- Consider use of a roof rainwater-harvesting scheme for **non-potable** uses.
- Specify low flow fixtures that work at the lower flow rates.
- Test water supply and determine if filtration, softeners, etc are needed to improve water quality for potable domestic uses.
- Consider use of gray-water for irrigation purposes to the extent permitted by USAF policy. See ETL 02-17, *Use of Non-Potable Water to Replace Potable Water*, located at <http://www.afcesa.af.mil/library/index.asp>.
- Develop strategies for innovative ground water recharge from water wastes.

### 4-17.2 Indoor Air and Environmental Quality

Employ practices that lend themselves to a Healthy Home and provide for resident comfort by controlling humidity and temperature and keeping indoor pollutant levels low. Healthy Home” standards have been established by the Healthy House Institute. They follow a three-part strategy: **eliminate, separate, and ventilate**. Materials that emit indoor pollutants or that can trap and re-emit pollutants and allergens are **eliminated**. Spaces that contain chemicals are **separated**. And homes are **ventilated** to provide fresh air without introducing excess moisture or pollutants.

Design for ventilation effectiveness and proper balance of fresh air supply either through mechanical means, natural ventilation, whole house fans, etc. Extreme caution must be

used to ensure the housing unit is designed to maintain indoor Relative Humidity below 60 percent. Review the MFH UFC 4-711-01, *Design: Family Housing* for a description of specific design actions that can be taken to improve indoor air quality.

#### 4-17.3 Operations and Maintenance

Develop a Residents' Manual highlighting the "green" features of the unit and include equipment maintenance suggestions, when to change filters, how to use the programmable thermostat, and suggestions for alternate, non-toxic cleaning or pest management products and techniques. See:

<http://www.epa.gov/opptintr/epp/cleaners/select/matrix.htm> and

<http://www.afcesa.af.mil/Directorate/CES/Mechanical/Pest/Pest.htm>

Provide for annual HERS rating check ups for the units and verify performance of equipment installed in the units.

#### 4-17.4 Mold Prevention

Mold has become a costly problem in Air Force facilities. Considerations for prevention of mold must start during facility design and be adhered to throughout construction. Humidity and moisture must be controlled to prevent mold growth in buildings.

##### Design Criteria

- Renovation and new construction designs must comply with ETL 04-3, *Design Criteria for Prevention of Mold in Air Force Facilities* located at <http://www.afcesa.af.mil/library/index.asp>.
- Building materials must be protected from conditions leading to mold growth not only during site storage but also during erection of a building structure.
- Proper site drainage and proper sealing of penetrations and intersections of walls, roofs, floors, and foundation walls to prevent water intrusion.
- Proper construction with an air/vapor retarder to prevent trapping of moisture within walls of a building structure.
- Rapid repair of any water leaks, as well as taking steps to dry wetted materials.
- Do not oversize air conditioning systems.
- Proper exhaust from areas of moisture generation (bath, kitchen, and laundry) to the building exterior.

#### 4-17.5 Asbestos

The Air Force is committed to minimizing and managing asbestos hazards in Family Housing. Asbestos refers to the group of silicate-based fibers that are found in some soils and rocks and have been frequently used for a number of applications relating to buildings. There are two basic varieties of asbestos-containing materials (ACM): non-

friable and friable. Non-friable ACMs contain asbestos fibers within a tightly held matrix of cement or similar binding material. The fibers remain in the matrix unless the ACM is broken, sanded, cut, or otherwise separated. By contrast, friable ACMs can easily release fibers if a relatively small force is applied. The inhalation or ingestion of asbestos fibers has been shown to increase the risk of several serious health problems, including lung cancer, asbestosis (scarring of the lung), and mesothelioma (cancer of the lung and stomach linings).

### Design Criteria

- Use Environmental Protection Agency (EPA) document EPA 560/5.83-624, *Guidelines for Controlling Asbestos-Containing Materials in Buildings*, for guidance on reducing asbestos contamination and on the use, handling, and removal of materials that contain asbestos.
- In existing housing, it is not mandatory that all asbestos be removed. In renovation projects, however, where some asbestos insulation must be removed in order to modify or replace piping in a system, remove all asbestos insulation in the system and replace it with an acceptable insulation. This policy applies also to other building materials containing friable asbestos. If the integrity of some of the ACM is infringed to the extent that exposure to residents will result, remove all of that ACM.
- For additional guidance, refer to the *Asbestos Handbook for Remodeling*, 1989, published by the National Association of Home Builders, Washington, DC.
- Allow asbestos inspection and assessment to be conducted only by trained specialists accredited under a program meeting the minimum requirements established by EPA as authorized under the EPA *Asbestos Hazardous Emergency Response Act (AHERA)*.
- Use only designers and contractors meeting the requirements of AHERA to plan, manage, and conduct asbestos abatement.

### 4-17.6 Lead-Based Paint

The integrated pollution prevention, minimization, and management program extends to lead-based paint (LBP) in Family Housing. Lead poisoning is traceable to several sources, one of which is LBP. While most lead poisoning results from ingestion of lead dust, some instances are due to the ingestion of paint chips, especially by small children. Ingestion of lead has been linked to various health problems, including developmental problems, loss of intelligence, short-term memory loss, kidney failure, and in some cases, death. Risks are considerably higher for children than for adults.

### Design Criteria

- Do not use or specify paint containing more than 0.06% lead by weight (calculated as lead metal). Test existing lead paint for the above criteria and conduct abatement in accordance with HUD guidelines.

- Identify and evaluate potential LBP hazards in accordance with Air Force Policy and *Guidance on Lead-Based Paint in Facilities*, issued 24 May 1993.
- Follow the procedures for locating LBP as described in U.S. Department of Housing and Urban Development, Lead-Based Paint; *Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing*, April 18, 1990. Note, however, that the number of units and locations within units to be tested under the guidance of the HUD document were developed solely to provide a high degree of confidence that all units would be lead-free if all test results did not detect lead-based paint.
- Determine the required level of testing (number of units and locations) based on the likelihood that LBP will be found (review as-built drawings and specifications). If LBP presence is strongly suspected, but its locations are not known, request a higher level of testing.
- Inspection requires specialized procedures to determine if a hazard exists. Lead paint detection can be done on site with an X-ray fluorescence (XRF) spectrum analyzer or in a laboratory using atomic absorption spectroscopic or other techniques approved by ASTM or other recognized testing authority. Paint with lead levels of 1.0 milligram/square centimeter (cm<sup>2</sup>) when using the XRF or 0.5 percent by weight when using atomic absorption spectroscopic analysis is considered hazardous.
- In-place management of LBP by interim methods may reduce the LBP hazard to acceptable levels. In-place management procedures include monitoring the condition of painted surfaces; reducing or eliminating dust by washing with high phosphate detergent or top coating with latex paint or wall coverings; repairing deterioration with latex paint; and by performing cleanup activities, such as high-efficiency particle air vacuuming, disposing of contaminated carpeting, and decontaminating upholstered furniture to the extent possible.
- When in-place management does not reduce the risk of hazardous LBP exposure to an acceptable level, perform abatement. Abatement or long-term and permanent measures include eliminating the hazardous exposure by replacing building components (doors, cabinets, molding, etc.), encapsulating with drywall or siding, and removing it in accordance with the HUD guidelines mentioned above. Abatement may be applied throughout a unit or in selected areas only.
- Abatement procedures normally include covering, encapsulating, or removing the hazard. Abatement, clean up, worker protection, and any necessary follow-up testing should always be performed by qualified personnel.
- Family Housing facilities occupied by children under age seven are high-priority facilities for identifying, evaluating, controlling, and eliminating LBP hazards.
- To assist in the costing of abatement, refer to the latest edition of the *Lead-Based Paint Cost Estimating Guide for Military Family Housing and Child Care Facilities*, prepared for Headquarters Civil Engineering Support Agency (HQ AFCESA).

#### 4-17.7 Lead Contamination of Drinking Water

The quality of domestic potable water must comply with Public Law 95-190, *Safe Drinking Water Act*. In addition to paint, another potential source of lead poisoning is concentrations of the metal in drinking water. Normally, lead can enter the water supply at three points: the source of the supply (e.g., groundwater, reservoirs, and rivers), the distribution system from the source to homes, and the plumbing in a home. Lead found in domestic potable water requires immediate attention, since, according to a 1986 EPA study, the lead in drinking water is absorbed in the body at higher rates than lead from food or other sources.

##### Design Criteria

- For guidance with respect to Air Force Family Housing, refer to Air Force Instruction (AFI) 32-1067, *Water Systems*.
- For testing purposes, refer to Environmental Protection Agency 40 CFR Parts 141 and 142, *Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper; Proposed Rule*; 18 August 1988 for criteria for determining lead contamination of potable water.
- For additional information, refer to *The Nature and Extent of Lead Poisoning in Children in the United States: A Report to Congress*, July 1988, U.S. Department of Health and Human Services, Public Health Service.
- Check with the local and state authorities to determine the current threshold limit of water lead contamination before conducting an inspection. Currently, authorities in some parts of the country are investigating a reduced maximum contaminant level for lead to as low as 5 micrograms per liter ( $\mu\text{g/l}$ ).
- Check water lead contamination inspection records. In a section where a potential problem is indicated, draw water samples.
- If the source of lead contamination is on base (e.g., distribution system, housing unit pipes, etc.) take immediate steps to eliminate the source of contamination.
- Take water samples from domestic water faucets, building water service connections, and neighborhood water mains at or near connections to the next upstream level of the water supply. Take two samples from each source. The first sample should be a first draw sample, take the second sample after 5 minutes of flushing the system. Expect the first sample to have more lead due to the potential for standing water in pipes to become contaminated.
- In cases where the first sample shows water lead levels of more than the current threshold limit of water lead contamination, but flushed samples are under the threshold, still plan action to reduce the lead concentration. Introduce a corrosion inhibitor (e.g., silicate- or phosphate-based compounds) that will coat

the piping interior, sequester various chemical elements, or neutralize the water's aggressiveness.

- When the flushed sample is higher than the current threshold limit, consider major repair or replacement. Repair may require the re-soldering of all pipe joints or the insertion of pipe coating material in specific home and/or neighborhood main(s). Replacement might range from replacing the service line to the neighborhood main, to the more costly alternative of replacing of water piping and fixtures within the house.
- Consult an engineering firm that specializes in the identification of lead contaminants and the engineering of solutions. Obtain a written report of conditions supplemented by specific recommendations to alleviate the problems.

#### 4-17.8 Radon

Air Force policy is to eliminate the hazards of radon, a naturally occurring radioactive gas that is present in varying degrees in many soils. This gas is released into buildings, especially basements and crawl spaces. Estimates put exposure to elevated radon levels as second only to cigarette smoke as a leading contributor to lung cancer.

##### Design Criteria

- Establish and conduct a radon-testing program on base.
- In regions with known concentrations of radon, ensure that foundation walls and slabs are properly designed to mitigate or eliminate seepage of radon into the structure.
- In new and existing structures, provide methods to adequately ventilate the entire structure to increase the number of air changes (replacement of the unit's air volume) per day.
- Consult the following for additional guidance:
  - Department of the Army Publication: AR 200-1, Chapter 11, *Army Radon Reduction Program*
  - EPA 520/11-87-20, *Radon Reference Manual*
  - EPA 600/8-88-087, *Radon-Resistant Residential New Construction*
  - EPA 625/5-87/019, *Radon Reduction Techniques for Detached Houses*
  - EPA 625/5-88/024, *Application of Radon Reduction Methods*
  - EPA 86-004, *Citizens' Guide to Radon*, 1986, U.S. Environmental Protection Agency, Office of Air and Radiation, Washington, DC

- EPA 520/1-90-017, *The National Radon Contractor Proficiency Program*, July 1990, U.S. Environmental Protection Agency, Office of Radiation Programs, Washington, DC
- EPA 520/1-90-001, *National Radon Measurement Proficiency Program, Cumulative Proficiency Report*, January 1990, U.S. Environmental Protection Agency, Office of Radiation Programs, Washington, DC
- *Indoor Radon and Radon Decay Product Measurement Protocols*, U.S. Environmental Protection Agency, Office of Radiation Programs, Las Vegas Facility, Las Vegas, NV
- *EPA Model Standards and Techniques for Control of Radon in New Residential Buildings*

#### **4-17.9 Ozone Depleting Substances**

The Air Force policy on Ozone Depleting Substances (ODS), is presented in AFI 32-7080, *Pollution Prevention Program* and AFI 32-7086, *Hazardous Material Management*, set a target for halting purchase of equipment using Class II ODSs, hydrochlorofluorocarbons (HCFCs). The *Clean Air Act Amendment* of 1990 requires recycling and recovery of ODS materials enabling possible reuse and preventing discharge to the atmosphere.

#### **Design Criteria**

- Specify refrigerators and air conditioning systems that use HFC refrigerants.
- During renovation projects, ensure that refrigerants are recovered from HVAC units and refrigerators being replaced.
- Prevent atmospheric discharges by requiring conservation measures, such as recovery, recycling during servicing and repair of air conditioning and refrigeration equipment.

#### **4-17.10 Termiticides**

Termite infestation, although present throughout the U.S., tends to occur more severely in warmer climates. If termite infestation occurs, it is usually found in wood members in close proximity to the ground. There are several methods to retard termite infestation; the most common method is the use of chemicals in the ground around and below the foundation wall. However, using chemicals is a reactive response. The damage may have already been done.

Where chemical treatment is determined to be warranted, supervised application of Termidor for exterior below grade applications is effective. If application is determined warranted, application must be in strict compliance with suppliers' directions and the guidance and overview of the Base Pest Control authorities.

The most common entry point to a living unit is from beneath the utility wall of the laundry. Moisture inside a dampened wall cavity such as the one housing the washer drain will negate any 18-inch limit to their ability to manufacture the essential mud tunnel. Ensure an adequate seal is provided to all plumbing penetration from subsoil.

### Design Criteria

- Pre-treat with “Termidor” in all locations.
- Ensure the likelihood of infestation is considered during new and renovation projects. Select the best method of prevention based on local conditions.
- Be proactive by using methods to inhibit infestation before the problem begins.
- Use pressure-treated wood in all cases where wood structural members are either less than 18 inches above grade or are accessible by termites from grade.
- The Uniform Building Code requires a minimum clearance of 18 inches between the bottom of unprotected floor joists (12 inches for girders) and the ground.
- Ensure adequate ventilation of and positive drainage in crawl spaces.
- Do not locate heating and cooling ducts in or under slabs on grade in all geographic areas that are subject to termite infestation.
- In revitalization projects, replace all HVAC ducts in or below the floor slab with an above-the-floor system.

#### 4-17.11 Recycled/Recyclable Materials

It is the Air Force’s goal to use existing natural resources as efficiently as possible, as well as to minimize and, ideally, eliminate negative impacts on the local environment. Recycling is an important element of that goal, not only in providing family housing but also as part of the everyday lives of Air Force members.

Family housing units should be designed with installation recycling programs in mind, to maximize ease of use and resident participation in the program. Also, EPA Guidelines for the use of certain products containing recycled material are a legal requirement and must be followed. These products currently include building insulation, interior latex paint, and concrete containing fly ash, polyester carpet, and several other products commonly used in housing construction. When specifying any of the items on the EPA’s list, Air Force projects must require these products to meet the recycled content requirements found at [www.epa.gov/cpg/products.htm](http://www.epa.gov/cpg/products.htm) unless the product fails to meet technical specifications, is not cost effective, or is not available competitively in a timely manner. For more information refer to ETL 00-1 and to Air Force guidance on the AFCEE web site: <http://www.afcee.brooks.af.mil/eq/programs/progpage.asp?PID=1>.

## Design Criteria

- At a minimum, use the following designated items, which in Air Force civil engineer specifications contain recycled and/or recovered material: concrete and cement containing fly ash, latex paint, structural fiberboard, lawn and garden edging, landscaping timbers, mulch and compost, playground surfaces and equipment, and building insulation. If using polyester carpet, ensure it contains recycled plastics. See ETL's 03-3 and 00-1. Other types of carpet and several other products are in the process of being added to the EPA designated product list, so check <http://www.epa.gov/cpg/products.htm> for the current list.
- Do not vary from this policy unless the material does not meet appropriate performance standards, is not available competitively within a reasonable time frame, or is only available at an unreasonable price.
- Look for opportunities to maximize the use of products containing recycled/recovered material in every new project. Future guideline items will be included in civil engineer specifications as they are designated by the EPA.

## 4-18 FIRE/LIFE SAFETY

Ensuring that projects meet applicable industry standards and codes is the primary responsibility of design, engineering, and construction professionals. However, it is important that Air Force project managers understand the importance of these codes and standards.

By adopting model and local building codes, the Air Force is endeavoring to safeguard life and property by controlling the design, construction, and quality of materials used in Family Housing. Safety requirements specific to systems are discussed under their respective headings (e.g., Electrical/Plumbing/ Mechanical, etc.) and in referenced documents in the appendices. This section is meant to complement those sections and to look at life safety issues holistically with respect to a housing unit.

Although the Air Force wants to conform to community building standards, in some cases, Air Force neighborhoods may lie outside the jurisdiction of any local code. In this case, a model code used within the region should be applied. In the event of a conflict between local or model codes and this Guide, use the most restrictive code.

## Design Criteria

- Use the International Residential Code as the model code for Family Housing. This code standardizes the requirements for Family Housing by using a compilation of data from national model codes listed hereafter. There are, however, construction materials and practices other than those listed in the IRC code that are adequate for the purposes intended or that apply to the region typically served by other national/model codes. These include:
  - *Building Construction and Safety Code*, NFPA 5000
  - *Life Safety Code*, NFPA 101
  - *National Electrical Code*, National Fire Protection Association (NFPA 70)

- Use the flame spread (FS) and smoke developed (SD) ratings shown in Table 4-42 or as called for by the locally accepted building code. Also, refer to the values listed in UFC 3-600-1, when tested in accordance with ASTM Test E-84.

**Table 4-42: Maximum FS and SD Ratings**

Location	FS	SD
Floor, wall, and ceiling finishes	Per NFPA 101	
Exit enclosures (apartment buildings)	25	50
Other spaces, not sprinklered	75	100
Other spaces, sprinklered	200	200
Thermal and acoustical insulation exposed	25	50
Within wall assemblies	100	NONE
Totally Enclosed per UFC 3-600-1	NONE	NONE

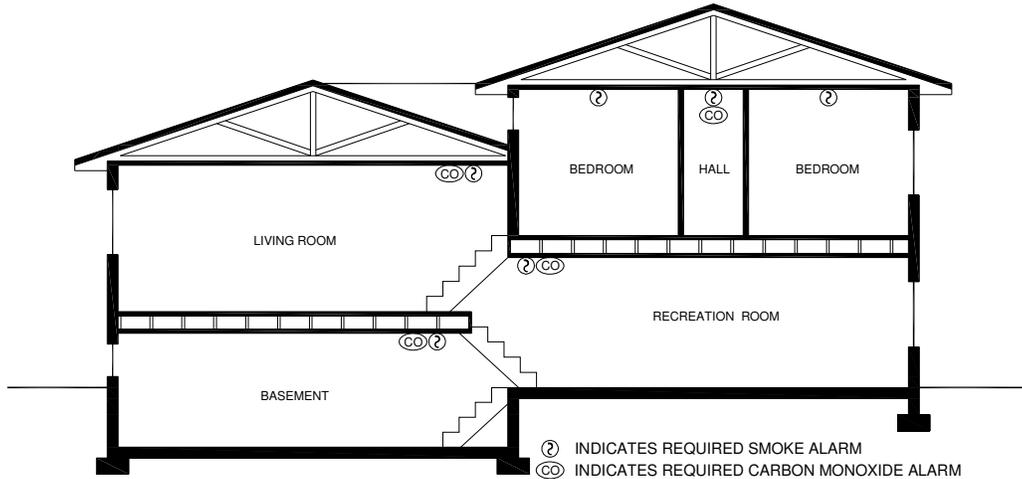
- In renovation projects, use the opportunity of project planning to review existing floor plans, construction, and systems for ways to bring existing conditions up to current life safety standards.
- Provide smoke and carbon monoxide alarms in accordance with Paragraph 4-18.1 of this document.
- Provide automatic residential sprinkler systems in accordance with Paragraph 4-18.2 of this document.
- In new projects, do not use kitchen range hood extinguishers (some existing devices may be left in place). Remove immediately all low-cost, throwaway kitchen range fire protection devices located over gas ranges. Leave these fire protection devices in place over electric ranges until their service life expires. Do not remove kitchen range fire protection devices installed on projects that were awarded prior to 30 Sep 93 until the housing unit is sprinklered or until the kitchen range fire protection device has reached the end of its service life.

#### 4-18.1 Smoke Alarms and Carbon Monoxide Alarms

The installation of smoke alarms and carbon monoxide alarms are an essential step in ensuring resident safety. Public Law 102-522, *Fire Administration Authorization Act of 1992*, requires the installation of hard-wired smoke alarms in all housing units in accordance with NFPA 72. All branch circuits that supply power to bedroom outlets including smoke alarms shall be protected by an arc-fault circuit interrupter (AFCI) that is listed to provide protection for the entire branch circuit. Fire alarm devices shall NOT be connected to a ground-fault circuit interrupter (GFCI) per the NEC. In houses with fireplaces, fossil fuel burning systems, or attached garages, carbon monoxide alarms are required.

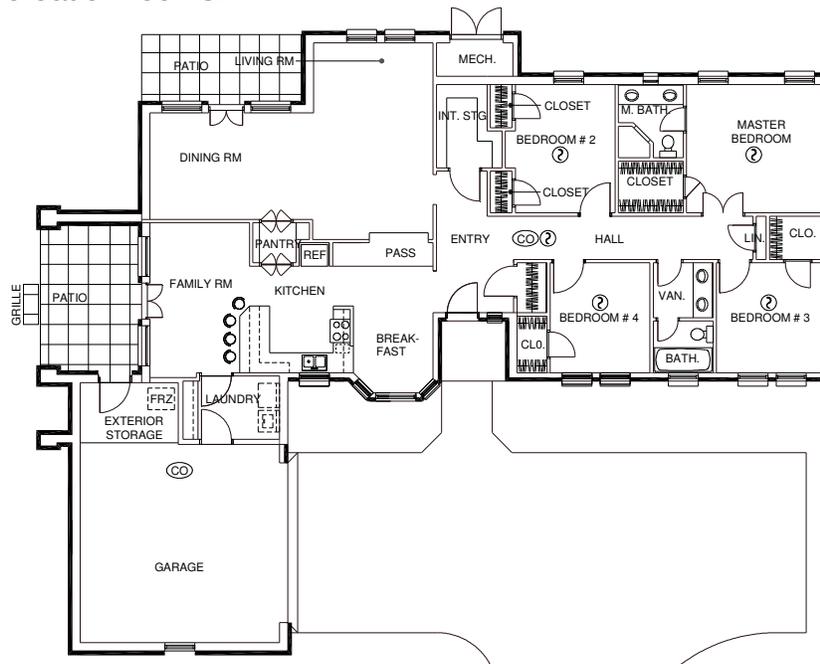
It is important that these devices not be an afterthought; they should be an integral part of Family Housing projects. It is the Air Force project manager's responsibility to ensure this happens.

**Figure 4-9: Smoke Alarm and Carbon Monoxide Alarm Locations in Family Housing**



Split-level arrangement: Smoke and carbon monoxide alarms are required where shown. Note that smoke alarms are required in each bedroom.

\* Smoke and carbon monoxide alarms are required only if a door is provided between living and recreation rooms.



In Family Housing with more than one sleeping area, smoke and carbon monoxide alarms are required to protect each sleeping area. Smoke alarms are required in each bedroom.

Note: In existing housing, smoke and carbon monoxide alarms are required as illustrated, but the smoke alarms located in bedrooms may be battery operated until a Whole House Improvement project is undertaken.

### Design Criteria (Smoke Alarm)

- Provide smoke alarms that are connected directly to an un-switched electrical circuit in the living unit (i.e., “hard-wired”). In accordance with Public Law 102-522 and NFPA 72 battery back up is required.
- EXCEPTION FOR EXISTING HOUSING: Hardwired smoke alarms are required as illustrated in Figure 4-9, but the alarms located in bedrooms may be battery operated until a Whole House Improvement project is undertaken.
- Provide smoke alarms so that all sleeping areas/bedrooms are protected as illustrated in Figure 4-9.
- Install smoke alarms on each additional story of the housing unit, including basements, but not in crawl spaces and unfinished attics. In split-level units, provide smoke alarms in the lower level only if it can be closed off from the upper level by a doorway.
- In new construction and whole house renovations, wire multiple station smoke alarms so that operation of any one smoke alarm will sound the alarm in all smoke alarms.
- Provide an audible-visible alarm device in addition to the required hard-wired smoke alarms where there is a vision- or hearing-impaired resident.
- Review and comply with the most recent edition of NFPA 72, *National Fire Alarm Code*.

### Design Criteria (Carbon Monoxide Alarm)

- Provide carbon monoxide alarms in all Air Force owned and leased housing units, with natural gas, oil, or liquefied petroleum gas (LPG) fired systems such as furnaces, gas water heaters, ranges, clothes dryers, or fireplaces.
- One carbon monoxide alarm is recommended per housing unit near each sleeping area. Install one carbon monoxide alarm per floor in multi-story units.
- Provide hard-wired multiple station carbon monoxide alarms during new construction and major renovation projects. Permanent hard-wired alarms with battery back up and a detection element service life of not less than 5 years shall be used. Consider installing hard-wired combination multiple station smoke and carbon monoxide alarms when feasible.
- As an interim measure, use direct plug-in alarms with battery back up and a five-year warranty.
- Alarms shall be listed by Underwriters Laboratory to the UL Standard 2034, *Single and Multiple Station Carbon Monoxide Detectors*, latest edition. Alarms manufactured and listed in the 1992 and 1996 editions shall not be used.

- When installing or issuing alarms, residents should be given copies of manufacturer's instructions regarding operation, installation recommendations, and proper maintenance of the alarms.
- The presence of carbon monoxide alarms does not ensure the absence of carbon monoxide. Carbon monoxide alarms are not an alternative for a well-managed maintenance program of fuel burning appliances, nor are they interim measures to the immediate repair or replacement of defective appliance. Routine maintenance checks must be performed annually, typically at the beginning of the heating season.
- Installation shall ensure routine appliance inspections are accomplished in accordance with NFPA Standard 54, *National Fuel Gas Code*, Appendix H, recommended Procedure for Safety Inspection. Fireplaces should also be checked to ensure safe operation.

#### 4-18.2 Sprinkler Protection

Due to the speed with which residential fires can spread and the severity of the damage caused by fire, fire sprinkler systems have become more common in residential applications and have been mandated by building code in multi-family housing. Sprinkler systems activate before room temperatures and smoke/toxic gases reach critical levels thus allowing residents to escape. Public Law 102-522 requires sprinkler protection in Family Housing units having three or more residential units under one roof.

##### Design Criteria

Provide sprinkler protection (in accordance with UFC 3-600-01 and National Fire Protection Association (NFPA) Standards 13, 13D, or 13R for Family Housing units having three or more residential units under one roof as follows:

- New Multi-Family Housing: In accordance with the Fire Safety Act and NFPA 101, *Life Safety Code*, provide sprinkler protection in accordance with NFPA 13 or NFPA 13R in all garden style apartments, townhouse style apartment units (Alternatives 1 and 2), and attached duplex multi-family dwellings. For multi-family dwellings greater than 4 stories in height, provide sprinkler protection in accordance with NFPA 13. For attached duplex multi-family dwellings, sprinkler protection can be provided in accordance with NFPA 13D.
  - Garden Style Apartments: Garden style apartments are multi-story structures having separate dwelling entrances at various elevations and having minimum one-hour fire resistive partitions between adjacent units. In addition, the floor/ceiling assemblies between units have a minimum fire resistance rating of one-hour.
  - Townhouse Style Apartment Units (Alternative 1): Townhouse style apartment units consist of three or more attached dwelling units having separate dwelling entrances with the dwelling units separated by one-hour fire resistive partitions.

- Townhouse Style Apartment Units (Alternative 2): Townhouse style apartment units consist of three or more attached dwelling units having separate dwelling entrances with the dwelling units alternating one-hour and two-hour fire resistive partitions between dwelling units in the building.
- Attached Duplexes: Attached duplexes are multi-family housing units, having separate dwelling entrances with the dwelling units alternating one-hour fire resistive partitions and two-hour firewall (such walls are designed and constructed to maintain its structural integrity independent of the unit on the opposite side of the wall) between units in the building.
- New Townhouse, Duplex and Single Family Housing: Sprinkler protection is not required for townhouse (attached single-family dwellings), duplex, and single family detached family housing.
  - Townhouse (Attached Single-Family Dwellings): Townhouses consist of three or more attached dwelling units having separate dwelling entrances, with the dwelling units separated by two-hour firewalls. The firewalls are designed and constructed to maintain its structural integrity independent of the unit on the opposite side of the wall.
  - Duplex: A duplex is a stand-alone structure that contains only two (2) dwelling units that are separated by one-hour fire resistive construction.
  - Single-Family Detached House: A single-family detached house is a stand-alone structure that contains one dwelling unit for a single family.
- Existing Multi-Family Housing: In accordance with Office of Under Secretary of Defense memorandum dated 14 January 2002, all windows in existing housing must comply with NFPA 101 as a secondary means of escape by 2007, unless a waiver is obtained from HQ AFCESA/CES.
- Projects That Exceed 50% of the Replacement Cost, refer to UFC 3-600-01 Paragraph 6-2.3.1.2: Ensure that a minimum of 1-hour fire resistive construction is provided between dwelling units, and between the dwelling unit and attached parking. Provide sprinkler protection in accordance with the above requirements.
- Projects That are Less Than 50% of the Replacement Cost. Provide hard-wired smoke alarms in the hallway between the bedroom areas and the rest of the dwelling unit, and on each additional story of the family living unit, including the basement. The smoke alarms should be interconnected so that when one goes into alarm, they all will go into alarm. The smoke alarms must comply with the requirements of NFPA 72 and NFPA 101.
- Minor Improvement and Repair Projects: For minor improvement and repair projects, depending on the scope of the project, sprinkler protection would be considered for installation. For projects that are cutting into a third of the walls, sprinkler protection can be provided with minimal cost impact to the project.

- Kitchen Range Hood Extinguishing Systems: Kitchen range hood extinguishing systems are not required and are not authorized in new, revitalized or existing housing.
- Continuity: The common fire wall or fire resistive partition for townhouses, duplexes, attached duplexes, or townhouse style apartments must be continuous from the foundation to the underside of the roof deck and must extend the full length of the common wall. The roof sheathing, for not less than a 1220 mm (4 feet) width on each side of the wall, must be of noncombustible material, fire retardant treated wood, or one layer of 5/8-inch Type X gypsum wallboard attached to the underside of the roof decking. Parapets are prohibited.
- Off-Base Housing Requirements: Family housing located outside military installations or bases must comply with the above requirements, and must comply with applicable local fire and building codes when the local fire department has “first due” responsibility.
- Overseas Housing Requirements: Overseas family housing, constructed or leased-constructed, must comply with the above requirements and the host nation fire protection requirements or NFPA 101 whichever is more stringent.

Ensure that a mechanical engineer reviews drawings and specifications to ensure that adequate water supplies and pressures are available for new fire sprinkler systems.

#### **4-19 ENERGY**

The Air Force policy is to maximize energy conservation by improving energy efficiency and maximizing the use of renewable forms of energy in all projects to the maximum extent practicable. Additionally, Congress has mandated the use of solar systems, to the extent that they are economically feasible.

The objective is to minimize the use of petroleum-based fuel by switching to a less polluting and non-petroleum-based energy source, such as natural gas, solar, or other renewable energy source. Where alternative fuels are not practical or cost effective, strive to improve the efficiency with which petroleum products are used.

#### **Design Criteria**

Design all units to meet the **US EPA Energy Star Home Program** and provide allowance for pre-occupancy testing by a certified Home Energy Rating System. HERS Rater Energy Star Homes are typically new construction that generally use 30% less energy for heating, cooling and water heating than those built to the Model Energy Code. The Energy Star Home typically has the following features:

- Improved insulation
- Advanced windows (and appropriate orientation, shading)
- Tightly sealed ducts

- High efficiency heating and cooling systems
- Reduced air infiltration
- High efficiency lighting

Source: Energy Star web site, [www.energystar.gov](http://www.energystar.gov) - refer to “Home Improvement” and “Products” sections of the site. Energy Star Homes use less energy and lower pollution, generate less green house gas emissions and are generally more comfortable and affordable to operate.

- Conduct an energy analysis or energy model for three typical units on each site and use the results to “test” alternative strategies.
- Design to use Renewable Energy where possible - wind energy, passive solar, solar domestic hot water or space heating, photovoltaic (PV), or ground source heat pumps.
- Carefully design the building envelope to meet the Energy Star requirements and carefully orient the units on the site to maximize “freebies” derived from the local climate.
- Design appropriate infiltration barriers (e.g., sealants, vapor barriers, etc.) in exterior walls to minimize infiltration.
- “Right-size” the mechanical equipment to use smaller sized equipment that runs the most efficiently; DO NOT OVERSIZE equipment.
- Executive Order (EO) 13123 mandates all appliances and energy consuming equipment such as furnaces, air conditioning systems, refrigerators, ranges, dishwashers, hot water heaters, trash compactors, etc. have an Energy Star rating or be within the top 25% for energy efficiency for that product.
- Design and install energy efficient lighting and put all exterior lights on motion or (preferably) solar sensors. Consider the energy efficiency and quality of lighting. The use of fluorescent fixtures with high-efficiency electronic ballasts and lamps for interiors is preferred. Practically speaking, an average fluorescent bulb with a higher initial cost and fixture will provide a given level of lighting at about one-fifth the cost and 10 to 20 times the life of a conventional incandescent bulb and fixture. Use high-intensity discharge (HID) lamps (pulse start metal halide, and high-pressure sodium) and low-pressure sodium lamps for outdoor lighting in areas such as parking lots and community areas. In outdoor areas, evaluate lighting fixtures for energy efficiency while keeping in mind that the quality of lighting is also important.
- Consider strategies to enhance comfort while using less energy such as installation of ceiling fans in all living areas.

- Consider stacking utility services and locating mechanical equipment to maximize efficiency, shade or protect exterior equipment and leave room for air circulation. Install HVAC ducts within the conditioned envelope of the unit.
- Conduct a pre-occupancy evaluation and HERS Rating for anticipated energy performance and then conduct random monitoring of units over the next 3 years to evaluate energy performance.
- Provide master metering to provide accurate future energy use data for conservation programs.
- Provide air-lock entries at exterior doors in areas with winter design temperatures (97.5 percent) of -10° F (-23° C) or less.
- Design Landscaping to plant and use deciduous trees in strategic locations to reduce cooling loads in the summer and allow solar gains in the winter. Consider landscaping as a means of blocking winds and increasing energy conservation.
- Design to use building orientation and setting, when building new, to capitalize on passive heating and cooling.

NOTE: The US HUD department has developed a set of technologies appropriate to low-rise residential design and construction through their PATH (Partnership for Advancing Technology in Housing) program. See <http://www.huduser.org/publications/pdf/guidetoserv.pdf>.

### **Energy Star Labeled Home**

The Contractor shall provide certification that all homes constructed in Air Force projects are Energy Star Labeled Homes. The Contractor shall provide groups of not more than seven homes for post-construction inspection. Contractor provided HERS inspector should select one home per group for blower door and duct blast testing.

However, if the test home fails, the Contractor shall make necessary repairs to allow home to pass and the remaining homes in the group shall also be tested, with the Contractor responsible for whatever repairs are necessary to allow each home to pass inspection.

#### **4-19.1 Building Commissioning**

The same housing units that are tested for Energy Star Labeled Home performance shall also be commissioned to ensure building systems function as proposed and specified. Repairs or adjustments made in test homes shall also be made in the remaining homes in each group. At a minimum, commissioning shall include:

- Test for proper combustion supply air and exhaust of all combustion equipment under all operating conditions.
- Test and adjust all combustion equipment to minimize carbon monoxide output.

- Test heating and air conditioning system(s) to ensure the systems and controls function to maintain design intent and comfort conditions.
- Test smoke and carbon monoxide alarms to ensure proper operation.
- Test electrical grounding system, including ground fault protection, to ensure proper grounding protection.
- Ensure Operating and Maintenance documentation intended for housing occupants is complete for building envelope and systems.

Ensure Operating and Maintenance documentation is complete for building shell and systems.

#### **4-20 HISTORIC/CULTURAL RESOURCES**

*The National Historic Preservation Act of 1966, AFI 32-7065, Cultural Resources Management,* and subsequent executive orders require the Air Force to take into account the consequences of their actions on historic housing facilities that are listed on or are eligible for listing on the National Register of Historic Places. Responsibility for the majority of Air Force preservation duties falls to each installation. All work planned for historically significant quarters must be coordinated with the State Historic Preservation Office (SHPO) and other local officials.

Also, historic or potentially historic dwellings are not exempt from current building codes and life safety requirements. They must be addressed in addition to compliance with historic structure guidelines.

##### **Design Criteria**

- Inventory and document significant or noteworthy historical housing and settings within the installation.
- When historic units need repair or improvement, always coordinate with the SHPO.
- Avoid alterations that detract from the design integrity of historic housing and their settings, such as inappropriate building modifications and intrusions of incompatible uses, buildings, or structures.
- When altering a historic house, make a reasonable effort to retain, uncover, and/or restore as much of the original materials, details, and design character of the building as is feasible.
- When introducing new parts or mixing old with new elements on the building exterior, preserve the original design character by obtaining competent professional design assistance.

- Avoid imitative designs when introducing new buildings within the setting of historic buildings. Encourage designs that are compatible with the old in their scale, form, and use of materials.
- Repair rather than replace deteriorated architectural features wherever possible.
- Ensure that the surface cleaning of structures is undertaken with the gentlest means possible.
- Whenever possible, complete new additions or alterations to historic houses in such a manner that if such addition or alteration were to be removed in the future, the essential form and integrity of the structure would remain intact.
- Consider using a landscape architect to preserve and protect landscape plantings of historic value.
- Provide fire/smoke detection, fire sprinklering, and life safety/means of egress measures per current codes (reference Paragraphs 4.18.1 and 4.18.2).
- Design adequate fire and life safety into existing structures without sacrificing historic integrity. See NFPA 909, *Code for the Protection of Cultural Resources*, and NFPA 914, *Code for the Protection of Historic Structures*.
- Protect and preserve archeological resources affected by, or adjacent to, any historic dwellings.
- Contact the National Historic Trust in Washington, DC for detailed guidance on conducting historic facility documentation as well as for the varying requirements between structures with historic significance and structures actually on the National Register of Historic Places.

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## CHAPTER 5 HOUSING PROJECT MANAGEMENT

### 5-1 PURPOSE

This chapter outlines the process of providing FH by focusing on the two broad categories of Design Management (Paragraph 5-2) and Construction Management (Paragraph 5-5). Paragraph 5-3, Alternate Delivery Methods; Design-Build, Design-Build Plus and Turnkey, outlines methods that consolidate the traditional design and construction process. Paragraph 5-4, Alternate Delivery Methods; Privatized Family Housing, concentrates on the specialized procedures associated with a privatized family housing project. Paragraph 5-6, The Post-Construction Process, discusses the post construction process and how the Air Force takes control of the new housing units.

This chapter provides an overview of the process based on the conventional Design-Bid-Build method. Alternate methods are addressed in Paragraphs 5-3 and 5-4. An important supplement and companion to this chapter is the *U.S. Air Force Project Manager's Guide to Design and Construction*, which outlines the project design and management process in detail.

### 5-2 DESIGN MANAGEMENT

#### 5-2.1 The Design Process

In order to end up with a successful project that provides quality housing for Air Force members, numerous representatives from the base, major command (MAJCOM), Headquarters Air Force (AF/ILE) and other outside agencies must work together. Responsibilities for the management of the design are divided between numerous representatives. The primary representatives include (also see Appendix A):

- Project Programmer: The project programmer is responsible for the particular project at the base, MAJCOM and AF/ILE level.
- Design Manager (DM): The DM is responsible for ensuring that design execution meets critical milestones. Although the DM is normally the MAJCOM, this function could be performed by another group, such as the Air Force Center for Environmental Excellence (AFCEE).
- Design Agent (DA): The DA is responsible for the execution of the design of the project. Although the DA is normally the Base Civil Engineer, this function could be performed by another group, such as AFCEE.
- Project Manager (PM): The person ultimately responsible to AF/ILE for ensuring that the Air Force achieves its goals and objectives on a project. The Project Manager could be from MAJCOM, AFCEE or base. The PM is usually an engineer or architect.

The construction manager (CM), construction agent (CA) and contracting officer (CO) will be discussed in Paragraph 5-5.

The Design Instruction (DI) as issued by AF/ILEH is based on the scope (number of units and grade/bedroom mix) and costs identified in the approved DD Form 1391 as developed from the approved HCP as outlined in Paragraph 2-3.6. Project must be designed in accordance with AF/ILEH DI.

In the sequence of events in FH design, a determination is made whether to use in-house design resources or the use of an A-E design services contract for all or a portion of the program. Since the execution goal is MAJCOM's responsibility, the final decision to execute in-house or through an A-E design services contract lies at the MAJCOM level. Some DAs elect to prepare a portion or all of their design program with in-house personnel. This is the DA's decision, but it should be based on the in-house staff expertise and workload. This allows their technical personnel to stay in better contact with current criteria, codes, materials, etc. Using in-house staff usually will allow design to start much sooner than when using an A-E firm, because the time required for public notice, A-E selection, audit and negotiation is saved. However, the overall design time is normally longer. If a DA or the base will act as execution manager, then a Field DI is issued based on the AF/ILEH DI to authorize the start of the design process (A-E selection, etc.). Any deviations to the scope (number of units and grade/bedroom mix) and PA as identified in the AF/ILEH approved DD Form 1391 must be approved by AF/ILEH **prior** to start of design.

After receiving funds from Congress through OSD, AF/ILEH normally issues design funds (P-714) up front so that MAJCOM's can budget their program priorities.

Design funds are tracked at the Air Staff by MAJCOM and year-of-funds appropriation only.

- Funds are initially issued against a Budget Authorization Account Number (BAAN). For example, 03-078 denotes FY03 design funds for family housing projects at HQ/ACC.
- This BAAN usage provides the MAJCOM's with greater flexibility in designing their FH construction and improvement programs.

MAJCOM's must carefully track FH design funds for any potential audits and to justify future requests.

In most cases, an A-E firm is used for the design. A project design announcement is placed in the FedBizOpps/Commerce Business Daily (FBO/CBD) or other appropriate medium as determined by the CO. A 30-day period is allowed for response to the project announcement. Exceptions to this requirement are discussed in the *Federal Acquisition Regulation* (FAR) but generally include services with fees under \$100,000, work orders on indefinite quantity/delivery (Open-End) contracts, small business (8a) contracts and certain emergency projects. The announcement provides a synopsis of the project, special qualifications, delivery method, expertise and special requirements needed of the designer, selection criteria and specific submittal requirements. Firms desiring to be considered must respond to the announcement on or before the closing date. The DA establishes formally constituted A-E preselection and final selection boards. The boards should be made up of licensed, experienced design professionals.

The DA should provide the shortest realistic design schedule possible within 30 days of receipt of the Field DI. The MAJCOM's DM should develop a preliminary design schedule within 10 days of issuing the Field DI for initial input into the Automated Civil Engineer System – Project Management (ACES-PM) system. This schedule will be used to evaluate the DA schedule. The ACES-PM will be revised as necessary, after the DA schedule has been accepted.

In the process of selecting a designer, there are specific protocols and procedures associated with audits, negotiations and funding (see AFI 32-1023, *Design and Construction Standards and Execution of Facility Construction Projects*). The contents of the scope of work and methods of quality assurance are also considered in the design contract phase. Design fees are limited to 6% of construction cost. Design fees exceeding \$1,000,000 per contract require prior notification to Congress. The A-E proposes fees based on guidance from a predefinition conference held at this stage of the process.

A-E firms that are selected to design FH projects must be knowledgeable and experienced in residential design and construction practices and in cost estimating that is directly related to the type of work involved in the proposed project. The firm should be able to demonstrate that it has successfully completed one or more housing projects comparable to the quality of housing that meets Air Force FH requirements and standards of quality.

Once the designer has been selected, the design criteria and requirements are discussed at a negotiation conference. It is crucial to the negotiations that the project objectives be accurately communicated to the design team.

The design statement of work (SOW) must clearly identify project design submittals (deliverables) and government review schedules. Once the DM approves project definition (preliminary) design, the DA can then proceed to design completion. Through continuing dialogue and project reviews, schematics are developed into working drawings and specifications and finally, contract documents. The design effort culminates with the advertisement for a construction contract.

Note that the above process is typical of the "Design-Bid-Build" process (see Table 5-1). Design-Build, Design-Build Plus and Turnkey processes are discussed in Paragraph 5-3. Privatization is discussed in Paragraph 5-4.

### **5-2.2 Family Housing Design Program Sequence**

Table 5-1 provides a timeline of tasks for a typical Design-Bid-Build process and Invitation for Bid (IFB) delivery method.

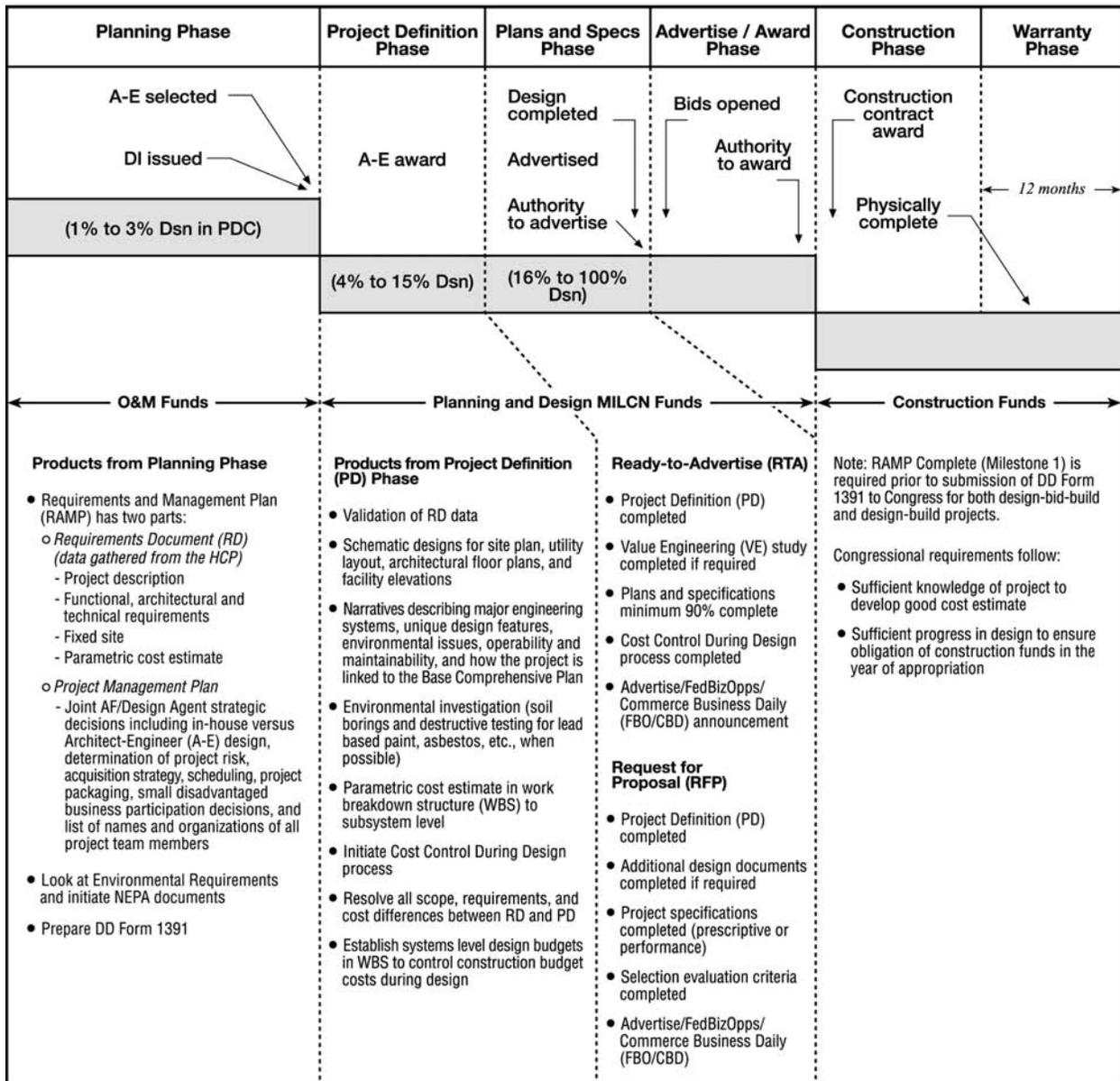
The timeline of tasks for 35 percent design in Table 5-1 also applies to Design-Build and Design-Bid-Build processes using the RFP delivery method.

A Turnkey process using the RFP delivery method is considered 35 percent designed when an A-E contract to prepare the RFP is awarded and the installation has a Housing Community Profile at least 65 percent complete.

All RFP's for housing projects are considered 100 percent designed when the RFP is complete and Ready to Advertise.

**Table 5-1: Family Housing Design Program Sequence of Events (Design-Bid-Build)**

	Milestone 1	Milestone 2	Milestone 3	Milestone 4	Milestone 5	Milestone 6
Design/Bid/Build	RAMP Complete	PD Complete	Ready to Advertise	Construction Contract Award	BOD	Financial Complete
Goal Dates:	Sep FY-2	Feb FY-1	Sep FY-1	Mar FY		
Design/Build	RAMP Complete	PD Complete	Ready to Advertise	Construction Contract Award	BOD	Financial Complete
Goal Dates:	Sep FY-2	Jul FY-1	Sep FY-1	Mar FY		



### **5-2.3 Design Conferences**

#### **Pre-Negotiation Conference**

Depending on the size and complexity of the project, a pre-negotiation conference between the Air Force project design managers, including the user (FH office representative), a base's project engineer or architect and MAJCOM design manager, may be warranted since it is important that the design requirements are conveyed clearly and accurately to the A-E.

#### **The Predefinition Conference**

The purpose of the Predefinition Conference is to clearly and accurately convey the specifics of the design requirements to the A-E in order for the A-E to prepare a responsible and reliable cost proposal for the scope of services. If the A-E is uncertain about aspects of the Air Force's requirements and consequently, the level of effort required to satisfy poorly defined requirements, these uncertainties will be reflected in inflated cost proposals to cover potential increases in scope due to the present uncertainties. This can adversely impact project fee negotiations and potentially stifle the entire design process.

### **5-2.4 Project Design Submittal Requirements (Deliverables)**

Table 5-2 provides an outline of basic deliverable requirements for FH projects. (Note that the requirements are cumulative; if an electrical plan is required at 35%, it is also required at 90%.)

**Table 5-2: Project Design Submittal Requirements (Deliverables)**

<p><b>15% PROJECT DEFINITION</b></p> <ul style="list-style-type: none"> <li>▪ Site development plan- show all existing and proposed buildings, access roads, parking, landscaping and any pedestrian walks</li> <li>▪ Floor plans</li> <li>▪ Exterior elevations</li> <li>▪ Building sections</li> <li>▪ General plan conformance - validate in narrative format that the design solution meets the requirements of the Housing Community Profile and Family Housing Master Plan. All base restrictions and compatibility issues must be resolved.</li> <li>▪ Design criteria - address in narrative form all proposed building systems, unique design features and related design criteria. This narrative will be developed into a basis of design in the final deliverable.</li> <li>▪ Cost estimate - validation of program amount</li> <li>▪ Environmental checklist - complete draft of environmental concerns and sustainable development considerations that will drive future design and construction decisions.</li> </ul>
<p><b>35% EARLY PRELIMINARY DESIGN (DESIGN CHARRETTE)</b></p> <ul style="list-style-type: none"> <li>▪ All elements of project definition submittal</li> <li>▪ Any changes necessary to comply with the project definition review comments</li> <li>▪ Site demolition, layout, grading and utility plans</li> <li>▪ Specific listing of special finishes</li> <li>▪ Detailed discussion on and economic rationale for selected architectural, civil, mechanical and electrical systems</li> <li>▪ Proposed specifications for the project</li> <li>▪ Design analysis</li> <li>▪ Cost estimate</li> </ul> <p>NOTE: For design build projects the Title I A-E will stop their design at this point and these documents will be included in the RFP to the design build contractor.</p>

**Table 5-2: Project Design Submittal Requirements (Deliverables) (Cont.)**

<b>60% PRELIMINARY DESIGN SUBMITTAL</b>	
<ul style="list-style-type: none"> <li>▪ All elements of project definition submittal if 35% early submittal not used or all elements of early preliminary design submittal</li> <li>▪ Any changes necessary to comply with review comments from previous submittal</li> <li>▪ Civil plans to include site demolition, site layout, grading and utility plans with details</li> <li>▪ Landscaping plans to include area layout, building specific layouts and plant list with details</li> <li>▪ Demolition floor plans</li> <li>▪ Complete floor plans with details</li> <li>▪ Interior elevations and cross sections</li> <li>▪ Door and window schedules</li> <li>▪ Cabinet schedules and details</li> <li>▪ Exterior elevations</li> <li>▪ Roof plans</li> <li>▪ Structural plans to include foundation plan, wall and floor framing plans with details</li> <li>▪ Mechanical plans to include demolition, mechanical and plumbing layouts with details</li> <li>▪ Electrical plans to include demolition, electrical site plans, electrical, communication, television and data layouts with details</li> <li>▪ Preliminary color boards and finishes (exterior and interior) if required</li> <li>▪ Specifications in rough draft</li> <li>▪ Design analysis</li> <li>▪ Sustainable Development Workbook</li> <li>▪ Cost estimates</li> </ul>	
<b>90% PRE-FINAL DESIGN</b>	Drawings and specifications must be submitted as ready-to-advertise (RTA).
<ul style="list-style-type: none"> <li>▪ All elements of preliminary design review</li> <li>▪ Any changes necessary to comply with the Preliminary Design review comments</li> <li>▪ Final design analysis</li> <li>▪ Color board and finishes (exterior and interior) if required</li> <li>▪ Cost estimate</li> <li>▪ Bid schedule</li> <li>▪ Rendering required for new unit construction</li> </ul>	
<b>100% CORRECTED FINAL DESIGN</b>	
<ul style="list-style-type: none"> <li>▪ Any changes necessary to comply with the Pre-Final Design Review comments</li> <li>▪ Final design analysis</li> <li>▪ Sustainable Development Workbook</li> <li>▪ Color boards and finishes (exterior and interior) if required</li> <li>▪ Cost estimate</li> </ul>	

### **5-2.5 Design for Constructability**

The design process culminates in the preparation of the documents necessary to solicit bids for the construction of the project.

Although the following issues pertain to the construction and contracting process, they can impact the outcome of the project. It is important that the design managers are familiar with the following issues:

#### **5-2.5.1 Constructability Reviews**

Begin the reviews at the earliest design review stages. Use experienced architects, engineers and inspectors with multi-discipline knowledge about how a project is built for the technical aspects of the design. Use shop personnel with experience in the base utility infrastructure (e.g. maintenance engineering, fire and CE engineers to analyze constructability). Use housing office personnel for functional aspects of the design (e.g. appearance and spatial relationships). Take the plans into each unit type to verify existing conditions and design logic. Check carefully for conflicts between architectural, mechanical, electrical and structural systems. Require that review comments be carefully stated, in keeping with the criteria, and requesting a check or a change rather than commenting in the form of a question.

All review comments should be sent to the AF PM for consolidation and transmitted to the DA. The DA should not accept any comments that have not been reviewed by the AF PM. The DA will transmit all comments to the A-E prior to the review meeting so the A-E may make annotations and prepare any comments.

A constructability review meeting should be held with the A-E after each submittal to discuss comments. This meeting should be documented with minutes documenting the attendees, topics discussed, information passed on to A-E, conclusions drawn, decisions made and directions given.

#### **5-2.5.2 Materials Submittals**

These submittals are required as part of the construction process and are normally called for in the construction specifications. Different specification systems (AIA Master Spec, CSI, DoD, etc.) use different formats but the intent is for the Government to inspect parts, materials, or equipment that the construction contractor is proposing to use on the project and to make a decision as to whether the contractor-proposed materials meet the construction specifications standards.

Include a submittal log (e.g. AF Form 66 or similar format) based on the specifications sections as a part of the contract documents. Do not request submittals over and above those requested in the specifications sections unless truly unique circumstances so dictate.

### **5-2.5.3 Schedule Control**

The construction contractor is responsible for the preparation of the construction schedule and details how the contract completion date(s) will be met. Construction contractors use various scheduling methods [Critical Path (CPM), GANT (Bar) Chart and Program Evaluation and Review (PERT)].

The AF PM should be familiar with the logic and mechanics of network scheduling.

While the CA must approve reasonable Contractor schedules, the AF PM should question any schedule that provides for a disproportionate amount of work in the last month or two of the contract.

The schedule is a major construction management tool. Identify in the schedule and watch very closely those areas that may cause the critical points during the construction or the construction completion date to slip. Compare the schedule with the actual construction progress because the contractor should be paid only for the work accomplished. Especially review the status of pending modifications and their potential effect on the schedule.

The Contracting Officer of the CA is responsible for review and approval of the schedule. The Air Force can require changes to the schedule. A network schedule, properly administered by the CA, provides an accurate means of measuring the time impact of potential changes.

### **5-2.5.4 Poor Performance Protection**

Include a clause in the specifications to release the government of the responsibility to turn over previously scheduled or additional units when the contractor is behind schedule.

### **5-2.5.5 Liquidated Damages**

Liquidated damages (LDs) are intended to establish, in advance, a fair compensation to the Air Force for each day the beneficial occupancy is delayed by the Contractor beyond the scheduled completion date. Ensure LDs are not set so high, relative to the contract amount, that contractors either put excess contingencies in their bids, refuse to bid the project, or the LDs clause becomes construed by the courts as a "penalty" and thus unenforceable. LDs are normally deducted from final payments.

Establish LDs on a per unit basis when the construction project involves phased turnover as well as end of construction performance period.

### 5-2.5.6 Progress Reporting and Payments

Progress reports shall be submitted on a monthly basis. The contractor submits progress reports and the CA has the responsibility to approve the progress. The Government inspector and the Contractor should get together to compare progress and come to an agreement on percentages of work complete before the progress report is submitted to the Contracting Officer. They facilitate progress payments to the contractor; however, the frequency of progress reports specified in the contract can put unnecessary burden on the contractor and the Government inspector resulting in bottlenecks in the flow of information, possibly resulting in a stalled project.

Consider payments for delivered materials. Payments are normally made for materials put in place. In some cases, the contractor can be paid for critically needed materials that have been delivered and stored on site to ensure availability when they are needed. If a "Payments for Delivered Materials" clause is needed, explicitly define what materials are covered under this clause to protect the Air Force against payment claims.

### 5-2.6 Value Engineering

The Air Force uses Value Engineering (VE) to ensure the most essential functions of systems, subsystems, equipment, products and facilities meet customer requirements and are obtained at the lowest cost. VE focuses on program essentials and analyzes systems, facilities, products and processes to determine the lowest life-cycle cost without degrading performance, reliability, maintainability and safety.

The Air Force will apply a VE analysis, via Value Engineering Study Proposals (VESP), during the project planning and design phase of all military construction projects estimated to cost \$10 million or more and to such projects estimated to cost \$2 million or more with a potential return on investment of 10 to 1 or greater. Air Force Policy Directive 63-8 contains complete Air Force guidance on Value Engineering.

## 5-3 ALTERNATE DELIVERY METHODS; DESIGN-BUILD, DESIGN-BUILD PLUS and TURNKEY

Currently, the Design-Build, Design-Build Plus and Turnkey approval authority lies with the MAJCOM's in accordance with Secretary of the Air Force Order (SAFO) 715.2, *Facilities*.

In these methods the contractor, rather than the Air Force, prepares the final design documents in response to an RFP. Chapter 8 of the *U.S. Air Force Project Manager's Guide to Design and Construction* provides guidance to the design-build process. In Turnkey, the RFP contains a very general description of the project with no sketches or drawings, and proposals are technical and detailed. In the Design-Build method, the Air Force provides preliminary design drawings and specifications, leaving the design-build contractor latitude in developing the final, detailed designs and working drawings. In the Design-Build Plus method (refer to the *Design Build Plus Guide*), the design-build

contractor is involved in the concept definition phase of the project providing reviews and cost validations and performing geotechnical and hazardous material surveys to aid in the preparation of the preliminary design drawings and specifications that will be used in the RFP for the design build contract.

The most significant difference between Design-Build and DB+ execution strategies is that a DB+ construction contractor is selected early in the planning and development stages to participate and contribute to the Concept Definition Phase of the project. DB+ contractors are selected using Fair Opportunity Consideration clauses contained in FAR 16.505 that have been incorporated into the master DB+ IDIQ contract.

The addition of a pre-qualified Design-Build construction contractor to the DB+ process during the Concept Definition phase of development to perform various studies and constructability reviews produces a much more refined Request For Proposal (RFP) document; i.e., the final concept design is based on current, extensive field investigations and construction experience which greatly reduces the uncertainties that lead to contract cost growth. The DB+ contractor receiving the RFP will have a greater overall understanding of the Air Force's project requirements.

The Air Force selects the turnkey or design build contractor (and consequently the design solution) from all proposals submitted for the project based on the combination of design and cost that is most beneficial to the Air Force. The design build plus contractor is selected from a cadre of contractors using the Fair Opportunity Selection Criteria. This contrasts with procurement by sealed bidding or "conventional method" in which all contractors bid on a single design that was prepared by the Air Force and the selection of the successful contractor is based on the lowest responsible bid for the project.

With the design build, design build plus and turnkey methods there is a single point of responsibility which reduces the litigation, delays and project cost impacts to the Government.

There are significant benefits inherent when everyone is committed to the design-build approach. Some of the advantages are collaboration between the architect of record and the builder since they are on the same team, lower cost because of the close working relationship between the architect of record and the builder, an earlier fixed price, a faster schedule, reduced litigation and contract modifications, reduced administrative burden since the final design and construction are awarded at the same time, and reduced design time and cost.

The AF PM/Design Agent is responsible for the overall success of the process. The AF PM must be well organized and have a thorough understanding of the design-build process. The most important task is to ensure that there is open and continual communication among all key players.

**5-4 ALTERNATE DELIVERY METHODS; PRIVATIZED FAMILY HOUSING**

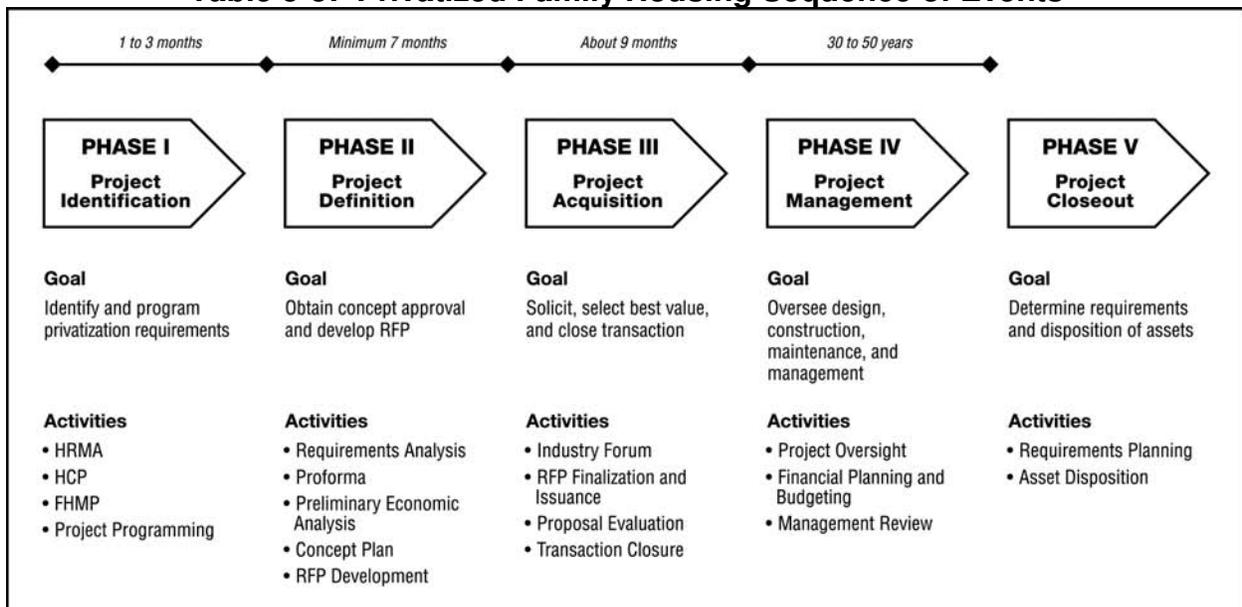
**5-4.1 The Privatized Family Housing Process**

In this method, Air Force requirements and private sector real estate market opportunities are matched to provide the “Best Value” proposal, encouraging maximum flexibility in proposal development within parameters set forth in a Request for Proposal package. A Privatization Support Contractor (PSC) is central to this method. The PSC assists the Air Force in developing an acceptable and financially feasible concept, completes the RFP, solicits proposals from multiple Offerors in an open competition and objectively assesses them against evaluation factors and sub factors. The Air Force makes all final decisions and ultimately selects a Successful Offeror who will plan, design, develop, renovate, demolish, construct, own, operate, maintain and manage the housing inventory for up to 50 years. In general, privatization at each Air Force installation will be completed through a Five Phase Process (see Table 5-3):

1. Project Identification: Initial project concept development
2. Project Definition: Refinement of project alternatives and feasibility; RFP development
3. Project Acquisition: Solicitation and evaluation of proposals and contractor selection process
4. Project Management: Design, construction and oversight of housing project
5. Project Closeout: Disposition of assets at end of project

AFI 32-6007, *Privatized Family Housing* provides specific guidance on the Housing Privatization process.

**Table 5-3: Privatized Family Housing Sequence of Events**



### 5-4.2 Project Identification

Prior to the CSAF approval for the start of Housing Privatization Project development, a series of project criteria are checked to determine if a proposed installation's housing is a candidate for privatization. The requirements stem from both statutory and OSD-level guidance and a project must meet or exceed the requirements before approval is granted. The criteria includes:

- The life-cycle cost of a project must be less for privatization than a traditional military construction and management approach;
- The government's participation in a Military Housing Privatization Initiative (MHPI) cannot exceed 80% of the total value of the project. The participation amount includes both the value of the housing conveyed and any scoring dollars required to support the project;
- The amount of the government direct loan must be less than the proposed SO's private loan amount(s); and
- The leverage calculation (equivalent military construction cost of a project divided by the amount of scored dollars required for the project) must be greater than 3 to 1.

These criteria are assessed using a privatization predictive model which utilizes inputs from existing planning tools, including HRMAs and HCPs. If all criteria are met, privatization is generally identified in the FHMP as the preferred method of revitalizing the housing. Programming documentation is then developed and provided to Congress for authorization and appropriation.

### 5-4.3 Project Definition

Project Definition includes the activities to define and program housing privatization project requirements. An initial step is revalidating the financial viability of the privatization scope as compared to other alternatives available to revitalize the housing through an Economic Analysis (EA). The results of the EA, together with an overview of the HP project scope, are elevated to Deputy Under Secretary of Defense (DUSD) for concept approval. A successive activity to complete the Project Definition phase is the development and completion of the RFP. RFP documents refer to all documents required to announce, advertise, solicit, evaluate and select an entity to provide quality housing for military families, including sample legal and financial instruments. The purpose of the RFP is to describe the existing conditions, project requirements, design and construction standards, proposal submittal requirements and evaluation standards to industry. The RFP is inherently flexible in requesting project desirable and enhancement features not accustomed within traditional MILCON. Once RFP approval is received, SAF/IEI and SAF/FMB may notify Congress of the intent to solicit the project.

#### **5-4.4 Project Acquisition**

Project Acquisition includes the activities to solicit, evaluate and close out the project transaction with the Successful Offeror. One of the key components of this phase is to host an Industry Forum. The purpose of the Industry Forum is to communicate the project requirements and receive comments from industry prior to soliciting the RFP. The key activity to close out this phase is the successful closure of the transaction with the Offeror who provided the “Best Value” to the Air Force.

#### **5-4.5 Project Management**

Implementation of the project as required by the terms of the transactional documents by demolishing, renovating, replacing, maintaining and managing housing and infrastructure systems represent the 50 years of project management activities. In addition, during the project construction period, the Air Force will provide supervision and inspection of the project to the level necessary to ensure compliance with negotiated agreements, local and national construction codes and Air Force quality standards. An Air Force asset manager will report on the condition of the project relative to the transaction documents on a periodic basis and according to an agreed-upon schedule

#### **5-4.6 Project Closeout**

At the conclusion of the transactional performance period, assets are disposed of and the project is closed out. The Successful Offeror will restore and return the premises to the Air Force in good, usable and buildable condition as specified in the transaction documents.

The use of private financing cannot always eliminate the requirements for appropriated funds to support housing needs. However, privatization leverages the limited appropriated funds available for construction and renovation. The private sector is willing to invest their resources if the service members’ rents (BAH) and other Air Force inducements provide adequate cash flow and return on their investments. These private funds are used to renovate and/or construct housing units and related amenities traditionally financed through MILCON.

#### **5-4.7 Funding Sources**

Refer to Paragraph 2-3.4 for a discussion of funding sources.

### **5-5 CONSTRUCTION MANAGEMENT**

The physical construction phase begins only after a notice to proceed has been issued to the construction contractor. Management actions provide cost control, schedule control and quality control. This section covers the process and procedures that are necessary to achieve the objective of delivering quality housing on time and within budget. Responsibilities for construction management are divided between numerous representatives. The primary representatives include (also see Appendix A):

- Construction Manager (CM): The CM is responsible for monitoring and reporting construction execution of a project, including estimated and actual dates for major schedule milestones, award information, change orders, cost information and status of project funds. The CM is the organization designated by HQ USAF/ILEH to manage the construction phase of a project and report its status to HQ USAF.
- Construction Agent (CA): The CA is responsible for the technical execution of construction of a project. The CA is usually the BCE for FH unless otherwise designated by the MAJCOM.
- Contracting Officer (CO): The CO is the individual who is designated as the government's representative for the project. The CO has overall responsibility for contract administration.

For Design-Bid-Build projects, ensure that the CA, the construction contractor and all inspectors are aware of the sustainable development requirements in the specifications. This will prevent construction changes that may otherwise be made by personnel who are unfamiliar with sustainable design.

### 5-5.1 Construction Funds

Construction funds (P-711 and P-713) are authorized and appropriated annually to cover the funded costs of construction of new or replacement housing (P-711) and the revitalization of existing facilities (P-713).

Before issuing an IFB or an RFP, the DM requests the authority to advertise, as well as a reservation of construction funds from HQ AF/ILEH. This is done through the Automated Civil Engineer System – Project Management (ACES-PM). **HQ AF/ILEH verifies the final design is in accordance with the scope (number of units and grade/bedroom mix) and PA as identified in the approved AF/ILEH DI and confirms the reservation of funds prior to entering the authority to advertise in the ACES-PM.** When the actual amount of the construction funds required is known, after receipt of bids or proposals, the DM enters a bid report and award Current Working Estimate (CWE) in the ACES-PM. HQ AF/ILEH then issues the construction funds through comptroller channels and enters the authority to award in the ACES-PM upon receipt of a budget authorization number from SAF/FMBIC.

The award CWE for each project includes the contract amount for construction (total amount if more than one contract); design funds in turnkey and design-build projects; land costs, if any; cost of government-furnished equipment, if any; an allowance for contingencies; and an allowance for supervision, inspection and overhead (SIOH), including the cost of A-E Title II services, if applicable.

Use contingency funds to fund contract modifications after contract award. If an increase in construction funds, above the projected funding amount, is required to

complete a project, the CM requests additional funds from HQ AF/ILEH. The CM provides, with the request, a revised CWE and justification for the increase.

Fiscally close a project within four (4) months of beneficial occupancy to permit withdrawal of any surplus funds by HQ AF/ILEH. Pending claims not settled within this 120-day period should not preclude fiscal closeout. HQ AF/ILEH will reopen the account for any project on which a claim or other funding action develops after fiscal closeout.

In June, before the end of each FY, the CM should identify all surplus funds that will expire at the end of the FY. HQ AF/ILEH will withdraw these funds.

Although the acquisition process may be similar, the funding procedures outlined above do not apply to build-lease, rental-guarantee, installment-purchase, or land out-lease projects, since construction of these projects is not funded with appropriated construction funds (P-711 or P-713):

- Do not use appropriated funds for the construction and maintenance of rental-guarantee or land out-lease projects. The owner recovers the cost of the project from rental charges paid directly by the resident.
- Use funds from the FH Operations and Maintenance Account to pay the lease costs (and maintenance costs, where applicable) of build-lease housing. Such payments do not start until after the housing has been accepted by the Air Force.

## **5-5.2 Construction Management Procedures**

### **5-5.2.1 Options**

Several options exist for construction management and the inspection of large FH projects. These include in-house inspections, Title II inspection services and inspection by the COE or NAVFAC field office. Typical considerations in using outside construction management services are the cost of the services, the extent of services and past performance. Use of the COE or NAVFAC typically includes contract administration, which eliminates base contracting from the construction phase. This option would normally be used only if the COE or NAVFAC also advertised and awarded the project.

### **5-5.2.2 Notification and Approval**

The base's preferred option must be included in the Project Management Plan (PMP) and approved prior to the start of the design process. If the base wants to use Title II, it should be included in the Title I CBD announcement. If the COE or NAVFAC is to be used, then they should be a part of the review process from the beginning. Make this request simultaneously with the proposed method for advertising and award, as this may also influence the development of the plans and specifications.

### 5-5.2.3 Project Management Plan

Past experience has demonstrated the need for a comprehensive project management plan for the exclusive use of the government and that is separate from the plans and specifications. This plan should be drafted before beginning the design phase and modified as necessary as the project progresses. The completed plan should include the following:

- Organizational plan (line diagram) and manning levels
- The roles and responsibilities of the management team and the management groups. These include: Design Manager, Design Agent, Construction Manager, Construction Agent, Civil Engineer Squadron, Contracting Office, User, Design A-E, construction contractor and Title II contractor if used.
- A description of the process and responsibilities for change orders; progress reporting; quality control; financial management; submittals; daily inspections; special tests and inspections; schedule changes; turnover of units; removal, storage and installation of appliances; post-construction warranty documentation, etc.
- Supplementary schedules, consistent with the construction phasing plan and covering significant actions required by the government, such as vacating quarters before removal of asbestos by in-house personnel, etc.
- "Prototype" requirements
- List of all the project team member names and organizations. This list will be updated after construction contract is awarded.

### 5-5.2.4 Use of the COE or NAVFAC

If the COE or NAVFAC is chosen for construction contract administration and inspection, negotiate the cost and extent of services and include this with the project management plan. Specify the length of time and the number of qualified inspectors.

### 5-5.2.5 Weekly Job Meetings

The construction agent (CA) holds periodic project meetings to discuss and resolve job problems. The CA should encourage the housing manager, base PM, contracting officer, contractor, subcontractors and A-E (if performing Title II services) representatives to attend. These informal meetings provide improved coordination, better understanding and faster handling of changes, discrepancies and submissions. They also provide good opportunities to recognize and deal with potential problems before they develop.

### **5-5.3 Preconstruction Conference**

The Preconstruction (sometimes referred to by the DA as pre-performance) conference is a meeting held at the job site to establish local ground rules, both those covered by the contract (such as labor standards' clauses) and those not covered by the contract (such as base regulations) that are directly related to contractor actions and interactions on base. Attendees should include the Construction Agent (CA) and representatives from the Fire Department, Bioenvironmental Engineering office, Security Forces, Housing Manager, Base Civil Engineering, Environmental Flight, Safety, Communications and the MAJCOM.

The Construction Agent (CA) conducts the meeting, but the AF PM should be prepared to address issues such as phasing, Government Furnished Equipment (GFE), Government Furnished Materials (GFM), and items and coordination for work in restricted areas. Resolve such issues before the Preconstruction Conference and present a unified government position in the contractor's presence. The Preconstruction Conference is not the time to discuss potential change requests.

Also essential at this stage is the development of an effective Partnering Agreement with the contractor. Key stakeholders should be identified from each of the following groups: Housing Office, Base CE, the CA, the CO and the Contractor. This agreement will establish certain guidelines and goals by which construction/contract problems are addressed and solved in an expeditious manner. Effective partnering will lead to higher contractor efficiency, virtually eliminating cost overruns resulting from unresolved contract disputes and unnecessary work.

### **5-5.4 Notice to Proceed**

The Notice to Proceed (NTP) is the instruction from the CO to the contractor to start work on the project. This notice authorizes the contractor to spend money and establishes the start date for the contract performance period. This date is important to ensure that Base Civil Engineering and the Housing Manager are ready for the contractor to start and the start date is consistent with any critical need dates and schedules that are important to project success. Most contractors will work with the CO and the base to minimize user disruption. The CO will normally issue the NTP between 15 to 30 days after contract award. Minor adjustments to that time frame can be made if it is in the best interest of the government. However, excessive delays in issuing the NTP may result in a claim, unless the intent to delay NTP issuance was specified in the bid documents.

### **5-5.5 Submittals**

The construction contract will require the contractor to submit materials and equipment data, samples and shop drawings prior to the start of any segment of work related to the items involved. The government has a responsibility to provide timely review and

prompt return of the submittals to the contractor; otherwise, delays and claims may result. Those items reserved for Air Force approval need special attention because of the number of organizations involved in the review process. Reviews must be thorough, accurate and timely. The CO and government inspector should maintain a submittal log and monitor it closely. Be sure to return rejected submittals quickly to the contractor for correction and resubmittal, as appropriate.

Late, incorrect, or incomplete submittals from the contractor can adversely affect the job. Just as importantly, the CA's review must be timely and responsive to critical items in the contract schedule.

## **5-5.6 Quality Control**

### **5-5.6.1 Contractor Quality Control**

The contractor is responsible for inspecting, testing and documenting those tests and inspections that are required by the contract to analyze material quality and workmanship. The contractor is also required by the terms of the contract to employ a Quality Control (QC) representative. The contract specifications spell out in detail what inspections and tests are to be performed and to the detail of reporting. When the QC representative's purpose is not in alignment with the contractor's objective of protecting profit, expect shortcuts for tests, inspections, safety, materials acquisition and handling and workmanship.

The CA, through the Quality Assurance (QA) program, oversees the contractor's QC program. Quality cannot be "inspected" into the project; rather, the individual instances of workmanship and overall job quality are directly related to the contractor's reputation and pride of accomplishment. Although over-inspection can reduce cooperation and result in changes, the CA must be effective in controlling quality. It is difficult to make corrections to appearance-related work when the construction nears completion, so bring these issues to the CO's attention immediately.

The AF PM should encourage the CA's QA effort to aim at enhancing the contractor's pride to receive the desired project quality. This may include quizzing QC personnel, holding frequent meetings with the contractor's superintendent or project executive on quality issues, and checking preparatory inspection work.

Normally, government CA personnel perform construction QA of Air Force projects. If this is not possible because of workload or lack of qualified personnel, use Title II A-E services for the inspection. When Title II A-E services are used, the responsibility for government inspection remains with the CA, who will monitor the work of Title II A-E personnel. Select A-E firms and contract for Title II A-E services in accordance with AFI 32-1023, *Design and Construction Standards and Execution of Facility Construction Projects*. If it possible to select the Title I design A-E to perform Title II A-E services, this will keep continuity in the project.

### **5-5.6.2 Construction Inspection**

Continuous construction inspection is the responsibility of the contractor. Federal and Air Force acquisition regulations require the contractor to maintain an adequate inspection system and to perform inspections that will ensure that the work performed under the contract conforms to contract requirements. The contractor will also maintain inspection and test records and make them available to the government. The government reserves the right to inspect and test any phase of the work at all reasonable times without relieving the contractor of any responsibility for contract compliance.

### **5-5.6.3 Construction Surveillance**

The CA should perform construction surveillance on the job site and at off-site locations (fabrications or stored materials) when necessary. Construction surveillance differs from inspection in that specific technical inspections and tests are not performed on a continuing basis. Those items are the responsibility of the contractor. The AF PM's job is to review the project function and overall appearance and to raise any cost and time issues that affect the Air Force. Do not discuss or provide any comments and suggestions directly to the contractor. Document concerns using photos, videos and notes and discuss discrepancies with the CO or the CO's representative (COR). Notify the CA, in writing, of those job site, schedule, cost, or quality problems needing prompt attention and resolution.

The government reserves the right to inspect the contractor's work as necessary to determine the acceptability of materials and workmanship as well as compliance with contract requirements. Government inspectors should not provide an inspection service for the contractor or relieve the contractor of the responsibility for acceptable execution of the work.

### **5-5.6.4 Quality Assurance by the Construction Agent**

The CA is the government's legal contact with the contractor. The CA's responsibilities for the project from start of construction to completion include:

- Acting as the technical representative of the CO
- Being the single point-of-contact between the contractor and the government
- Providing Quality Assurance (QA) of the work; reviewing and approving submittals
- Maintaining schedules

- Administering the contract; modifying the contract when necessary
- Protecting the government's interests
- Authorizing progress payments
- Accepting finished products/facilities

Require the CA to maintain good communications with the contractor's superintendent and QC person; this will improve project management effectiveness.

Under the QA/QC system, the contractor is required to control quality. The CA has the responsibility, in a QA role, to ensure that the contractor performs the QC provisions required by the contract. The level of quality desired and expected in the completed project must be accurately reflected in the contract documents. The CA must ensure that the level of quality specified is indeed received. Accept nothing less. For specific details, see the *Air Force Project Managers Guide for Design and Construction*.

#### **5-5.6.5 Testing and Approving Materials, Equipment and Systems**

Two of the principal methods of assuring compliance with the terms of the contract are material submittals and testing. The contract documents must establish requirements for submittals and tests and procedures for approvals.

Materials and items of equipment used in a project are approved based on samples submitted by the contractor. These materials must be accompanied by the manufacturer's literature, certifications of compliance and manufacturer's warranties.

As stated in the contract documents, the required tests may be among the following:

- Laboratory tests performed on a manufactured product for the manufacturer of the product under a recognized test program, such as fire retardant tests or sound attenuation tests of materials of assemblies
- Laboratory tests performed on samples collected in the field, such as concrete compression tests or soil compaction tests
- Field tests of work in place, such as utility system tests, infiltration tests, or equipment operating tests

The CO will approve material submittals and test results based on technical input from a representative of the CA. The contractor will perform field tests and will collect field samples for laboratory tests in the presence of the CO.

### 5-5.6.6 Prototype Units

For the on-site construction of most multi-unit projects, whether for new construction or for the revitalization of existing units, consider the use of prototype units as an aid to construction inspection and acceptance. Also consider the use of prototypes when substantial construction or assembly takes place off-site, such as for manufactured or factory-built housing.

In general, try to designate only one prototype unit, unless unit types differ significantly (e.g., one-story or two-story, detached or attached, two-bedroom or four-bedroom). Complete each stage of work on the prototype unit before starting work on the same stage for like units in the project. Leave construction details exposed for study by authorized inspectors and workers. Each stage of the prototype unit should be left exposed until that stage has been completed in all units in the construction contract, unless otherwise specified in the contract, including any options of the contract. Use this work to verify details of the approved design and material selections and to establish the standards of construction and workmanship against which the rest of the work will be judged. Start work on each successive stage of the prototype units immediately after the approval of the preceding stage. However, retain a representative sample of the work of each stage of construction for examination (not worked over, covered, or concealed in any way) until completion of that stage of work throughout the project, unless otherwise authorized by the CO. As a minimum, the CO approves the following stages of work in a prototype unit (as applicable):

- Masonry work (foundations, walls)
- Concrete work
- Rough framing (floors, walls, partitions, roofs)
- Wall and roof sheathing, subflooring
- Plumbing, mechanical, electrical rough in
- Insulation (underslab, floor, wall, ceiling, or roof)
- Roofing
- Exterior finishes (siding, masonry veneer, stucco) and trim
- Drywall installation
- Drywall finishing

- Interior finishes and trim
- Installation of fixtures and equipment (plumbing, mechanical and electrical)
- Landscape elements (trees, shrubs, turf headers, etc.)

### **5-5.7 Schedule Control**

The construction schedule is the plan prepared by the contractor that details how the contract completion date(s) will be met. Network schedules are used by Air Force CA's to schedule work and to track the progress of the contractor using the Critical Path Method (CPM). CPM network scheduling allows for the analysis of the impact of critical activities on overall completion.

The advantages of this type of schedule are that complex construction activities and phasing can be broken down into simpler tasks and analyzed. This approach can make the most complicated project a series of simple jobs. Analyzing and hypothesizing (playing "what if" games) is simplified when the network schedule is on a computer. Compare the schedule with actual construction progress, as the contractor should be paid for only the work accomplished. Review the status of pending modifications and their potential effect on the schedule. Insist that actions be taken to meet the schedule when the contractor falls behind in construction. Extended overhead can add considerable cost to a project when construction completion is delayed through no fault of the contractor.

The CO is responsible for the review and approval of the schedule. A network schedule, properly administered by the CA, provides an accurate means of measuring the time impact of potential changes.

Project managers are cautioned that contractors have a tendency to delay the submission and approval of schedules. This tends to dilute the advantage of being able to estimate the impact of changes during the early period of construction.

Changes in the work and time extensions due the contractor must be included in the network concurrent with the performance of the change or immediately after a delay. Otherwise, the critical path network and schedule will not reflect the current status of work performed or progress being attained.

### **5-5.8 Cost Control**

An important cost control element deals with staying informed of changes as the project progresses. Good cost forecasting, like updating a CWE during construction, involves knowing costs to date, project status and the history of changes so that a "cost-to-finish-construction" can be communicated and compared with the budget and funds available.

Strive to maintain project cost within the PA or original cost of contract (whichever is higher). When cost overruns become apparent, MAJCOM's must contact HQ USAF/ILEH as noted above.

### **5-5.8.1 Cost Status Analysis**

This financial status analysis is a conglomeration of information compiled by the CM and the Funds Manager from the project information contained in the ACES-PM system and from job site observations. The goal of the analysis is not only to reflect the current financial health of the project, but to forecast the future financial needs as well. Proper cost forecasting should allow the Funds Manager sufficient notice for locating and transferring the needed funds to the CA before they are actually required. Poor cost forecasting has resulted in either stop work orders or work deletion modifications.

This analysis compares the latest estimate to finish a project (CWE) with the programmed amount (PA), the funded amount and other financial limits, such as the apportioned amount and the threshold. The analysis will also include other pertinent financial data, such as contract price, executed modifications, E&D (engineering and design during construction), SIOH (Supervision, Inspection and Overhead), available contingency funds and other associated costs. The most important inputs to this analysis, and probably the most difficult to assess, are the estimated costs for potential changes, and undecided claims. The CM, along with the CA, must observe the interaction between the contract documents, the contractor and the CO, so future costs can be analyzed. Keep in mind that the last and most current information is at the job site. Not knowing the scope and cost of pending items has caused jobs to stop or needed work to be deleted because sufficient notice could not be given to the funding agency to obtain additional funds or authority. The cost status analyses should be revised at least monthly or every time there is a change. The following two cost status items should be updated in the ACES-PM:

- The current cash position. Are you currently funded to execute validated pending modifications?
- Forecast to completion. Are you funded to execute validated pending modifications and finish the job within available contingencies?

### **5-5.8.2 Progress Payment Estimates**

Procedures described below do not apply to build-lease, rental-guarantee, installment-purchase, or land out-lease projects.

As provided in the contract documents, make progress payments as the work progresses. The CA prepares an estimate of the progress payment due the contractor for work performed during the preceding payment period. Payment may be made for work in place.

The CA makes sure that payment is authorized only for work actually completed. As a general rule, retain at all times enough funds to accomplish the remaining work with other contractors if the prime contractor defaults. As noted in Paragraph 5-2.5.6, payments can also be made for materials delivered.

### **5-5.8.3 Change and Claim Management**

Cost control requires that each change or claim be separately identifiable, otherwise control is lost. Potential or anticipated change requests must be scoped, validated, designed and estimated before the CO can negotiate. A pre-validation cost estimate, as part of scoping, should be used to develop total cost exposure. To know the cost exposure for unresolved claims (which have the potential to become contract modifications), a Construction Agent should provide the status detail of each claim (description, claimed amount and associated performance time and number of days since received by the CO). Stay on top of the Construction Agent to ensure that claims are resolved in a timely manner.

The CA sometimes negotiates modifications without negotiating the time and its cost. The additional time and associated cost are often lumped into a "time extension" modification to be negotiated and executed later. Modifications that ignore time should be considered a "bomb ready to explode," because the final time and associated cost settlements are often considerably higher than anticipated. Press the CA to negotiate time with each modification or unilaterally add time when appropriate to force the discussion with the contractor. Do not let the CA execute modifications which invite the contractor to re-open negotiations on the modification at a later time.

### **5-5.9 Construction Contract Modifications**

Modifications are negotiated "mini-contracts" formalized within the context of the original contract. Modifications allow equitable adjustments to the contract requirements so as to accommodate differing site conditions, unforeseen conditions, changes in code and criteria, corrections of errors and omissions (design deficiencies), delays and impacts to the work, administrative changes, weather delays, work suspensions, additions and deletions. Within this list fall the various CA changes and user-requested changes.

Modifications are expensive; they are not usually competitively bid; and they frequently add time to the schedule of construction. Always question the requirement for the modification, and consider a competitive contract as an alternate method of implementation. The MAJCOM's determine the change requirements. CA changes (changed conditions, design errors, etc.) must be reviewed and questioned, particularly

where time extensions are involved. The DM must maintain close coordination with the CA since these changes are usually exercised by the CA without prior AF approval when contingency funds exist at the CA office. To keep on top of the modifications, track their status and urge them along at every possible opportunity. The CA should respond to initiate modification within two days. Review the outstanding modifications regularly, including the length of time to execute and those modifications that were negotiated without time limits.

One of the more important tasks of a construction manager is to ensure that the user is not left out of the modification process. Each modification has the potential to affect the user's operation or planned occupancy date. If modifications are executed by the CA with little or no coordination with the user, the customer's plans may be adversely impacted.

Change orders and change requests must be limited to those circumstances that would render that facility unusable from a functional standpoint, or are required, due to a major mission change that renders the original design inadequate. Process each contract modification in accordance with applicable FARs.

Normally, modifications are the result of:

- Unforeseen conditions
- Design ambiguities, deficiencies, or omissions
- Changes in user requirements
- Defective or unsuitable GFM or GFE
- Excusable delays
- Emergencies requiring immediate action to protect government property, personnel, or interest
- Benefits or savings such as value engineering proposals

#### **5-5.9.1 Minor and Major Classification of Contract Modifications**

A minor contract modification is any change which requires no adjustment in price, or an adjustment in price not exceeding the approval level delegated by the MAJCOM, and which does not result in the acceptance of materials, equipment, or systems of significantly greater or lesser quality than specified in the contract. Minor contract modifications, as defined above, may be approved at the installation level if they do not result in an increase in project cost above the approved maximum project cost.

Major contract modifications are all changes that are not classified as a minor change. The MAJCOM must approve the modifications prior to their execution.

### **5-5.9.2 Special Approval**

HQ AF/ILEH must approve the changes listed below. Forward all requests for approvals through MAJCOM channels with a proposed, revised current working estimate reflecting the proposed change, as well as a justification and description of the required change in sufficient detail to permit full evaluation without a need to request additional information. Such changes are those that:

- Result in a decrease in the scope of work such as decreasing the number of units
- Result in an increase above the authorized high unit cost
- Result in an increase in obligational authority or approved maximum cost
- Result in an increase in funding

### **5-5.10 A-E Liability**

The means for establishing A-E responsibility based on FARs are routinely included in the A-E's design contract. The government will pursue A-E liability in cases where a modification was necessary due to an error or omission (design deficiency by the A-E), and the error or omission caused the government damages. Notification to the A-E must be quick to minimize damages and to allow the A-E an opportunity to propose corrections. The A-E, even if not negligent, must correct the design error(s) or omission(s) in the plans and specifications at no additional cost to the government. The A-E can work directly with the contractor to minimize the cost to the government.

To determine A-E liability, all of the following must be answered "Yes":

- Is the construction modification attributable to design error or omission?
- Does the design deficiency stem from an error or omission by the A-E?
- Does the error or omission result from the A-E's negligent failure to meet the standard of care reasonably associated with the A-E profession or from a breach of contractual duty?
- Has the government suffered damage as a result of the error or omission?

Costs caused by an A-E firm's failure to perform contractual obligations can be recovered. The following paragraphs address A-E responsibilities, the extent of A-E liability and the efforts by DAs and COs to recover funds when unnecessary costs can be attributed to an A-E firm.

When the A-E is found liable for the error or omission, the A-E is only responsible to correct the design and the contract documents and to pay those costs that the government would not have paid had the design been correct.

#### **5-5.10.1 A-E Responsibilities**

The FAR outlines the responsibilities of an A-E contractor. The A-E is also responsible for:

- The professional quality, technical accuracy and coordination of all designs, drawings, specifications and other services furnished by the contract
- Corrections and revisions of any design deficiency
- Added cost incurred by the government caused by negligent performance of any service under the contract

#### **5-5.10.2 Extent of A-E Liability**

The extent of A-E liability must be evaluated against either document errors or damages:

- Liability for Document Errors. The A-E is liable for correcting any error or omission in drawings, specifications, design, or other services furnished by the firm. Corrections are at no cost to the government. This liability is not absolved by government reviews, approvals, acceptance of work, or payments for work.
- Liability for Damages. When the government incurs additional costs resulting from design deficiencies (errors or omissions), such as a contract modification, the CO uses his or her professional judgment (with the advice of technical personnel and legal counsel) to determine the extent of A-E liability and evaluates the liability against four conditions. All four conditions must be met:
  - The construction modification must be attributable to the design error or omission.
  - The design error or omission must stem from an act or omission by the A-E.

- The act or omission on the A-E's behalf must result from the firm's failure to meet reasonable professional standards.
- The government must have been damaged. The A-E liability is for only the additional cost over and above the cost of the requirement if it had been included in the original design. Examples of over and above costs include tear-out costs resulting from project delays.
- Pursuit of A-E Liability. The DA, through the CO, has the responsibility to pursue A-E liability. Usually, correcting design errors or omissions does not present a problem since the A-E's professional reputation is at stake and because the FAR clearly states the legal ramifications. Pursuing A-E liability to recover damages resulting from a construction contract modification presents more of a problem. If the CO establishes A-E liability, the CO must determine the actual damages and estimate administrative costs to recover the damages. If the estimated recoverable costs for damages exceed the administrative costs or it is otherwise in the government's best interest, the CO is obligated by the FAR to pursue A-E liability. Once the CO determines that there may be A-E liability, the CO must document the decision either to pursue or not pursue recoverable damages.
- Civil Engineering Responsibilities. Project managers, during design and construction, must be sensitive to change orders that may be the result of an A-E's failure to perform. When a change order appears to be the result of a design deficiency on the A-E's behalf, the project manager, along with the DM, should evaluate the change order against the four conditions listed above. When the results of this evaluation support the position that the A-E may be liable, the DM prepares and provides documentation to the CO for review and determination and files the results in the project folder.

### 5-5.10.3 Field Relationships

The contractor is obligated to provide the end item on the date specified in the contract documents. Air Force personnel should not dictate how the contractor proceeds in complying with the contract requirements; day-to-day scheduling of personnel and materials is the contractor's responsibility. The contractor must have a representative on the job site who is authorized to deal with Air Force and subcontractor personnel any time work is being performed.

The CO is the only individual authorized to make changes to the contract. Changes to the contract are executed through a modification document, signed by the CO if it is a change order and signed by the contractor and CO if it is a supplemental agreement. Directions provided by other persons are not binding and may result in personal liability for any additional costs the contractor incurs.

### **5-5.11 Inspections and Close-Out**

Although the CA performs continuous inspection of the work throughout construction and finds the work of the various trades acceptable, an overall final inspection of the work is required. This inspection ensures that all finish items have been completed satisfactorily in accordance with the contract documents.

As project completion approaches, so does the point at which the government will "inherit" the new facility and all of those "hidden" problems. Strive to ensure that all appropriate personnel are notified about the date, time and location of the pre-final and final inspections, as these are the last times for them to ask questions and find those "hidden" problems before the contractor's level of interest drops significantly (when he's paid the final payment of the contract). The CA will prepare a list of defects, known as the "punch list," that were identified during the pre-final inspection and will direct the contractor to correct these defects before the final inspection. The team members should inspect punch list items at the final inspection to ensure that they have been properly corrected. Judgment will often be required while reviewing the corrections made, since perfection is not contracted; rather, what was contracted for and the standards of the industry are the "yardstick." Always note design deficiencies separately from construction deficiencies so that separate action for the CA can be identified and pursued independent of the close-out of the contract.

Normally, divide the acceptance inspection into two phases: pre-final and final.

Accept no work without a final inspection. Make the final inspection of the work at the completion of the project or, when provisions allow for incremental acceptance, at the completion of each successive portion as it reaches the appropriate stage. A successful final inspection should find no deficiencies other than punch list items or items awaiting a seasonal opportunity to complete.

#### **5-5.11.1 Design Deficiencies**

The contractor is contractually required to build according to the plans and specifications; however, the contractor is not responsible for deficiencies caused by errors or omissions in the design or contract documents. The designer and design/construction agent are responsible for the correction of the design deficiencies within the scope of the project. Normally these deficiencies will be identified during the course of construction and corrected by modification to the construction contract. However, if these items are not identified until near contract completion or later, it may be best to correct these through a separate contract or other purchasing action.

#### **5-5.11.2 Construction Deficiencies**

Construction deficiencies are the result of poor workmanship, inadequate inspection or QA/QC, incomplete construction, inferior or damaged materials, unacceptable substitution of material and for the failure to construct according to the contract plans

and specifications. If the construction does not comply with the contract specifications and drawings, the contractor is responsible for correcting the deficiencies. The CA should follow up with the contractor to ensure those construction deficiencies are properly corrected. The contractor is responsible for latent deficiencies, those that become apparent after construction completion, even if the final release has been issued. Good craftsmanship and correct engineering practices are always the key to good construction. When responsibility is not quickly determined, the CA unilaterally directs the contractor and designer to correct the deficiency and establish responsibility and payment later.

### **5-5.11.3 Pre-Final Inspection**

When the contractor indicates that a group of houses is ready for acceptance, the CA and the inspection team will inspect all exterior and interior phases of work. Note on the checklist the items that require correction or that have been omitted by the contractor. Consolidate the deficiencies on the individual checklists into a "punch list" and forward this through the CO to the contractor for correction before the final inspection. Unless otherwise agreed to by the CO, the contractor must correct all punch list items before final acceptance. In general, it is best to have all interior punch list items corrected before acceptance of the unit. This will minimize disruption of the new resident and simplify coordination.

The development of successive lists of deficiencies due to prior oversight or variation in standards among inspectors is improper practice. Limit additions to deficiency lists to:

- Damage to other work resulting from correction of work reported on the deficiency list
- Damage or deterioration resulting from the failure to protect work from exposure to the weather
- Loss or damage due to theft or vandalism
- Deficiencies previously overlooked that would be detrimental to the health and safety of the residents if not corrected
- Latent deficiencies not readily apparent in an unoccupied unit but which appear after occupancy in previously accepted units (for example, malfunctioning equipment)

#### 5-5.11.4 Scheduling of Final Acceptance Inspection

To ensure that the housing units and projects are ready for inspection before a final acceptance inspection is scheduled, the CA should complete the following:

- Pre-final inspection on all units in question
- Lists of discrepancies, forwarded to the contractor for correction
- Follow-up inspections made to determine that the contractor has corrected discrepancies discovered in pre-final inspection

The CA's inspection team should not provide an inspection service for the contractor. If, at any time during the pre-final or final inspection, the listed deficiencies become so numerous that they indicate inadequate inspection and supervision on the part of the construction contractor, terminate the inspection and notify the contractor.

#### 5-5.11.5 Final Acceptance of Completed Units

##### 5-5.11.5.1 Completed Project:

- Upon the satisfactory completion of the construction of an entire project, a final acceptance takes place and the project is judged physically complete. At this time, the Air Force assumes complete control and accountability of all the units on projects constructed with P-711 or P-713 funds and on installment-purchase projects.
- The acceptance of housing units into the Air Force inventory is accomplished by completing DD Form 1354, Transfer and Acceptance of Military Real Property, in accordance with AFI 32-9005, *Real Property Accountability and Reporting*.

##### 5-5.11.5.2 Incremental Acceptance:

- When the contractor completes individual housing units within a given area and the units pass a final inspection under the terms of the contract, the Air Force may accept these units. On P-711, P-713 and installment-purchase projects, after the Air Force accepts the units it takes control of, the Air Force assumes accountability for those units by completing DD Form 1354.
- The Air Force obtains permission to occupy these units before the completion and acceptance of the entire project by written agreement with the contractor. The agreement should ensure that suitable ingress and egress is provided and that occupancy will not interfere with the contractor's operations.

- The inspection performed on individual units proposed for incremental acceptance is a final inspection. On P-711, P-713, build-lease and installment-purchase projects, upon accepting individual units, the Air Force becomes responsible for the maintenance and operation of the units, even though the final acceptance of the remainder of the project takes place much later. Although the Air Force has accepted the units, the contractor is responsible for the correction of defects listed at time of final inspection, incomplete items, latent defects and items that are covered by the warranty provisions of the contract. The warranty period begins on the day a substantial completion agreement becomes effective for each unit.

#### **5-5.11.5.3 Final Settlement:**

- If, at the time of final settlement, some corrections have not been made because of seasonal considerations, lack of materials, or other reasons, the CO withholds from final payment an estimated amount sufficient to correct such items until all outstanding items are corrected or resolved.

#### **5-5.11.6 Facility Acceptance/Beneficial Occupancy Date**

After the final inspection acceptance, the Air Force may accept the facility from the CA. This point marks the date that the facility is ready for occupancy by the user and is referred to as the Beneficial Occupancy Date (BOD). Although BOD normally occurs after all the construction and the final inspection have been completed, a partial BOD can take place in order to allow the user to vacate other space scheduled for construction or to begin performing part of the user's mission immediately. Partial BOD's should be discouraged if the partial occupancy serves no real advantage for the performance of the user's mission, as it clouds the issues of warranties' expirations.

#### **5-5.11.7 Warranty**

The typical construction contract requires the contractor to warrant his workmanship, materials and equipment for a period of one year from the date of substantial completion or beneficial occupancy, whichever occurs first. In addition, the contract may specify that some work or equipment be warranted for longer periods and may contain specific response times. Also, there are specific manufacturer's warranties not required by specifications but available due to the contractor's choice of materials allowed in submittals. Examples of contract-specific warranty items are window systems, roof systems and HVAC equipment. The FAR clause for construction warranties is 52.246-21. The Base Civil Engineer should receive a composite listing of all warranties in effect as a result of the construction work.

### 5-5.11.8 As-Builts

The contractor is required to mark one set of the contract drawings and specifications with the differences between what was required and how the contractor actually built the project. These differences should include not only the contract modifications, but also any differences due to the contractor's selection of materials and installation technique. These marked up documents are used to incorporate the noted differences onto the original drawings and are known as "as-builts." Check to ensure drawings have been annotated by the required time and that the as-builts have been filed with the BCE. On some installations, the base drawings are being "digitized" for storage and retrieval through a Computer Aided Design/Drafting (CADD) system. For these situations, the original designer has usually been retained to take the contractor's marked documents and incorporate the changes into the original documents before digitizing. The CA and the DA should work together to accomplish the updating and digitizing in a timely manner and to follow through to see that the digitized records were turned over to the BCE.

## 5-6 THE POST-CONSTRUCTION PROCESS

The project management role in the post-construction process includes addressing warranty support, claims, financial close out, post-occupancy evaluation and the documentation of lessons learned.

### Post-Acceptance Responsibilities:

- Contracting Officer. The CO makes sure that the contractor has corrected all deficiencies listed at final acceptance inspections and that all incomplete items are complete. The CO also enforces the provisions of the contract on latent defects and warranties.
- Construction Agent. When construction is complete, the CA:
  - Accepts from the contractor and transfers to the BCE all door keys, operating manuals, parts lists, spare parts, catalogs and guarantees or warranties, as required by the contract. This requirement is not applicable to rental guarantee and land out-lease projects.
  - Certifies the accuracy of the "as-built" prints prepared and submitted by the contractor.

## 5-6.1 Warranty and Guarantee Program

After the Base Civil Engineer (BCE) accepts the facility and its construction, the BCE becomes responsible for documenting and verifying that all warranty items are annotated using *DD Form 1354, Checklist*. Base Civil Engineering will advise the designated CO when to have the contractor return and correct any work under warranty. The BCE must also ensure that the problems identified are warranty problems, and not due to abuse or a lack of proper maintenance. The list of activities below provides general guidance on the Warranty and Guarantee Program per AFPAM 32-1005, *Working in the Engineering Flight*.

### 5-6.1.1 Warranties and Latent Defects

**Manufacturers' Warranties.** Normally, the contract will require warranties for such items as ranges, refrigerators, dishwashers, air-conditioning components and other installed appliances and equipment.

**Latent Defects.** A latent defect is one which could not reasonably have been discovered during inspections but which appears after occupancy and use of the house or project.

**Repair of Latent Defects.** The Air Force expects and requires reasonable service from the contractor to correct latent defects. This includes providing labor and material necessary to replace or repair defective items.

**Damage Due to Latent Defects.** If a latent defect results in a fire, explosion, or other damage to a unit or units of a project, the Air Force will require the contractor to repair both the defect and the damage that arose from it. The CO for the project:

- Ensures that competent authorities, such as engineers and fire inspectors, determine the nature, cause and extent of the damage and loss to the housing unit or units.
- Ensures that a detailed analysis, photographs and other evidence bearing on the cause of the incident are secured and held for inspection and possible presentation in court.
- Ensures that property is protected from future damage that might be caused by weather or vandalism.
- Permits the contractor free access to the area for inspection and analysis purposes, but does not permit the removal of any evidence of the damage without prior approval of the base legal officer.

- Takes appropriate action under provisions of the contract and the FAR to restore the project to the condition described in the plans and specifications.
- Furnishes to the bonding company copies of all correspondence to the contractor.

### **5-6.1.2 The Construction Manager Responsibilities**

The Construction Manager (CM) ensures inclusion of the FAR warranty clause(s) in the contract (Ref. FAR clauses 52.246-17 through 52.246-25).

The CM also ensures the CO advises the contractor that the expected response time on a warranty call will be three days or reasonably parallels the BCE's response time for a service call of a similar nature and urgency, whichever is less. A listing of these types of calls and the nominal response time (which would be considered the "within a reasonable time" guideline) should be included in the project contract and identified at the pre-construction conference.

The CM also ensures the CA provides the following to the BCE: a written memorandum of understanding (MOU) that defines responsibilities and procedures during the warranty periods following the transfer of facilities to the Air Force. Subject areas which should be covered are:

- A copy of the warranty and guarantee documents identifying the contract number and the dates during which the warranties and guarantees are in effect.
- The specific contact point at the prime contractor with complete address and telephone number(s). The specific procedure and contractual conditions for contact if the contact for warranty action is other than the prime contractor. Written verification, where applicable, that the prime contractor notified the subcontractors and equipment suppliers in writing that the BCE is authorized to directly contact them for warranty and guarantee support.
- A list of all components and systems, such as roofing, that are covered by separate guarantee periods under the terms and conditions of the contract.
- A copy of a letter from the CA to the prime contractor informing the contractor that the appropriate BCE (or other Air Force Official) represents the government in implementing the guarantee and warranty contract clauses.

The construction manager ensures that the CA assumes the responsibility to evaluate and obtain the correction of defects if notified by the BCE that the contractor will not meet the warranty and guarantee responsibility of his contract. In this case, the CA maintains primary responsibility for warranty and guarantee action until the BCE can reassume it or until the warranty or guarantee periods expire, whichever comes first.

In coordination with the CA, the construction manager schedules a post-occupancy inspection 9 to 11 months after construction completion, or at other times at the request of the CA, to identify warranty and guarantee deficiencies before the expiration of the one-year construction warranty (ref. COE ER 415-345-38, *Warranty*, paragraph 7). BCE personnel perform the physical inspection work and provide a history of service calls to the inspection team. (NOTE: When the MAJCOM authorizes a formal post-occupancy evaluation team (POET), the CM represents the Air Force in the post-occupancy inspection.)

### **5-6.1.3 The BCE Responsibilities**

The BCE uses the above procedures provided by the construction agent for the enforcement of warranty provisions and in accordance with the MOU cited previously.

The BCE implements the warranty and guarantee provisions of the contract. The BCE ensures that operations and maintenance personnel operate, service and perform preventive maintenance in accordance with the manufacturer's maintenance and operating instructions and follow procedures identified in specialty areas, such as ETL 90-1 (*Roofing*), ETL 02-12 (*Communications and Information System Criteria for Air Force Facilities*), etc. The BCE ensures that maintenance personnel keep appropriate records of their actions in servicing components and equipment in conjunction with the above.

The BCE examines failed components to determine whether the failure is covered by the warranty or guarantee. When needed, the BCE requests technical assistance from the CA to assist in determining the nature and extent of the deficiency. Normally, BCE personnel should not dismantle a component covered by a warranty or guarantee, nor attempt to make repairs to it, as this action may void the warranty or guarantee.

The BCE requests the contractor to investigate and dismantle the item to determine the cause of the failure. The BCE makes the appropriate provisions beforehand with contracting and finance to cover the cost of dismantling the component. This is required to prevent the occurrence of an unauthorized obligation should the deficiency later be determined to be not covered by the warranty or guarantee. The BCE also ensures that technically qualified BCE personnel observe the dismantling and, where deemed appropriate, the use of video equipment and cameras is used to document the dismantling by the contractor.

The BCE obtains an agreement from the contractor to complete the repairs or to replace the faulty component within the time required at no cost to the government. This is required when the component failure is found to be the direct result of faulty materials and/or workmanship. This is confirmed in writing to the contractor.

The BCE assesses the urgency of the problem when the contractor fails to agree that the deficiency exists under the terms of the component warranty or guarantee. The BCE has the following options:

- If Base Civil Engineering decides it is necessary to repair or replace a defective component to prevent serious interruption of functional activities, the BCE requests the CA to act immediately under the terms of the MOU as outlined above. Should the CA not agree with the BCE's decision, the CA should inform the BCE who then proceeds with repairs using Air Force resources.
- If the urgency is insufficient, the BCE will ensure that the CO takes the necessary contractual actions to gain the contractor's compliance under the terms of the contract.

The BCE repairs the component using Air Force resources when the BCE determines:

- After investigation and inspection, that the defect is not covered under the warranty or guarantee.
- That project isolation renders it impossible to comply with the procedures for implementing warranty and guarantee contract provisions stated above or that the contractor response will be too slow to prevent a serious interruption of functional activities.
- That the contractor refuses to perform after trying the procedures listed above.

The following order of priority applies in component replacement or repair:

- Remove the component as a unit and replace it with a spare.
- Repair it, using available or obtainable spare parts.

Thorough documentation is essential. When possible, video equipment or a camera shall be used to record BCE repair/replacement activities.

Make a report of the failure to the CA with a complete record of all labor hours and material involved in the repair/replacement for potential reimbursement.

### **5-6.2 Claims Management**

Modifications to a contract after the award have the potential for claims from the contractor. The CO must represent the government in executing these changes. It is important to remember that once a contract is awarded, the contract terms and requirements are binding on both the government and the contractor.

Claims can be minimized with proper planning, early problem recognition and resolution and the use of claims avoidance techniques. Many of the problems that arise during the construction of a project come from indecision and poor planning early on in the project. The following provide insight and guidance on claims mitigation and avoidance:

- Have a pre-acquisition strategy. The delivery method, type and number of contracts, delivery organization and project scope should be established before design begins. The quality and type of contract documents may vary substantially with the acquisition strategy chosen and the scope definition. Conflicting specification sections most frequently occur when the acquisition strategy, scope, or building system selection changes and the design or construction reviews do not correct the conflict.
- Use particular care in obtaining information from the various users concerning specialty equipment and functions. Users often request contract modifications to have the most up-to-date equipment in the project. Those equipment changes usually result in easy-to-show delay claims because of their close association with the previously completed or planned contract work. When the risk of change for technical improvements is very high, then include language in the contract to cost those modifications on the basis of time and materials.
- Grant all justifiable requests by the contractor for extensions of time, unless there is some substantial reason for not doing so. Failure to issue time extensions will seldom result in an earlier job completion. Rather, it is more likely to result in claims for accelerated performance of the work. The extension of time due to weather, strikes and other delays for which the government does not have to compensate the contractor, should be granted when warranted.
- At the start of the job, require the contractor to commit in advance the dates when the government's input will be needed on items such as GFE delivery dates and "rough-in" data. Require the contractor to include this information in the project schedule. This action may preclude later claims that the government failed to fulfill responsibilities assigned under the contract.
- Resolve claims in a timely manner. The CO should normally render a decision within 60 days for claims less than \$50,000. In claims for errors and omissions, be cautious that the A-E is not unduly protecting his own position at the expense of the government. Claims resolution includes a prompt investigation of the situation, and a prompt response to all contractor notices (notification of changed contract conditions) and claim letters (intent to file a request for time or compensation).
- Resolve modifications and claims as they occur. At the end of the project, the government has little leverage over the contractor, since most of the work has been completed and most of the payments have been made to the contractor. Also, the contractor can more easily develop impact and delay claims on a "ripple effect" from multiple changes (wrap arounds) when resolution is delayed to the conclusion of the project.

- Keep good records, particularly about contractor manpower levels, days or part days worked and areas where work is performed. Those records may be useful in the event that a delay, acceleration, or loss-of-efficiency claim is submitted. Those records should also document errors and filings by the contractor and should contain letters that place the contractor formally on notice of defects. The use of dated photographs and videos can really make a difference as a supplement to written documentation.
- Modifications executed with the contractor for additional work or as compensation for design errors and omissions should expressly state that the contract time is not extended because of the work within the modification, if that is the case. Avoid situations where the contractor is paid labor and material costs, but reserves the right to claim additional compensation later for delay, disruption and loss of efficiency. Make every reasonable effort to negotiate such costs as part of the modification. There may even be projects where the CO must be asked to unilaterally determine the time and compensation associated with a modification, because of an uncooperative contractor.

Project managers should be instructed that when claims come in:

- Treat them in a businesslike manner. Do not get hostile and close communication channels with the CO or the contractor. This might hinder subsequent negotiations.
- Insist that the CO meet face-to-face with the contractor if the project manager does not understand the claim or thinks it is not valid.
- Make sure the government's attorney is involved immediately.
- Don't pay invalid claims just to get rid of them.

### **5-6.3 Financial Close-Out**

A project becomes physically complete when the CA certifies that the project is construction complete and all deficiencies have been corrected. A project is defined as financially closed when:

- Costs applicable to the project are recorded and those costs are included in the final CWE.
- Project obligations have either been liquidated or canceled.
- Account receivables pertinent to the project are collected.

The target closeout period is 120 days after beneficial occupancy of the line item. This period starts on the date that the facility is accepted by the BCE and ends on the date the CA initiates the revocation directive certifying payment of all outstanding bills. Although the Air Force goal is to reduce the closeout time, do not financially close a project with outstanding construction or design deficiencies.

Within 120 days from the beneficial occupancy of the project, surplus funds can be withdrawn allowing the Air Force to complete the processing of the new units into the Real Property Records in a timely manner. Do not let pending claims that cannot be settled within the 120-day period preclude financial closeout. Neither should the CA retain at field level, after the facility is accepted, any payments for pending claims to be acted upon by an appeals board. When a facility is physically complete, but not financially closed out due to a pending or unresolved claim, funds may be held by the agent based on the CO's written statement that a settlement and obligation of funds is expected within 90 days. Monitor closely any remaining deficiencies to ensure that any cause for closeout delay is resolved promptly.

Submit financial closeout reports of completed P-711 and P-713 projects. Report all obligations. Submit the report to the MAJCOM within 120 days after contract completion. It should include:

1. Contract Number
2. Award Amount and Date
3. Final Cost
4. Other (GFE, In-house, etc.) list
5. SIOH (Reimbursable, Funded)
6. Telephone Reconnection
7. Environmental Exclusions
8. Contingency Funds
9. Total Requirements
10. Amount Funded
11. Excess Funds

#### **5-6.4 Post Occupancy Evaluation**

The contractor is required by contract to warrant the workmanship and material for 1 year. Perform a post-occupancy evaluation 9 to 11 months after beneficial occupancy, noting any and all defective work. Report all construction deficiencies to the CO for correction by the contractor. Document problems or mistakes that were made during the design and give this information to the DA to review for other projects that are similar.

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## APPENDIX A GLOSSARY OF ACRONYMS AND TERMS

- AAMA:** American Architectural Manufacturer's Association
- AATCC:** American Association of Textile Chemists and Colorists
- ACES:** Automated Civil Engineer System
- ACES-HM:** Automated Civil Engineer System – Housing Management
- ACES-PM:** Automated Civil Engineer System – Project Management.
- ACM:** Asbestos-Containing Materials
- ADA:** Americans with Disabilities Act
- ADAAG:** Americans with Disabilities Act Accessibility Guidelines
- A-E:** Architect-Engineer
- AF:** Air Force
- AFB:** Air Force Base
- AFCEE:** Air Force Center for Environmental Excellence
- AFCCC:** Air Force Combat Climatology Center
- AFI:** Air Force Instruction
- AF/ILE:** Air Force Civil Engineer
- AF/ILEH:** Headquarters USAF, Housing Division
- AFRPA:** Air Force Real Property Agency
- AFS:** Air Force Station
- AGA:** American Gas Association
- AHERA:** Asbestos Hazardous Emergency Response Act
- ANSI:** American National Standards Institute
- Arc-Fault Circuit-Interrupter (AFCI):** A device intended to provide protection from arc-faults by recognizing arcing characteristics and acting to de-energize the circuit when an arc-fault occurs.
- Area Cost Factor (ACF):** A numerical index that reflects the statistical differences in construction costs for similar facilities constructed in different geographical areas. The base for these indices is 1.0 which represents the national average of costs for all locations surveyed within CONUS.
- ARI:** Air Conditioning and Refrigeration Institute
- ASHRAE:** American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc.
- ASTM:** American Society for Testing and Materials
- Attached Single Family Housing:** Family Housing constructed with two or more living units per building.
- BAH:** Basic Allowance for Housing
- Base Civil Engineer (BCE):** Installation engineer, and his or her representatives, responsible for planning, programming, design, and construction of FH.
- BEES:** Building for Economic and Environmental Sustainability
- BHMA:** Builders Hardware Manufacturer's Association
- BMP:** Best Management Practices
- BOD:** Beneficial Occupancy Date

**CAM:** Condition Assessment Matrix

**CATEX:** Categorical Exclusion

**CATV:** Cable Television

**CC:** Installation Wing Commander

**CDIP:** Korean Combined Defense Improvement Program

**CDM:** Corporate Decision Model

**CE:** Civil Engineer

**CEQ:** Council for Environmental Quality

**CERCLA:** Comprehensive Environmental Response, Compensation, and Liability Act

**CGO:** Company Grade Officer

**Charrette:** An intensive conceptual design work session, usually at the customer site, lasting several days and attended by the customers, A-E, construction agent, the project management team, and sometimes representatives from regulatory agencies.

**CMU:** Concrete Masonry Unit

**COE:** U.S. Army Corps of Engineers

**Construction Agent (CA):** Organization responsible for the technical execution of construction of a project. Usually the BCE for FH unless otherwise designated by the MAJCOM.

**Construction Manager (CM):** Organization designated by AF/ILEH to manage the construction phase of a project and report status to HQ USAF. Responsible for monitoring and reporting construction execution of a project, including estimated and actual dates for major schedule milestones, award information, change orders, cost information, and status of project funds.

**Contracting Officer (CO):** Government's representative on a project. Responsible for contract administration.

**CONUS:** Continental United States

**CPSC:** Consumer Product Safety Commission

**CSAF:** Chief of Staff – Air Force

**DE:** Declarations of Excess

**Design Agent (DA):** Organization responsible for technical execution of project design. Usually the BCE for FH unless otherwise designated by the MAJCOM.

**Design Authorization:** Authorization issued to DM by AF/ILEH to proceed to a specified milestone in the design process, including the use of Architect-Engineer services (Title I), if required. Design authorization is an element of the Design Instruction.

**Design-Build (D-B):** The construction project delivery method that uses competitive negotiation for contract award based on conformance with RFP and contractor qualification criteria. Design-Build has several variations in detail of the design requirements contained in the RFP. In all cases, final design and construction are integrated under a single contractor.

**Design-Build Plus (D-B+):** Design-Build Plus is very similar to traditional Design-Build. The most significant difference between Design-Build and DB+ execution strategies is that a DB+ construction contractor is selected early in the planning and development stages to participate and contribute to the Concept Definition Phase of the project.

**Design Instruction (DI):** Authorization issued by AF/ILEH by means of the ACES-PM system to the DM/CM to initiate design procedures on a specific project. The DI contains relevant project information as applicable, such as project scope and composition, and funding level. Also used to issue AF/ILEH authority to advertise and to award contracts.

**Design Manager (DM):** Organization designated by AF/ILEH to manage the design phase of a project and report status to AF/ILEH. Responsible for monitoring and reporting design execution of a project including estimated and actual dates for major schedule milestones, current working estimates, and bid results.

**Detached Single Family Housing:** Family Housing constructed with a single living unit per building.

**DOC:** Department of Commerce

**DoD:** Department of Defense

**DOE:** Department of Energy

**E9:** Chief Master Sergeant

**EA:** Economic Analysis

**EIAP:** Environmental Impact Analysis Process

**EIFS:** Exterior Insulation Finish System

**EIS:** Environmental Impact Statement

**EO:** Executive Order

**EPA:** Environmental Protection Agency

**ETL:** Engineering Technical Letter

**FEMP:** Federal Energy Management Program

**FGO:** Field Grade Officer

**FH:** Family Housing

**FHCP:** Family Housing Community Profile

**FHMP:** Family Housing Master Plan

**FM:** Financial Manager

**FONSI:** Finding of no significant impact

**fps:** Feet per Second

**GO:** General Officer

**GOQ:** General Officer Quarters

**GPM:** Gallon per Minute

**GPO:** Federal Government Printing Office

**Gross Floor Area:** Space within the exterior faces of exterior walls (the centerline of party walls) of living units, excluding garages and carports, detached exterior bulk storage, trash enclosures, porches, terraces, patios, decks, balconies, and entrance stoops. Also see Figures 4-1 and 4-2.

**Ground-Fault Circuit-Interrupter (GFCI):** Immediately shuts off electrical current when a difference of 5 ( $\pm 1$ ) milliamperes is detected between the two circuit conductors (e.g., short circuit, damaged appliance, appliance in contact with water, etc.).

**GSF:** Gross Square Feet

**GWB:** Gypsum Wall Board

**Habitable Room:** A room designed and used for living, sleeping, eating, cooking, or a combination thereof. Bathrooms, toilet compartments, closets, halls, storage spaces, laundry and utility rooms, mechanical equipment rooms, and similar areas are not considered habitable rooms.

**HAC:** U.S. House (of Representatives) Appropriations Committee.

**HASC:** U.S. House (of Representatives) Armed Services Committee.

**HCFC:** Hydrochlorofluorocarbons

**HCP:** Housing Community Profile

**HDPE:** High Density Polyethylene

**HERS:** Home Energy Rating System

**HFC:** Hydrofluorocarbon

**Historic Housing Facilities:** Facilities currently on, or eligible for nomination to, the National Register of Historic Places or facilities that figure significantly in state or local history.

**Housing Area:** An identifiable grouping of family housing facilities planned, developed, and maintained in a residential character.

**Housing Community Profile (HCP):** A long-range planning and programming document, consistent with land use as defined in the Base General Plan, which maps out development of the entire housing area to incorporate whole house and whole neighborhood concepts. A comprehensive revitalization plan to bring Family Housing areas up to contemporary standards and make the units and neighborhoods livable for the next 25+ years.

**Housing Requirements and Market Analysis (HRMA):** A formalized method used to estimate current and projected housing deficits or surpluses at any given installation. Professionals trained in social sciences and familiar with principal data sources and analysis techniques conduct these analyses working as independent consultants. They justify the need for the Air Force to acquire or construct new family housing units, replace existing family housing units, or undertake whole house or whole neighborhood improvement projects.

**HQ AFCESA:** Headquarters Civil Engineering Support Agency

**HRMA:** Housing Requirements and Market Analysis

**HUC:** High Unit Cost

**HUD:** U.S. Department of Housing and Urban Development

**HVAC:** Heating, Ventilation, and Air Conditioning (Mechanical)

**IAQ:** Indoor Air Quality

**IAW:** In Accordance With

**IBC:** International Building Code

**IC:** Insulation in Contact

**ICCEC:** International Code Council Electrical Code

**IECC:** International Energy Conservation Code

**IEQ:** Indoor Environmental Quality

**IESNA:** Illuminating Engineering Society of North America

**IFHMP:** Installation Family Housing Master Plan

**IMC:** International Mechanical Code

**Inadequate Housing:** Any unit requiring whole-house improvement or replacement as identified by the Services' condition assessments, typically exceeding a per unit cost of \$50,000 adjusted by the area cost factor. Services' condition assessments utilize private sector housing industry construction codes and sizing standards as a basis for assessing inventory adequacy.

Air Force condition assessments are defined as follows:

- Housing units with an HCP condition score of  $\geq 3.75$  are considered adequate and will not be replaced or improved; they will be retained with no construction and maintained using O&M funds.
- Housing units with an HCP condition score of  $< 3.75$  are considered inadequate; accordingly, revitalization, either improvement or replacement, is required.

**IPC:** International Plumbing Code

**IRC:** International Residential Code

**ISNCO:** Installation Senior Non-Commissioned Officer

**JENL:** Junior Enlisted

**JFIP:** Japanese Facility Improvement Program

**JNCO:** Junior Non-Commissioned Officer

**LBP:** Lead Based Paint

**LEED:** Leadership in Energy and Environmental Design

**LID:** Low Impact Development

**LPG:** Liquefied Petroleum Gas

**MAJCOM:** Major Command

**M&R:** Maintenance and Repair

**MFH:** Military Family Housing

**Military Construction (MILCON):** The program approved annually by Congress via the Military Construction Authorization Act and the Military Construction Appropriation Act.

**MIP:** Minor Improvement Project

**Modular Housing:** Consists of two or more modules, or "boxes" which are shipped complete from the factory and connected to each other at the site to form a complete and usable housing unit. While modular housing may be constructed on a mobile chassis, the modules more commonly are constructed without a chassis, transported to the site on separate carriers, and installed on permanent foundations. Modules are shipped to the site in a complete and fully finished condition with all equipment, fixtures, and utility systems installed, and require a minimum of connection, hook-up, or assembly prior to occupancy.

**MOU:** Memorandum of Understanding

**NAHB:** National Association of Home Builders

**NATO:** North Atlantic Treaty Organization

**NEC:** National Electrical Code

**NEPA:** National Environmental Policy Act

**NESC:** National Electrical Safety Code

**Net Floor Area:** The space within the interior faces of exterior walls and party walls of living units, with the following areas of exclusions (also see Figures 4-1 and 4-2):

- a. Carports and Garages.
- b. Exterior storage, up to the maximum allowance for exterior storage for the grade and bedroom type. See Tables 4-6 to 4-14 and Footnote \*5.
- c. Interior bulk storage up to the maximum allowance for interior storage for grade and bedroom type. See Tables 4-6 to 4-14 and Footnote \*4.
- d. Trash enclosures.
- e. Porches open or enclosed, which are not heated or cooled and which retain the basic characteristics of a porch.
- f. Terraces, patios, decks, balconies, and entrance stoops.
- g. Utility Rooms/Laundry Rooms and/or washer and dryer space, if not located in separate utility or laundry room, up to the maximum allowance indicated in Tables 4-6 to 4-14.
- h. Stairways on each floor (including intermediate landings between floors).
- i. Stair landing at each floor level above the first floor (not to exceed 10 square feet per floor).
- j. Unfinished space under stairs.
- k. Unfinished attic space.
- l. Unfinished basement space.
- m. Common stairways, halls, and entries in multi-family dwellings.
- n. Areas required solely for installed solar energy systems, including collection and storage equipment and mass walls as well as interior spaces required by and designed specifically for passive solar energy systems.
- o. Increase required to meet accessibility standards (not to exceed 75 SF). Additional square footage over the allowance is countable against the net and gross.
- p. Mechanical rooms and chases.
- q. Fireplaces where applicable.

**NFPA:** National Fire Protection Association

**NFRC:** National Fenestration Rating Council

**NLR:** Noise Level Reduction

**NLT:** Not Later Than

**NOAA:** National Oceanic and Atmospheric Administration

**NPDES:** National Pollutant Discharge Elimination System

**NPV:** Net Present Value

**NWS:** National Weather Service

**O&M:** Operation and Maintenance

**Occupancy Rate:** 100 minus the vacancy rate (as calculated in ACES-HM).

**OCONUS:** Outside Continental United States

**ODC:** Ozone Depleting Chemical  
**ODS:** Ozone Depleting Substances  
**OSD:** Office of the Secretary of Defense

**PA:** Programmed Amount  
**PAIP:** Post Acquisition Improvement Program  
**PCB:** Polychlorinated Biphenyl  
**POM:** Program Objective Memoranda

**Project Manager (PM):** The person ultimately responsible to AF/ILE for ensuring that the Air Force achieves its goals and objectives on each a project. . The Project Manager could be from MAJCOM, AFCEE or the installation. The PM is usually an engineer or architect.

**Programmed Amount (PA):** The total project cost, including construction, contingencies, supervision, inspection, and overhead.

**Project Definition (PD):** The requirements validation and schematic design phase of the design process defined in ETL 95-2 and the USAF Project Manager's Guide for Design and Construction.

**Prototype Unit:** A housing unit, representative of a type of design and/or construction prevalent in a project, which is constructed in advance of similar work in the rest of the project. During construction of the prototype unit, specific items of work are inspected and approved and become the standards against which similar work in the rest of the project is judged.

**PVC:** Polyvinylchloride

**Replacement Cost:** The cost to replace an existing family housing unit built to authorized size and whole house standards. MAJCOMs and bases estimate the unit cost together with the cost to replace supporting facilities using the DoD Family Housing Cost Model. Calculate unit cost per net square foot according to the DoD pricing guide, multiply this by authorized net square footage and adjust the total by the area cost factor and project size. For supporting facilities, calculate cost based on a specifically proposed site, using engineering cost estimates for lot costs, site improvements, street, utility mains, landscaping, recreation, and any other features, such as demolition or environmental hazard remediation.

**Request For Proposal (RFP):** The solicitation in a negotiated contracting action in which proposers submit technical and cost proposals and negotiate with the Air Force to arrive at a mutually acceptable project design and cost.

**RMC:** Regular Military Compensation  
**ROD:** Record of Decision  
**ROKFC:** Republic of Korea Funded Construction  
**ROW:** Right of Way  
**RPM:** Real Property Maintenance  
**RPMA:** Real Property Maintenance Activities  
**RPMC:** Real Property Maintenance by Contract  
**RTA:** Ready to Advertise

**SAC:** U.S. Senate Appropriations Committee.

**SAF/GCN:** Deputy General Counsel (Installations and Environment)

**SAF/IEI:** Deputy Assistant Secretary (Installations)

**SASC:** U.S. Senate Armed Services Committee.

**SCP:** Special Command Position

**SEER:** Seasonal Energy Efficiency Ratio

**SHPO:** State Historic Preservation Office

**Site-Built Housing:** Residential structures which are wholly or substantially constructed at the site (commonly referred to as stick-built).

**SMACNA:** Sheet Metal & Air Conditioning Contractors National Assoc., Inc.

**SNCO:** Senior Non-Commissioned Officer

**SO:** Senior Officer

**SOQ:** Senior Officer's Quarters

**Statement of Work (SOW):** Description of work or services to be performed by a contractor along with the level of performance expected.

**STC:** Sound Transmission Class

**Streetscape:** The overall view of all the elements located along the street including curb appeal, plant material, sidewalks, site furniture, lighting and signage.

**Surplus Housing:** Housing no longer needed to support that base's family housing requirements as determined by the Housing Requirements and Market Analysis.

**Surplus Unit:** Family housing unit(s) excess to requirements in the HRMA.

**TIA/EIA:** Telecommunications Industry Association/Electronic Industries Alliance

**Turnkey:** One method of design-build contracting for construction projects in which the successful contractor provides the design and construction; selection of a contractor is based on a quality evaluation of design and negotiation of price.

**UFAS:** Uniform Federal Accessibility Standards

**UFC:** Unified Facilities Criteria

**UL:** Underwriters Laboratory

**Unit Type:** A unit with a distinctly different floor plan configuration for a specific grade and rank as identified in the HCP. Slight variations (renovated kitchens, etc.) may exist within a unique unit type.

**USAF:** United States Air Force

**U.S.C.:** United States Code

**Useful Economic Life:** Either 50 years from the date of original construction, 25 years from the most recent whole-house renovation, or when a unit requires operations and maintenance investment (RPMC) to keep the unit habitable.

**USGBC:** United States Green Building Council

**VOC:** Volatile Organic Compounds emitted into the atmosphere adversely affecting the air quality and ozone.

**WDMA:** Window and Door Manufacturer's Association

**XRF:** X-Ray Fluorescence

## APPENDIX B RELATED DIRECTIVES AND DOCUMENTS

The directives and documents in Appendix B are grouped under two sections. Section One contains those directives and documents that are directly referred to in the text. Section Two contains those directives and documents that are not directly referred to in the text but which may be useful references.

### Section One

#### Federal Guidance

- 10 U.S.C. 2667, *Lease: Non-Excess Property*, 30 October 2000
- 10 U.S.C. 2821, *Requirement for Authorization of Appropriations for Construction and Acquisition of Military Family Housing*, 29 November 1989
- 10 U.S.C. 2822, *Requirement for Authorization of Number of Family Housing Units*, 23 October 1992
- 10 U.S.C. 2823, *Determination of Availability of Suitable Alternative Housing for Acquisition in lieu of Construction of New Family Housing*, 18 November 1997
- 10 U.S.C. 2825, *Improvement to Family Housing Units*, 30 October 2000
- 10 U.S.C. 2835, *Long-Term Leasing of Military Family Housing to be Constructed*, 5 December 1991
- American Architectural Manufacturer's Association (AAMA) 1002.10
- American Association of Textile Chemists and Colorists AATCC 16-1992
- *Americans with Disabilities Act (ADA) Accessibility Guidelines of 1990 Americans with Disabilities Act (ADA) Architectural Guidelines (ADAAG)*
- American Gas Association (AGA)
- Builders Hardware Manufacturer's Association (BHMA)
- Department of Commerce (DOC) (FF 1-70 *Pill Test*)
- Energy Price Indices and Discount Factors for Life Cycle Cost Analysis
- Environmental Protection Agency (EPA) 40 CFR Parts 141 and 142, *National Primary Drinking Water Regulations, National Primary Drinking Water Regulations Implementation*.
- Energy Star Homes
- EPA 86-004, *Citizens Guide to Radon*, 1986
- EPA 520/1-90-001, *National Radon Measurement Proficiency Program Cumulative Proficiency Report*, January 1990
- EPA 520/1-90-017, *The National Radon Contractor Proficiency Program*, July 1990
- EPA 560/5.83-624, *Guidelines for Controlling Asbestos Containing Materials in Buildings*
- EPA 520/11-87-20, *Radon Reference Manual*
- EPA 600/8-88/087, *Radon Resistant Residential New Construction*
- EPA 625/5-88/024, *Application of Radon Reduction Methods*
- EPA 625/5-87/019, *Radon Reduction Techniques for Detached Houses*

- EPA *Asbestos Hazardous Emergency Response Act (AHERA)*
- EPA *Cooling Our Communities – A Guidebook on Tree Planting and Light Colored Surfacing*
- EPA *Indoor Radon and Radon Decay Product Measurement Protocols*
- EPA *Model Standards and Techniques for Control of Radon in New Residential Buildings*
- EPA *Low Impact Development Program (LID)*
- Executive Memorandum, *Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds*, 26 April 1994
- Executive Order 12770, *Metric Usage in Federal Government Programs*, July 1991
- Federal Energy Management Program (FEMP)
- Federal Highway Administration's *Manual of Uniform Traffic Control Devices*
- Forest Stewardship Council (FSC)
- Healthy House Institute
- Housing and Urban Development (HUD) Use of Material Bulletin 72A, *HUD Building Product Standard and Certification Program for Carpet Cushion*
- HUD 4940.2, *Minimum Design Standards for Community Water Supply Systems*
- HUD 4940.3, *Minimum Design Standards for Community Sewage Systems*
- HUD CPD 1269, *Energy in Housing and Community Development/Guide to Performing Energy Retrofit During National Multi-family Property Rehabilitation*, October 1990
- HUD, *Lead-Based Paint; Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing*, 18 April 1990
- *Low Impact Development Techniques*
- *National Environmental Policy Act of 1969 (NEPA)*
- *National Historic Preservation Act of 1966 (NHPA)*
- National Weather Service
- NIST *Building For Environmental and Economic Sustainability*
- Office of the Secretary of Defense (OSD) *Sustainable Planning Guide*
- Public Law 102-522, *Fire Administration Act of 1992*
- *Safe Drinking Water Act*
- *Residential Telecommunications Cabling Standard TIA/EIA-570-A*
- *The Clean Air Act Amendment of 1990*
- *The Federal Acquisition Regulation (FAR)*
- The United States Green Building Council's (USGBC) *Leadership in Energy and Environmental Design (LEED) Green Building Rating System*, [http://www.usgbc.org/Docs/LEEDdocs/LEED\\_RS\\_v2-1.pdf](http://www.usgbc.org/Docs/LEEDdocs/LEED_RS_v2-1.pdf)
- *Uniform Federal Accessibility Standard (UFAS)*, <http://www.access-board.gov/ufas/ufas-html/ufas.htm>
- U.S. Department of Health and Human Services, Public Health Service, *The Nature and Extent of Lead Poisoning in Children in the United States: A Report to Congress*, July 1988
- U.S. Consumer Product Safety Commission (CPSC), *Handbook for Public Playground Safety* <http://www.cpsc.gov/CPSCPUB/PUBS/325.pdf>

- U.S. Postal Service
- Window and Door Manufacturer's Association (WDMA)
- *Whole Building Design Guide*, [www.wbdg.org](http://www.wbdg.org)
- World Climate Organization

### DoD Guidance

- DoD 2000.12-H, *Handbook for the Protection of Personnel Against Acts of Terrorism*
- DoD Manual 4165.63-M, *DoD Housing Management*
- DoD 6055.6, *Response Time and Distance to Local Fire Company*
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### Corps of Engineers Guidance

- EM 385-1-1, *Safety and Health Requirements Manual*
- Engineering Regulation (ER) 415-1-261, *Vol. 1 through 4, Construction Inspector's Guide*

### Codes and Standards

- ASTM F 2075 *Engineered Wood-Fiber Safety Surfacing*
- ASTM F 2049 *Guide for Fencing and Barriers for Playgrounds*
- ASTM F 1951, *Method to Test Accessibility of Safety Surfacing for Playgrounds*
- NFPA 1, *Uniform Fire Code*
- NFPA 54, ANZI Z223.1-2002 *National Fuel Gas Code*
- NFPA 73, *Electrical Inspection Code for Existing Dwellings*
- NFPA 77, *Recommended Practice on Static Electricity*
- NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*
- NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*
- NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*
- NFPA 501, *Standard on Manufactured Housing*
- NFPA 501A, *Standard for Fire Safety Criteria for Manufactured Home Installations, Sites, and Communities*
- NFPA 720, *Recommended Practice for the Installation of Household Carbon Monoxide (CO) Warning Equipment*
- NFPA 780, *Standard for the Installation of Lightning Protection Systems*
- NFPA 909, *Code for the Protection of Cultural Resources*
- NFPA 914, *Code for Fire Protection of Historic Structures*

- IESNA G-1-03, *Guideline for Security Lighting for People, Property, and Public Spaces*
- IESNA RP-11-95, *Design Criteria for Interior Living Spaces*
- *Advanced Lighting Guidelines*, New Building Institute, <http://www.newbuildings.org>
- ASTM F 1487-93, *Use and No-Encroachment Zones*
- *Code for the Installation of Heat Producing Appliances*
- NAHB and Oak Ridge National Laboratory, *The Design Guide for Energy Efficient Revitalization of Military Family Housing for Improvement and New Construction*
- NAHB Research Center, *Insulation Handbook*
- NAHB Research Center, *Moisture in Homes Handbook*

### **Additional References**

- *Architectural Graphic Standards*; Ramsey-Sleeper
- *Building Construction Illustrated*; Francis D. Ching
- *Cost Effective Site Planning*; National Association of Home Builders
- *Playground Safety is No Accident: Developing a Public Playground Safety and Maintenance Program* Published by NRPA (2002, 3<sup>rd</sup> Ed.) ISBN 0-929581-32-6
- *Time Saver Standards: Housing*; McGraw-Hill

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**APPENDIX C**  
**Developing DD1391 Programming Documents**

Appendix C contains the PowerPoint presentation that provides the key to translating Family Housing community Profile data into the information needed on a DD1391 programming document, whether for a new construction/replacement project or for an improvement/renovation project.

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## **Developing DD1391 Programming Documents**

*FROM*

***Family Housing Community Profile  
(FHCP)***

*TO*

***Automated Civil Engineer System –  
Project Management  
(ACES-PM)***

NOTE: Print with Notes Pages to see screen shots and guidance text.

From Planning to Programming: This guide provides the key to translating Family Housing Community Profile (FHCP) data into the information needed on a DD1391 programming document, whether for a new construction/replacement project or for an improvement/renovation project.

The ACES 1391 screens shown in this document are only used for replacement or new construction projects that will be using the DoD Family Housing Cost Model for cost estimation on the DD1391. However, the FHCP data will also be used for improvement 1391s and also input through ACES.

Refer to the “hard copy” of the Housing Community Profile (HCP) Phasing Plan as well as the FHCP database and the Family Housing Master Plan (FHMP) for your installation to identify the project phase construction and funding requirements needed to create the project in ACES.

You will need information to include:

Type Work =

NEW (New Construction or Replacement)

IMPROVE (Improvement or Renovation)

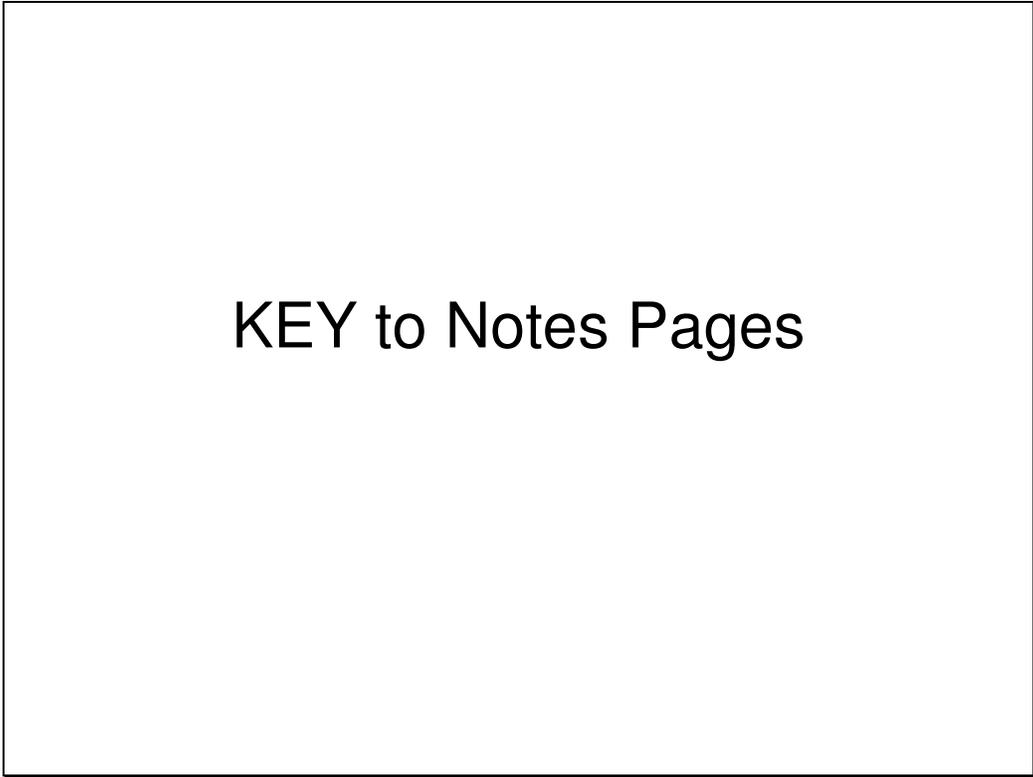
PA

Scope

Project Composition

etc.

Once a project has been established in ACES, use this guide to develop the 1391 document.



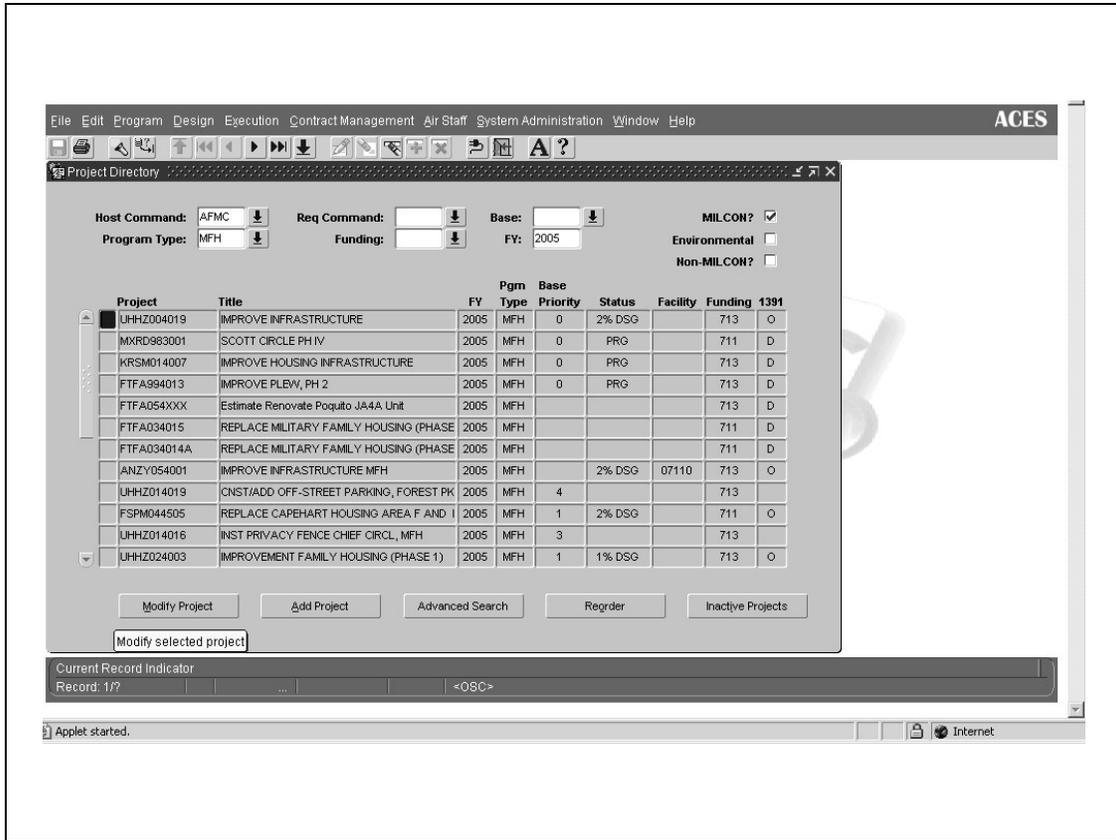
## KEY to Notes Pages

KEY to the Notes Pages in this guide:

**Bold text** = button/tab/column name

*Italics text* = data

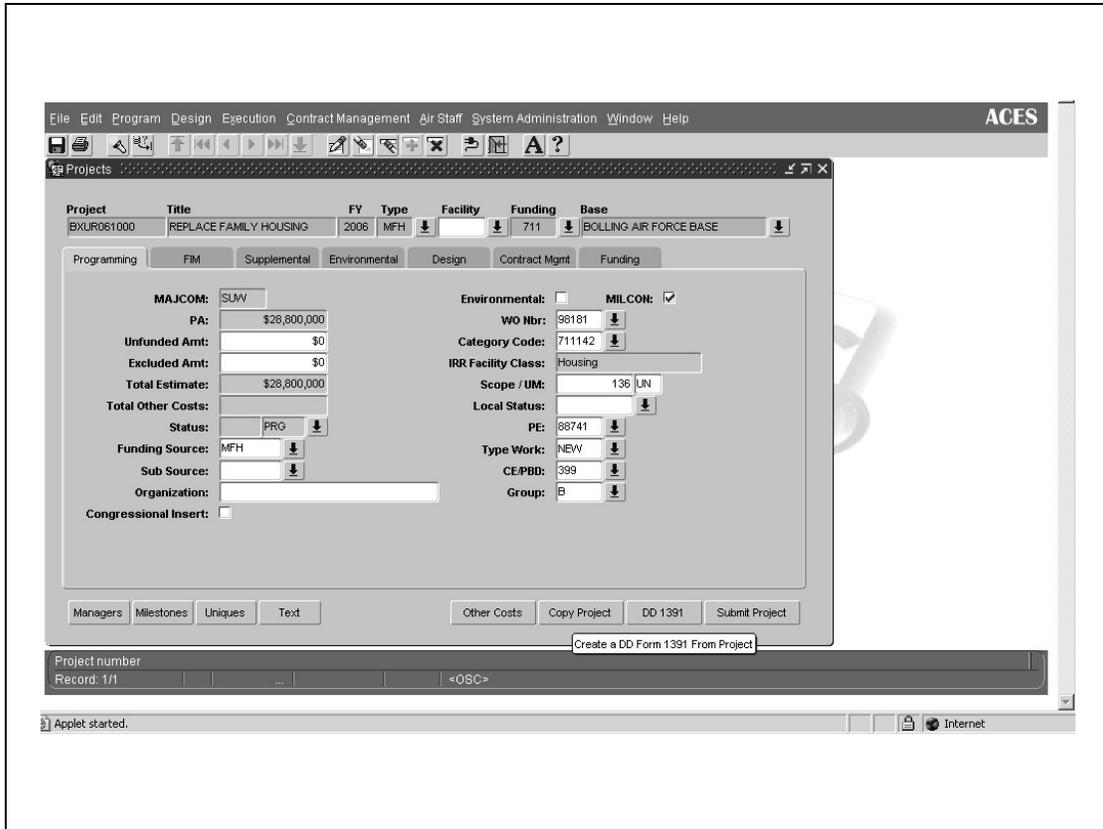
ACES or FHCP = the first note under each screen shot identifies which database the screen is from. The ACES screens will show which data fields need to be filled in. The FHCP screens show where to get the required data.



**ACES**

Once a project has been created in ACES, start from the **Project Directory** screen.

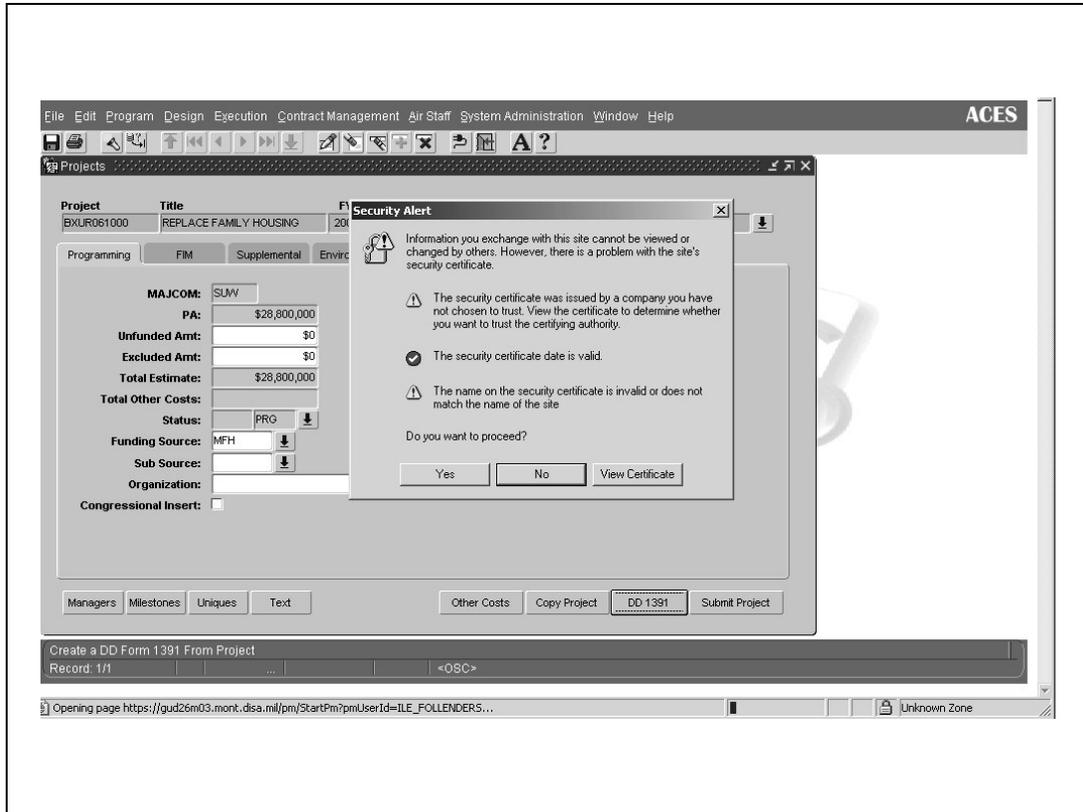
Select project and select **Modify Project** button.



**ACES**

**Projects** screen.

Select **DD 1391** button.

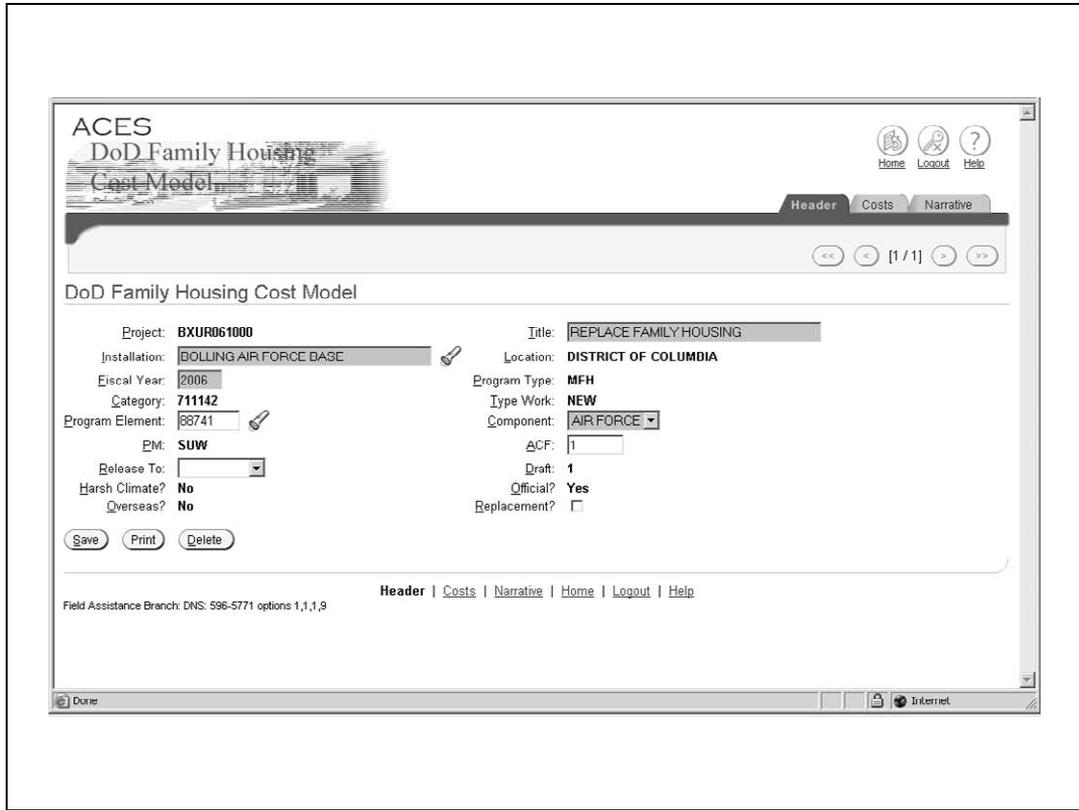


## ACES

If the project is for New Construction/Replacement, it will use the DoD Family Housing Cost Model. ACES has implemented this Cost Model and will automatically open a separate window for the DD1391. If you get this **Security Alert** message before the new DD1391 window opens, select **Yes**.

If the project is for Improvement, it will not use the DoD Family Housing Cost Model. You will continue to access the DD1391 screens in ACES as in previous years.

You will use the FHCP to determine what data to input to the DD1391 whether it is for an Improvement or New Construction/Replacement project. Sample screens for both kinds of projects will be reviewed in this guidance.

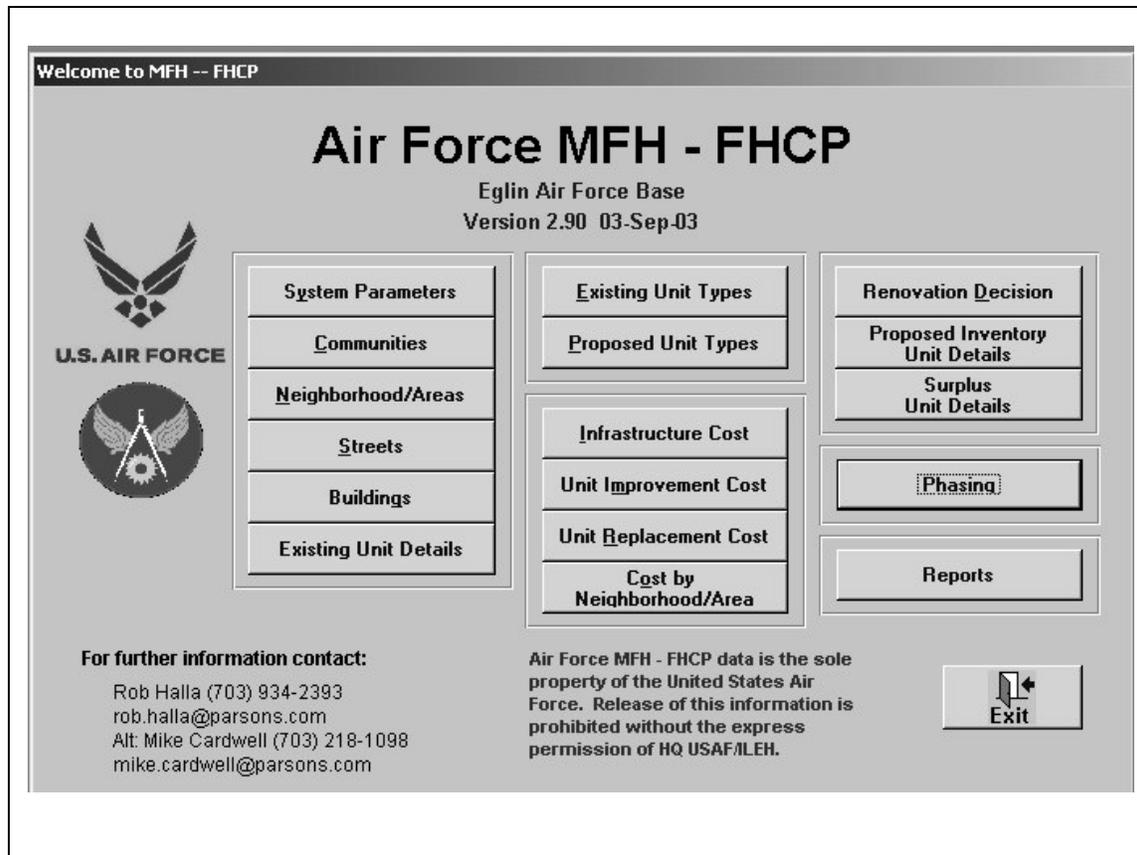


**ACES DD 1391**

**Header tab.**

Confirm that **Type Work** is consistent with **New Construction Unit Type** column in FHCP (**Proposed Unit Types** sheet).

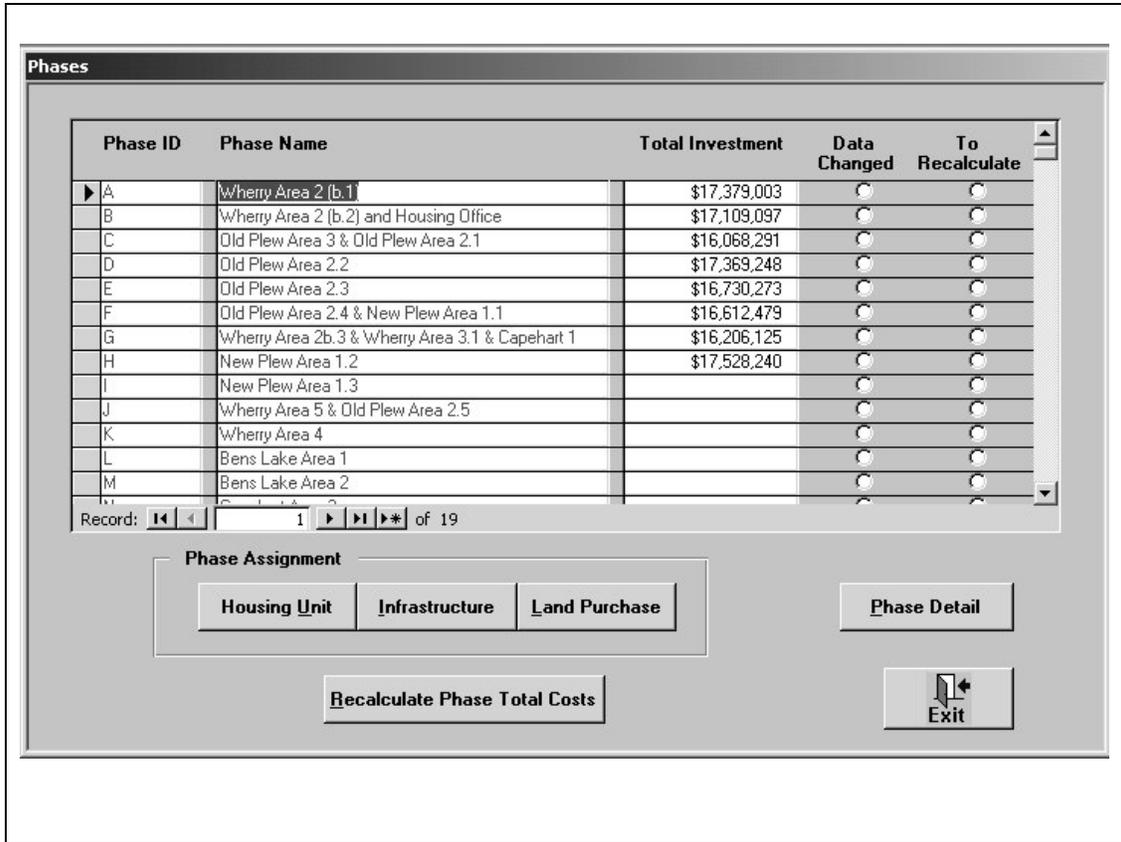
- Type Work could be
- ADAL – Addition and Alteration
- ADD – Addition
- ALTR – Alteration
- DEMO – Demolition
- IMPR – Improvements
- MNT – Maintenance
- NEW – New Construction
- RENOV – Renovation
- REPR – Repairs



Open the FHCP for your installation.

This is the FHCP main screen.

Select the **Phasing** button.



**FHCP**

From the Phases screen, select the Phase Detail button.

The screenshot shows a software window titled "Phase Details" with a dropdown menu for "Phase" set to "A". The window has several tabs: "Cost Summary", "Housing Units", "Lump Sum & Standalone", "Infrastructure/Community", and "Land Purchase". The "Cost Summary" tab is active, displaying a table of costs:

Unit Cost*	\$13,907,652.76
Land Purchase	\$0.00
<b>Prorated I/C Costs:</b>	
Improvement Units	\$0.00
Replacement Units*	\$3,471,350.13
New Units*	\$0.00
Lumpsum I/C Cost	\$0.00
<b>Total</b>	<b>\$17,379,002.89</b>
Target Phase Cost (\$20M * ACF)	\$16,400,000.00
Remaining Target Available	(\$979,002.89)
Standalone I/C Cost	\$0.00
Surplus Unit Demo. Cost	\$52,000.00

\* Includes PSF

**FHCP**

Select the **Phase ID** for the appropriate project phase.

Determine whether the project phase is for and Improvement project, or for a New Construction/Replacement project.

Note that **Prorated I/C Costs** are identified for **Improvement Units**, **Replacement Units**, or **New Units**.

As you can see, on this slide, **Phase A** is for a Replacement project.

The screenshot shows a software window titled "Phase Details" with a dropdown menu set to "S". Below the menu are tabs for "Cost Summary", "Housing Units", "Lump Sum & Standalone", "Infrastructure/Community", and "Land Purchase". The "Cost Summary" tab is active, displaying a table of costs:

Unit Cost*	\$13,631,946.89
Land Purchase	\$0.00
Prorated I/C Costs:	
Improvement Units	\$3,197,958.78
Replacement Units*	\$0.00
New Units*	\$0.00
Lumpsum I/C Cost	\$0.00
<b>Total</b>	<b>\$16,829,905.66</b>
Target Phase Cost (\$20M * ACF)	\$16,400,000.00
Remaining Target Available	(\$429,905.66)
Standalone I/C Cost	\$0.00
Surplus Unit Demo. Cost	\$0.00

\* Includes PSF

**FHCP**

Select the **Phase ID** for the appropriate project phase.

Note that **Prorated I/C Costs** are identified for **Improvement Units**, **Replacement Units**, or **New Units**.

As you can see, on this slide, **Phase S** is for an Improvement project.

**ACES DoD Family Housing Cost Model**

Home Logout Help

Header Costs Narrative

Primary Facilities Supporting Facilities Additional

**Primary Facilities**

Project: **BXUR061000** Replacement? **No** FY: **2006**  
 Project Title: **REPLACE FAMILY HOUSING** Harsh Climate? **No** Project Factor: **0.93**  
 Installation: **BOLLING AIR FORCE BASE** Overseas? **No** ACF: **1**  
 Total Project Cost: **\$99,552**

**Dwellings**

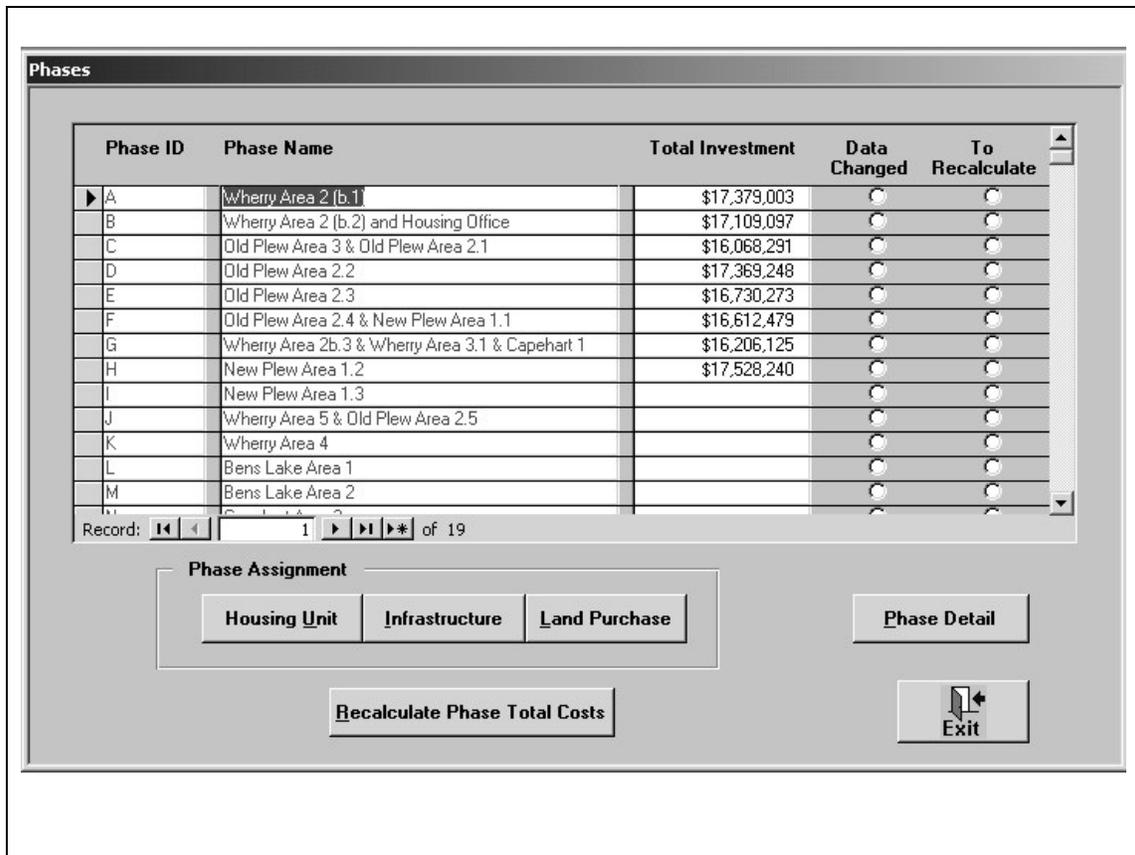
Paygrade	Bedrooms	Units	GSM	Cost/GSM	Unit Cost (\$000)	Total Cost (\$000)
E1-E3	2	0	124	754	\$0	\$0
E1-E3	3	0	151	754	\$0	\$0
E1-E3	4	0	181	754	\$0	\$0
E1-E3	5	0	214	754	\$0	\$0
E4-E6	2	120	124	754	\$11,220	\$10,435
E4-E6	3	0	151	754	\$0	\$0
E4-E6	4	0	181	754	\$0	\$0
E4-E6	5	0	214	754	\$0	\$0
E7-E8	2	0	138	754	\$0	\$0
E7-E8	3	0	173	754	\$0	\$0

Internet

**ACES DD 1391**

**Costs** tab; **Primary Facilities** tab (top of page).

Number of **Units** in each **Paygrade/Bedrooms** category should reflect the requirements identified in the **Phasing** section of the FHCP.



**FHCP**

From the FHCP main screen, select the **Phasing** button.

Select the **Phase ID** for the appropriate project phase. First, we will look at screens for a Replacement project, **Phase A**.

Be sure to note the **Phase Name**, for reference later when summarizing **Cost Element** percentages.

Select the **Housing Unit** button.

**Housing Unit Phase Assignment**

Search for: Neighbor./Area  Street  Unit Type  Grade  Phase  Bedrooms

Sort by: 1st  2nd  3rd  4th

Neighbor./Area	Bldg #	Street Name	Street #	Unit ID	Grade	Unit Type	Ren.	Cost	Phase
Bens Lake	2516	Adams Drive	401	156	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2501	Adams Drive	402	157	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2516	Adams Drive	403	158	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2503	Adams Drive	404	159	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2514	Adams Drive	405	160	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2503	Adams Drive	406	161	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2514	Adams Drive	407	162	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2504	Adams Drive	408	163	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2513	Adams Drive	409	164	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2504	Adams Drive	410	165	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2513	Adams Drive	411	166	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2506	Adams Drive	412	167	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2511	Adams Drive	413	168	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2511	Adams Drive	415	169	JNCO	JNCOR2	R	\$114,617.84	L
Bens Lake	2510	Adams Drive	417	170	JNCO	JNCOR2	R	\$114,617.84	L

Record: 1 of 2359

Group Phase Assignment

**FHCP**

Select the **Phase**, using the pull-down menu in the top part of the screen.

Select the **Refresh** button to update the screen.

**Housing Unit Phase Assignment**

Search for: Neighbor./Area  Street  Unit Type  Grade  Phase  Bedrooms

Sort by: 1st  2nd  3rd  4th

Neighbor./Area	Bldg #	Street Name	Street #	Unit ID	Grade	Unit Type	Ren.	Cost	Phase
Wherry	10708	Hatchee Road	47A	1472	JNCO	JNCOR3	R	\$132,617.34	A
Wherry	10708	Hatchee Road	47B	1473	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10708	Hatchee Road	47C	1474	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10708	Hatchee Road	47D	1475	JNCO	JNCOR3	R	\$132,617.34	A
Wherry	10709	Hatchee Road	49A	1478	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10709	Hatchee Road	49B	1479	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10709	Hatchee Road	49C	1480	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10709	Hatchee Road	49D	1481	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10774	Hatchee Road	50A	1482	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10774	Hatchee Road	50B	1483	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10774	Hatchee Road	50C	1484	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10774	Hatchee Road	50D	1485	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10710	Hatchee Road	51A	1486	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10710	Hatchee Road	51B	1487	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10710	Hatchee Road	51C	1488	JNCO	JNCOR2	R	\$114,617.84	A

Record: 1 of 124

Group Phase Assignment:

**FHCP**

This is **Phase A**, a Replacement project.

At the bottom of the table, on this screen, you will see “**Record: [#] of [Total #].**” The **Total #** indicates the total number of units included in the selected project phase. In this case, there are *124* units to be replaced in Phase A.

**Housing Unit Phase Assignment**

Search for: Neighbor./Area  Street  Unit Type  Grade

Sort by: 1st  2nd  3rd  4th

Phase  Bedrooms

Neighbor./Area	Bldg #	Street Name	Street #	Unit ID	Grade	Unit Type	Ren.	Cost	Phase
Wherry	10708	Hatchee Road	47A	1472	JNCO	JNCOR3	R	\$132,617.34	A
Wherry	10708	Hatchee Road	47B	1473	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10708	Hatchee Road	47C	1474	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10708	Hatchee Road	47D	1475	JNCO	JNCOR3	R	\$132,617.34	A
Wherry	10709	Hatchee Road	49A	1478	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10709	Hatchee Road	49B	1479	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10709	Hatchee Road	49C	1480	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10709	Hatchee Road	49D	1481	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10774	Hatchee Road	50A	1482	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10774	Hatchee Road	50B	1483	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10774	Hatchee Road	50C	1484	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10774	Hatchee Road	50D	1485	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10710	Hatchee Road	51A	1486	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10710	Hatchee Road	51B	1487	JNCO	JNCOR2	R	\$114,617.84	A
Wherry	10710	Hatchee Road	51C	1488	JNCO	JNCOR2	R	\$114,617.84	A

Record: 1 of 116

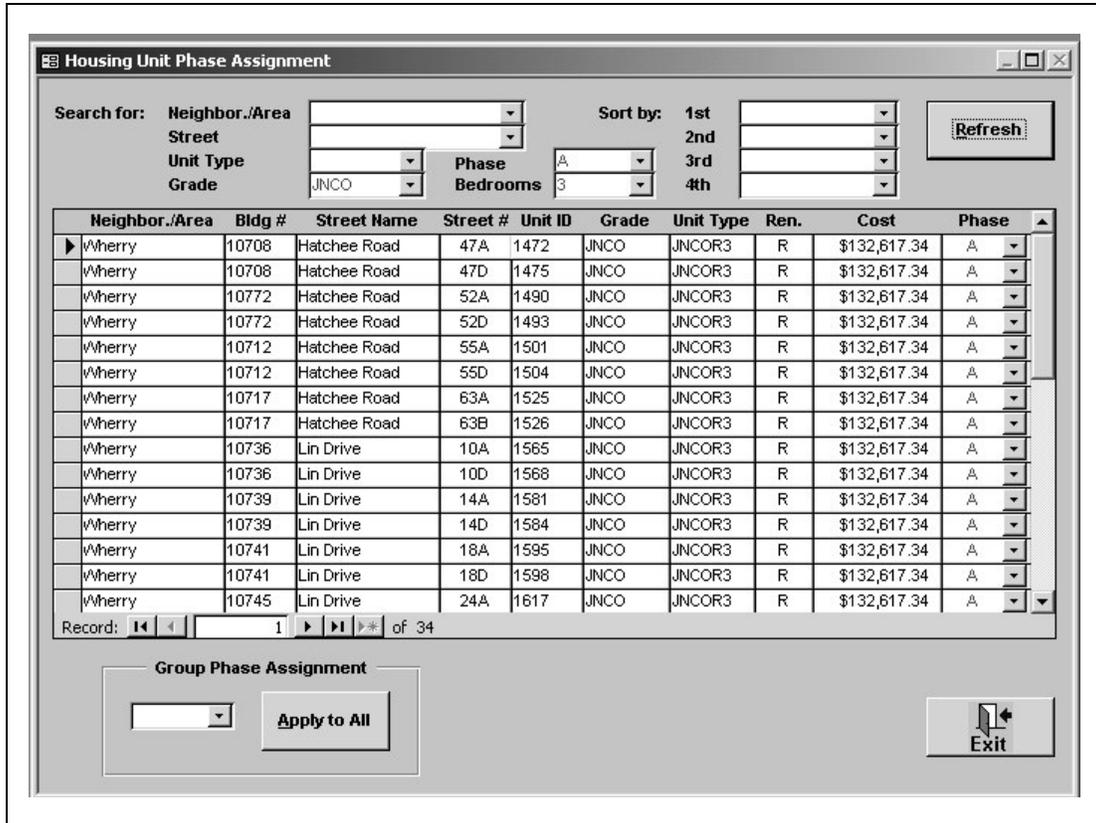
Group Phase Assignment

**FHCP**

Now, select the **Grade**, using the pull-down menu in the top part of the screen.

Select the **Refresh** button to update the screen.

At the bottom of the table, on this screen, you will see “**Record: [#] of [Total #].**” The **Total #** indicates the total number of units included in the selected project phase and grade. In this case, there are 116 JNCO units to be replaced in Phase A.



**FHCP**

Now, select the number of **Bedrooms**, using the pull-down menu in the top part of the screen.

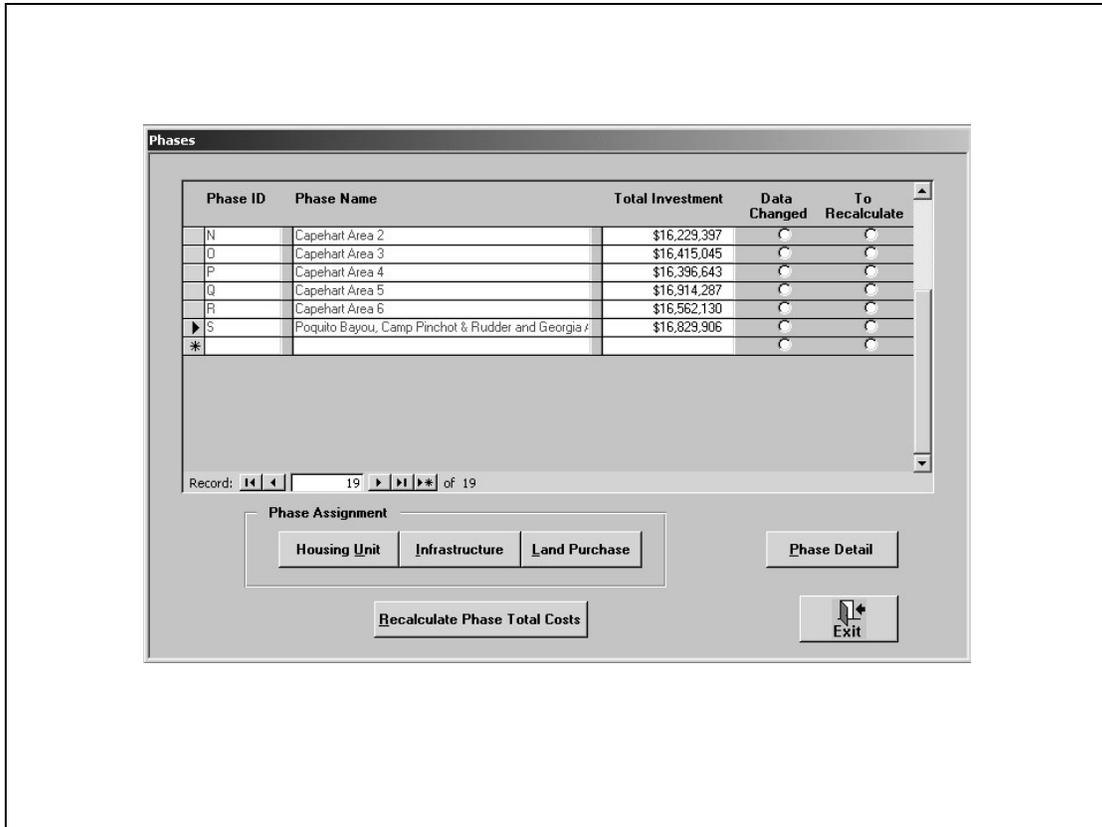
Select the **Refresh** button to update the screen.

At the bottom of the table, on this screen, you will see “**Record: [#] of [Total #].**” The **Total #** indicates the total number of units included in the selected project phase and grade. In this case, there are 34 3-bedroom JNCO units to be replaced in Phase A.

Continue to select combinations of **Grade** and **Bedrooms** to identify how many units of each type are included in this project phase.

Or, from the FHCP main screen, select the **Reports** button and view the **6.5.2 Proposed Investment Cost Summary By Phase** report.

Select the **Exit** button to leave this screen.



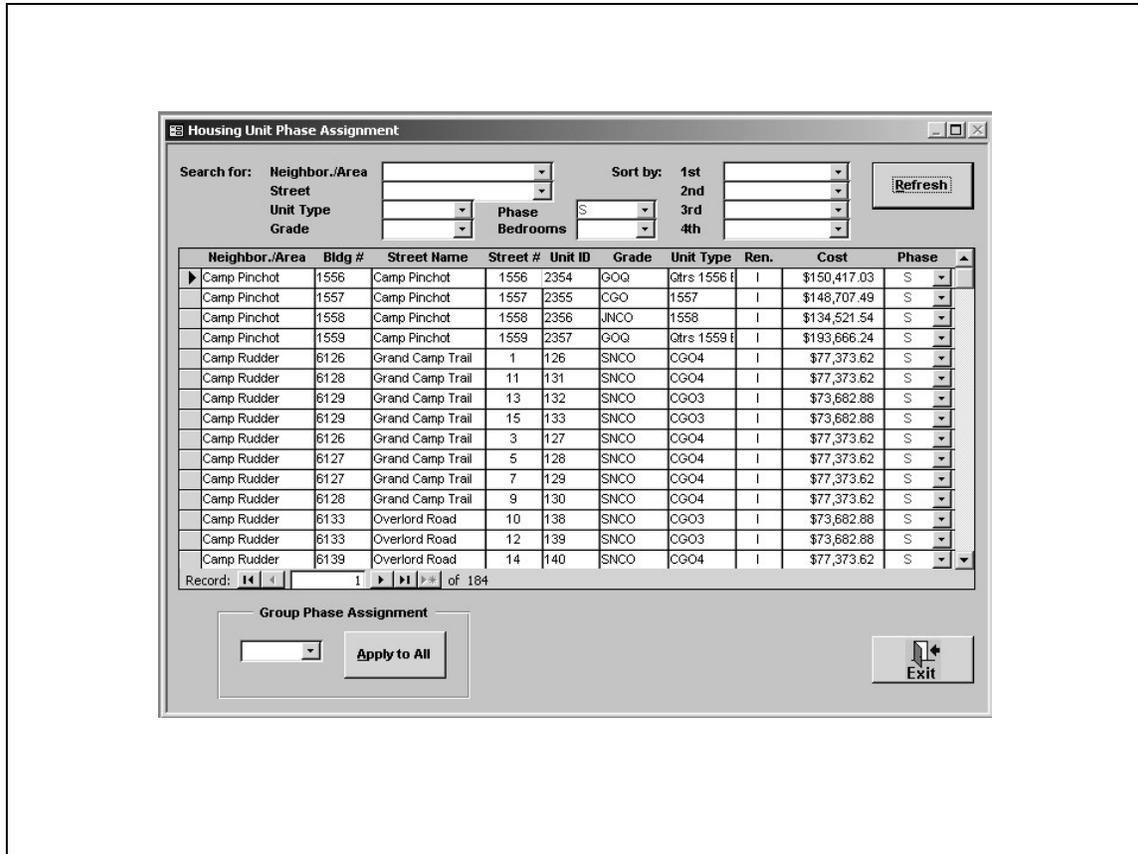
## FHCP

From the FHCP main screen, select the **Phasing** button.

Select the **Phase ID** for the appropriate project phase. Now we will look at similar screens for an Investment project, Phase S.

Be sure to note the **Phase Name**, for reference later when summarizing **Cost Element** percentages.

Select the **Housing Unit** button.



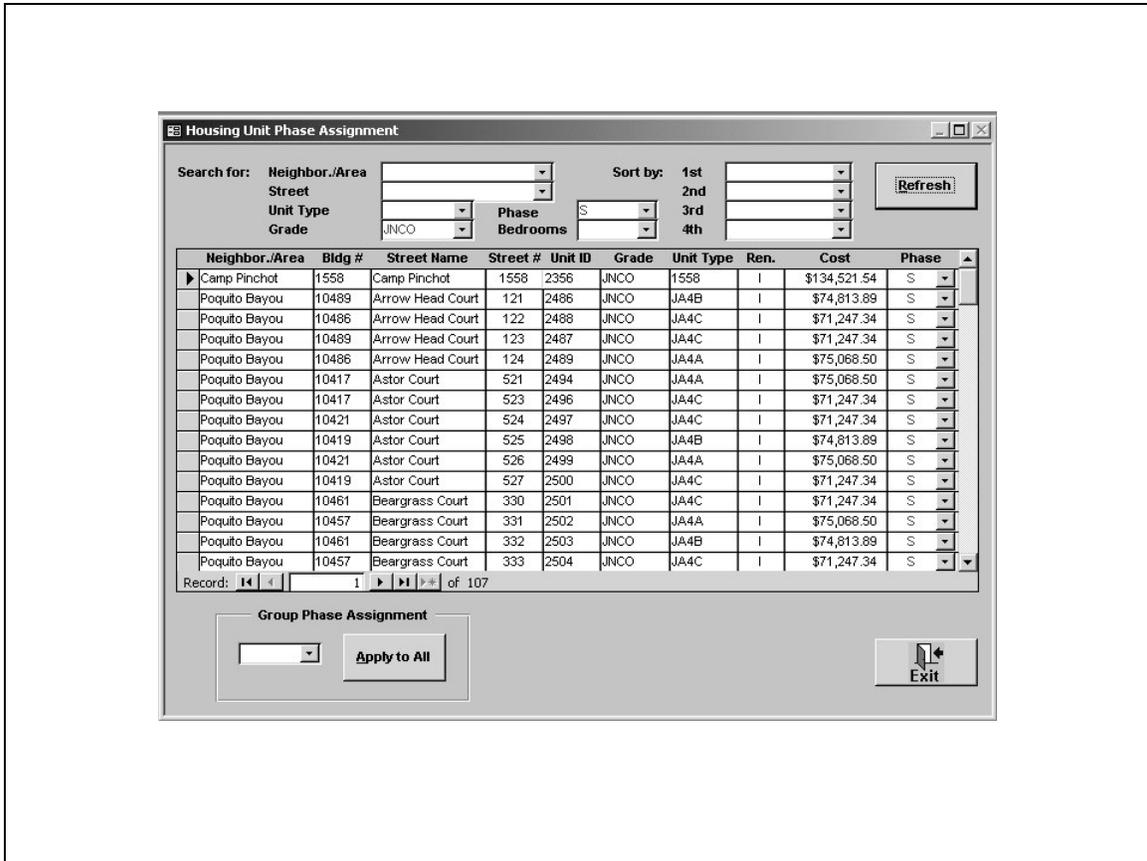
**FHCP**

Select the **Phase**, using the pull-down menu in the top part of the screen.

Select the **Refresh** button to update the screen.

This is Phase S, an Improvement project.

At the bottom of the table, on this screen, you will see **“Record: [#] of [Total #].”** The **Total #** indicates the total number of units included in the selected project phase. In this case, there are *184* units to be improved in Phase S.

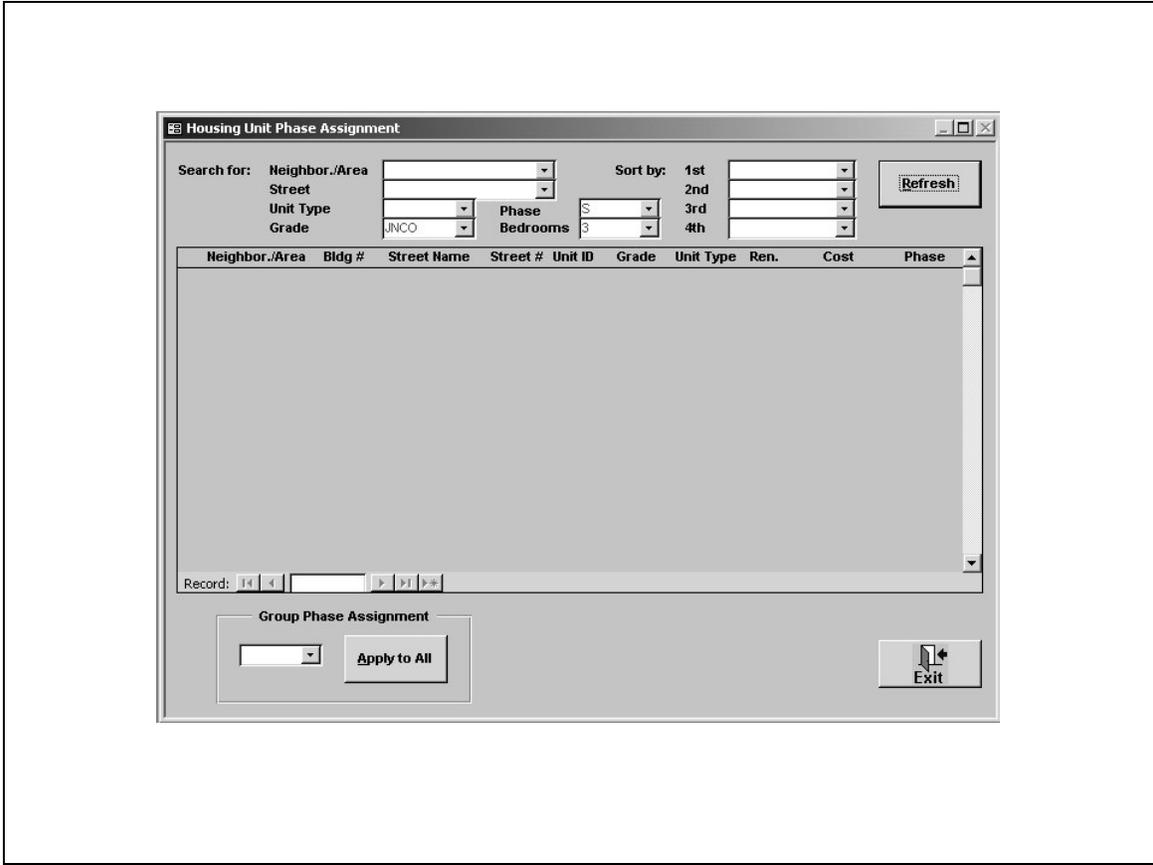


**FHCP**

Now, select the **Grade**, using the pull-down menu in the top part of the screen.

Select the **Refresh** button to update the screen.

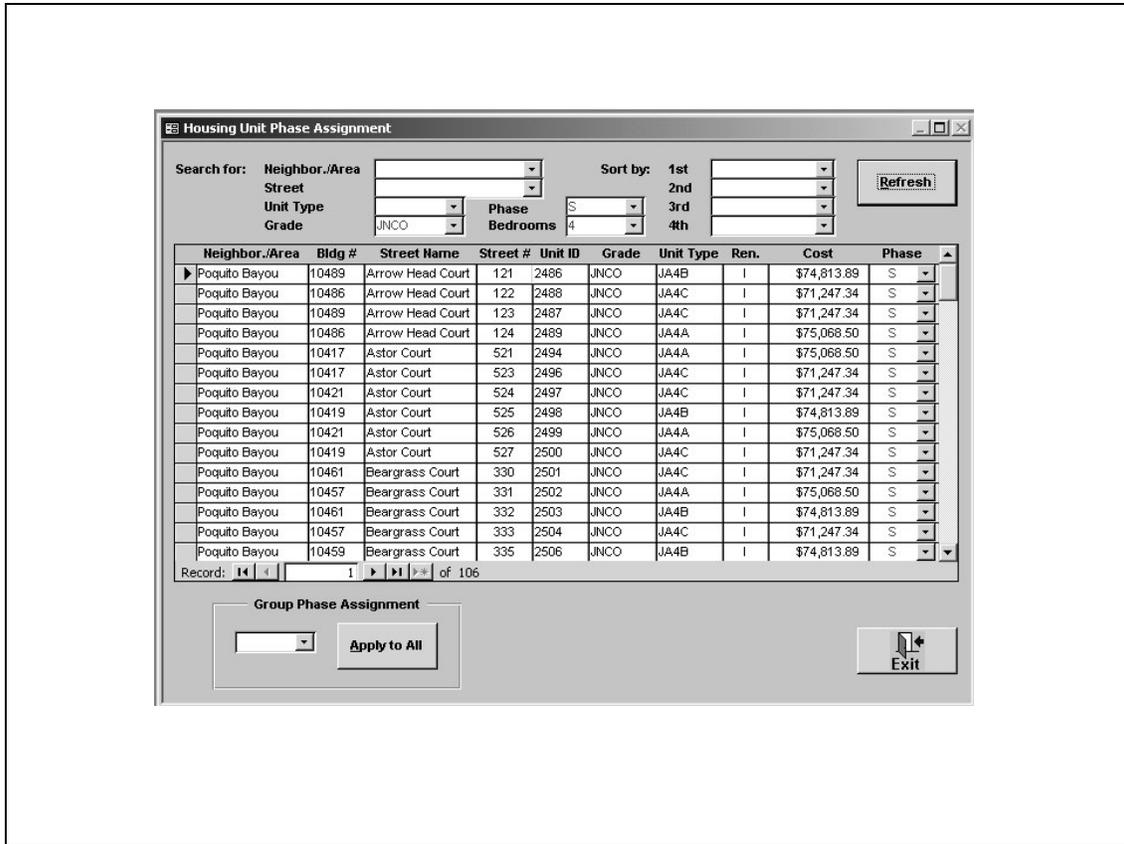
At the bottom of the table, on this screen, you will see **“Record: [#] of [Total #].”** The **Total #** indicates the total number of units included in the selected project phase and grade. In this case, there are 107 JNCO units to be improved in Phase S.



**FHCP**

Now, select the number of **Bedrooms**, using the pull-down menu in the top part of the screen. Select the **Refresh** button to update the screen.

You'll notice that there are no 3-bedroom JNCO units to be improved in Phase S.

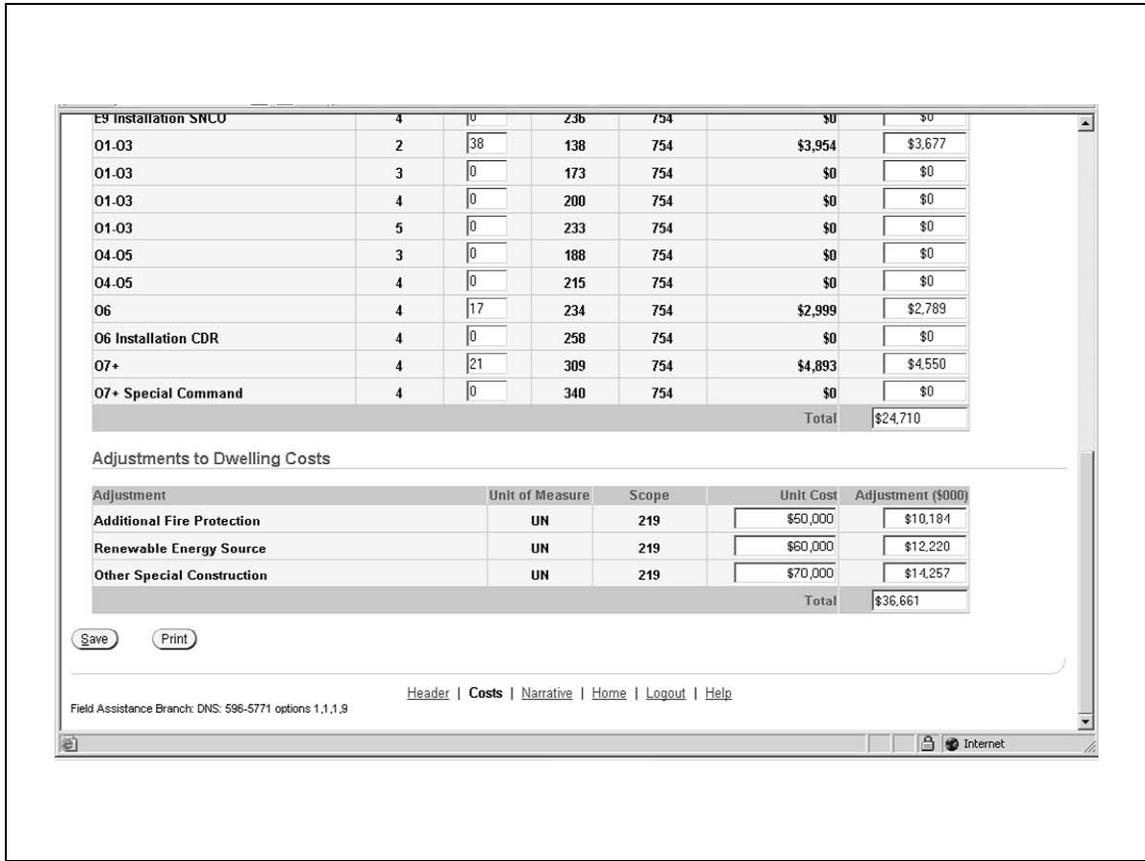


**FHCP**

However, there are other units, including 4-bedroom JNCO units, to be improved. For example, select the number of **Bedrooms** to be 4, using the pull-down menu in the top part of the screen.

Select the **Refresh** button to update the screen.

At the bottom of the table, on this screen, you will see **“Record: [#] of [Total #].”** The **Total #** indicates the total number of units included in the selected project phase and grade. In this case, there are 106 4-bedroom JNCO units to be improved in Phase S.



**ACES DD 1391**

**Costs** tab; **Primary Facilities** tab (bottom of page).

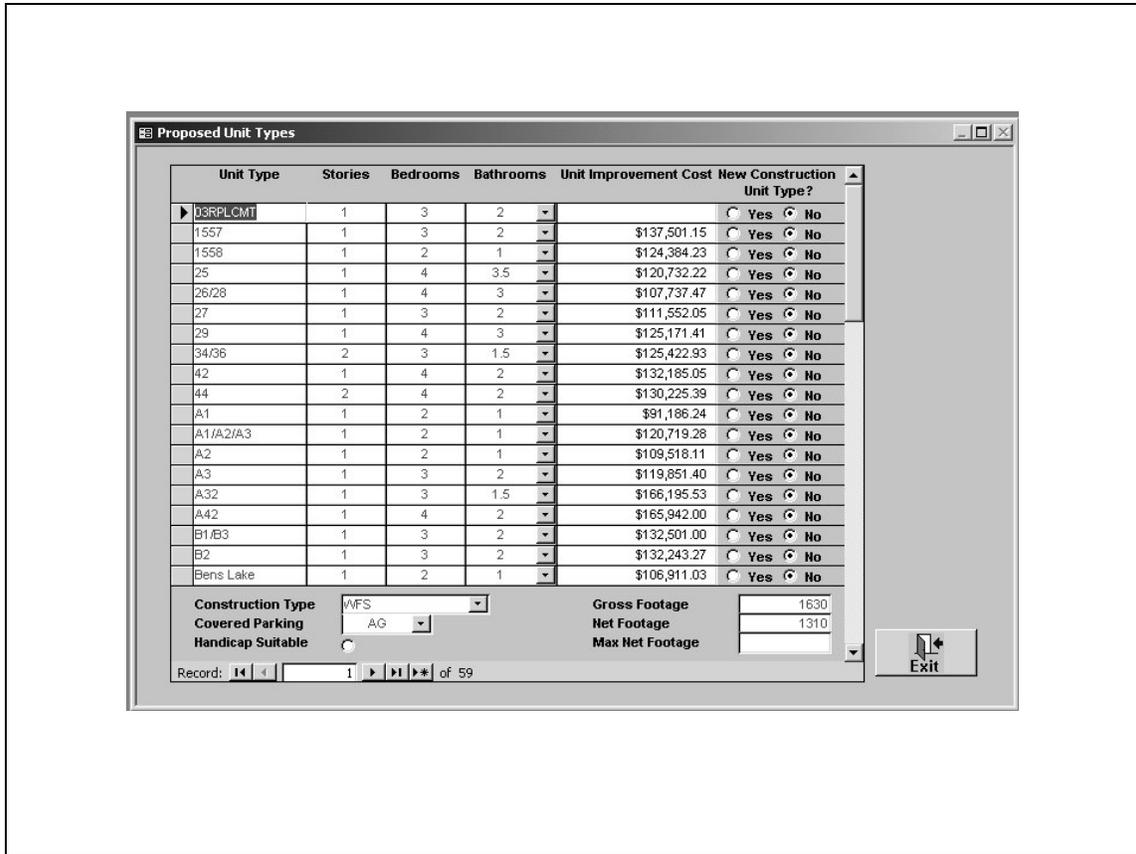
**Additional Fire Protection:** N/A (leave blank)

**Renewable Energy Source:** N/A (leave blank)

**Other Special Construction:**

Include costs such as garages, from FHCP **Proposed Unit Types** screen, **Covered Parking** field.

Include other costs identified on **Unit Replacement Cost** screen, **General Adjustments** column



**FHCP**

From the FHCP main screen, select the **Proposed Unit Types** button.

View **Covered Parking** field to determine input for DD1391 **Other Special Construction**.

- AC = Attached Carport
- AG = Attached Garage
- DC = Detached Carport
- DG = Detached Garage
- NO = No Covered Parking

Unit Replacement and New Construction Cost						
Grade	Bedrooms	Unit Replacement/New Construction Cost				Total*
		Base Cost	General Adjustments	Lot Elements(%)		
GOQ-SCP	4	\$238,214.90	\$32,950.00		5.07	\$284,912.96
GOQ	4	\$216,556.99	\$32,950.00		5.07	\$262,157.00
SOQ	4	\$163,880.97	\$32,950.00		5.07	\$206,810.30
FGO	4	\$150,224.22	\$32,950.00		5.07	\$192,461.15
FGO	3	\$131,364.90	\$32,950.00		5.07	\$172,645.67
CGO	5	\$163,230.65	\$32,950.00		5.07	\$206,127.01
CGO	4	\$139,819.08	\$32,950.00	Special Considerations		\$181,528.47
CGO	3	\$120,959.76	\$32,950.00		5.07	\$161,712.99
CGO	2	\$96,897.87	\$32,950.00		5.07	\$136,431.16
E9	4	\$150,224.22	\$32,950.00		5.07	\$192,461.15
E9	3	\$131,364.90	\$32,950.00		5.07	\$172,645.67
SNCO	5	\$163,230.65	\$32,950.00		5.07	\$206,127.01
SNCO	4	\$139,819.08	\$32,950.00		5.07	\$181,528.47
SNCO	3	\$120,959.76	\$32,950.00		5.07	\$161,712.99
SNCO	2	\$96,897.87	\$32,950.00		5.07	\$136,431.16
JNCO	5	\$149,573.90	\$32,950.00		5.07	\$191,777.86
JNCO	4	\$126,812.65	\$32,950.00		5.07	\$167,862.62
JNCO	3	\$106,002.37	\$32,950.00		5.07	\$145,997.26
JNCO	2	\$87,143.05	\$32,950.00		5.07	\$126,181.77

Record: 5 of 19

\* Does not include land purchase or Unit Cost Adjustments by Neighborhood/Area.

Cost By Address (GOQ) Exit

**FHCP**

From the FHCP main screen, select the **Unit Replacement Cost** button.

**General Adjustments** column

Select the **Gray Square** for **Special Considerations (Adjustments to Cost Elements)** for further details.

**Adjustments to Cost Elements**

Grade: FGD Bedrooms: 3

Adjustment	Cost
Trash enclosures	\$1,000.00
Terraces, patios, decks, balconies and entrance stc	\$1,950.00
2 Car Garage with Bulk Storage	\$30,000.00
*	

Total: \$32,950.00

Record: 1 of 3

Add/Edit Adjustment List Exit

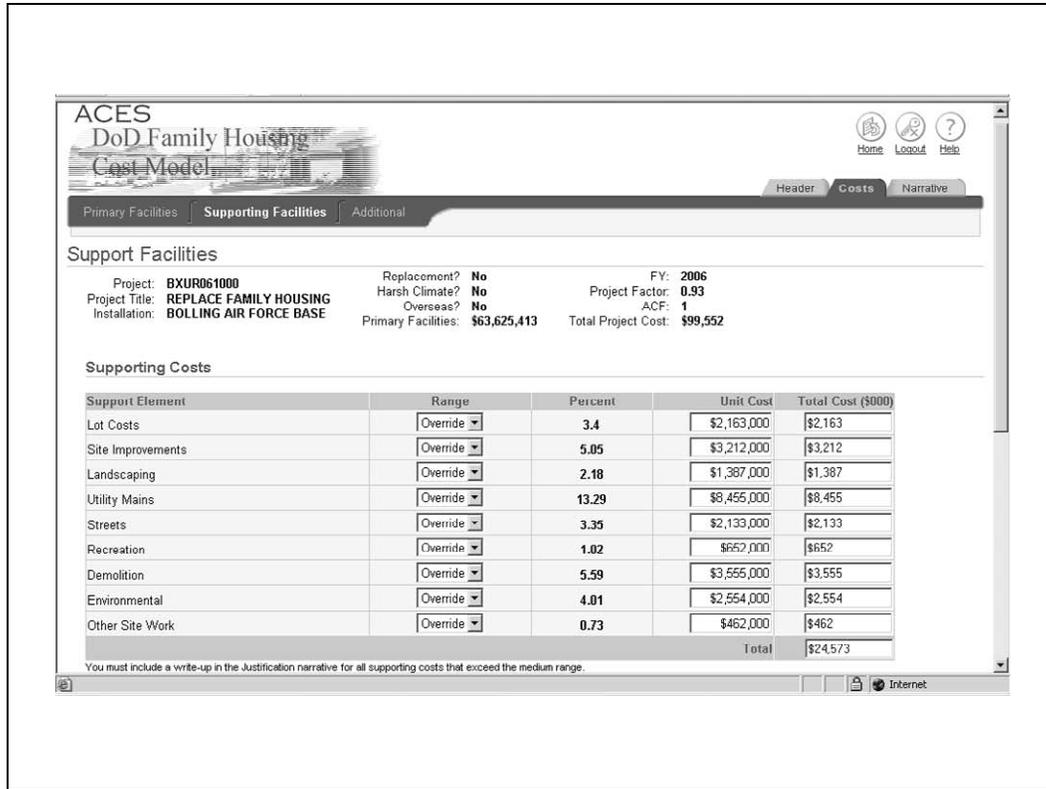
## FHCP

**Unit Replacement Cost** button.

Selecting the **Grey Box** in the **General Adjustments** column will bring up **Special Considerations (Adjustments to Cost Elements)**.

Garage costs should be included as lump sum costs in **Other Special Construction** (divide by total number of units in project to get Unit Cost) and should be referenced in the DD 1391 **Narrative** sections.

Note: Trash enclosures, patios, etc., are included in the DoD Family Housing Cost Model integral to Dwelling Costs. DO NOT include these costs as **Other Special Construction** costs.



**ACES DD 1391**

**Costs** tab; **Supporting Facilities** tab (top of page).

For each **Support Element**, select *Override* for the **Range** and input the **Percent** to reflect the FHCP data.

In the **Lot Cost** row, **Range** and **Percent** columns should reflect the FHCP data. Select *Override* in the **Range** column and manually input the value in the **Percent** column from the **Lot Elements (%)** on FHCP **Lot Elements** screen.

In the **Site Improvements** row, **Range** and **Percent** columns should reflect the FHCP data.

In the **Landscaping** row, **Range** and **Percent** columns should reflect the FHCP data.

In the **Utility Mains** row, **Range** and **Percent** columns should reflect the FHCP data.

In the **Streets** row, **Range** and **Percent** columns should reflect the FHCP data.

In the **Recreation** row, **Range** and **Percent** columns should reflect the FHCP data.

In the **Demolition** row, **Range** and **Percent** columns should reflect the FHCP data.

In the **Environmental** row, **Range** and **Percent** columns should reflect the FHCP data.

In the **Other Site Work** row, **Range** and **Percent** columns should reflect the FHCP data.

May need to adjust support costs/percentages to balance to the programmed amount

Unit Replacement and New Construction Cost						
Grade	Bedrooms	Unit Replacement/New Construction Cost				Total*
		Base Cost	General Adjustments	Lot Elements(%)		
▶ GOQ-SCP	4	\$238,214.90	\$32,950.00	5.07		\$284,912.96
GOQ	4	\$216,556.99	\$32,950.00	5.07		\$262,157.00
SOQ	4	\$163,880.97	\$32,950.00	5.07		\$206,810.30
FGO	4	\$150,224.22	\$32,950.00	5.07		\$192,461.15
FGO	3	\$131,364.90	\$32,950.00	5.07		\$172,645.67
CGO	5	\$163,230.65	\$32,950.00	5.07		\$206,127.01
CGO	4	\$139,819.08	\$32,950.00	5.07		\$181,528.47
CGO	3	\$120,959.76	\$32,950.00	5.07		\$161,712.99
CGO	2	\$96,897.87	\$32,950.00	5.07	Special Considerations	
E9	4	\$150,224.22	\$32,950.00	5.07		\$192,461.15
E9	3	\$131,364.90	\$32,950.00	5.07		\$172,645.67
SNCO	5	\$163,230.65	\$32,950.00	5.07		\$206,127.01
SNCO	4	\$139,819.08	\$32,950.00	5.07		\$181,528.47
SNCO	3	\$120,959.76	\$32,950.00	5.07		\$161,712.99
SNCO	2	\$96,897.87	\$32,950.00	5.07		\$136,431.16
JNCO	5	\$149,573.90	\$32,950.00	5.07		\$191,777.86
JNCO	4	\$126,812.65	\$32,950.00	5.07		\$167,862.62
JNCO	3	\$106,002.37	\$32,950.00	5.07		\$145,397.26
JNCO	2	\$87,143.05	\$32,950.00	5.07		\$126,181.77

Record: 1 of 19

\* Does not include land purchase or Unit Cost Adjustments by Neighborhood/Area.

Cost By Address (GOQ) Exit

**FHCP**

Get data for ACES DD 1391 **Lot Cost**.

From the FHCP main screen, select the **Unit Replacement Cost** button. This brings up the **Unit Replacement and New Construction Cost** screen.

The values in the **Lot Elements** column should all be the same. Select *Override* in the **Range** column and manually input the **Lot Elements (%)** value in the **Percent** column in the **Lot Cost** row in ACES.

Cost by Neighborhood/Areas					
ID	Neighborhood/Area Name	I/C Improvement Cost	I/C Replacement Percentage	Land Purchase	Unit Cost Adjustments by Neighbor./Area
1	Bens Lake	\$2,470,291.49	25.82		
2	Wherry	\$3,830,267.54	24.96		
3	Capehart	\$5,811,380.61	25.76		
4	New Plew	\$2,660,441.89	25.41		
5	Georgia Avenue	\$257,255.02	37.82		
6	Hidden Oaks Terrace	\$547,665.17	16.85		
7	Camp Pinchot	\$298,801.96	37.82		
8	Camp Rudder	\$864,880.70	37.82		
9	Old Plew	\$3,981,123.82	25.20		
10	Poquito Bayou	\$1,536,028.37	37.82		
11	ReplacmtFY03Neigh/Area	\$0.00	74.64		

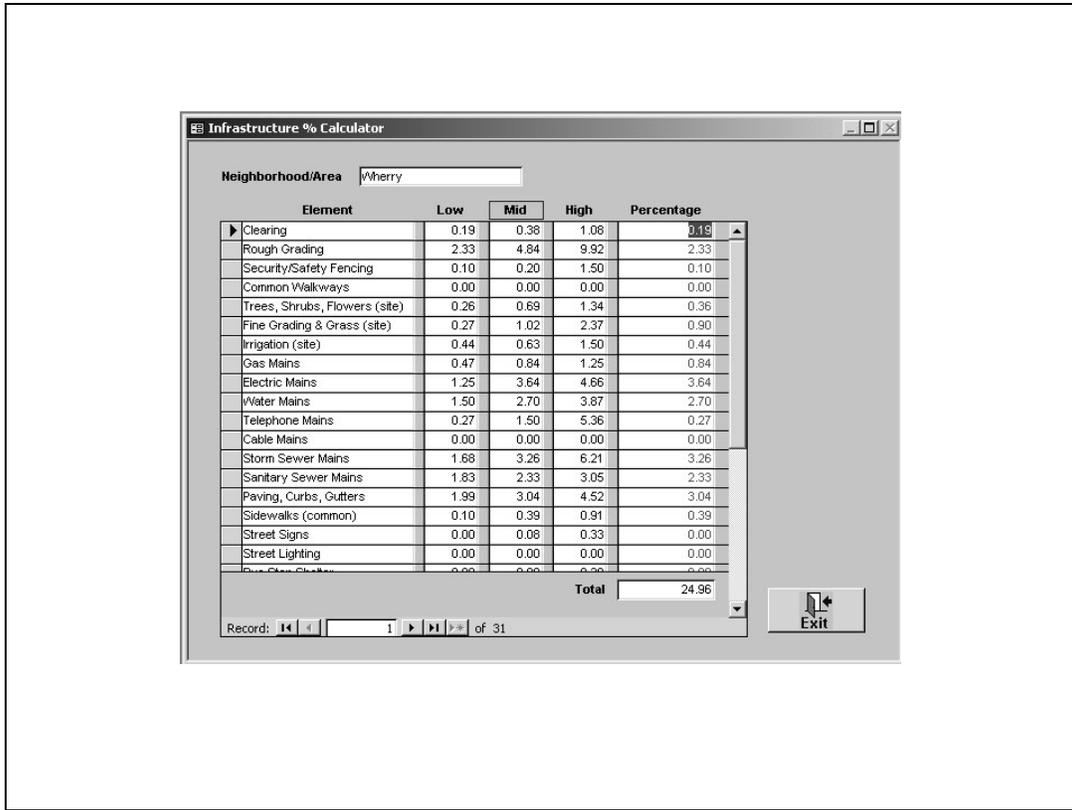
Record: 1 of 11

Exit

**FHCP**

From main FHCP screen select **Cost by Neighborhood/Area** button.

In the **I/C Replacement Percentage** column, select **Gray Box** to see all element percentages on the **Infrastructure % Calculator** screen.



**FHCP**

**Infrastructure % Calculator** screen (top of page).

For each **Support Element** in the ACES DD 1391 screen, select *Override* for the **Range** and manually input the value in the **Percent** column to reflect the FHCP data as follows:

Each **Support Element** percentage is the sum of the components identified on the **Infrastructure % Calculator** screen.

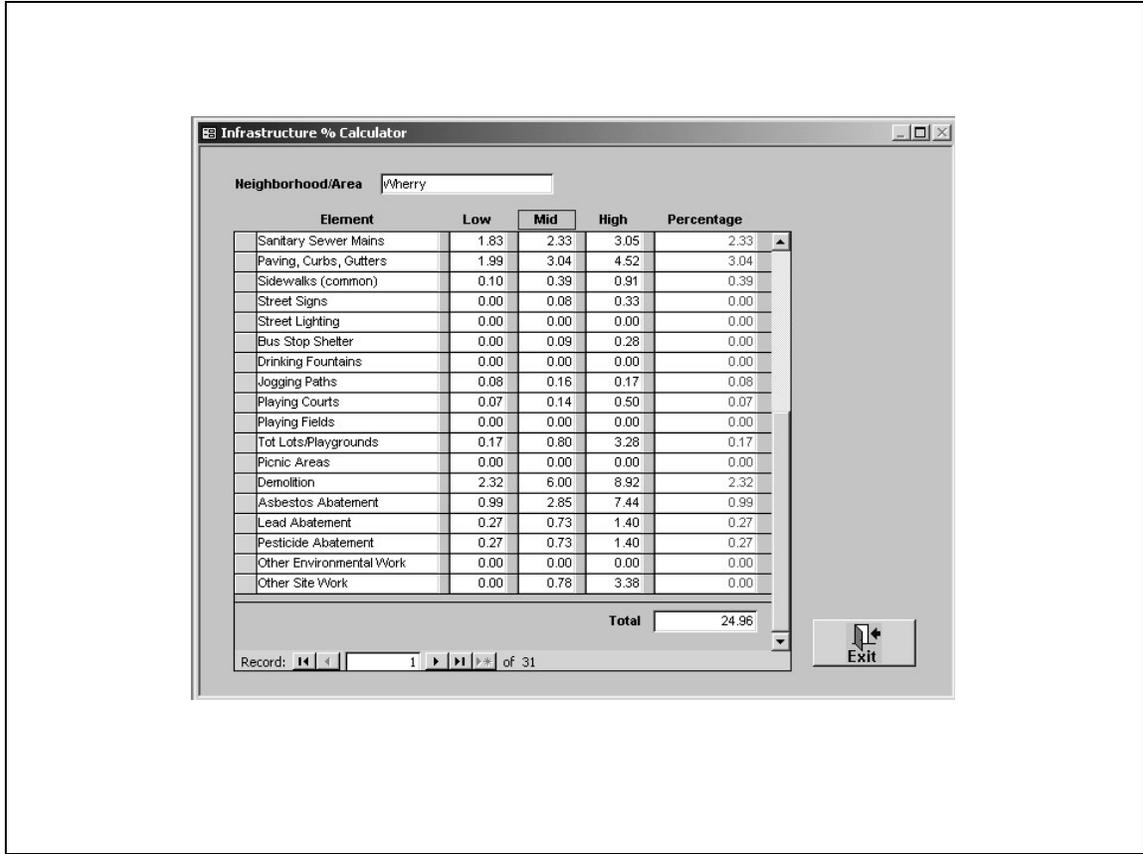
**Site Improvements % = Clearing + Rough Grading + Security/Safety Fencing + Common Walkways**

(i.e., 0.19 + 2.33 + 0.10 + 0.00 = 2.62% of the total Dwelling Costs will be for Site Improvements)

**Landscaping % = Trees, Shrubs, Flowers (site) + Fine Grading & Grass (site) + Irrigation (site)**

**Utility Mains % = Gas Mains + Electric Mains + Water Mains + Telephone Mains + Cable Mains + Storm Sewer Mains + Sanitary Sewer Mains**

**Streets % = Paving, Curbs, Gutters + Sidewalks (common) + Street Signs + Street Lighting**



**FHCP**

**Infrastructure % Calculator** screen (bottom of page).  
(Continued)

For each **Support Element** in the ACES DD 1391 screen, select *Override* for the **Range** and manually input the value in the **Percent** column to reflect the FHCP data as follows:

Each **Support Element** percentage is the sum of the components identified on the **Infrastructure % Calculator** screen.

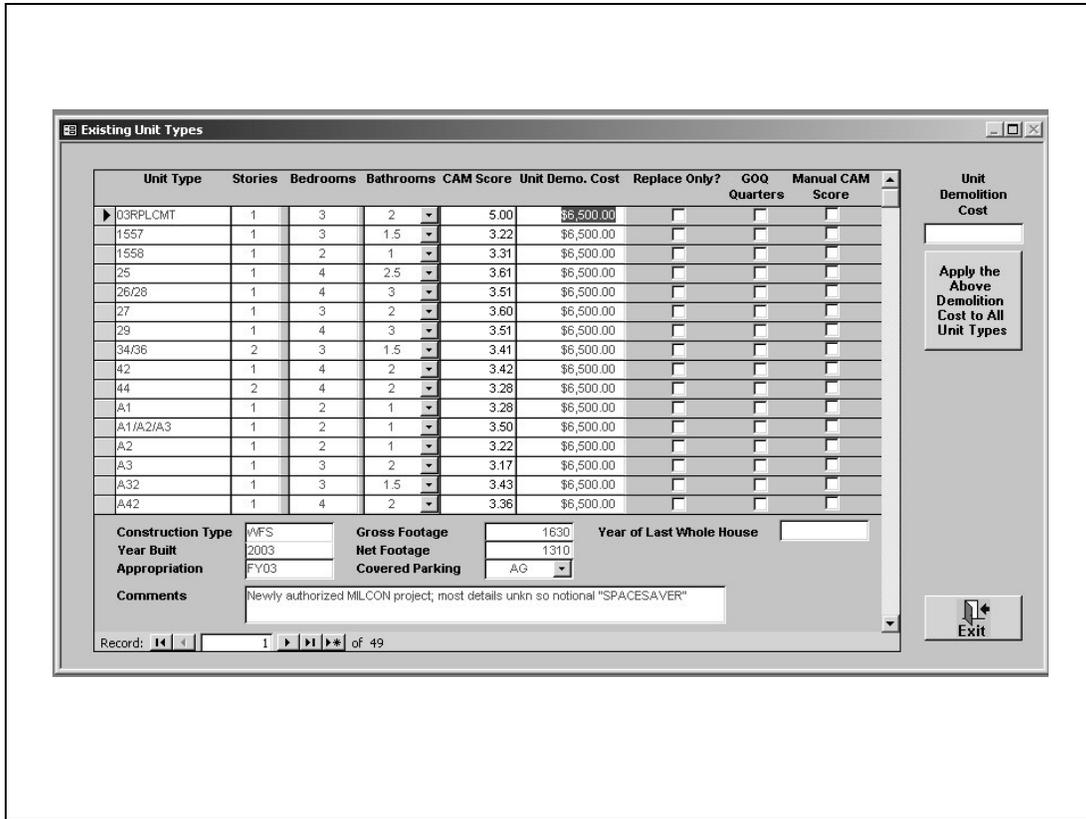
**Recreation % = Bus Stop Shelter + Drinking Fountains + Jogging Paths + Playing Courts + Playing Fields + Tot Lots/Playgrounds + Picnic Areas**

**Demolition % = Demolition**

ACES **Unit Cost** column for **Demolition** line on **Support Costs** section of **Support Facilities** screen on **Costs** tab should reflect **Unit Demo. Cost** on FHMP **Existing Unit Types** screen.

**Environmental % = Asbestos Abatement + Lead Abatement + Pesticide Abatement + Other Environmental Work**

**Other Site Work % = Other Site Work**



**FHCP**

Get data for ACES DD 1391 **Demolition**.

From the FHCP main screen, select the **Existing Unit Types** button.

**Unit Demo. Cost** on FHMP **Existing Unit Types** screen should be reflected in ACES **Unit Cost** column for **Demolition** line on **Support Costs** section of **Support Facilities** screen on **Costs** tab.

ACES  
DoD Family Housing  
Cost Model

Home Logout Help

Header Costs Narrative

Primary Facilities Supporting Facilities **Additional**

**Additional Costs**

Project: **BXUR061000** Replacement? **No** FY: **2006**  
 Project Title: **REPLACE FAMILY HOUSING** Harsh Climate? **No** Project Factor: **0.93**  
 Installation: **BOLLING AIR FORCE BASE** Overseas? **No** ACF: **1**  
 Total Project Cost: **\$99,552**

**Block 9**

SIOH %:  Unfunded Design:   
 Contingency %:  Appropriated Amount:   
 Congressional Add:  Add Description:

**Block 10**

Unit of Measure:  Requirement:   
 Type Currency:  Adequate:   
 Exchange Rate:  Substandard:

**Block 12**

Internet

**ACES DD 1391**

**Costs** tab; **Additional** tab (top of page).

The **SIOH %** should reflect the FHCP **SIOH Factor**, which should indicate the appropriate project execution agent, on the **System Parameters** screen.

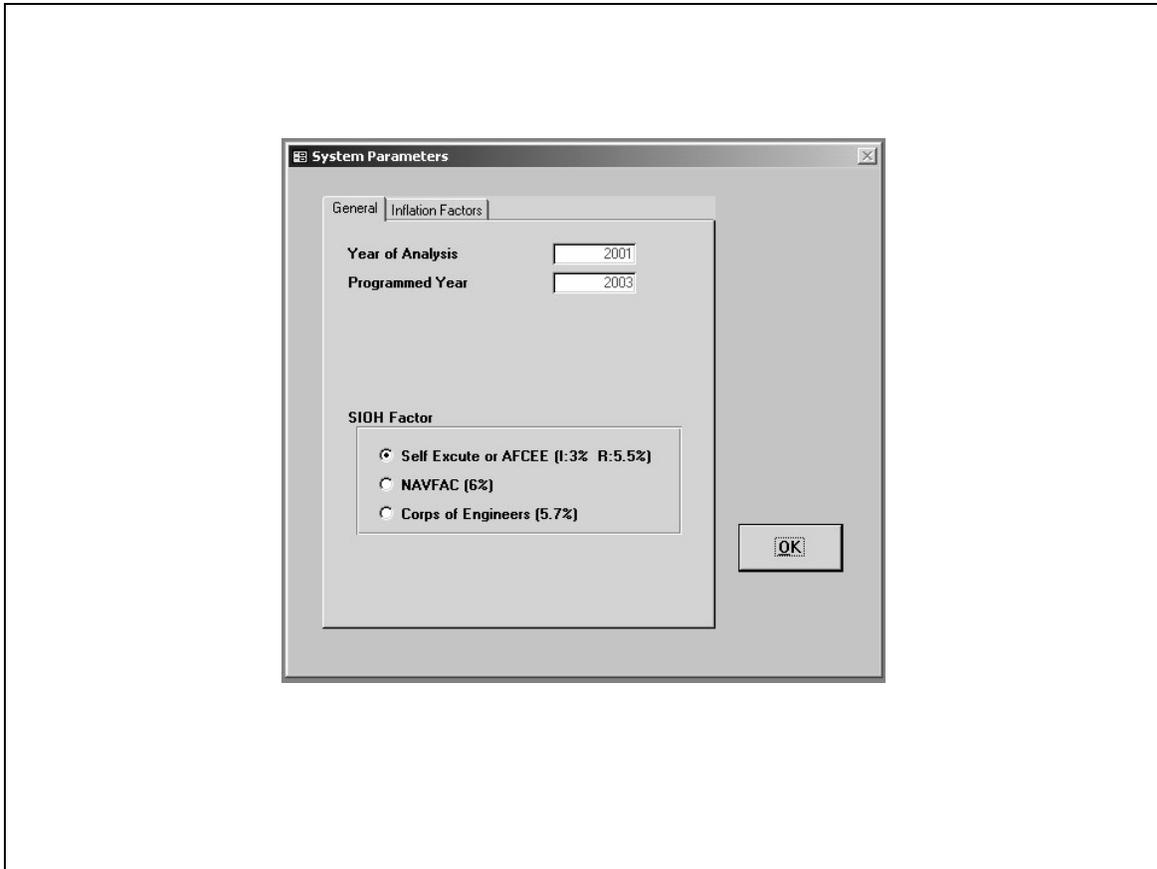
**CONUS**

Army Corps of Engineers = 5.7%  
 Navy (NAVFAC) = 6.0%  
 Air Force (AFCEE) = 5.5% for New/Replacement  
 3% for Improvement/Renovation

**OCONUS**

Army Corps of Engineers = 6.5%  
 Navy (NAVFAC) = 6.5%  
 Air Force (AFCEE) = 5.5% for New/Replacement  
 3% for Improvement/Renovation

**Contingency %** should always be 5%.



## FHCP

From the FHCP main screen, select the **System Parameters** button.

The **SIOH Factor** should be reflected in the ACES DD 1391 **SIOH %** on the **Costs** tab; **Additional Costs** screen.

Select **OK** to exit.



**ACES DD 1391**

**Narrative** tab (top of page).

Find sample narratives in AFI 32-6002, *Family Housing Planning, Programming, Design and Construction*.

**Requirement**

Project is required to provide modern and efficient housing for military members and their dependents at Bolling AFB. All units will meet modern housing standards and are programmed in accordance with the Housing Community Plan. The design will provide a modern kitchen, living room, family room, bedroom, and bath configuration, with ample interior and exterior storage. The number of bedrooms will range from two to four, as identified in most recent housing market analysis. Units will be provided with a single car garage and exterior parking for a second vehicle. Adequate infrastructure support for roads and utilities shall also be provided. This is

**Current Situation**

These existing housing units were constructed in the 1930s and 1970s. They show the effects of age and heavy use. They have had no major upgrades since construction, and they do not meet the needs of today's families, nor do they provide a modern home environment. Roof, wall, foundations and exterior pavements require major repair or replacement due to age. Plumbing and electrical systems are antiquated and do not meet current standards for efficiency and safety. Interiors are generally inadequate by modern criteria. Bathrooms are small and lack adequate closet space. Kitchens have insufficient cabinets, storage and counter space. Lighting,

**Impact If Not Provided**

There are no alternatives to living in inadequate or expensive housing if families desire to avoid lengthy and costly (both financially and psychologically) "voluntary" separations. The impact will be major morale and/or financial problems for the affected families.

**Additional Comments**

Done Internet

**ACES DD 1391**

**Narrative** tab (middle of page).

These existing housing units were constructed in the 1930s and 1970s. They show the effects of age and heavy use. They have had no major upgrades since construction, and they do not meet the needs of today's families, nor do they provide a modern home environment. Roof, wall, foundations and exterior pavements require major repair or replacement due to age. Plumbing and electrical systems are antiquated and do not meet current standards for efficiency and safety. Interiors are generally inadequate by modern criteria. Bathrooms are small and lack adequate closet space. Kitchens have insufficient cabinets, storage and counter space. Lighting,

**Impact if Not Provided**

There are no alternatives to living in inadequate or expensive housing if families desire to avoid lengthy and costly (both financially and psychologically) "voluntary" separations. The impact will be major morale and/or financial problems for the affected families.

**Additional Comments**

Demolish 281 and construct 219 multiplex family housing units with all necessary amenities and supporting facilities. Project includes site preparation, attached single car garages, air conditioning, energy conserving features, parking, exterior patios and privacy fencing, support infrastructure of roads, utilities, recreation areas, landscaping, asbestos removal, and demolition.

[Header](#) | [Costs](#) | [Narrative](#) | [Home](#) | [Logout](#) | [Help](#)

Field Assistance Branch: DNS: 596-5771 options 1,1,1,9

Done Internet

**ACES DD 1391**

**Narrative** tab (bottom of page).

**APPENDIX D**  
**Example DD 1391 Programming Documents**

Appendix D contains examples of DD 1391 Programming Documents for the following project types:

**New Construction Project (Deficit Reduction).....Page 335**

**Replacement Construction Project.....Page 339**

**Support Facility Project .....Page 343**

**Improvement Project.....Page 347**

**Privatization Project .....Page 349**

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New Construction Project (Deficit Reduction)

1. COMPONENT AIR FORCE		FY20XX MILITARY CONSTRUCTION PROJECT DATA			2. DATE			
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, SOMEWHERE				4. PROJECT TITLE CONSTRUCT FAMILY HOUSING (PHASE 1)				
5. PROGRAM ELEMENT 88741		6. CATEGORY CODE 711-142	7. PROJECT NUMBER XXXX0340001		8. PROJECT COST (\$000) 6,359			
9. COST ESTIMATE								
ITEM				U/M	QUANTITY	COST (\$000)		
MILITARY FAMILY HOUSING								
DWELLINGS				UN	34	4,627		
SUPPORT FACILITIES				LS		1,114		
LOT COSTS				LS		(80)		
SITE IMPROVEMENT				LS		(325)		
UTILITIES				LS		(305)		
STREETS				LS		(220)		
LANDSCAPING				LS		(90)		
RECREATION				LS		(94)		
SUBTOTAL						5,741		
CONTINGENCY (5%)						287		
TOTAL CONTRACT COST						6,028		
SUPERVISION, INSPECTION AND OVERHEAD (5.5%)						331		
PROJECT COST						6,359		
AREA COST FACTOR: 1.05								
10. DESCRIPTION OF PROPOSED CONSTRUCTION: Construct 34 single and multiplex family housing units with all necessary amenities and supporting facilities. Project includes site preparation, attached single car garages, air conditioning, energy conserving solar features, parking, exterior patios and privacy fencing, support infrastructure of roads and utilities, neighborhood playgrounds, recreation areas, and all landscaping.								
<b>Paygrade</b>	<b>Bedrooms</b>	<b>NSF</b>	<b>GSF</b>	<b>GSM</b>	<b>Project Factor</b>	<b>Cost Per GSM</b>	<b>No Units</b>	<b>(\$000) Total</b>
E1-E3	2	1,080	1,340	124	1.155	\$732	6	629
E4-E6	3	1,310	1,630	151	1.155	\$732	12	1,532
E4-E6	4	1,570	1,950	181	1.155	\$732	4	612
E7-E8	3	1,500	1,860	173	1.155	\$732	7	1,018
E7-E8	4	1,730	2,150	200	1.155	\$732	4	677
O4-O5	3	1,630	2,020	188	1.155	\$732	1	159
							34	4,627
Maximum Size: E1-E3 Two Bdrm (1,210 NSF/1,500 GSF/139 GSM) E4-E6 Three Bdrm (1,420 NSF/1,760 GSF/164 GSM) E4-E6 Four Bdrm (1,790 NSF/2,220 GSF/206 GSM) E7-E8 Three Bdrm (1,650 NSF/2,050 GSF/190 GSM) E7-E8 Four Bdrm (2,020 NSF/2,500 GSF/232 GSM) O4-O5 Three Bdrm (1,850 NSF/2,300 GSF/214 GSM)								
11. REQUIREMENT: 600 UN      ADEQUATE: 550 UN      SUBSTANDARD: 50 UN <b>PROJECT:</b> Military Family Housing (Current Mission) <b>REQUIREMENT:</b> This project is required to provide modern and efficient housing for military members and their dependents stationed at Blue AFB. All units will meet modern housing standards and are programmed in accordance with the Housing Community Profile. The housing will provide a safe, comfortable, and appealing living environment comparable to the off-base civilian community. The design will provide a modern kitchen, living room, family room, bedroom, and bath configuration, with ample interior and exterior storage. The number of bedrooms will range from two to four, as identified in the most recent housing requirements and market analysis. Units will be provided with a single car garage and exterior parking for a single vehicle. Space will also be provided with an adequate support infrastructure of roads and utilities. The base currently has 550 housing units versus a validated requirement of 600.								

1. COMPONENT AIR FORCE	<b>FY20XX MILITARY CONSTRUCTION PROJECT DATA</b>			2. DATE
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, SOMEWHERE			4. PROJECT TITLE CONSTRUCT FAMILY HOUSING (PHASE 1)	
5. PROGRAM ELEMENT 88741	6. CATEGORY CODE 711-142	7. PROJECT NUMBER XXXX0340001	8. PROJECT COST (\$000) 6,364	
<p><u>CURRENT SITUATION:</u> The most recent Housing Requirements and Market Analysis for the base shows a deficit of 50 housing units over and above adequate and affordable housing available in the local community. The shortage of suitable housing forces many military families to occupy inadequate housing units, thus affecting family morale, or forcing members to occupy housing at rents outside the acceptable range, causing unacceptable financial hardships as other portions of limited budges are used to offset high housing costs.</p> <p><u>IMPACT IF NOT PROVIDED:</u> There are no alternatives to living in inadequate or expensive housing if families desire to avoid lengthy and costly (both financially and psychologically) “voluntary” separations. The impact will be major morale and/or financial problems for the affected families.</p> <p><u>ADDITIONAL:</u> This project meets the criteria/scope specified in Air Force Family Housing Guide. An economic analysis has been prepared comparing the alternatives of new construction, acquisition, and status quo operation. Based on the net present values and benefit of this respective alternative, new construction was found to be most cost effective over the life of the project. The local school authority indicates a capability exists to accept the increase in the student population generated by this project. No additional school construction will be required. Base Civil Engineer: Lt Col John Doe, (123) 456-7890.</p>				

1. COMPONENT AIR FORCE		FY20XX MILITARY CONSTRUCTION PROJECT DATA		2. DATE	
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, SOMEWHERE			4. PROJECT TITLE CONSTRUCT FAMILY HOUSING (PHASE 1)		
5. PROGRAM ELEMENT 88741		6. CATEGORY CODE 711-142	7. PROJECT NUMBER XXXX0340001		8. PROJECT COST (\$000) 6,364
12. SUPPLEMENTAL DATA:					
a. Estimated Design Data:				Design/Bid/Build	
(1) Status:					
(a) Date Design Started				04 Aug 15	
(b) Parametric Cost Estimate used to develop costs				NO	
(c) Percent Complete as of 1 Jan 2005				35	
(d) Date 35% Designed				04 Dec 20	
(e) Date Design Completed				05 May 25	
(f) Energy Study/Life-Cycle analysis work performed				Yes	
(2) Basis:					
(a) Standard or Definitive Design				NO	
(b) Where design most recently used				N/A	
(3) Total Cost (c) = (a) + (b) or (d) + (e):					
(a) Production of Plans and Specifications				300	
(b) All Other Design Costs				0	
(c) Total				300	
(d) Contract				300	
(e) In-house				0	
(4) Construct Contract Award:				06 Jan	
(5) Construction Start:				06 Apr	
(6) Construction Completion:				07 Aug	

**DoD Family Housing Cost Model, New Construction Project (Deficit Reduction)**

**DoD Family Housing Cost Model**

<b>Service</b> Air Force	<b>Activity and Location</b> Blue AFB, Somewhere	<b>Project Number</b> XXXX034001	<b>Fiscal Year</b> 20XX	<b>Date</b>
Harsh Climate Location? N	Overseas? N	Replacement? N	ACF 1.05	<b>Total Project Cost</b> <b>\$6.4 Million</b>

Paygrade	Bedrooms	Size of House			Cost per		Dwelling	Project	Total Cost	Cumulative Project Cost
		NSF	GSF	GSM	GSM	No. Units	Unit Cost (\$000)			
E1-E3	2	1,080	1,340	124	\$732	6	\$545	1.155	\$629	
E4-E6	3	1,310	1,630	151	\$732	12	\$1,326	1.155	\$1,532	
E4-E6	4	1,570	1,950	181	\$732	4	\$530	1.155	\$612	
E7-E8	3	1,500	1,860	173	\$732	7	\$881	1.155	\$1,018	
E7-E8	4	1,730	2,150	200	\$732	4	\$586	1.155	\$677	
O4-O5	3	1,630	2,020	188	\$732	1	\$138	1.155	\$159	
						<b>34</b>	<b>\$4,006</b>		<b>\$4,627</b>	<b>\$4,627</b>

(1) Project Factor = ACF \* Project Size Factor  
1.155 (1.05) (1.10)

ADJUSTMENTS TO DWELLING COSTS:	Unit Cost	No. Units	(\$000)	Project Factor (1)	Adjustment (\$000)
Additional Fire Protection/Unit	\$0	34	\$0	1.155	\$0
Renewable Energy Source Cost/Unit	\$0	34	\$0	1.155	\$0
Other Special Construction/Unit	\$0	34	\$0	1.155	\$0
<b>TOTAL ADJUSTMENTS:</b>					<b>\$0</b>
<b>Average Unit Cost:</b>					<b>\$136.09</b>

SUPPORT COSTS:	
Lot Costs	\$80
Site Improvements	\$325
Utility Mains	\$305
Streets	\$220
Landscaping	\$90
Recreation	\$94
Environmental	\$0
Demolition	\$0
Other Site Work	\$0
<b>TOTAL SUPPORT COSTS:</b>	
	<b>\$1,114</b>
	<b>\$5,741</b>

ADMINISTRATIVE ADJUSTMENTS:					
Contingency	(5.0%)	of Cumulative Project Cost		\$287	\$6,028
SIOH	(5.5%)	of Cumulative Project Cost		\$331	\$6,359

SUMMARY:							
	\$4,627	\$0	\$1,114	\$5,741	\$287	\$331	<b>\$6,359</b> =Project Cost
	Dwelling	+Adjust.	+Support	=Subtotal	+Contin.	+SIOH	

	NSF	GSF	GSM	NSF	GSF	GSM
<b>Project Size:</b>	47,386	58,756	5,445	Normalized Avg Costs (ACF=1.0)		
Adjusted Dwelling Cost per Project Size:	\$97	\$78	\$846	\$93	\$75	\$805
Project Cost per Project Size:	\$134	\$108	\$1,169	\$128	\$103	\$1,113

Replacement Construction Project

1. COMPONENT AIR FORCE		FY20XX MILITARY CONSTRUCTION PROJECT DATA			2. DATE			
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, SOMEWHERE				4. PROJECT TITLE REPLACE FAMILY HOUSING (PHASE 2)				
5. PROGRAM ELEMENT 88741		6. CATEGORY CODE 711-142	7. PROJECT NUMBER XXXX061000		8. PROJECT COST (\$000) 94,418			
9. COST ESTIMATE								
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)			
Military Family Housing					61,371			
Dwellings		UN	219	110,527	(24,710)			
Additional Fire Protection		UN	219	50,000	(10,184)			
Renewable Energy Source		UN	219	60,000	(12,220)			
Other Special Construction		UN	219	70,000	(14,257)			
Support Costs:		LS			23,,701			
Lot Costs		LS			(2,087)			
Site Improvements		LS			(3,099)			
Landscaping		LS			(1,338)			
Utility Mains		LS			(8,156)			
Streets		LS			(2,056)			
Recreation		LS			(626)			
Demolition		LS			(3,431)			
Environmental		LS			(2,461)			
Other Site Work		LS			(448)			
Subtotal					85,072			
Contingency (5.0%)					4,254			
Total Contract Cost					89,326			
SIOH (5.7%)					5,092			
Project Cost					\$94,418			
Area Cost Factor: (1.0)								
10. Description of Proposed Construction: Demolish 281 and construct 219 multiplex family housing units with all necessary amenities and supporting facilities. Project includes site preparation, attached single car garages, air conditioning, energy conserving features, parking, exterior patios and privacy fencing, support infrastructure of roads, utilities, recreation areas, landscaping, asbestos removal, and demolition.								
		Programmed			Project	Cost Per	No	(\$000)
<u>Paygrades</u>	<u>Bedrooms</u>	<u>NSF</u>	<u>GSF</u>	<u>GSM</u>	<u>Factor</u>	<u>GSM</u>	<u>Units</u>	<u>Total</u>
E4-E6	2	1,080	1,340	124	0.93	754	120	10,435
E9	3	1,630	2,020	188	0.93	754	11	1,450
E9	4	1,860	2,310	215	0.93	754	12	1,809
O1-O3	2	1,200	1,490	138	0.93	754	38	3,677
O6	4	2,030	2,520	234	0.93	754	17	2,789
O7+	4	2,690	3,330	309	0.93	754	21	4,550
						Totals:	219	24,710
Maximum size: E4-E6 2 Bedroom		1,210 NSF / 1,500 GSF / 139 GSM						
Maximum size: E9 3 Bedroom		1,850 NSF / 2,300 GSF / 214 GSM						
Maximum size: E9 4 Bedroom		2,180 NSF / 1,790 GSF / 251 GSM						
Maximum size: O1-O3 2 Bedroom		1,440 NSF / 1,790 GSF / 166 GSM						
Maximum size: O6 4 Bedroom		2,350 NSF / 2,920 GSF / 271 GSM						
Maximum size: O7+ 4 Bedroom		3,270 NSF / 4,060 GSF / 377 GSM						

1. COMPONENT AIR FORCE		<b>FY20XX MILITARY CONSTRUCTION PROJECT DATA</b>		2. DATE	
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, SOMEWHERE			4. PROJECT TITLE REPLACE FAMILY HOUSING (PHASE 2)		
5. PROGRAM ELEMENT 88741		6. CATEGORY CODE 711-142	7. PROJECT NUMBER XXXX061000		8. PROJECT COST (\$000) 94,418
11. REQUIREMENT: 219 UN      ADEQUATE: 0 UN      SUBSTANDARD: 219 UN					
<p><b>PROJECT: REPLACE FAMILY HOUSING (PHASE 2)</b></p> <p><b>REQUIREMENT:</b> Project is required to provide modern and efficient housing for military members and their dependents at Blue AFB. All units will meet modern housing standards and are programmed in accordance with the Housing Community Profile. The design will provide a modern kitchen, living room, family room, bedroom, and bath configuration, with ample interior and exterior storage. The number of bedrooms will range from two to four, as identified in the most recent Housing Requirements and Market Analysis. Units will be provided with a single-car garage and exterior parking for a second vehicle. Adequate infrastructure support for roads and utilities shall also be provided. This is the seventh phase of a multiphase initiative to replace an additional 219 housing units for Blue AFB. The Housing Community Profile and Housing Requirements and Market Analysis are elements of the General Plan for Blue AFB, and are the basis for this project.</p> <p><b>CURRENT SITUATION:</b> These existing housing units were constructed in the 1930s and 1970s. They show the effects of age and heavy use. They have had no major upgrades since construction, and they do not meet the needs of today's families, nor do they provide a modern home environment. The roof, walls, foundations, and exterior pavements require major repair or replacement due to age. The plumbing and electrical systems are antiquated and do not meet current standards for efficiency and safety. Interiors are generally inadequate by modern criteria. Bathrooms are small and lack adequate closet space. Kitchens have insufficient cabinets, storage, and counter space. Lighting, heating, and air conditioning systems require upgrade and replacement. The current Housing Requirements and Market Analysis and Housing Community Profile renovation costs exceed the current replacement cost. The cost to correct eminent problems existing with the inventory, space deficiencies, and modernization requirements has proven to be more costly than the original voucher cost and the capitalization combined.</p> <p><b>IMPACT IF NOT PROVIDED:</b> There are no alternatives to living in inadequate or expensive housing if families desire to avoid lengthy and costly (both financially and psychologically) "voluntary" separations. The impact will be major morale and/or financial problems for the affected families.</p> <p><b>ADDITIONAL:</b> This project meets the criteria/scope specified in the Air Force Family Housing Guide. An economic analysis has been prepared comparing the alternatives of new construction, improvement, leasing and status quo operation. Based on the net present values and benefit of respective alternatives, new construction was found to be the most cost effective alternative over the life the project. The cost of improving existing units is 78% of the cost of replacing these units. Since this is replacement housing, there will be no increase in the student population and therefore no impact on local school district. Base Civil Engineer: Lt Col John Doe, (123) 456-7890.</p>					

1. COMPONENT AIR FORCE		FY20XX MILITARY CONSTRUCTION PROJECT DATA		2. DATE	
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, SOMEWHERE			4. PROJECT TITLE REPLACE FAMILY HOUSING (PHASE 2)		
5. PROGRAM ELEMENT 88741		6. CATEGORY CODE 711-142	7. PROJECT NUMBER XXXX061000		8. PROJECT COST (\$000) 94,418
12. SUPPLEMENTAL DATA:					
a. Estimated Design Data:				Design/Bid/Build	
(1) Status:					
(a) Date Design Started				04 Aug 10	
(b) Parametric Cost Estimate used to develop costs				NO	
(c) Percent Complete as of 1 Jan 2005				35	
(d) Date 35% Designed				04 Dec 15	
(e) Date Design Completed				05 May 20	
(f) Energy Study/Life-Cycle analysis work performed				Yes	
(2) Basis:					
(a) Standard or Definitive Design				NO	
(b) Where design most recently used				N/A	
(3) Total Cost (c) = (a) + (b) or (d) + (e):					
(a) Production of Plans and Specifications				4,500	
(b) All Other Design Costs				0	
(c) Total				4,500	
(d) Contract				4,500	
(e) In-house				0	
(4) Construct Contract Award:				06 Jan	
(5) Construction Start:				06 Apr	
(6) Construction Completion:				07 Dec	

**DoD Family Housing Cost Model, Replacement Construction Project**

**DoD Family Housing Cost Model**

<b>Service</b>	<b>Activity and Location</b>	<b>Project Number</b>	<b>Fiscal Year</b>	<b>Date</b>
AIR FORCE	BLUE AFB, SOMEWHERE	XXXX061000	20XX	
<b>Harsh Climate Location?</b>	<b>Overseas?</b>	<b>Replacement?</b>	<b>ACF</b>	<b>Total Project Cost</b> <b>\$94.4 Million</b>
N	N	N	1.0	

Paygrade	Bedrooms	Size of House			Cost per		Dwelling Unit Cost (\$000)	Project Factor (1)	Total Cost (\$000)	Cumulative Project Cost (\$000)
		NSF	GSF	GSM	GSM	No. Units				
E4-E6	2	1,080	1,340	124	\$754	120	11,219,520	0.93	10,435	
E9	3	1,630	2,020	188	\$754	11	1,559,272	0.93	1,450	
E9	4	1,860	2,310	215	\$754	12	1,945,320	0.93	1,809	
O1-O3	2	1,200	1,490	138	\$754	38	3,953,976	0.93	3,677	
O6	4	2,030	2,520	234	\$754	17	2,999,412	0.93	2,789	
O7+	4	2,690	3,330	309	\$754	21	4,892,706	0.93	4,550	
						219	26,570,206		24,710	24,710

(1) Project Factor =	ACF *	Project Size Factor
0.93	1.0	0.93

ADJUSTMENTS TO DWELLING COSTS:	Unit Cost	No. Units	(\$000)	Project Factor (1)	Adjustment (\$000)	
Additional Fire Protection	\$50,000	219	10,950	0.93	10,184	
Renewable Energy Source Cost	\$60,000	219	13,140	0.93	12,220	
Other Special Construction	\$70,000	219	15,330	0.93	14,257	
<b>TOTAL ADJUSTMENTS:</b>					36,661	61,371

SUPPORT COSTS:			
Lot Costs		2,087	
Site Improvements		3,099	
Landscaping		1,338	
Utility Mains		8,156	
Streets		2,056	
Recreation		626	
Demolition		3,431	
Environmental		2,461	
Other Site Work		448	
<b>TOTAL SUPPORT COSTS:</b>		23,701	85,072

ADMINISTRATIVE ADJUSTMENTS:	Contingency	(5.0%)	of Cumulative Project Cost	4254	89,326
	SIOH	(5.7%)	of Cumulative Project Cost	5092	94,418

SUMMARY:	24710	36661	23701	85072	4254	5092	94418
	Dwelling	+ Adjust.	+ Support	= Subtotal	+ Contin.	+ SIOH	= Project Cost
<b>Project Size:</b>		<b>NSF</b>	<b>GSF</b>	<b>GSM</b>	<b>NSF</b>	<b>GSF</b>	<b>GSM</b>
<b>Adjusted Dwelling Cost per Project Size:</b>		306450	380130	35239	Normalized Average Cost (ACF=1.0)		
<b>Project Cost per Project Size:</b>		200	161	1742	200	161	1742
		308	248	2679	308	248	2679

Support Facility Project

1. COMPONENT AIR FORCE		FY20XX MILITARY CONSTRUCTION PROJECT DATA			2. DATE	
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, NOWHERE				4. PROJECT TITLE FAMILY HOUSING MANAGEMENT FACILITY		
5. PROGRAM ELEMENT 88741		6. CATEGORY CODE 610-119	7. PROJECT NUMBER XXXX030003		8. PROJECT COST (\$000) 569	
9. COST ESTIMATE						
ITEM				U/M	QUANTITY	COST (\$000)
FAMILY HOUSING MANAGEMENT FACILITY				SM	472	811
SUPPORT FACILITIES						130
SITE PREPARATION				LS		(25)
UTILITIES				LS		(30)
PAVEMENTS				LS		(50)
LANDSCAPING				LS		(15)
DEMOLITION				LS		(10)
SUBTOTAL						513
CONTINGENCY (5%)						26
TOTAL CONTRACT COST						539
SUPERVISION, INSPECTION AND OVERHEAD (5.5%)						30
TOTAL REQUEST						569
AREA COST FACTOR: 1.05						
10. DESCRIPTION OF PROPOSED CONSTRUCTION: All site preparation, drainage improvements, concrete slab foundation, brick veneer exterior surfaces over concrete block, with decorative interior finishing. Project provides offices, restrooms, counseling and meeting rooms, customer waiting area, computer equipment room, and interior and exterior child play areas. Includes all utilities, parking, landscaping, and irrigation system. Air conditioning: 5 tons.						
11. REQUIREMENT: 472 SM      ADEQUATE: 0      SUBSTANDARD: 472 SM <u>PROJECT:</u> Construct Family Housing Management Facility (Current Mission)						
<u>REQUIREMENT:</u> An adequate facility is required for managing base owned/operated family housing assets, for assisting all arriving personnel in finding adequate on or off base housing, and for managing furnishings for authorized base personnel. The facility must be located for convenient access by arriving personnel and those already assigned to base housing. It must be handicapped accessible and have adequate parking for vehicles pulling trailers, and small trucks, which may be used by arriving personnel. The facility must provide office space, a conference room, private counseling rooms, administrative space, a reception and customer waiting area, a customer referral area with multiple telephones, a computer room and storage space for equipment and publications, a kitchen area for use by families, and interior and exterior play areas for children of customers. Exterior play areas must be provided with recreation equipment and be fenced for security. The facility exterior requires landscaping to enhance customer appeal.						
<u>CURRENT SITUATION:</u> PROVIDE A GOOD "WORD PICTURE" OF EXISTING CONDITIONS AND PROBLEMS. The current Housing Management function is located in a wood frame structure constructed as an open-bay, central latrine barracks in 1948. The facility has had little work done in the intervening 45 years to make it an adequate administrative facility. The facility does not have adequate space to accommodate housing management functions and furnishings management responsibilities. The result is an extremely crowded housing management office with some office functions dispersed in other buildings. The poor facility presents an unfavorable impression and "welcome" to the thousands of customers who transit the facility each year. Facility layout is inadequate. The facility is located in the industrial portion of the base and is not convenient to users. The small building does not have the layout or space to provide necessary customer support. Counseling rooms are inadequate resulting in customer delays. Existing space affords little privacy to families in counseling. There is no interior play area for children to use while parents are being counseled on housing opportunities. Lack of storage space results in open storage of supplies and equipment in office and customer areas.						

1. COMPONENT AIR FORCE	<b>FY20XX MILITARY CONSTRUCTION PROJECT DATA</b>			2. DATE
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, NOWHERE			4. PROJECT TITLE FAMILY HOUSING MANAGEMENT FACILITY	
5. PROGRAM ELEMENT 88741	6. CATEGORY CODE 610-119	7. PROJECT NUMBER XXXX030003	8. PROJECT COST (\$000) 569	
<p>Heating and air conditioning systems are unreliable and do not adequately support the facility. Age and the environment have taken their toll on the structure. Floors are uneven, plumbing and electrical systems do not meet modern codes, and walls and ceilings are stained from water leakage. The facility will be demolished upon completion of this replacement project.</p> <p><b><u>IMPACT IF NOT PROVIDED:</u></b> Unusual and costly resource commitment will be necessary to keep the existing facility habitable. Major repair or improvement is not an option due to the age and condition of the facility and extensive investment required. Customers will continue to be served in an extremely cramped, deteriorated and unprofessional environment. Management and operations of housing functions will continue from multiple facilities, which detracts from the effectiveness of personnel and available for customers support.</p> <p><b><u>ADDITIONAL:</u></b> This project meets the criteria/scope specified in Air Force Housing Support Facilities Guide. Base Civil Engineer: Lt Col John Doe, (123) 456-7890.</p>				

1. COMPONENT AIR FORCE		FY20XX MILITARY CONSTRUCTION PROJECT DATA		2. DATE	
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, NOWHERE			4. PROJECT TITLE FAMILY HOUSING MANAGEMENT FACILITY		
5. PROGRAM ELEMENT 88741		6. CATEGORY CODE 610-119	7. PROJECT NUMBER XXXX030003		8. PROJECT COST (\$000) 569
12. SUPPLEMENTAL DATA:					
a. Estimated Design Data:				Design/Bid/Build	
(1) Status:					
(a) Date Design Started				04 Aug 10	
(b) Parametric Cost Estimate used to develop costs				NO	
(c) Percent Complete as of 1 Jan 2005				35	
(d) Date 35% Designed				04 Dec 10	
(e) Date Design Completed				05 Apr 20	
(f) Energy Study/Life-Cycle analysis work performed				Yes	
(2) Basis:					
(a) Standard or Definitive Design				NO	
(b) Where design most recently used				N/A	
(3) Total Cost (c) = (a) + (b) or (d) + (e):					
(a) Production of Plans and Specifications				34	
(b) All Other Design Costs				0	
(c) Total				34	
(d) Contract				34	
(e) In-house				0	
(4) Construct Contract Award:				06 Jan	
(5) Construction Start:				06 Apr	
(6) Construction Completion:				07 May	

**Deficiency Detail Data (DDD), Support Facilities Project**

1. COMPONENT AIR FORCE	<b>FY20XX MILITARY CONSTRUCTION PROJECT DATA</b>	2. DATE																																						
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, NOWHERE																																								
4. PROJECT TITLE FAMILY HOUSING MANAGEMENT FACILITY		5. PROJECT NUMBER XXXX030003																																						
<b>Existing Facility Deficiency Detail Data Sheet (EFDDDS)</b>																																								
1. Requirement and Assets:																																								
<p>(1) <u>Scope of Request</u>: Construct 472 SM</p> <p>(2) <u>Mission</u>: One B-3 SQ with associated training functions; 2KC-14SQ; two AFRES F-99 SQ; Survival Training for Aircrews. Base military population is 14, 998</p> <p>(3) <u>Requirement</u>: (Show specific source of requirement or how scope was derived). Total base requirement in the category code is 5,100 SF in accordance with Air Force Housing Support Guide for a base support over 2,000 units.</p> <p>(4) <u>Functional Breakout of Proposed Project Scope</u>:</p> <table style="width:100%; border-collapse: collapse;"> <tr><td style="width:80%;">a. Conference Room</td><td style="text-align: right;">30 SM</td></tr> <tr><td>b. Waiting Room</td><td style="text-align: right;">24 SM</td></tr> <tr><td>c. Office 18PN</td><td style="text-align: right;">185 SM</td></tr> <tr><td>d. Indoor Play Room</td><td style="text-align: right;">22 SM</td></tr> <tr><td>e. Computer Room</td><td style="text-align: right;">36 SM</td></tr> <tr><td>f. Other/Miscellaneous</td><td style="text-align: right;"><u>175 SM</u></td></tr> <tr><td></td><td style="text-align: right;">472 SM</td></tr> </table> <p>(5) <u>Requirement/Assets</u>:</p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:80%;"></th> <th style="text-align: center;"><u>SM</u></th> <th style="text-align: center;"><u>No. of Buildings</u></th> </tr> </thead> <tbody> <tr><td>a. Total Requirement</td><td style="text-align: center;">472</td><td style="text-align: center;">2</td></tr> <tr><td>b. Existing Substandard</td><td style="text-align: center;">472</td><td style="text-align: center;">2</td></tr> <tr><td>c. Existing Adequate</td><td style="text-align: center;">0</td><td style="text-align: center;">-</td></tr> <tr><td>d. Funded, Not in Inventory</td><td style="text-align: center;">0</td><td style="text-align: center;">-</td></tr> <tr><td>e. Adequate Assets (c+d)</td><td style="text-align: center;">0</td><td style="text-align: center;">-</td></tr> <tr><td>f. Included in Prior Program</td><td style="text-align: center;">0</td><td style="text-align: center;">-</td></tr> <tr><td>g. Deficiency (a-c-f)</td><td style="text-align: center;">472</td><td style="text-align: center;">1</td></tr> </tbody> </table>			a. Conference Room	30 SM	b. Waiting Room	24 SM	c. Office 18PN	185 SM	d. Indoor Play Room	22 SM	e. Computer Room	36 SM	f. Other/Miscellaneous	<u>175 SM</u>		472 SM		<u>SM</u>	<u>No. of Buildings</u>	a. Total Requirement	472	2	b. Existing Substandard	472	2	c. Existing Adequate	0	-	d. Funded, Not in Inventory	0	-	e. Adequate Assets (c+d)	0	-	f. Included in Prior Program	0	-	g. Deficiency (a-c-f)	472	1
a. Conference Room	30 SM																																							
b. Waiting Room	24 SM																																							
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a. Total Requirement	472	2																																						
b. Existing Substandard	472	2																																						
c. Existing Adequate	0	-																																						
d. Funded, Not in Inventory	0	-																																						
e. Adequate Assets (c+d)	0	-																																						
f. Included in Prior Program	0	-																																						
g. Deficiency (a-c-f)	472	1																																						
2. Facility Summary; Category Code 610-119																																								
<u>Nomenclature</u>	<u>Bldg Number</u>	<u>Scope Used/Total</u>	<u>Yr/Code/Const</u>	<u>Remarks</u>																																				
EXISTING SUBSTANDARD																																								
Fam Hsg Mgmt	408	200/200	48/3/Wood	Demo this project																																				
Fam Hsg Mgmt	842	272/272	57/3/Metal	Demo this project																																				
ADEQUATE		N/A																																						
DEFICIENCY:																																								
Fam Hsg Mgmt		472/472	-/-/Mason	This project																																				

**Improvement Project**

1. COMPONENT AIR FORCE		<b>FY20XX MILITARY CONSTRUCTION PROJECT DATA</b>			2. DATE
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, EVERYWHERE			4. PROJECT TITLE IMPROVE FAMILY HOUSING (PHASE 3)		
5. PROGRAM ELEMENT 88742		6. CATEGORY CODE 711-111	7. PROJECT NUMBER XXXX030002		8. PROJECT COST (\$000) 6,995
9. COST ESTIMATE					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
IMPROVE FAMILY HOUSING (PHASE 3)		UN	100	56,000	5,600
SUPPORTING FACILITIES					850
PAVEMENTS		LS			(50)
UTILITIES		LS			(450)
LANDSCAPING		LS			(200)
RECREATION FACILITIES		LS			(50)
ASBESTOS/LEAD-BASED PAINT ABATEMENT		LS			<u>(100)</u>
SUBTOTAL					6,450
CONTINGENCY (5%)					<u>322</u>
TOTAL CONTRACT COST					6,752
SUPERVISION, INSPECTION AND OVERHEAD (3.0%)					<u>203</u>
TOTAL REQUEST					6,955
MOST EXPENSIVE UNIT: \$75,000					
AREA COST FACTOR: 1.05					
10. DESCRIPTION OF PROPOSED CONSTRUCTION: Provides general interior and exterior modernization and renovation of 100 housing units. Includes utility upgrades and additions to meet current standards. Upgrade kitchens, bathrooms, and floor coverings, improves floor plans, provides increased energy efficiency, privacy fencing, patios, playgrounds and recreation areas. Includes demolition and asbestos/lead-based paint removal.					
11. REQUIREMENT: 1,000 UN      ADEQUATE: 500 UN      SUBSTANDARD: 500 UN <u>PROJECT:</u> Improve Military Family Housing (PHASE 3). This phase includes work for 20 CGO two-bedroom, 10 SNCO three-bedroom, and 70 JNCO two bedroom units (Current Mission).					
<u>REQUIREMENT:</u> This project is required to provide modern and efficient housing for military members and their dependents stationed at Blue AFB. The housing must be upgraded to meet current life safety codes and to provide a comfortable and appealing living environment comparable to the off-base civilian community. This is the third of multiple phases to upgrade 500 houses. Two hundred units have been upgraded or are approved in previous phases, and 200 remaining to be accomplished in subsequent phases. All units will meet "whole house" standards and are programmed in accordance with the Housing Community Plan, phase xx. Renovated housing will provide a modern kitchen, living room, family room, bedroom and bath configuration, with ample interior and exterior storage. Living units will be expanded to meet current space authorizations. Single car garages and off street parking will be provided where deficient. Neighborhood improvements are required and will include landscaping, playgrounds and recreation areas.					
<u>CURRENT SITUATION:</u> This project upgrades and modernizes housing that was constructed in 1958. These 40-year-old houses require major renovation and repair to correct deterioration resulting from age and heavy use. They have had no major upgrades since construction, and do not meet the needs of today's families, nor do they provide a modern home improvement. Kitchen and bathroom cabinets and fixtures are obsolete and deteriorated. Counter tops are warped, stained, and separating at the seams. Plumbing and lighting fixtures are deteriorated and dated. The electrical systems do not meet modern construction codes. Ground Fault Circuit Interrupter protection is not provided for bathrooms, kitchens, and exterior circuits. Flooring is stained, loose, and mismatched due to the non-availability of original materials for replacement. Windows, siding, and insulation require replacement.					

1. COMPONENT AIR FORCE	<b>FY20XX MILITARY CONSTRUCTION PROJECT DATA</b>			2. DATE
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, EVERYWHERE			4. PROJECT TITLE IMPROVE FAMILY HOUSING (PHASE 3)	
5. PROGRAM ELEMENT 88742	6. CATEGORY CODE 711-111	7. PROJECT NUMBER XXXX030002	8. PROJECT COST (\$000) 6,995	
<p>The units have inadequate living space and storage, and no patio or backyard privacy. Landscaping and recreation areas for housing residents are deficient. Paved areas need renovation.</p> <p><u>IMPACT IF NOT PROVIDED:</u> Units will continue to deteriorate rapidly, resulting in increasing operations, maintenance and repair to the Government and inconvenience to residents. Without this project, repair of these units will continue in a costly, piecemeal fashion with little or no improvement in living quality. Housing Requirements Market Analysis shows an on-base housing deficit of 150 units.</p> <p><u>WORK ACCOMPLISHED IN PREVIOUS THREE YEARS:</u> None</p> <p><u>WORK ACCOMPLISHED FOR NEXT THREE YEARS:</u> None</p> <p><u>ADDITIONAL:</u> An economic analysis has been prepared comparing the alternatives of new construction, improvement, and status quo operation. Based on the net present values and benefits of the respective alternatives, improvement was found to be the most cost effective over the life of the project. The cost to improve the units is 60% of the replacement cost. Base Civil Engineer: Lt Col John Doe, (123) 456-7890.</p>				

**Privatization Project**

1. COMPONENT AIR FORCE		FY20XX MILITARY CONSTRUCTION PROJECT DATA			2. DATE
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, EVERYWHERE			4. PROJECT TITLE PRIVATIZE FAMILY HOUSING		
5. PROGRAM ELEMENT 88742		6. CATEGORY CODE 711-121	7. PROJECT NUMBER XXXX031004		8. PROJECT COST (\$000) 24,448
9. COST ESTIMATE					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
PRIMARY FACILITIES					24,448
PRIVATIZE FAMILY HOUSING		UN	1500	16,234	(24,448)
SUPPORTING FACILITIES					0
SUBTOTAL					<u>24,448</u>
TOTAL CONTRACT COST					<u>24,448</u>
TOTAL REQUEST					24,448
AREA COST FACTOR		.98			
EFFECTIVE STATUTORY LIMIT		0			
10. DESCRIPTION OF PROPOSED WORK: Convey 1,413 existing single and multiplex units and construct 87 units for a privatization end state of 1,500 units on approximately 440 acres of leased lands. Without privatization, MILCON cost for this work is \$166M for an anticipated leverage of 6.8:1. Privatized units will provide modern interior and exterior conveniences and met current space and floor plan requirements.					
11. REQUIREMENT: 1,500 UN      ADEQUATE: 250 UN      SUBSTANDARD: 1,200 UN					
<u>PROJECT:</u> Privatize Military Family Housing (Current Mission)					
<u>REQUIREMENT:</u> This project is required to provide modern and efficient housing for military members and their dependents stationed at Blue AFB. 300 units will be upgraded to meet current life safety codes and to provide a comfortable and appealing living environment comparable to the off-base civilian community. Additionally, 200 new units will be constructed to reduce the projected deficits. All units will meet "whole house" standards and are programmed in accordance with the Housing Community Profile. Renovated housing will provide a modern kitchen, living room, family room, bedroom and bath configuration, with ample interior and exterior storage. Living units will be expanded to meet current space authorizations. Single car garages and off street parking will be provided where deficient. Neighborhood improvements are required and will include landscaping, playgrounds and recreation areas.					
<u>CURRENT SITUATION:</u> This project upgrades and modernizes housing that was constructed in 1958. These 40-year-old houses require major renovation and repair to correct deterioration resulting from age and heavy use. They have had no major upgrades since construction, and do not meet the needs of today's families, nor do they provide a modern home improvement. Kitchen and bathroom cabinets and fixtures are obsolete and deteriorated. Counter tops are warped, stained, and separating at the seams. Plumbing and lighting fixtures are deteriorated and dated. The electrical systems do not meet modern construction codes. Ground Fault Circuit Interrupter protection is not provided for bathrooms, kitchens, and exterior circuits. Flooring is stained, loose, and mismatched due to the non-availability of original materials for replacement. Windows, siding, and insulation require replacement. The units have inadequate living space and storage, and no patio or backyard privacy. Landscaping and recreation areas for housing residents are deficient. Paved areas need renovation.					
<u>IMPACT IF NOT PROVIDED:</u> Units will continue to deteriorate rapidly, resulting in increasing operations, maintenance and repair costs to the Government and inconvenience to residents. Without this project, repair of these units will continue in a costly, piecemeal fashion with little or no improvement in living quality. Housing Market Analysis shows an on-base housing deficit of 230 units.					

1. COMPONENT AIR FORCE	<b>FY20XX MILITARY CONSTRUCTION PROJECT DATA</b>		2. DATE
3. INSTALLATION AND LOCATION BLUE AIR FORCE BASE, EVERYWHERE		4. PROJECT TITLE PRIVATIZE FAMILY HOUSING	
5. PROGRAM ELEMENT 88742	6. CATEGORY CODE 711-121	7. PROJECT NUMBER XXXX031004	8. PROJECT COST (\$000) 24,448

WORK ACCOMPLISHED IN PREVIOUS THREE YEARS: None

WORK ACCOMPLISHED FOR NEXT THREE YEARS: None

ADDITIONAL: The installation commander agreed these units are severable according to the criteria contained in the 1999 Air Force Family Housing Master Plan. This project contains no resale merchandise, services or commercial recreation operations or activities IAW with the SAF/MI Housing Privatization Interim Operating Instructions memo dated 2 March 1999 and AF/IL memo regarding coordination with AAFES, DeCA, and MWR Board dated 19 March 1999. A viable pro forma and a preliminary economic analysis will be developed and provided during the concept approval process, and a certified economic analysis will be accomplished prior to completion of the solicitation process. The local school authority indicates a capability exists to accept the increased student population generated by this project. In the event Congress does not extend the privatization legislation or the privatization is financially infeasible, the Air Force will execute an improvement project for 300 units at the programmed amount requested by this project IAW the installation's Housing Community Profile. Base Civil Engineer: Lt Col John Doe, (123) 456-7890.

**APPENDIX E**  
**Family Housing Category Codes**

Appendix E contains the Family Housing Category Codes for use in programming Family Housing projects.

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<b>FAMILY HOUSING CATEGORY CODES</b>			
Category Code	Facility Type	Category Code	Facility Type
<b>Improvement Projects</b>			
711-111	Capehart	711-311	Attached Garage
711-121	Wherry	711-312	Attached Carport
711-131	Lanham		
711-142	Appropriated Fund (FY70 & After)	712-244	Trailer
711-143	Appropriated Fund (FY50-69)		
711-144	Appropriated Fund (FY50)	713-352	Trailer Court Support Facility
711-151	Surplus Commodity	713-366	Trailer Court Parking Area
711-161	Deutschmark		
711-171	Yen	714-431	Detached Garage
711-181	Other	714-432	Detached Carport
711-191	Re-locatable	714-433	Detached Storage
711-121	Rental Guarantee		
711-221	Leased	219-944	Family Housing Maintenance Facility
711-231	USA Housing	442-769	Family Housing Supply & Storage Facility
		610-119	Family Housing Management Office
<b>New/Replacement Construction Projects</b>			
711-142	Appropriated Fund (FY70 & After)	219-944	Family Housing Maintenance Facility
		442-769	Family Housing Supply & Storage Facility
		610-119	Family Housing Management Office

<b>FAMILY HOUSING INVESTMENT PROGRAM ELEMENTS</b>		
Program Type	Fund Type	Program Element
New Construction	P-711	88741
Improvement	P-713	88742
Planning & Design	P-714	88742

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