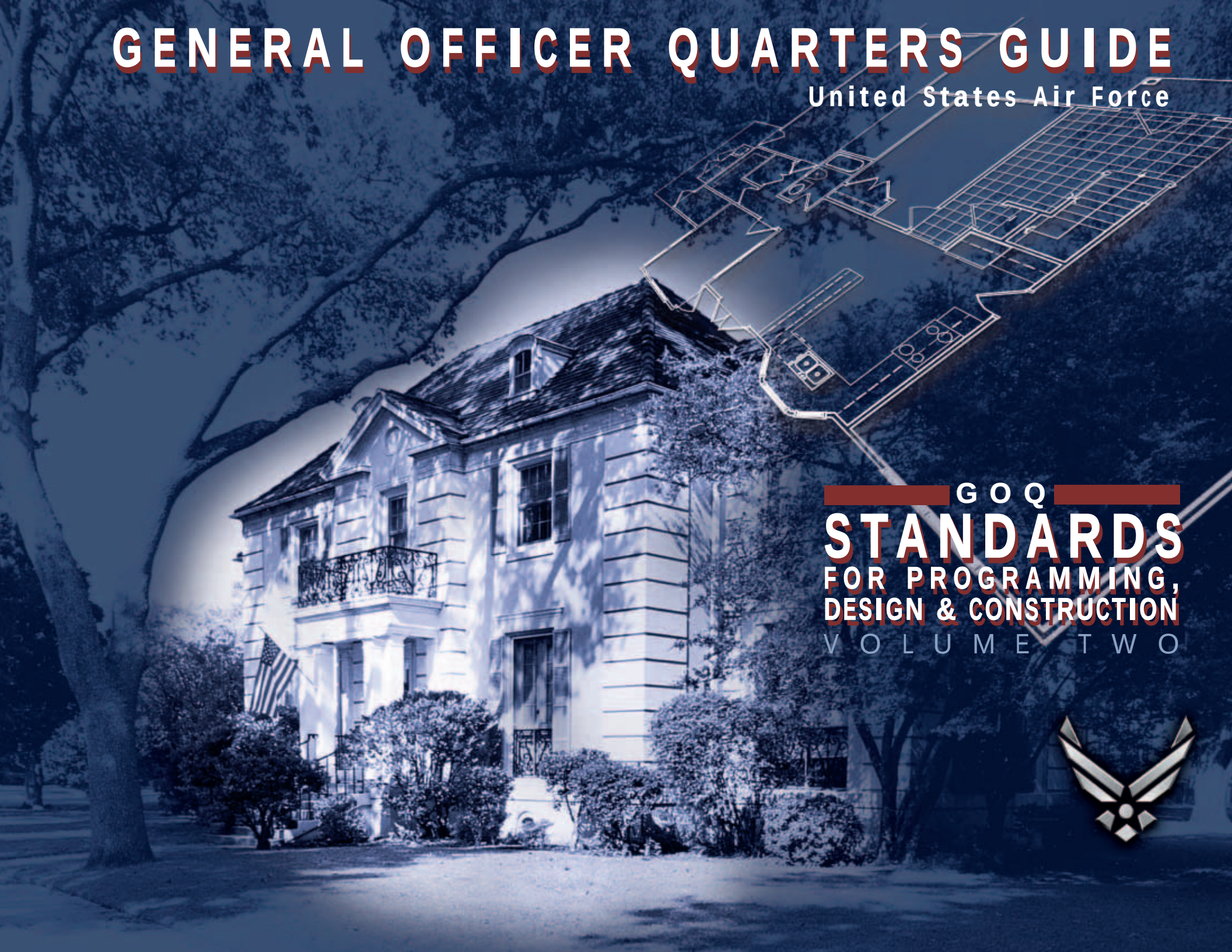
GENERAL OFFICER QUARTERS GUIDE

United States Air Force

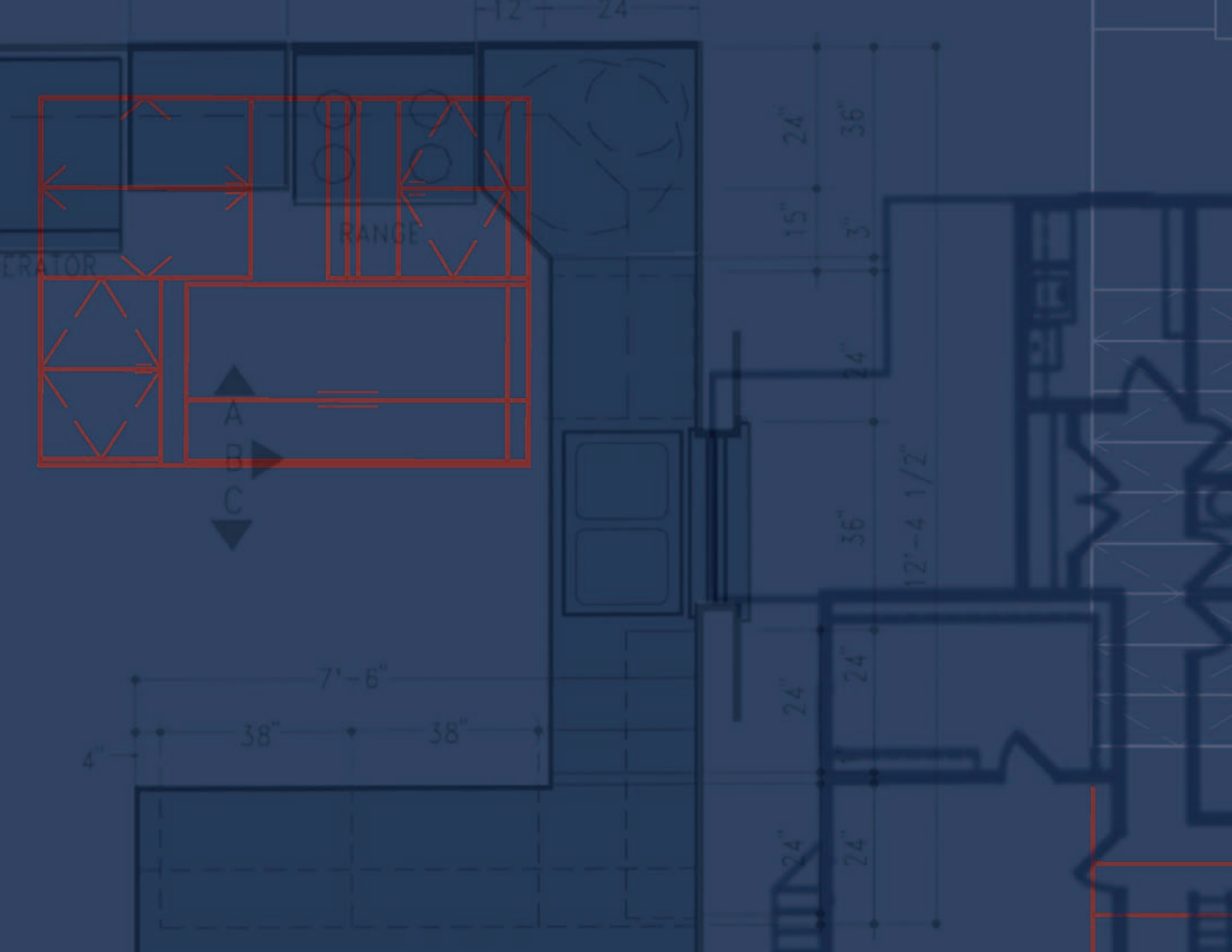


GOQ

STANDARDS

FOR PROGRAMMING, DESIGN & CONSTRUCTION

VOLUME TWO


A
B
C
RANGE
7'-6"
38"
38"
4"
12'-4 1/2"
24"
36"
15"
3"

Investments in Quality of Life create the living environment our people need and deserve to successfully accomplish the mission. The Air Force is committed to maintaining General Officer Quarters (GOQs) in a state of excellence commensurate with their purpose and historical significance. Quality GOQs for our senior Air Force leadership are critical, not only to enable our senior Air Force leaders to perform essential mission functions, but also to provide adequate settings for the official entertainment functions that they are expected to host.

We must maintain the delicate equilibrium between costs, quality, and timeliness in our GOQ facility investments. Equally important is ensuring GOQ projects are economically viable, prudent, and avoid even the appearance of "gold-plating." While fiscal constraints determine the pace we revitalize and update our GOQs, it's our job to ensure we provide the right quality of GOQs that consider efficient life-cycle cost of operations and maintenance.

This guide is a 'road map' in helping us provide the best GOQs, consistently and equitably Air Force wide. It describes and depicts quality standards for GOQs and the supportive customer services that help make these quarters outstanding places to live. These standards are an essential part of the journey toward the future in developing quality GOQs. Facilities excellence and tight budgets are not mutually exclusive. In order to balance quality of life with cost we must first focus on a long range plan developed for each GOQ, and then strive to execute the requirements through the most cost effective and comprehensive whole-house approach. An integral routine maintenance and repair plan of our facilities will assist in extending their life cycles and can reduce new/investment military construction requirements. Commanders, civil engineers, housing flight chiefs, design architects, and engineers in conjunction with the residents should use these basic principles and guidelines to plan, program, and design all future GOQ projects. We challenge you to apply the highest professional standards contained within this guide and necessary teamwork to achieve successful, quality, and cost efficient investments in Air Force GOQs to directly support the senior leaders of the world's most respected air and space force.

John P. Jumper
General, USAF
Chief of Staff

James G. Roche
Secretary of the Air Force

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United States Air Force

August 2002

GOQ

STANDARDS

FOR PROGRAMMING, DESIGN & CONSTRUCTION

VOLUME TWO

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Introduction

1.0

This document provides the design requirements and guidance for General Officer Quarters (GOQs) and associated engineering projects. These standards will serve many purposes. For the occupant, it defines the facility standards in terms of features, functionality, and material quality. For the Air Force Civil Engineers, it provides the design standards and policy, guidance, and interpretations to support the Air Force GOQ Master Plan and the Air Force Family Housing Master Plan (AF FHMP) used for planning, programming and budgeting activities for all GOQs.

These standards are an essential part of the journey toward the future in developing quality GOQs. The Air Force has developed these standards to:

- Provide common residential standards for General Officers residing in GOQs.
- Balance quality of life with cost.
- Set the architectural elements and building features to be comparable with the regional and local housing standards.
- Provide standards that will minimize reoccurring GOQ maintenance.
- Establish standards that are cost effective and best executed through the use of whole house investment projects.

This document is an expansion of the facility standards provided in the GOQ Resident's Handbook, Volume I of your boxed set and supplements the Air Force Family Housing Guide for Planning, Programming, Design, and Construction. Chapters 1, 2, 3 and 5 of the Air Force Family Housing Guide are still applicable to all GOQ projects.

This document provides overarching Air Force GOQ standards that provide common facility parameters. Each installation with GOQs should supplement this document with their local installation standards that are compatible within the Air Force parameters, but address climatic conditions, architectural styles, and local construction practices. MAJCOM policies, applicable laws and regulations also must be considered.

Unit Design Criteria

2.0

This guide is relevant to all Air Force projects, including the acquisition or construction of new housing, the improvement, maintenance, and repair of existing GOQ housing, and the site development or site improvements to GOQ housing areas. This document is relevant to all Air Force funded GOQ housing projects within the United States, its territories and possessions, and in host nations. Air Force GOQ construction programs include:

- New Construction
- Build-Lease (CONUS and Overseas)
- Land Out-Lease
- Post-Acquisition Improvement
- Maintenance and Repair
- Privatization

2.1 Livability

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

- The responsiveness of the home design to the needs of the users, while accommodating the responsibilities associated with the occupant's assignment.
- The compatibility of the structure with local conditions, requirements, and customs.
- The importance of maintaining the historic or architectural theme of the neighborhood in support of our military heritage.
- The aesthetic and functional characteristics of the design to reflect the executive position of a General Officer.
- Cost effectiveness.

These standards describe the characteristics of a GOQ project that will provide long-term livability, 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. To assure quality and functionality, minimum standards for spaces and durability have been established. In some cases, it may be desirable to exceed the minimum, particularly for such items 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, within the level of funding authorized for the project, and does not exceed statutory limits or Air Force Policy.

Design Standards

3.0

The guidelines in the following sections define the recommended levels of the GOQ quality acceptable to the Air Force. This guidance is intended to assist housing project managers and design professionals with maintenance and repair standards, specific renovations to existing houses, developing "whole-house" improvements, and new and replacement projects:

- In the revitalization of existing GOQ units, regardless of the funding method used, the constraints of the project may make full compliance with all of the requirements impractical, particularly regarding recommended 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.
- The following programs can also provide GOQ housing:
  - Build-Lease (Section 801) Long-Term Leasing of Military Family Housing
  - Rental-Guarantee (Section 802) Military Housing Rental Guarantee Program
- These programs rely primarily on local codes and livability standards to establish the quality of the housing. Build-Lease and Rental-Guarantee projects use a Statement of Work developed by the DoD for use, uniformly, by all military branches. Public Law 102-522, Fire Administration Authorization Act of 1992, requires that leased housing comply with the fire protection criteria.
- In general, the guidelines in this document establish a baseline of quality for the entire Air Force GOQ inventory, regardless of the housing style, project size, or funds involved.
- Section 2826, Title 10 USC, specifies the net floor area allowable by pay grade and number of bedrooms. This law applies to new construction, alterations, additions, improvements, or any work that would change the net living area of the house. The maximum size for a newly constructed GOQ is 2,100 net square feet (NSF). The limit is increased to 2,310 NSF for Special Command Position. Many GOQs were acquired before size limitations were established and now exceed the square footage limitation; however, they may remain so only until replacement and may not be further increased in size.

Note: At the time of publication, Congress had removed size standards for Military Family Housing, including General Officer Quarters. New criteria reflecting these changes will be issued as a supplement to this guide when approved. The standards set forth in this guide shall apply until such supplemental guidance is issued.

Habitable and Non-habitable Spaces 3.1

Habitable space is defined by the Life Safety Code to avoid compromising the health and safety of the occupant.

- Habitable space is defined as finished space with a minimum ceiling height of 7'-6" over at least 50% of the ceiling area. In addition, it requires appropriate Heating, Ventilation, and Air-conditioning (HVAC) systems for its geographic location. A finished space is further defined as having ceiling, wall, and floor surfaces consistent with the rest of the living spaces.
- Bedrooms must have at least one window that meets National Fire Protection Association (NFPA) and local safety code egress requirements.

Non-habitable spaces are defined by any of the following conditions:

- The space is unfinished or not finished in compliance with applicable codes.
- The space is not conditioned with an HVAC system.
- The space does not have a 7'-6" ceiling height over 50% of the ceiling area.
- The space does not meet the life safety code requirements for egress.

Non-habitable spaces that have received finish upgrades but still do not meet the requirements for habitable space as listed above may stay intact, but shall not be considered for further investment, either self-help or O&M, to repair or replace finishes. These spaces should be returned to storage space with the appropriate finish level when the unit undergoes whole-house renovation. Refer to the Interior Storage section of this guide for more information.

3.2 Net Floor Area

The following table is an excerpt from the Air Force Family Housing Guide and illustrates allowable net square footage and configuration criteria:

Maximum Net Floor Areas Authorized

IF	the occupant's pay grade = 0-7 and above
THEN	the number of bedrooms = 4
	and
	the maximum net floor area = 2,100 SF (195 SM)

NOTE: The following are exceptions to the above:

- The applicable maximum net floor area prescribed above may be increased by 10% for the housing unit of an officer holding a Special Command Position (as designated by the Secretary of Defense), for the housing unit of the Commanding Officer of a military installation, and for the senior non-commissioned officer of a military installation.
- The maximum net floor area prescribed above may be increased in any case by 5% if the Secretary of the Air Force determines that the increase is in the best interest of the government (1) to permit award of a turnkey construction contract to the contractor offering the most satisfactory proposal; or (2) to permit purchase, lease, or conversion of housing units. An increase in the maximum net floor area of a housing unit under the paragraph above, when combined with an increase in the maximum net floor area of such unit under this paragraph, may not exceed 10% of the standard 2100 SF limit.
- The Secretary of the Air Force may waive the limitation on net area with respect to a family housing unit leased in a foreign country if it is not possible to obtain a suitable family housing unit within the applicable maximum net floor area prescribed above.
- The maximum net floor areas prescribed in this table apply to family housing provided to civilian personnel, based on civilian pay scales comparable to military grades, as determined by the Secretary of Defense.
- In harsh climates (defined as having more than 7,500 heating degree-days annually), the net floor area may be increased up to 300 SF for indoor recreation space.
- Floor areas may be increased to provide air-lock entries at exterior doors in areas with winter design temperatures (97.5 percent) of -10°F (-23°C) or less.

Net Floor Area: Defined as the space within the interior faces of exterior walls and party walls of living units, with the following exclusions:

- Utility rooms
- Laundry rooms
- Interior bulk storage
- Exterior bulk storage
- Trash enclosures
- Washer and dryer space, if not located in a separate utility or laundry room (not to exceed 30 square feet)
- Furnace or boiler equipment, domestic water heater, heat pump, and solar equipment if any, if not located in a separate utility room
- Stairways on each floor (including intermediate landings between floors)
- Stair landing at each floor level above the first floor (not to exceed 10 square feet per floor)
- Finished space under stairs with headroom less than 4'-6"

- Unfinished attic space
- Unfinished basement space
- Porches, open or enclosed, which are not heated or cooled and which retain the basic characteristics of a porch
- Arctic entries (not to exceed 20 square feet) in northern climates
- Terraces, patios, and balconies
- Carports and garages
- 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
- Increases required to meet accessibility standards (not to exceed 75 SF)
- Increases required to meet the harsh climate indoor recreation space/arctic recreation room as further defined in this guide

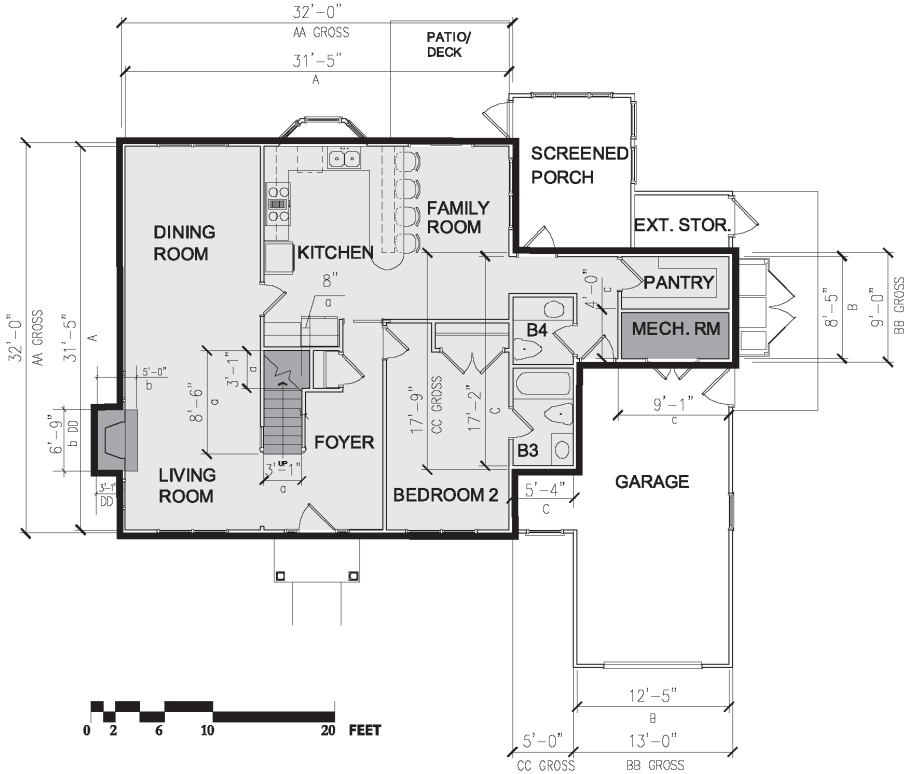
Gross Floor Area 3.3

Gross Floor Area includes all interior spaces (habitable and non-habitable) within the exterior faces of exterior walls and center line of party walls (in multiplex units) of living units with the following areas of exclusion:

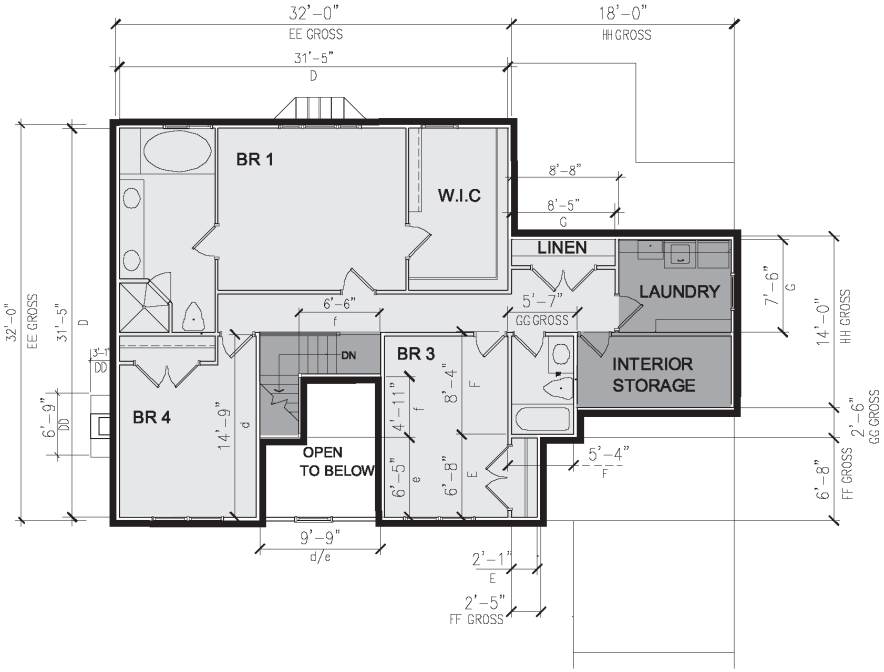
- Carports and garages
- Exterior bulk storage
- Trash enclosures
- Porches, open or closed, which are not heated or cooled and which retain the basic outdoor characteristic of a porch
- Terraces, patios, decks, balconies and entrance stoops

Net and Gross Calculations for a Two Story Unit

Gross SF Area Boundary | Net SF Area | Deductible Net SF Area



First Floor Plan



Second Floor Plan

Net and Gross Calculations for a Two-Story Unit

Net (First Floor):

AxA 31′-5″ x 31′-5″ - axa-bxb 925 SF
[where axa is area of stairwell on first floor (3′-1″ x 8′-6″) + (0′-8″ x 3′-1″) 28 SF]
[and bxb is area of fireplace and hearth (6′-9″ x 5′-0″) 34 SF]

BxB 12′-5″ x 8′-5″ - c.c 69 SF
[where cxc is area of mechanical room on first floor (4′-0″ x 9′-1″) 36.0 SF]

CxC 5′-4″ x 17′-2″ 92 SF

FIRST FLOOR TOTAL: 1086 SF

Gross (First Floor):

AAxAA	32′-0″ x 32-0″	1024 SF
BBxBB	13′-0″ x 9′-0″	117 SF
CCxCC	5′-0″ x 17′-9″	89 SF
DDxDD	3′-1″ x 6′-9″	21 SF

FIRST FLOOR TOTAL: 1251 SF

Net (Second Floor):

DxD 31′-5″ x 31′-5″ - dxd 843 SF
[where dxd is area of stairwell, landing on second floor and area open above Foyer 9′-9″ x 14′-9″ 144.0 SF]

ExE	2′-1″ x 6′-8″	14 SF
FxF	5′-4″ x 8′-4″	44 SF
GxG	8′-5″ x 7′-6″	63 SF

SECOND FLOOR TOTAL: 964 SF

Gross (Second Floor):

EExEE 32′-0″x32′0″ - (exe + fxf) 929 SF
[where exe and fxf is area of open below (9′-9″ x 6′-5″) + (6′-6″x 4′-11″) 95 SF]

FFxFF	2′-5″ x 6′-8″	16 SF
GGxGG	5′-7″ x 2′-6″	14 SF
HHxHH	14′-0″ x 18′-0″	252 SF

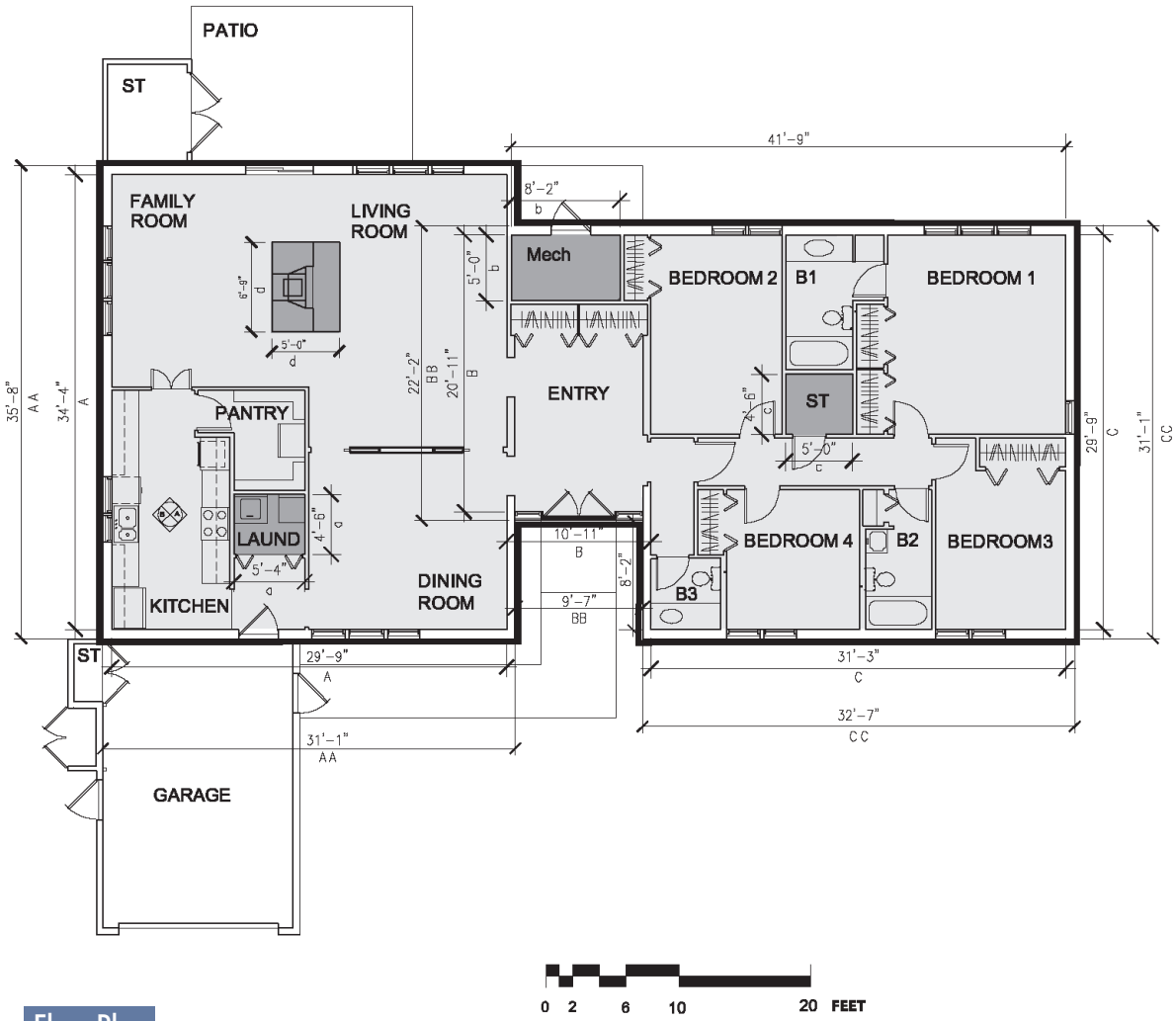
SECOND FLOOR TOTAL: 1211 SF

TOTAL NET: 2050 SF

TOTAL GROSS: 2462 SF

Net and Gross Calculations for a One-Story Unit

Gross SF Area Boundary | Net SF Area | Deductible Net SF Area



Floor Plan

Net:

AxA 29′-9″ x 34′-4″ - a x a - d x d =963 SF

[where axa is area of laundry room = (5′-4″ x 4′-6″) = 24]

[where dxd is area of fireplace = (5′-0″x 6′-9″) = 34]

BxB 10′-11″ x 20′-11″ - b x b =187 SF

[where bxb is area of mech. room = (8′-2″ x 5′-0″) = 41]

CxC 31′-3″ x 29′-9″ - c x c =907 SF

[where cxc is area of int. bulk stor. = (5′-0″ x 4′-6″) = 23]

TOTAL NET: 2057 SF

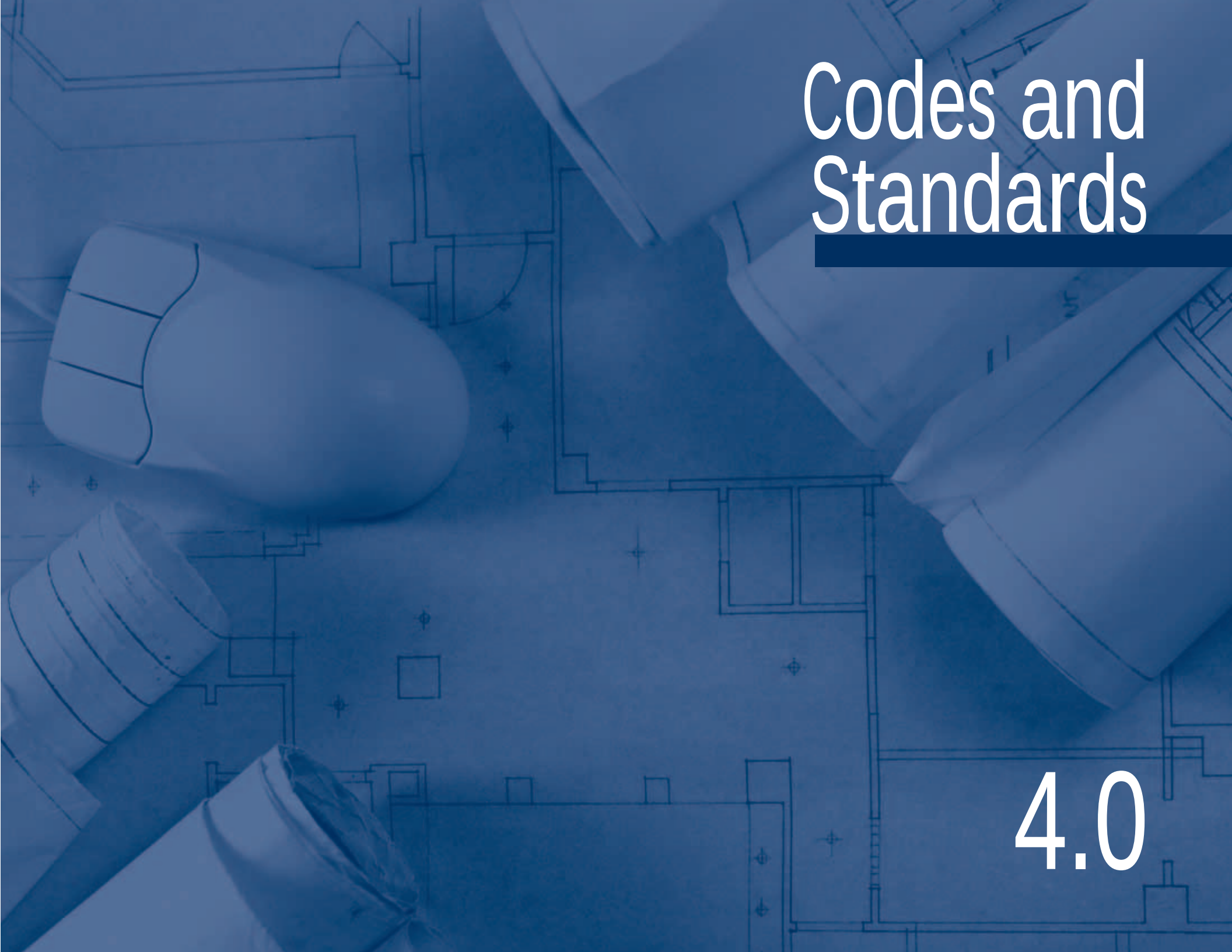
Gross:

AAxAA 31′-1″ x 35′-8″ =1109 SF

BBxBB 9′-7″ x 22′-2″ =212 SF

CCxCC 32′-7″ x 31′-1″ =1013 SF

TOTAL GROSS: 2334 SF



Codes and Standards

4.0

4.1 Codes

GOQ construction must comply with applicable national and local residential construction codes. When Air Force neighborhoods are located outside the jurisdiction of a local code, use a model code that is accepted within the geographic area of the project. If no building code governs, the latest International Council of Building Officials (ICBO) Uniform Building Code will govern. In the event of a conflict between local codes and this Section, the most stringent code will apply.

Additional references for Codes, Regulations and Policies, and Industry Standards are provided in this section.

- National Electric Code (NEC) 1999.
- National Electric Safety Code (ANSI C2-1997).
- International Council of Building Officials (ICBO):
  - Uniform Building Code, 1997.
  - Uniform Mechanical Code, 1997.
  - Uniform Plumbing Code, 1997.
- International Code Council (ICC), International One and Two Family Dwelling Code, 1998. This group combined with ICBO in 1998.
- National Fire Protection Association (NFPA): NFPA 101 Life Safety Code, 1997, NFPA 220-1995, NFPA 252-1995,NFPA 24-1995, NFPA 70-1999.

4.2 Regulations and Policies

- AF Carbon Monoxide Policy, Mar 24, 1999.
- AFM 88-5, Chapter 4 "Drainage for Areas Other than Airfields," Oct 83.
- AFM 88-7, Chapter 3 "Engineering and Design - Flexible Pavement for Roads, Streets, Walks, and Open Storage Area," October 1990, Chapter 5 (July 1987) "Geometric Design for Roads, Streets, Walks, and Open Storage Areas."
- AFM 88-11, Vol 3, Sanitary 8: Industrial Waste Water Collection, Gravity Sewers and Appurtenances.
- AFM 88-5, Chapter 2 "Drainage and Erosion Control - Subsurface Drainage Facilities and Airfield Pavements."
- AFI 32-6001, Housing Management.
- AFI 32-6002, Family Housing Programming, Design And Construction.
- AFI 32-6003, General Officer Quarters.
- AFI 32-7065, Cultural Resources Management.
- Air Force Family Housing Guide, Dec 95, except Chapter 4.
- DoD Directive 6050.9 Ozone Depleting Chemicals.
- Manual on Uniform Traffic Control Devices for Streets and Highways published by the US Department of Transportation - Federal Highway Administration - 1996.
- OSHA. Title 29, Code 4, Federal Regulation Parts 1921, 1926 & 1910.
- Military Handbook 1008, Fire Protection for Facilities Engineering, Design and Construction.

Industry Standards 4.3

- American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
- Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
- Illuminating Engineers Society (IES) Handbook.
- National Standard for Landscape Design.
- American Standard for Nursery Stock.
- Americans with Disabilities Act Architectural Guidelines.
- Aluminum Association "Specification for Aluminum Structures."
- American Society for Testing and Materials (ASTM): D 1557-98, D 3034-98, D 3212-96a, C 828-98, C 924-R97, E119-98, E90-97, E84-el-98, A615/A615M96a, A185-97, E779.E1-87.
- American Water Works Association (AWWA).
- Underwriter's Laboratories (UL): Standard 268-96.
- Department of Energy, 10 CFR, Char II, Section 435.103.
- Society of Protective Coatings, (SSPC) SP 6-94.
- NACE International, National Association of Corrosion Engineers (NACE) RP-0286-97.
- American National Standards Institute (ANSI): ANSI/ASME B31.8-99, ANSI/ASME B16.3-98, Z21.45-95, Z124.187, with Addendums dated 90 and 91.
- Window and Door Manufacturers Association (WDMA) (formerly National Woodwork Manufacturers Association [NWMA]).
- Consumer Product Safety Commission (CPSC).
- National Association of Home Builders (NAHB).
- Kitchen Cabinet Manufacturers Association (KCMA), ANS/KCMA A161-2000
- American Architectural Manufacturers Association, (AAMA) 1504-97 Rev.
- ACI International, American Concrete Institute Font (ACI) 318-89.
- American Iron and Steel Institute (AISI).
- American Plywood Association (APA).
- Air-conditioning and Refrigeration Institute (ARI) "Directory of Certified Applied Air-conditioning Products."
- American Gas Association (AGA).
- American Society of Heating, Refrigeration & Air Conditioning (ASHRAE): 90.2-1993.
- Air Conditioning and Refrigeration Institute (ARI) 210-94.
- HUD Minimum Property Standards for One and Two Living Units.
- American Association of Textile Chemist and Colorist (AATCC) Test Methods.
- American Institute of Steel Construction (AISC).
- American Welding Society (AWS).
- American Wood-Preservers' Association (AWPA).
- Brick Institute of America (BIA).
- Federal Manufactured Housing Construction and Safety Standards (FMHCSS) CABO/ANSI 2.0 (1998).
- National Association of Architectural Metal Manufacturers (NAAMM) "Metal Finishes Manual."

- American Forest and Paper Association (AF&PA) (formerly National Forest Products Association).
- Steel Joist Institute (SJI).
- Truss Plate Institute (TRI).
- Title 24 - HUD Part 3280 Federal Manufactured Housing Construction and Safety Standards (FMHSCC), with latest revisions.

4.4 Metric Measurements

In compliance with Executive Order 12770, Metric Usage and Federal Government Program, June 25 1991, all GOQ projects programmed and designed should include both English and metric dimensional units.

Lot and Site Design

5.0

5.1 Landscape Design

Housing planners and designers must ensure that lot and site designs conform to the standards or requirements stated in the base General Plan and the Housing Community Profile. Ensure that local zoning regulations do not have jurisdiction on Air Force land when planning new projects. Prior to laying out new sites, survey local communities with similar housing to observe how these projects address site design issues.

In this Section, considerations refer to landscaping such as trees, shrubs, groundcover, and turf directly associated with the home to establish a distinctive curb appeal. The exterior of the GOQ and the immediate surroundings are as important as the interior spaces and play a major role in establishing the proper Air Force image. The benefits of proper landscaping are stabilizing the soil adjacent to the unit, providing shade that can reduce heating and cooling loads, and enhancing the aesthetic quality of the unit and the surrounding neighborhood. The Air Force does not allow features that are not a standard amenity in private sector residences.

Design Considerations

- Provide a complete sustainable landscape and/or hardscape designed by a landscape professional that utilizes native plants to the maximum extent. The design should integrate edging, walkways, and accent lighting as part of the design package. Undisturbed areas may remain in their natural state.
- Provide a neighborhood setting that integrates the site layout, landscaping, parking, walkways, outdoor living spaces, and fencing into a cohesive, unified design. Within this framework, provide opportunities for the residents to plant, as they desire.
- Provide enough 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 visually integrates the ground/foundation line, yet will not cause foundation structural problems. Paving and trees should be placed to avoid foundation problems.
- Select plant materials that are hardy, appropriate to the locale, and will not result in excessive maintenance costs. The use of perennials in flower beds is encouraged.
- Use landscaping to provide a warm and inviting "curb appeal" around the unit, and to enhance the walkways leading visitors to the front entry.
- Use landscaping to help individualize the unit, and to provide a sense of privacy and enclosure in the rear yard area.
- The Base Civil Engineer should establish a lawn, tree, and shrub maintenance standard, and provide this information to residents. An approved plant list should be included.
- Construction of lawn irrigation systems are not allowed in residential yard areas because they are not a standard home construction amenity in the private sector. If they exist they should be maintained until the end of their serviceable lives then abandoned in place when no longer serviceable.
- Ensure that adequate number of hose bibs are provided so occupants can maintain their lawns.
- Install frost-proof hose bibs if required by the local climate.
- Use strategic placement of shrubs to screen unattractive utility items.
- Permanent barbecue pits are not allowed in residential yards, because they are not a standard home construction amenity in the private sector. If they exist, they should be removed when no longer serviceable.
- Incorporate force protection requirements when developing or updating the landscape plan.
- Designated personal planting areas are encouraged to avoid changes to the permanent landscape. See the Base Civil Engineer for guidance regarding self-help landscaping.
- When a self-help project for a dog pen or run is approved locally, they should be kept from public view in the rear of the residence. Proper siting and use of landscaping can achieve this.

Grading and Drainage 5.2

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

Design Considerations

- Provide gutters and downspouts to ensure proper drainage of roof areas. Place splash blocks under downspouts that do not have a buried connection to storm drains.
- Direct runoff from downspouts away from walkways or areas of pedestrian or vehicular traffic.
- Ensure positive grading away from the house in all directions for a minimum of 10 feet. A grade of 5 to 8 percent is recommended.
- Ensure that foundation planting beds are designed to positively drain so that water cannot pond next to the foundation.

Walkways 5.3

Walkways should be considered an integral part of the neighborhood and the unit's landscaping plan. Design walkways to take advantage of the natural terrain in an overall site layout/design to be distinctive and functional, yet easily maintained.

Design Considerations

- Provide walkways and any necessary pavement to all unit entries. The minimum width for the main entry walkway is 4 feet. When feasible, utilize curvilinear and variable width walkways to enhance the curb appeal by leading the visitor to the front entry.
- The main entry walk should be designed to accommodate the entertainment functions of the GOQ. Entertaining brings large numbers of people to the house at one time.
- Use materials that are appropriate to the design of the house, and are typical of the geographic region. Acceptable materials are concrete paving, colored concrete paving, pebble finish concrete paving, brick, pavers, flagstone, and clay tile.
- New walkways should be installed when existing walks are deteriorated, unsafe or their functional purpose has changed.
- Provide paved access between the house, trash enclosures, and roadside trash pick-up locations. When possible, the driveway can be used to accommodate this requirement.
- Design walks to conform to the Americans with Disabilities Act Architectural Guidelines.
- Design walks for site conditions, such as expansive soils, harsh weather, and proper drainage. Provide contraction and isolation joints, and a level surface.
- Design walks to structurally support maintenance vehicles or snow removal equipment if they are typically driven on walkways.
- Provide walkway lighting to ensure safety and illuminate exterior entertainment areas.

5.4 Driveways/Parking

Driveways serve a dual purpose by providing automobile access to a garage or carport and space for vehicular parking. The design of the driveway or parking area can also affect the appearance of the house and neighborhood. General Officer Quarters should have at least two off-street parking spaces. Additionally, one of these spaces should be covered, provided by a single garage or carport.

Design Considerations

- Driveway and parking layout options are as follows:
  - Tandem parking (one vehicle behind the other): Provide a single driveway at least 30 feet long by 10 feet wide.
  - Side-by-side parking: Provide single driveway at a minimum 18 feet long by 18 feet wide.
  - Where side-by-side parking is provided, either in driveways or in a common parking area, provide a minimum parking space width of 9 feet each.
  - When the driveway is used to provide off-street parking for the GOQ, provide a minimum length of 24 feet to accommodate 2 cars, exclusive of walks at the street.
- Do not design common parking areas such that cars are required to back into main collector streets. Avoid large paved areas that give a commercial parking lot appearance.
- Use local materials with regional consideration in mind. Satisfy architectural relationships and material compatibility issues. Acceptable materials are concrete paving, asphalt paving, and stamped concrete paving with integral color.
- Ensure proper slope of the driveway away from the garage/carport entry or any adjacent part of the house.
- Consider historic preservation and force protection requirements when planning parking spaces.

Exterior Building Features

6.0

6.1 Foundation Design

The foundation is one of the most important systems in any structure, and its design and maintenance may have an adverse effect throughout the structure. Self-help additions to GOQs that require foundations must be coordinated with the Base Civil Engineer.

Design Considerations

- Extend the top of the foundation 8 inches above finished grade.
- Seal foundations thoroughly and completely against moisture penetration. 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 slabs beneath habitable spaces. Provide foundation insulation as climate dictates.
- 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.
- Provide adequate natural ventilation of crawl spaces. Provide crawl space floors with a tightly sealed, continuous moisture barrier. Provide floor insulation in crawl spaces according to 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) and Oak Ridge National Laboratory.
- Do not use foundation insulation material containing urea-formaldehyde.
- Ensure adequate reinforcement of concrete and masonry components to prevent or minimize cracking.
- Provide adequate soil analysis from a licensed geo-technical consulting engineer and design the foundations accordingly.

6.2 Roof

The Air Force policy is to use sloped roofs for ease of maintenance and for providing a residential appearance to the neighborhood.

Roof Design Considerations

Roof Slopes and Overhangs

- Design new roof slopes to a minimum of 3 in 12.
- Existing roofs with slopes less than 3 in 12 shall be covered with either fiberglass shingles or built-up roofing.
- Evaluate the use of overhangs to minimize or maximize exposure to the sun (solar gain) and other elements.

Maintenance Considerations

- Use gutters and gutter guards in compliance with Historic Preservation requirements as applicable.
- Base the roof overhang design on the local climate and local building practices.
- Place splash blocks under all downspouts that are not connected to a storm drain system. Ensure that the water discharge from splash blocks is not directed toward the foundation, pedestrian or vehicular traffic paths.
- Avoid the use of soffits, fascia, and gutter materials that require routine painting and maintenance.

Roof Coverings

- 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.
- Where appropriate, use materials with a minimum 25-year performance guarantee. Synthetic materials should be evaluated and considered as a viable alternative. In all cases, the material selection should be sensitive to the architectural style and historically accurate when required.
- Do not use expensive roof covering materials such as metal, slate, clay, or concrete tile except when dictated by local conditions and when supported by an economic analysis that has considered less costly alternatives.
- Use appropriate roof materials for historically designated units.
- Avoid wood shingles in new construction, unless there is a historical area requirement.
- Where metal roofs are installed, ensure adequate sound attenuation is used to minimize the sound transmission from rain and outside noise.
- In very cold climates, employ industry standard construction methods for proper ice-damming protection in order to protect roofs from leaking.

Attic Ventilation, Roof Penetrations, and Insulation

- Provide attic ventilation through the use of a combination of soffit vents, ridge vents, or gable vents. Provide vents that match the color of the adjoining surface or paint to match. Use thermostatically controlled attic exhaust fans in lieu of wind turbine vents.
- Make sure that plumbing vents and exhaust fans do not vent into the attic, but penetrate the roof or wall to the outdoors. Ensure that roof penetrations extend the height above the roof per local building codes. Also ensure they have adequate flashing and minimize the penetrations that are visible to guests.
- Provide ceiling and roof insulation according to the Design Guide for Energy Efficient Revitalization of Military Family Housing for Improvement and New Construction.
- Consider using radiant barriers in the roof system. This product can reduce attic temperatures in the summertime by 20°F in warm southern climates.

6.3 Exterior Walls

Exterior finish materials provide an attractive means of protecting the building from all weather conditions. Exterior insulation and finish systems are becoming increasingly popular and economical to use as a finish material. Consider this option when warranted by local conditions during new construction and whole house renovations. The exterior walls should provide sound attenuation, energy efficiency, moisture protection and some level of threat protection when required.

Design Considerations

- All exterior wall construction must comply with traditional residential construction standards, national, and local construction practices.
- Use acceptable finish materials and quality specifications for the exterior wall construction. Selection of materials should be sensitive to the architectural style, regional availability, and historic impact where applicable. Typically acceptable materials for GOQs are:
  - Brick masonry
  - Glazed concrete masonry
  - Architectural concrete masonry
  - Stucco
  - Pre-finished, wood simulated concrete planks
  - Factory-finished or vinyl-clad steel or aluminum siding
  - High quality, heavy-gauge solid vinyl siding
  - Exterior insulating systems (EIS) or other insulated composite wall systems consisting of insulation core, reinforcing mesh or fabrics, and a cementitious exterior finish. Additional reinforcing mesh must be installed to increase durability at areas subject to impact from pedestrians, lawn-mowing equipment, etc.
- Avoid materials requiring field finishing (painting, staining, sealing, etc.).
- Provide wall insulation according to the the Design Guide for Energy Efficient Revitalization of Military Family Housing for Improvement and New Construction.
- Avoid using urea-formaldehyde insulation materials.
- Specify non-ozone-depleting chemical (ODC) insulating materials.
- Always provide a vapor barrier on the warm side of the insulation in exterior walls.
- Use sustainable systems and methods of construction that have a life expectancy of 25 years minimum, unless restricted by historical or regional constraints.
- Provide wall insulation in compliance with the GOQ's Energy Budget Analysis.

Exterior Openings 6.4

Windows and doors should be compatible with the architectural style and design, and should comply with any applicable Historic Preservation requirements. Window and door selections should be based on durability, functionality, and maintainability.

Windows

When strategically placed, windows can provide supplemental heat through solar gain. Arbitrary placement is discouraged because it can adversely impact the structural safety, and the thermal envelope, thus increasing the cost of heating and cooling. Consider the impact window placement will have on flexibility in furniture arrangements and interior functionality.

Design Considerations

- Consider the energy impact and passive solar performance in the placement and size of windows. Selection and placement should be in compliance with energy conservation requirements for non-historically designated units. Use energy-efficient insulating windows with double or triple glazing as the local climate dictates. Provide thermal breaks, weather-stripping, and proper sealing as required.
- For historic designated units, select window types that are historically accurate, architecturally appropriate, and energy efficient.
- Provide at least one window in each bedroom that meets the minimum requirements for egress in the event of fire:
  - Width: At least 20 inches clear opening
  - Height: At least 24 inches clear opening
  - Area: At least 5.7 SF clear opening
  - Sill Height: Not more than 44 inches above the floor
- Provide removable screens for all operable windows.
- Provide locks on all windows.
- Consider solid vinyl, vinyl-clad metal, or vinyl clad wood windows to reduce maintenance costs.
- Specify windows that are manually operated. Avoid cranking mechanisms except in units designed for accessibility, or when required for historic GOQs.
- Select tilt-in windows to allow ease of cleaning and maintenance.
- Use the appropriate window materials or film for proper glass protection to meet force protection requirements.

Skylights

Skylights may increase the cost of heating and cooling, and must be strategically placed to avoid solar damage to furniture and interior finish materials.

Design Considerations

- Maximize the amount of natural light in the living areas. Consider using energy efficient tinted skylights. Consider the impact of the skylight to the elevation of the house and solar gain in hot climates. Skylights must not be installed using self-help; but must be installed by licensed professionals to avoid nullifying the manufacturer's warranty.
- Install skylights on a properly flashed curb in accordance with the manufacturer's recommendations for installation on the specific roof type.
- Provide skylights only if appropriate and applicable to historic housing or local codes.
- Installation and materials need to be consistent with current industry standards and in harmony with other roof components.
- Consider force protection requirements when locating skylights.

Doors

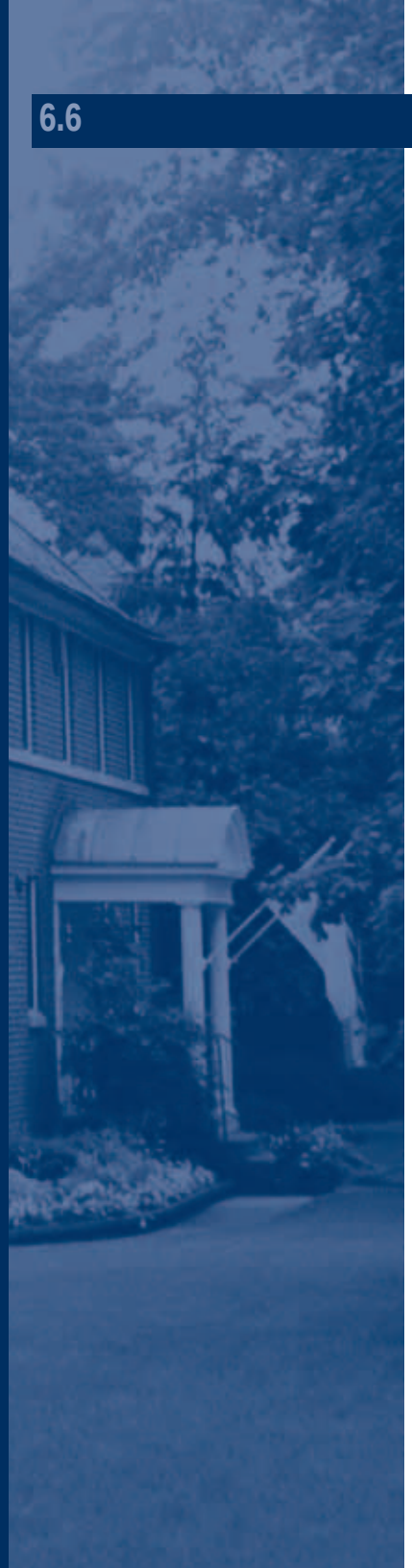
Arbitrary door placement is discouraged because it can adversely impact force protection requirements, exterior aesthetics, and the relationship and access to exterior areas.

Design Considerations

- Select exterior door styles that complement the architectural style of the house. In all houses, storm doors should be as unobtrusive as possible. Consider solid core, wooden, or steel insulated doors for the main entry into the foyer. When space permits, consider using sidelights to enhance the character of the main entry.
- Consider the use of fiberglass doors and frames or other non-corrosive materials for coastal environments.
- Provide a door chime or knocker at the front main entry.
- Provide a wide-angle viewer at 60 inches above the finished floor on the main entry door.
- For patios, use French doors or energy efficient sliding glass doors.
- Provide dead-bolt locks on all exterior doors. Provide security bars or other secondary locking devices on sliding glass patio doors.
- Provide lock cores compatible with the base keying system.
- Provide durable hardware that is appropriate for the architectural style of the home.
- Provide weather-stripping gaskets and seals on all exterior doors. Provide door stops and returns when appropriate.
- Consider using secondary doors (storm/screen door) on exterior doors that will accept a fully glazed panel or a screen. Provide storm doors that are durable high quality architectural products.
- When force protection is required use the appropriate door materials or types for the degree of protection required.

Main Entry Design 6.5

- Entry porches should provide safe, convenient access into the house. Consider the number of anticipated guests when designing GOQ entries. The entry porch should be distinctive as the prominent focal point and add identity and "curb appeal" to the housing unit. An entry porch also should be appropriately lighted and protected from the elements.
- Entry porches are typically constructed of concrete, have one or more steps, and are covered with a roof projection.
- Enclosed Arctic entries (not to exceed 50 SF) are required in designated locations.
- Slope the porch stoop ¼ inch per foot away from the house to provide positive drainage.
- Provide porch surface materials that have high slip resistance. Acceptable surface materials are concrete, concrete with integral color, exposed aggregate (pebble finish), brick, clay tile, terrazzo tile, and flagstone.
- Provide adequate lighting so that no areas of the entry are left dark. Additionally, the address numbers for the house should be illuminated per local standards.
- Eliminate all "blind spots" in the entryway that would prevent viewing of visitors as they approach the entry door.
- Closed Circuit TV is allowed when required by a force protection threat assessment.
- Mailboxes, house plaques, and numbers should be installed in accordance with U.S. Postal Service standards and the installation's design standards. These items should be consistent with the look of the rest of the family housing neighborhood. House plaques should be re-usable and made of durable materials compatible with the installation's design standards.
- GOQs may have a US or other flag and stanchion attached to the exterior of the residence that is in compliance with criteria in Title 36, U.S.C., Chapter 10 - The Flag Code.
  - Special Command Positions, when appropriate to the site and scale of the house, may consider residential scale freestanding flagpoles concentrated on the grounds of the quarters.
  - In every case, flagpoles and stanchions should comply with the installation design and construction standards, as well as harmonize with the neighborhood.



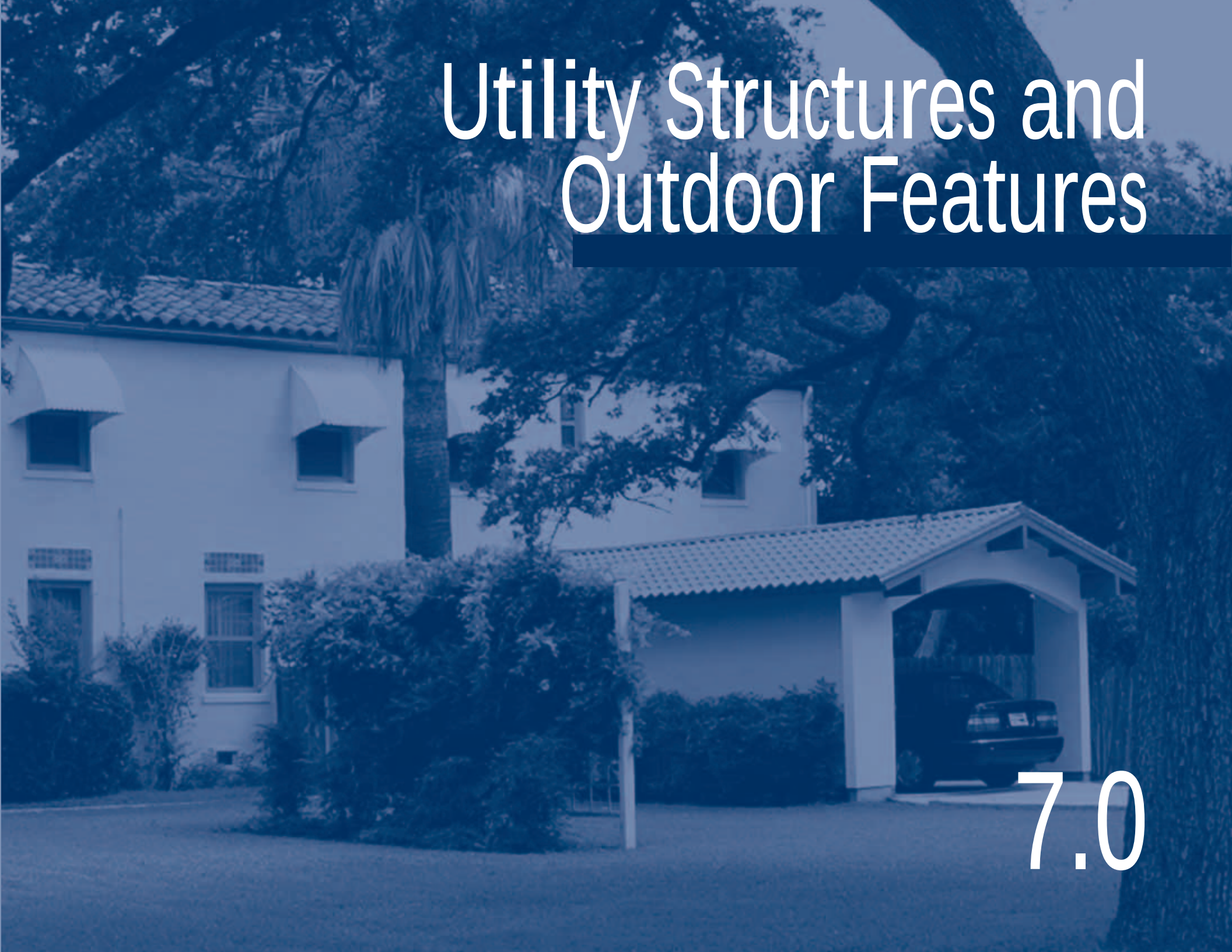
6.6 Exterior Stairs

Where exterior stairs are used to provide access to living areas or multiple units in colder climates, provide railings on both sides of steps and around the landings.

Design Considerations

- Ensure the railing has intermediate rails/patterns such that a 4-inch sphere cannot pass through.
- Conform to Americans with Disabilities Act Architectural Guidelines for stair design requirements when applicable.
- 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 no more than ¼-inch, with the rear being higher.
- Provide adequate lighting to illuminate the stairway.

Utility Structures and Outdoor Features



7.0

7.1 Garage and Carports

Consider providing miscellaneous storage in garages and carports. Avoid the use of indoor/outdoor carpeting in garages and carports to reduce maintenance and repair costs. Use durable, slip-resistant floor materials.

Single-car garages/carports (12 feet 8 inches by 22 feet 4 inches maximum clear dimensions) are authorized for all GOQs, except where prohibited due to inadequate site space, high site preparation costs, stylistic compromise with the design of the house, where local housing trends do not have garages, or Historic Preservation requirements.

Double-car garages/carports (20 feet 10 inches by 22 feet 4 inches maximum clear dimensions) will be considered for approval by AF/ILE for Special Command Positions or the installation commander, except where prohibited due to inadequate site space, high site preparation costs, stylistic compromise with the design of house, where local housing trends do not have garages, or Historic Preservation requirements.

Provide attached garages/carports for each GOQ 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 requires enclosed shelters.

Design and Layout

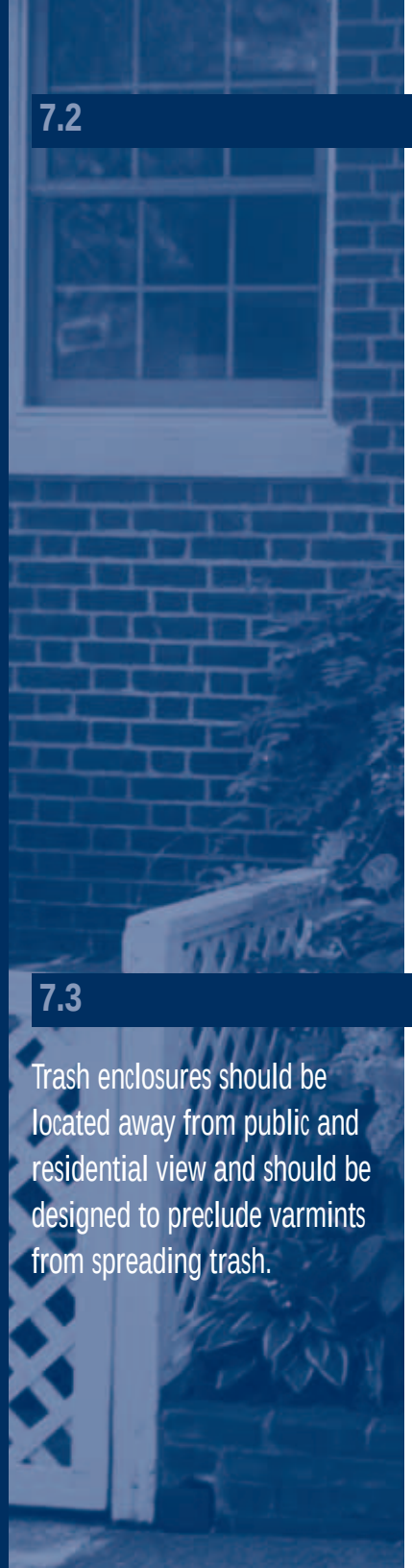
- Design a garage/carport to complement the architectural features and materials of the house.
- Combine the exterior bulk storage with the carport/garage, if possible. Bulk storage can be included in the garage or carport as long as the bulk storage allowance is not exceeded. The clear dimensions of the garage or carport may be increased when bulk storage is included. Provide 12-inch-deep, heavy-duty shelving for bulk storage. The location of shelving shall not compromise the parking space.
- Trash enclosures can be included as a component of a garage structure, but the enclosure must not open into the garage.

Construction

- Design the garage/carport such that the floor slab is a minimum of 4 inches below the floor of an adjoining house. Where the drop is greater than 7 inches, provide appropriate stair design. Slope the slab toward the garage/carport door or opening for positive drainage.
- For attached garages, provide a rated firewall between the house and garage, and between adjacent garages. Consult the local building code for specific requirements and firewall ratings.
- Where garages/carports of adjoining units share a common roof, provide a fire separation between the occupants' spaces with a floor to roof partition. Cover the partition with finished materials on each side.
- For garages not directly attached to units, provide a 36-inch personnel door from the garage to the exterior.

Hardware and Accessories

- For attached garages/carports, provide a light switch inside the living unit in addition to the switch in the parking area.
- Consider using motion-sensitive exterior lighting for convenience and security.
- Provide a minimum of two weatherproof Ground Fault Circuit Interrupting (GFCI) duplex convenience outlets in the garage/carport.
- For garages, 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.
- For garages, provide a powered garage door opener with remote control, built-in lighting, and a safety stop device.



7.2 Exterior Bulk Storage Areas

Exterior bulk storage is part of the allowable (interior and exterior) general storage area that is not countable towards the net square footage calculation. Exterior bulk storage areas augment indoor storage and should be designed for items normally used outdoors. This storage area may be located in the garage/carport, or in a storage room attached to the house. Provide access to these storage areas from the exterior of the housing unit. Exterior bulk storage is generally for items that keep well in non-conditioned space, such as garden tools, hoses, lawn mowers, and outdoor furniture cushions. Freestanding storage sheds are discouraged. Exterior storage should have unencumbered access with a walkway to the house. Indoor storage will be discussed later in this document.

Design Considerations

- Avoid locating exterior storage in separate sheds, when possible. If freestanding storage sheds exist or are necessary they should be screened with landscaping.
- The exterior bulk storage areas shall be a maximum of 100 SF. When interior bulk storage space is inadequate, exterior bulk storage space may be increased to compensate, as long as the total bulk storage space does not exceed 200 SF.
- 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.
- Provide a concrete or solid floor.
- 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 12-inch-deep, heavy-duty shelving.

7.3 Trash Enclosures

Trash enclosures should be located away from public and residential view and should be designed to preclude varmints from spreading trash.

Design Considerations

- Provide each living unit with an exterior area large enough to accommodate the base standard trash container and recycling containers. Locate the area convenient to the trash pick-up point. Provide paved access for the occupant.
- Acceptable trash enclosure materials include landscaping with shrubs, wood fencing, brick masonry, and decorative concrete masonry units (CMU). Trash enclosures should have a concrete slab floor. Consider the overall architectural environment when designing the enclosure. Stress functionality and simplicity.
- Trash enclosures can be included as a component of a carport/garage, but the enclosure must not open into the structure.

Outdoor Living Spaces 7.4

Outdoor living spaces include patios, porches, decks, or enhanced breezeways, and provide the occupants with a private outdoor dining, entertaining, and relaxation area to augment interior living spaces. The design of these spaces should be integrated with the overall house design and neighborhood context.

Design Considerations

- Provide outdoor living areas with a maximum combined area sized within a minimum of 120 SF to a maximum of 350 SF, determined by the entertainment requirements of the GOQ. The total maximum area includes all outdoor living areas, including patios, porches, decks and enhanced breezeways. Provide a minimum front-to-back dimension of 8 feet for any single outdoor living area. A raised deck of the same size, constructed of weather-resistant and slip-resistant materials, is an acceptable alternative to the concrete patio. All wood should be pressure treated wood, redwood, or cedar as appropriate to the climate and geographic region.
- Replacement, improvement, or self-help projects must not cause the maximum combined outdoor living area (120 SF min. - 350 SF max.) to be exceeded. If existing combined outdoor living areas exceed the 350 SF maximum, replacement cannot exceed the existing square footage.
- Outdoor living areas must meet base architectural compatibility guidance or historical architectural requirements.
- Breezeways are typically a covered open passage connecting two structures such as an adjacent garage/carport to the nearest exterior door of the main structure. A narrow breezeway that only serves as circulation space does not count toward the maximum combined area allowance for outdoor living spaces unless it is enhanced, enlarged, and functions as an entertainment area. Enclosed, habitable breezeways that are enhanced and acquire the characteristics of interior living spaces will count toward the interior net floor area of the house.
- Patio, breezeways, and porch covers or enclosures are permitted and will not count toward the interior net floor area of the house, if they conform to the following criteria:
  - They must retain the qualities of exterior finishes both in exterior appearance and functionality.
  - All materials, finishes and features are to be selected and/or designed according to exterior design criteria.
  - They may not be climate controlled with heating or cooling equipment.
- Porch and patio covers and enclosures shall not be constructed by self-help.
- Obscure the view of patios, decks, and breezeways from streets, common areas, and adjacent living units with a combination of walls, fencing, or planting.
- Provide direct access to outdoor living space from the living room, dining room, or family room with an appropriate exterior door.
- Provide a minimum of two weatherproof Ground Fault Circuit Interrupting (GFCI) duplex electrical outlets. Weather resistant ceiling fans and exterior lighting are allowed in enclosed outdoor living space.
- Ensure the patio or deck elevation 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 and deck rails as required by local code.
- 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 even surfaces to prevent rainwater from ponding.

7.5 Fencing

Fences and screens define both an outside area for family activities and individual space. Although fences/walls ensure privacy, they can create other problems in terms of security/visibility and maintenance. Properly designed landscaping can also define and screen outdoor living areas and should be considered in lieu of fences when appropriate.

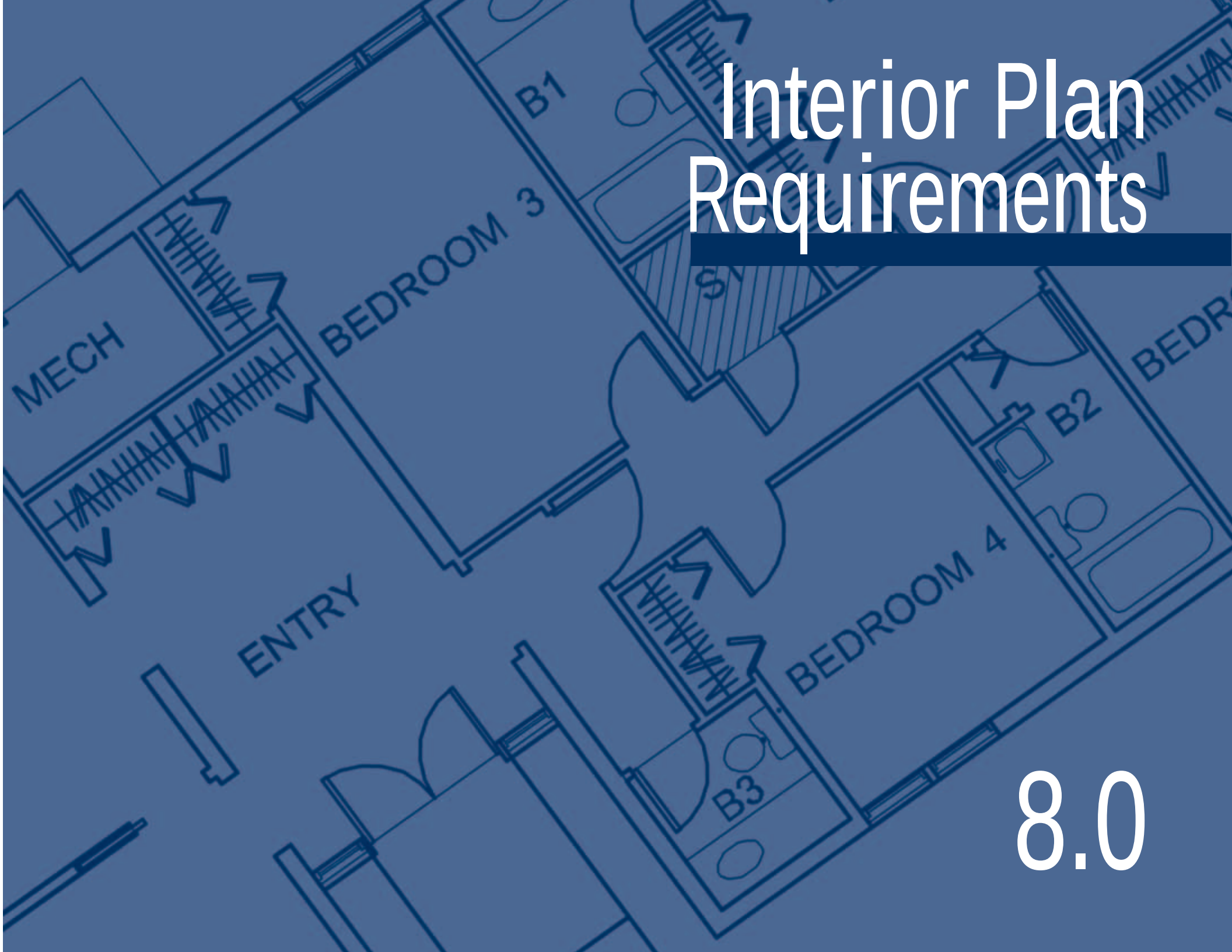
Privacy Fence Design Considerations

- Provide privacy fences with a maximum height of 8 feet 0 inches and at least one gate.
- Provide visual screening by using structural walls or fencing as applicable.
- Select durable, low-maintenance materials consistent with the architectural style of the house and regional or historic requirements of the residential neighborhood. Acceptable materials include unpainted treated wood fencing, brick masonry, recycled plastic material, or decorative CMU.
- Discourage the use of chain-link fencing, which is typically associated with industrial security uses.
- Privacy fences are part of the home and for the sole use of the occupant, therefore they count against the $35K O&M limitation.

Perimeter Yard Fence Design Considerations

- Perimeter fencing can be provided to define boundaries, enhance safety and security, and for ornamental enhancement.
- Select materials consistent with the architectural style of the house and regional or historic requirements of the residential neighborhood and the installation architectural compatibility standards. Acceptable materials include unpainted treated wood fencing, brick masonry, recycled plastic material which looks like simulated wood products, or decorative CMU.
- Chain-link fencing should be limited to separating the GOQ from other functional areas of the base.
- Consider force protection issues as established by local security forces where applicable.
- Other considerations listed above for privacy fences may also apply to perimeter fences.
- If the perimeter fence is for the sole use of the occupant, it counts against the $35K O&M limitation.

Interior Plan Requirements



8.0

8.1

GOQ design is based on four guiding principles:

- Applicability
- Economic viability
- Functionality
- Architectural compatibility

Functional Area Relationships

This section provides a general overview of the functional areas of the GOQ. The following sections give space-by-space analysis and criteria for these various functional areas. The official entertainment requirement for GOQs places special emphasis on functional relationships, circulation flow, and mechanical system design.

Foyer

Provide each housing unit with a main entry leading into a foyer, an entry light, and a nearby coat closet. Locate the foyer in or adjacent to the living room and provide access to other areas without passing directly through the living room. Allow access from the foyer to the kitchen, and the passage leading to the sleeping areas.

Kitchen

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. When convenient, allow access from the kitchen to a covered parking area and to interior utility and exterior service areas.

Secondary Dining Area

A secondary dining area may be provided as part of a larger kitchen. This secondary eating area may be in direct sight of food preparation areas but not in direct sight of the bathroom. Make this area accessible to less formal spaces such as the family room/den, sunroom, or outdoor living spaces, if possible.

Dining Room

The primary dining area may be a separate room or combined with the living room in an open plan. The dining room must have convenient access to the kitchen without having direct visual access. Direct the circulation pattern through the dining room along one wall instead of through the middle of the room. Ensure bathrooms do not have direct visual access to dining rooms.

Living Room

Provide a living room, which may be a separate room or part of an open floor plan that incorporates the dining room function. Ensure bathrooms do not have direct visual access to living rooms.

Family Room/Den

Provide a family room/den, which may be a separate room or part of an open floor plan that incorporates the kitchen function. Ensure bathrooms do not have direct visual access to family rooms/dens. Dens are typically separate rooms used for study and relaxation, but may be included as part of the entertainment areas in some layouts.

Sunrooms

Sunrooms may be provided as an interior space distinct from the living room with direct access to the exterior and where possible, accessible to the other living areas of the house. Sunrooms when provided, should satisfy the functional requirements of a family room.

Bedrooms

Separate the sleeping areas from all other functional areas of the house, but locate bathrooms nearby. Provide a master bedroom plus three additional bedrooms in each GOQ.

Bathrooms

Locate bathrooms near the bedrooms and out of sight of the other areas of the house. Provide at least two full baths, one of which being directly accessible from a hall without requiring passage through another room in the sleeping area of the GOQ. Provide a dedicated master bath for the master bedroom. In two-story units, provide a powder room to serve the first floor. When a powder room is provided, consider accessibility for both guests and family activities. Open the powder room to circulation space rather than to a living space.

Hallways & Stairways

Hallways, stairways, and stairwells are areas dedicated to circulation. Incorporate circulation into living space to minimize usable floor space lost to circulation.

Laundry Area

Provide an enclosed laundry area large enough to accommodate a washer and dryer plus shelving or cabinets for storing laundry supplies out of sight. Avoid opening laundry areas directly into entertainment areas. Do not locate the laundry area within a bathroom or near food preparation areas.

Storage

Provide clothes closets, linen closets, and interior bulk storage in the housing unit. Also provide exterior bulk storage for larger items, such as athletic and lawn-care equipment.

Garages and Carports

Provide a single-car garage or carport for all GOQs. With ILE approval, Special Command Position quarters may have two-car garages. Garages and carports should have direct access to the house through the kitchen or laundry areas.

Arctic Recreation Rooms

Where basements are present, and Arctic recreation rooms are authorized, they should be located in the basement. In new construction, consider locating Arctic recreation rooms to maximize solar gain. The space should be distinct from but convenient to the living room and family room, but must only be used as additional recreation space. The allowance for Arctic recreation rooms is not meant to increase the living room or family room space.

8.2 Fireplaces

- When appropriate and cost-effective, a single new fireplace, fully vented to the exterior, may be added to the living or family room areas during whole-house renovation projects. Gas fireplaces are preferred if the home has existing gas service.
- Provide firebox screens or doors.
- Consider adding a flue cap to chimneys to minimize maintenance.

8.3 Furniture

Design circulation areas to permit the movement of queen size beds and other bulky items of furniture:

- Hallway and stairway width: 3 feet minimum
- Stairway headroom: 6 feet 8 inches minimum
- Stairway treads: 11 inches minimum
- Stairway risers: 7 inches maximum

8.4 Space Considerations

- When designing new GOQs, consider architect-engineer or in-house comprehensive interior design services to provide suggested furniture layouts and efficient circulation patterns.
- Establish base standards for finishes, color schemes, and materials for GOQs if no such standards exist.
- Centrally locate and arrange circulation space to serve as many functional areas as possible without the need for extended hallways.
- When designing GOQs, the designer should consider the probable furniture placement in each habitable room to accommodate at least two furniture arrangements. Consider the placement of windows, doors, electrical outlets/switches, telephone outlets, cable outlets, and HVAC supply, and return registers in furniture arrangements. Consider the interior elevations for furniture placement as well as the horizontal layout of the rooms.
- Provide a minimum ceiling height of 8 feet in all living spaces unless unique conditions warrant a variance. Do not allow ceiling heights to be less than 7 feet 6 inches in habitable interior spaces.
- Provide acoustical separation between living units as noted below. Determine the Sound Transmission Class (STC) ratings in accordance with ASTM E 90 and E 413. Determine the Impact Insulation Class (IIC) in accordance with ASTM E 492 (Tapping Machine Method):
  - Party walls between living units: minimum STC = 50.
  - Floor/ceiling assemblies between adjoining living units and assemblies within a unit: minimum STC = 52, minimum IIC = 52.
  - Between adjacent bathrooms, and living areas, and living areas and bedrooms: minimum STC = 42.
  - Between adjacent bedrooms: minimum STC = 37.

Foyer 8.5

The foyer is the principal point of entry to and from the housing unit, and provides the first impression of the house to visitors. The foyer's location should allow guests to access entertainment areas of the house without passing through private areas of the house. Walls, changes in floor or ceiling height, placement of furniture or decorative railings, may define the foyer.

Design Considerations

- Locate the foyer adjacent to the living room, but provide access to other areas without having to pass through the living room.
- Provide a coat closet with minimum dimensions of 2 feet 4 inches deep by 5 feet wide.
- Crown molding, chair rails and wainscoting appropriate to the architectural style of the home may be used. When hallways, stairwells, and stairways form a visual part of the foyer, then their finishes and decorative architectural millwork should be compatible.
- When practical, provide minimum foyer dimensions of 5 feet by 4 feet 6 inches, excluding the coat closet area.
- Provide a main entrance/front door with a minimum width of 3 feet. Where possible, provide sidelights at the entry.
- Lighting in the foyer should be incandescent recessed, ceiling, or wall mounted.
- Provide light switches in the foyer by the main entry door.
- Provide doorstops to prevent doors from damaging adjacent walls.
- Use durable, moisture-impervious, and slip-resistant floor materials. Floor material should not be replaced before reaching the end of its life expectancy. Life expectancy should be clearly defined in the construction specifications and local base standards.
- In areas with winter design temperatures (97.5 percent) of -10° F (-23° C) or less, provide air-lock entries in foyers to prevent heat loss. The maximum area for air-lock entries not counted against the net floor area of the house is 50 square feet.

8.6

Kitchen And Secondary Dining Areas

High quality kitchen appliances and fixtures may be provided to support the official entertainment requirement. Provide a kitchen layout that is both functional and practical.

Layout

- Arrange the kitchen so that the "work triangle" (the total of the distances between the center of the range, the refrigerator, and the sink) does not exceed 24 linear feet.
- Locate the sink between the range and refrigerator, if possible.
- If possible, allow space for a supplemental or second refrigerator or freezer in the kitchen. Other potential locations are the laundry area, storage area, or the garage.
- Maximize natural light and provide both overall and task lighting. Lighting should be ceiling- or wall-mounted, recessed, or part of a ceiling fan.
- Provide visual access to outdoor living/play areas.
- Where feasible and practical, provide a minimum of 4 feet of aisle space between base cabinets and opposing walls or cabinets.
- Where appropriate, a cooking or food preparation island is allowable. Provide for electrical connections or plumbing as required.
- Provide a double compartment sink with a single-lever faucet and separate sprayer. Faucets may be chrome, brass, or chrome and brass with a lifetime finish. Sinks may be integral molded acrylic, porcelain, or stainless steel.
- A secondary eating area in or adjacent to the kitchen may be provided.

Finishes

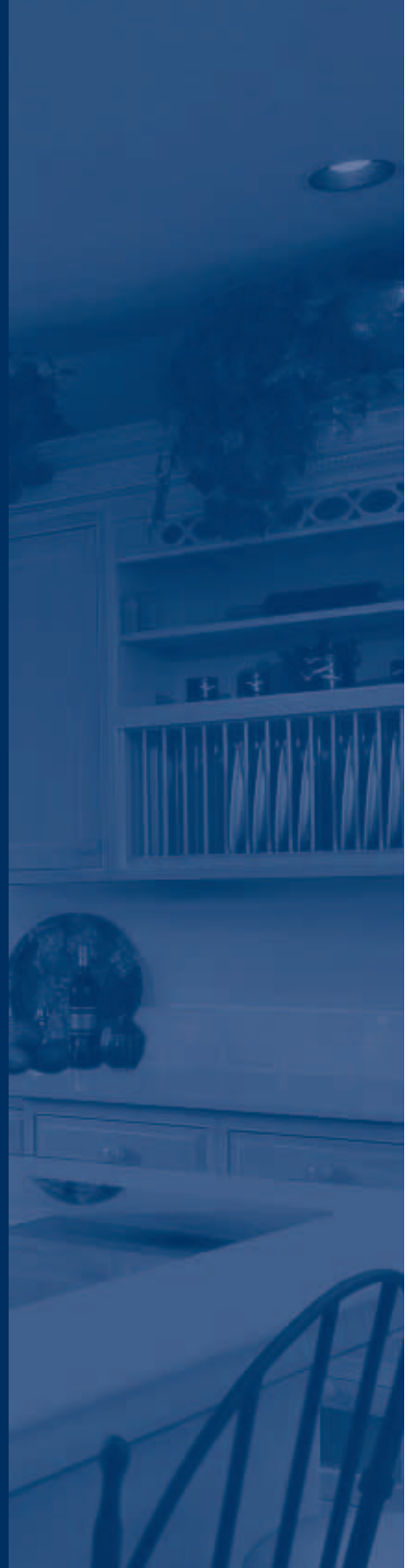
- Neutral color wallcovering is permitted in the kitchen. Ensure the wallcovering is of adequate weight strippable vinyl to withstand point impact and provide good cleanup characteristics. If applying wallcovering on plaster walls, ensure walls are properly prepared to preserve the wall. Do not use wallcovering on ceilings. Decorative borders may be applied.
- Wall paint should be a neutral color semi-gloss.
- The floor must have a water and slip-resistant surface, such as resilient sheet vinyl, hardwood or ceramic tile. Do not use carpet in kitchens. Floor material should be should not be replaced before reaching the end of its life expectancy. Life expectancy should be clearly defined in the construction specifications and local base standards.
- Ceilings should be white flat or satin finish. Paints with texture additives are not allowed. Do not use acoustical suspended ceiling tiles or wallcovering on ceilings.
- Base molding should be compatible with the floor finish, and may be wood or tile.

Cabinets

Provide cabinets with the following minimum dimensions (see the figures on pages 44 through 47 for sample calculations):

ITEM	MINIMUM DEPTH	MINIMUM AREA
Wall Cabinet Shelving	12"	30 SF
Base Cabinet Shelving	24"	30 SF
Drawers	24"	18 SF
Countertops	24"	22 SF

- In addition to cabinets prescribed herein, whenever possible, include pantry closets in or adjacent to the kitchen for storage of packaged foods and house cleaning equipment and supplies. Adjustable shelves in the pantry are recommended.
- Provide modular, factory-manufactured kitchen cabinets that meet the requirements of the Kitchen Cabinet Manufacturers Association. Ensure the finish on the exposed surfaces meet the following:
  - natural or stained finish on solid hardwood
  - natural or stained finish on hardwood veneer plywood
  - plastic laminate on plywood substrate
  - semi-gloss or gloss paint on solid hardwood
  - cabinet finishes must be washable.
- Consider using full-height overhead cabinets to maximize kitchen storage space, or provide open storage by finishing the cabinet tops to allow the display of decorative items.
- Kitchen cabinetry is expected to last 10-15 years. Cabinets should only be replaced when their useful life is exceeded, or as part of a whole-house renovation. The cabinet finish should be of such quality, materials, and construction as to ensure the 15-year life expectancy.
- 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 within sealed surfaces and contain urea-formaldehyde binders.
- Where appropriate, provide standard base and wall cabinet module sizes to avoid custom design and installation costs.
- Use high-quality standard kitchen cabinet hardware.
- Where the layout allows, avoid end cabinet conditions. Cabinets and countertops should terminate into an end wall. Where a wall is not available and space permits, end cabinet and countertop runs with a knee wall 3'-6" high and 2'-2" long. Provide a wall cap of the same material and finish of the kitchen countertop or base cabinet.



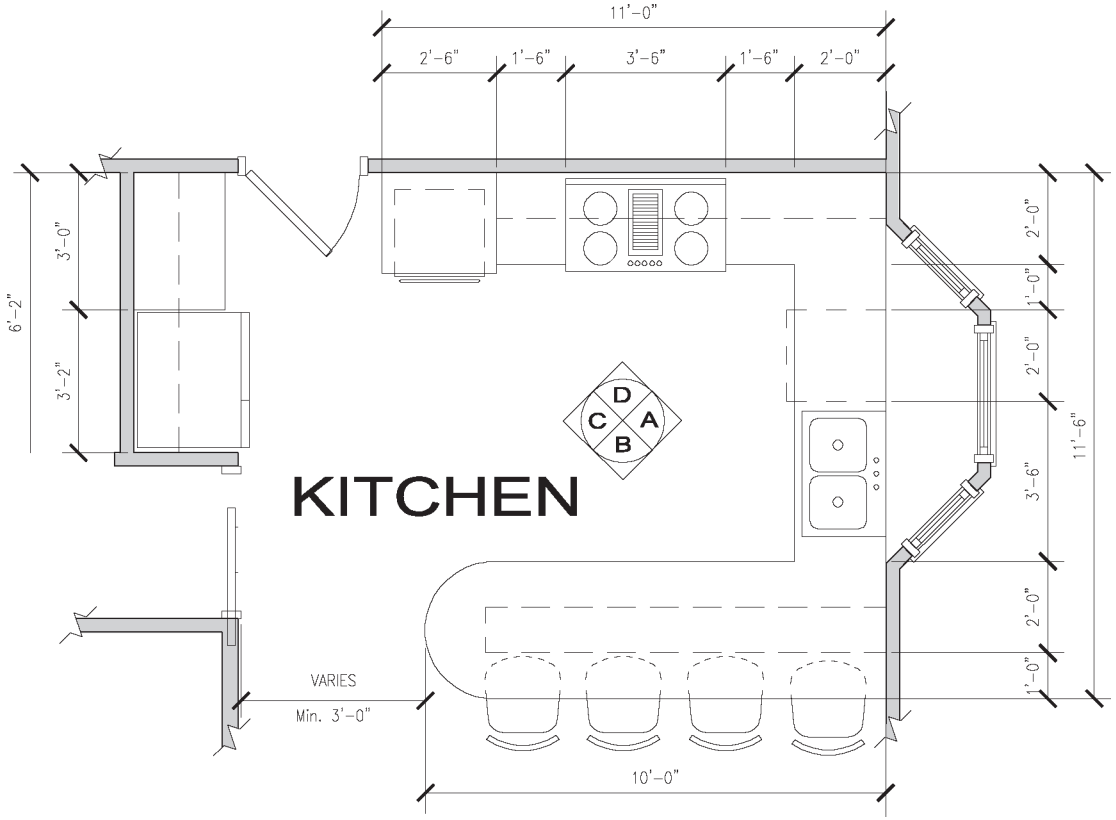
Countertops

- Provide countertops that are neutral in color and harmonize with the cabinets, the appliances, and the flooring.
- Approved countertop materials include high-density acrylic composite, granite, and high-grade laminates. Do not use wood butcher-block or ceramic tile for counter tops due to hygiene and maintenance concerns.
- Other suitable materials may be appropriate based on local construction practices. In any case, the chosen countertop materials should not be replaced before reaching the end of its life expectancy. Life expectancy should be clearly defined in the construction specifications and local base standards.
- For acrylic resin product installation, employ manufacturer trained or approved installers.
- Provide seamless, rounded corners at counter nosings and at the intersection of the counter top and the splash block. If a solid surface material is used, the backsplash may be a separate piece.
- Provide dedicated countertop space for an occupant-owned microwave oven. Locate the space near the food preparation area.
- Ensure the minimum vertical separation between the counter top and wall cabinets is 1 foot 6 inches.
- 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. Avoid small sections of base cabinets and countertops to the extent possible.
- For laminated countertops, provide ¾" plywood top with ¾"x 4" plywood frame all around to provide a minimum 1 ½" edge. Provide ¾" x 4" minimum plywood backsplash with cove style construction.
- The required minimum total area of countertop space is 22 SF or approximately 112 linear inches (exclusive of sink and range space).

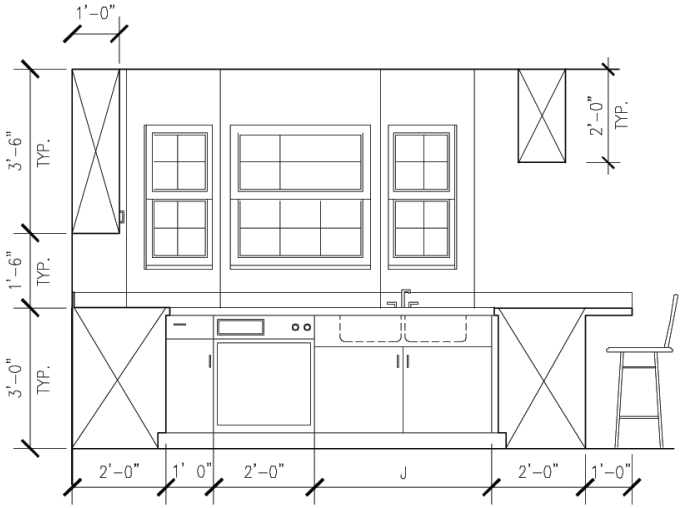
Appliances

- Provide high quality, energy-efficient, residential grade kitchen appliances, to include the following:
  - range or cook top
  - range hood ducted to the exterior
  - double oven
  - microwave oven
  - refrigerator
  - dishwasher
  - freestanding or under-counter trash compactor
  - garbage disposal
  - freestanding or under-counter icemaker
- Washers and dryers are not provided.
- Kitchen appliances should not be replaced before reaching the end of their life expectancy. Life expectancy should be clearly defined in the construction specifications and local base standards.
- Special Command Position quarters may receive commercial grade appliances and a washer and dryer.
- Ensure the kitchen range, range hood, refrigerator, trash compactor, and dishwasher harmonize and are neutral in color.
- Provide gas or electric ranges or cook tops, and ovens, depending on the most cost-effective utility.
- One freestanding self-contained range, or one cook top with separate double ovens may be provided. Ranges or cook tops may be 30 to 40 inches wide. Two conventional ovens may be provided.
- Do not locate the range immediately adjacent to the refrigerator or against a wall in a corner of the kitchen.
- Do not provide range-hood extinguishers in new projects. Existing devices may be left in place as permitted by Air Force Policy letter, Policy on Kitchen Range Hood Fire protection in Military Family Housing (MFH), 30 June 1993. Remove immediately all low-cost, throwaway kitchen range fire protection devices located over gas ranges. They may be left in place over electric ranges until their service life expires.
- Provide a downdraft venting system for cook tops located in a cooking island where feasible.
- Provide a freestanding residential refrigerator with a separate, automatic-defrost freezer compartment. An icemaker should be included in the freezer compartment. The combined refrigerator-freezer unit should be a minimum of 22 cubic feet in capacity. A door mounted ice/water dispenser is allowable.
- Install dishwashers adjacent to the kitchen sink. Set water heater boosters, if required, at 140 degrees F.
- Provide a water-hammer arrester for dishwashers.
- Provide an under-the-sink, continuous-feed, minimum ½ horsepower (HP) garbage disposal. In new construction or whole house renovation, ¾ HP disposals are recommended.
- Provide ample (minimum of two duplex outlets) Ground Fault Circuit Interrupting (GFCI) electrical receptacles above the countertop to accommodate a variety of small appliances per local code.

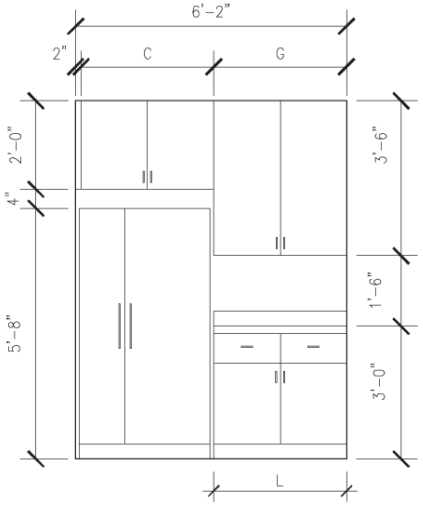
Sample Kitchen Calculations (Kitchen with Eat-In Area)



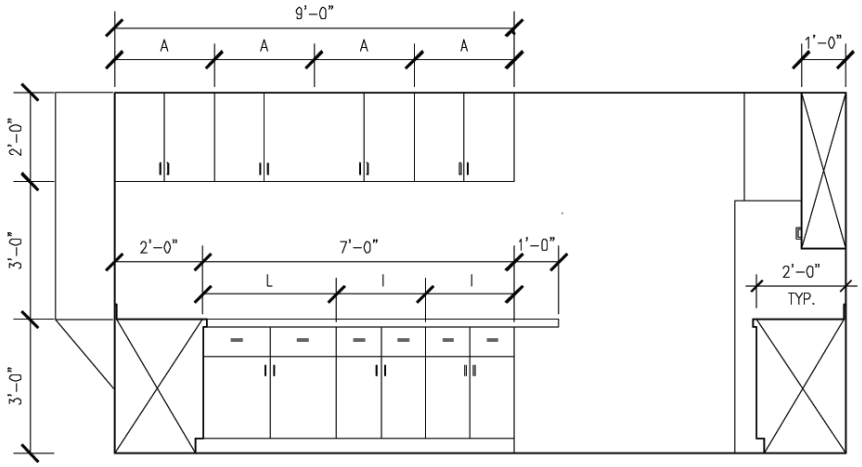
Plan



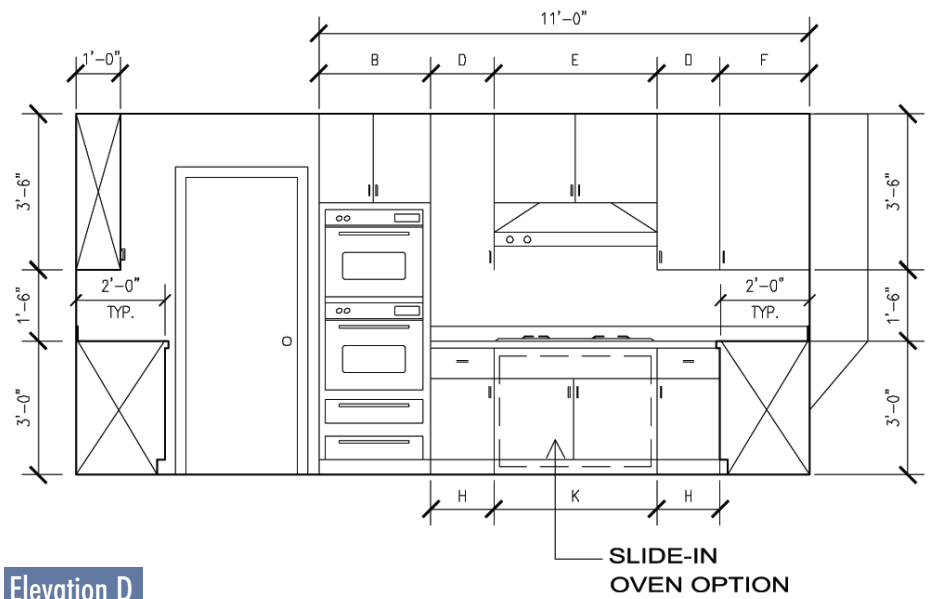
Elevation A



Elevation C



Elevation B



Elevation D

WALL CABINET SHELVING AREA:

CAB.	QTY.	WIDTH	#SHELVES	L.F. SHELVES 12"DEEP	SHELF AREA
A	4	2'-3"	2	18.0	18.0
B	1	2'-6"	2	5.0	5.0
C	1	3'-0"	2	6.0	6.0
D	2	1'-6"	3	9.0	9.0
E	1	3'-6"	2	7.0	7.0
F	1	2'-0"	3	6.0	6.0
G	1	3'-0"	3	9.0	9.0
				TOTAL SHELF AREA, WALL CABINETS	60.0
					(min. SF 30.0)

BASE CABINET SHELVING AREA:

CAB.	QTY.	WIDTH	#SHELVES 12"	#SHELVES 24"	L.F. SHELVES 12"	L.F. SHELVES 24"	SHELF AREA
H	2	1'-6"	1	1	3.0	3.0	6.0
I	2	2'-0"	1	1	4.0	4.0	12.0
J	1	3'-6"	-	1	-	3.5	7.0
K	1	3'-6"	-	1	-	3.5	7.0
L	2	3'-0"	1	1	6.0	6.0	18.0
M	1	1'-0"	1	1	1.0	1.0	3.0
					TOTAL SHELF AREA, BASE CABINETS		56.0
							(min. SF 30.0)

DRAWER AREA:

Cabinets (H+H+L+L+I+I+M)

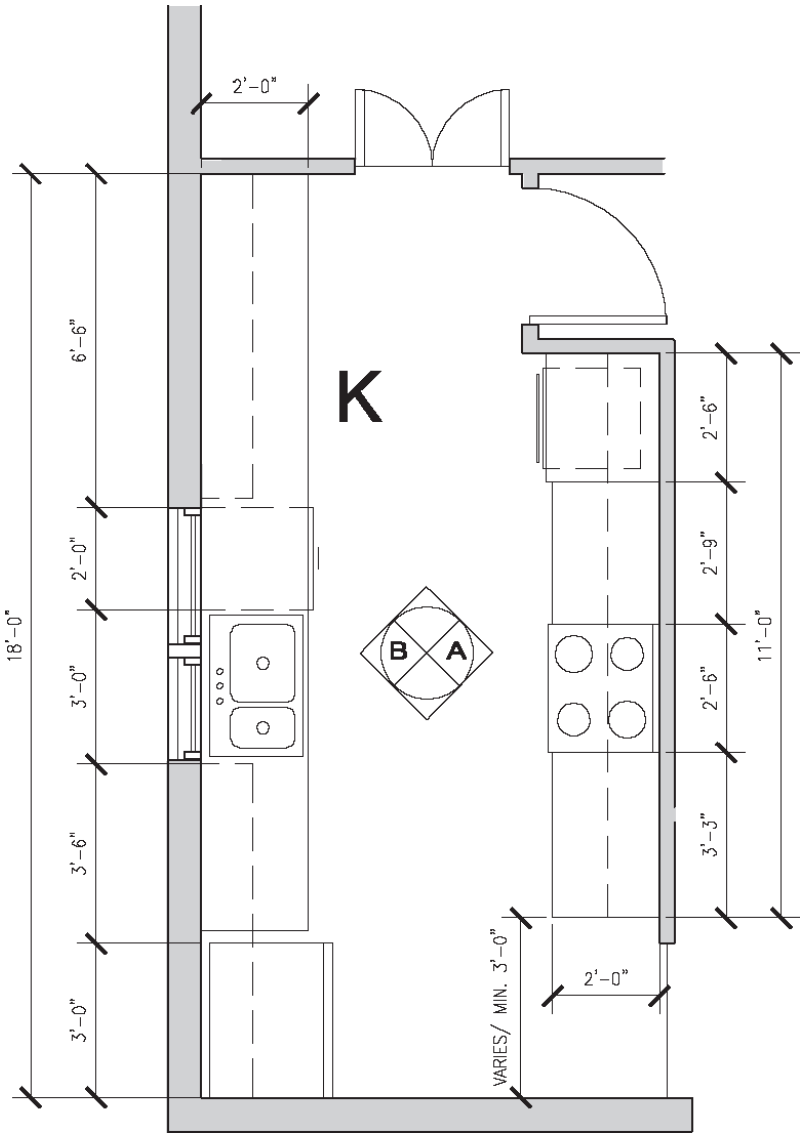
TOTAL L.F. 14.0 x 2'-0" deep = 28.0
(min. SF 18.0)

COUNTER AREA:

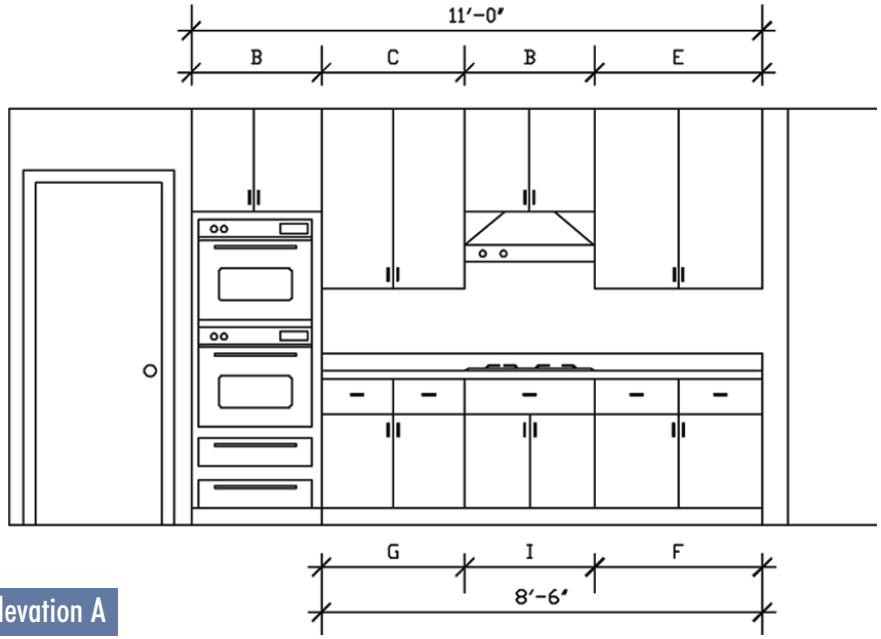
Cabinets 2.0 [(H+H+L+M) + 2.0 (DW+corner 1) + 3.0 (L+I+I+corner 2) + 3.0 (half-circle at end of island)]

TOTAL L.F. 11.0 x 2'-0" deep = 22.0
10.0 x 3'-0" deep = 30.0
Total 52.0
(min. SF 22.0)

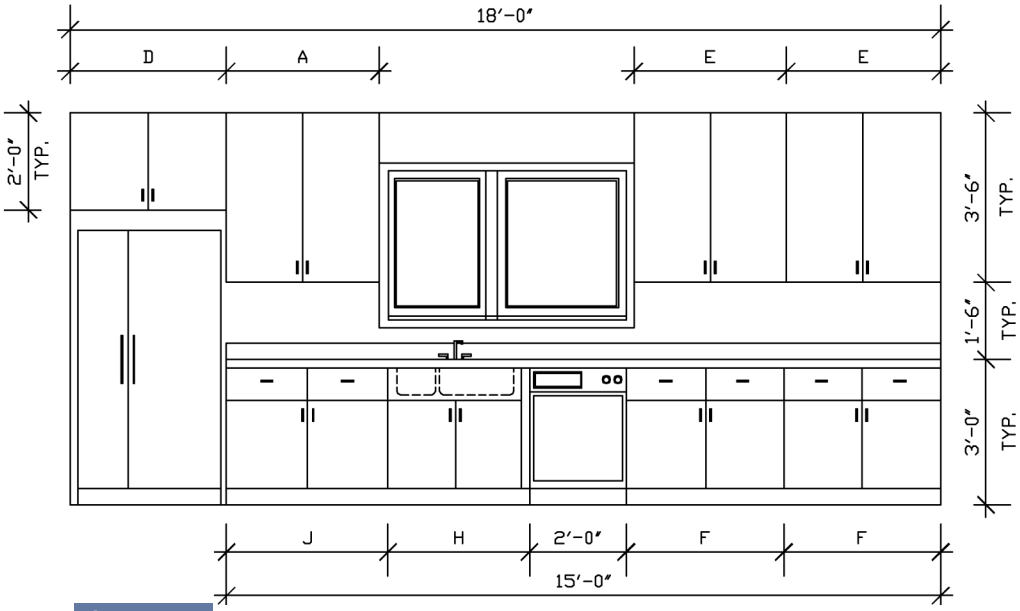
Sample Kitchen Calculations (Kitchen with Breakfast Counter)



Plan



Elevation A



Elevation B

WALL CABINET SHELVING AREA:

CAB.	QTY.	WIDTH	#SHELVES	L.F. SHELVES 12"DEEP	SHELF AREA
A	1	3'-6"	3	10.5	10.5
B	2	2'-6"	2	10.0	10.0
C	1	2'-9"	3	8.25	8.25
D	1	3'-0"	2	6.0	6.0
E	3	3'3"	3	29.25	29.25

TOTAL SHELF AREA, WALL CABINETS 64.0
(min. SF 30.0)

BASE CABINET SHELVING AREA:

CAB.	QTY.	WIDTH	#SHELVES		L.F. SHELVES		SHELF AREA
			12"	24"	12"	24"	
F	3	3'-3"	1	1	9.75	9.75	29.25
G	1	2'-9"	1	1	2.75	2.75	8.25
H	1	3'-0"	-	1	-	3.0	6.0
I	1	2'-6"	-	1	-	2.5	5.0
J	1	3'-6"	1	1	3.5	3.5	10.5

TOTAL SHELF AREA, BASE CABINETS 59.0
(min. SF 30.0)

DRAWER AREA:

Cabinets(F+F+F+G+J)

TOTAL L.F. 16.0 x 2'-0" deep = 32.0
(min. SF 18.0)

COUNTER AREA:

Cabinets (DW+F+F+F+G+J)

TOTAL L.F. 18.0 x 2'-0" deep = 36.0
(min. SF 22.0)

8.7 Dining Room

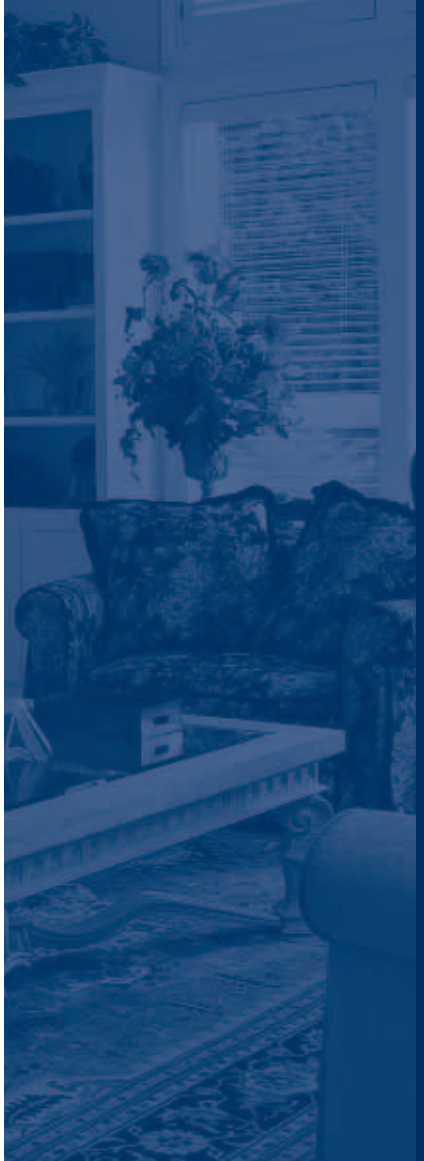
The dining room may be its own separate space of part of an open plan combined with the living room. Consider this space formal in character as part of the entertainment function of the GOQ.

Design Considerations

- For most GOQs, the dining room should accommodate a china closet, a buffet, and a table and chair set for 8 to 10 people.
- Dining rooms in Special Command Position quarters should accommodate the same furnishes as above, however the table should seat 10-12 people.
- Consider natural and artificial light and ventilation sources.
- Consider providing views to the exterior.
- If space permits, provide a door into the kitchen that can be closed to block views.
- When feasible, provide direct access from the dining room to the patio or other outdoor living spaces.
- Provide a dining room with a minimum area of 130 SF and minimum dimension of 9 feet.
- Provide a chandelier light fixture with a dimmer switch. Use a chandelier that is appropriate for the architectural style and historic period of the house. Coordinating wall sconces may also be added.
- Lighting should be incandescent, ceiling- or wall-mounted, recessed, or part of a ceiling fan. Other accent lighting may be added as appropriate.
- Where feasible and architecturally appropriate, provide a coffered, vaulted, or coved ceiling.
- Crown molding, chair rails, and wainscoting may be used when appropriate to the architectural style of the home.
- Neutral color wallcovering is permitted in the dining room below the chair rail only. Ensure the wallcovering is of adequate weight strippable vinyl to withstand point impact and provide good cleanup characteristics. If applying wallcovering on plaster walls, ensure walls are properly prepared to preserve the wall.
- Floor material should be carpeting, hardwood, or tile, and should not be replaced before reaching the end of their life expectancy. Life expectancy should be clearly defined in the construction specifications and local base standards.

Living Room 8.8

In GOQs, the living room is part of the official entertainment space and serves as the formal gathering area and focal point.



Design Considerations

- Consider natural light, ventilation sources, and exterior view in planning or modifying existing spaces.
- Provide a minimum of 170 SF floor area.
- The minimum room dimension is 11'-6".
- Minimize passage through the living room to access other areas of the house.
- Provide the ability to accommodate two different furniture arrangements.
- Layout the space or modify existing spaces to work in conjunction with the dining room and foyer.
- Lighting should be incandescent, ceiling- or wall-mounted, recessed, or part of a ceiling fan. Other accent lighting may be added as appropriate.
- Crown molding, chair rails, and wainscoting may be used when appropriate to the architectural style of the home.
- Neutral color wallcovering is permitted in the living room below the chair rail only. Ensure the wallcovering is of adequate weight strippable vinyl to withstand point impact and provide good cleanup characteristics. If applying wallcovering on plaster walls, ensure walls are properly prepared to preserve the wall.
- Floor material should be carpeting, hardwood, or tile and should not be replaced before reaching the end of its life expectancy. Life expectancy should be clearly defined in the construction specifications and local base standards.

8.9 Family Room

Family rooms provide an informal space for most family activities but should also be accessible to the formal entertainment areas to support the GOQ entertainment requirements. Where possible, the family room should be adjacent to the kitchen.

Design Considerations

- Provide a minimum floor area of 100 SF for family rooms with a minimum dimension of 9 feet.
- Locate the family room convenient to the kitchen and outdoor living space and provide a door to the outdoor living space.
- Consider the kitchen, family room, and outdoor living space as a planning unit in new designs, or consider modification to existing GOQs to allow this to occur.
- Lighting should be incandescent, ceiling- or wall-mounted, recessed, or part of a ceiling fan.
- Crown molding, chair rails and wainscoting may be used when appropriate to the architectural style of the home.
- Neutral color wallcovering is permitted in the family room below the chair rail only. Ensure the wallcovering is of adequate weight strippable vinyl to withstand point impact and provide good cleanup characteristics. If applying wallcovering on plaster walls, ensure walls are properly prepared to preserve the wall.
- Floor material should be carpeting, hardwood, or tile and should not be replaced before reaching the end of its life expectancy. Life expectancy should be clearly defined in the construction specifications and local base standards.
- Provide visual and acoustical separation between the family room and formal living areas in new construction and where practical in whole house renovation.
- The design of and access to the family room should reflect its dual use as both an informal entertainment/living area for the family and a formal entertainment area for GOQ functions.

8.10 Sunroom

Sunrooms are separate and distinct from the living room and family room. They are appropriate in cold climates where passive heat gain can contribute to heating the house during the winter, but are not energy-efficient in temperate climates where excessive summer heat gain may occur.

Design Considerations

- Maximize daylight into sunrooms. Take advantage of desirable views.
- Materials and finishes should be compatible with those used in the house interior.
- Lighting should be incandescent, ceiling- or wall-mounted, recessed, or part of a ceiling fan.
- Sunrooms count toward the net living area and are considered conditioned spaces with mechanical systems similar to those used in other areas of the GOQ.
- Include an exterior door to the outdoor living spaces from sunrooms.
- Sunrooms, when provided, satisfy the functional requirements of a family room.

Bedrooms 8.11

Bedrooms must accommodate restful sleep and should be located away from entertainment and recreational areas.

Design Considerations

- Optimize bedrooms to allow functional flexibility. When possible, furniture arrangements should accommodate a king-size bed in the master bedroom and twin beds or a single full size bed in other bedrooms. Locate windows, doors, and closets to allow for flexible furniture placement.
- Provide separate access to each bedroom.
- Each window should have a sill height and size compliant with life safety codes.
- In new construction, provide acoustical insulation in walls between bedrooms and adjacent noisy areas. Avoid direct lines of sight into bedrooms from the living room, dining room, kitchen, or other living areas.
- Provide minimum bedroom floor areas and minimum widths as shown in the chart below:
- Walk-in closets are preferred.
- Maximize closet space by providing double closet rods and closet organizers. Ensure there is adequate structural support since it is common to overload clothes hangar rods.
- Install wood or 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 clothing rods exceeding 5 feet in length.
- In linen closets, provide a minimum of four full depth shelves. Consider the use of modular shelving to maximize closet space and versatility.
- Lighting should be incandescent, ceiling- or wall-mounted, or part of a ceiling fan.

Bedroom Minimum Dimensions:

	Minimum Area	Minimum Dimension	Minimum Closet Depth	Minimum Closet Width
Master bedroom	150 SF	10’	2’-0”	10’-0”
Bedroom 2	130 SF	10’	2’-0”	6’-0”
Bedroom 3	100 SF	9’	2’-0”	4’-0”
Bedroom 4	90 SF	9’	2’-0”	3’-0”
Bedroom 5	80 SF	8’	2’-0”	3’-0”

8.12

Bathrooms and Powder Room

It is important to keep utility and quality in mind when renovating or designing bathrooms and powder rooms. Powder rooms should provide ease of access by guests away from the bedrooms. Bathroom finishes, storage cabinets, vanities, accessories, and plumbing fixtures should only be replaced when:

- their life expectancy is exceeded
- they are part of a whole house renovation or major bathroom M&R project.

Bathroom vanities and storage cabinets are expected to last 10 to 15 years.

When newly constructed, powder rooms are part of the GOQ entertainment area, therefore they must be adaptable to comply with the Americans with Disabilities Act. ADA requirements must also be considered when major renovations to powder rooms occur.

Provide at least a master bathroom, and one additional bathroom. For two-story housing units provide a powder room. Also consider powder rooms for one-story GOQs if space and configuration permit.

Design Considerations

- Ensure the master bathroom includes a water closet, a vanity with two lavatories where possible, and a bathtub with an integral shower. If space permits, a separate shower is allowed.
- Other bathrooms should include a water closet, a vanity with one lavatory and bathtub.
- Ensure the powder room is convenient to the entertainment areas and in close proximity to the foyer. Powder rooms should have water closet, a mirror, and a single basin vanity or a pedestal sink as appropriate to the architectural style of the house.
- Do not allow direct lines of sight into bathrooms or powder rooms from other rooms.
- Avoid configurations with bathrooms or powder rooms opening directly off of family room, kitchen, or entertainment spaces.
- Lighting should be incandescent, ceiling- or wall-mounted, or recessed. Additional task lighting should be provided near the sink. Bathroom vanity lighting should be designed for grooming.
- Avoid placing bathtubs and showers under windows. If this is unavoidable due to space constraints, design sills with proper drainage using water impervious materials. These windows should have obscure glass for privacy.
- Provide direct access to the master bathroom only from the master bedroom.
- Provide sound attenuation in walls for new construction.
- At least one bathroom must be directly accessible from a hall without requiring passage through another room.

Size

- Minimum size for a bathroom is 5x8 feet.
- Minimum size for a powder room is 3x5 feet.

Construction

- Collocate common plumbing walls as much as possible without degrading the livability or quality of living spaces.
- Provide exhaust fans vented to the outdoors in all bathrooms and powder rooms. Do not vent bathrooms exhaust into attic spaces. Provide backflow dampers to restrict airflow when fans are not operating.
- Provide ceiling mounted supplemental heating as necessary.
- Do not use particleboard floor underlayment.
- Gypsum wallboard used in bathrooms or powder rooms should be water-resistant.
- Provide GFCI electrical circuits in compliance with the electrical code in bathrooms and powder rooms.
- For new construction, provide windows in all bathrooms.

Hardware, Fixtures, and Finishes

- Provide neutral colored bathroom fixtures in bathrooms and powder rooms, preferably white, almond, taupe, or cream.
- Provide water-saving plumbing fixtures in compliance with the plumbing code.
- Provide porcelain enameled steel or acrylic bathtubs in bathrooms.
- The following applies to shower construction:
  - Walls: ceramic tile or acrylic liners
  - Floors: ceramic tile, appropriate precast and cast in place shower bases, or pressure molded receptors integral with molded walls
- Acrylic and molded liners shall comply with ANSI Z124.1.
- For bathroom shower stalls, always provide shower doors in lieu of curtains.
- Provide flow-control devices on showerheads in compliance with the plumbing code.
- Ensure all bathroom and powder room finishes are durable and easily cleaned.
- Provide adequate hardware in each bathroom, such as shower curtain rods for tubs, towel bars, a robe hook, and a toilet tissue holder. Hardware items should have high quality durable finishes in chrome, brass, or chrome on brass.
- Use coordinated and complementary ceramic accessories as much as possible in bathtubs and showers.
- Bathrooms and powder rooms should have durable finishes, hardware, and light fixtures. Finishes, fixtures, and hardware should match throughout each bathroom and powder room.
- Provide water and slip-resistant floor finish, including ceramic tile, terrazzo, or seamless sheet vinyl. Carpeting is not an acceptable floor finish for bathrooms or powder rooms.
- Provide wall base materials that complement the flooring. Avoid the use of vinyl or rubber base materials.
- Use semi-gloss latex or alkyd-based paint on wallboard, plaster and painted doors, windows, and trim in bathrooms.
- Neutral color wallcovering or decorative borders are permitted in bathrooms and powder rooms. Ensure the wallcovering is of adequate weight strippable vinyl to withstand point impact and provide good cleanup characteristics. If applying wallcovering on plaster walls, ensure walls are properly prepared to preserve the wall.
- Provide recessed medicine cabinets with adjustable shelves in bathrooms.
- In bathrooms and when applicable in powder rooms, install lavatories in countertops on vanity bases meeting the industry standard height and depth.
- The following options may be used for vanity lavatories:
  - Countertops: neutrally colored molded acrylic, cultured marble, or plastic laminate
  - Lavatory bowls: molded acrylic or cultured marble integral to the countertop, vitreous china, or porcelain enameled cast iron.
- Provide a full-width mirror over the bathroom vanity. Also include a door-mounted full-length mirror in bathrooms.
- In the powder room, provide durable decorative fixtures as discussed above. Avoid wall-hung lavatories, medicine cabinets, and hardware typically associated with full bathrooms, such as wide towel bars and robe hooks.
- Maximize the amount of cabinetry and storage space within the bathrooms.
- Provide water-impervious wainscot, to a minimum of 6 feet above the finished floor, around all bathtub areas and showers.

8.13 Hallways and Stairways

Well-designed stairways can enhance the quality of the living space by serving as an important architectural feature of the home. Hallways and stairways are often combined with the entry, foyer, and entertainment areas to create the first impression of the GOQ.

Design Considerations

- If possible, provide direct access from the entrance foyer to the entertainment areas without passing through any other room.
- Provide stair widths not less than 3 feet clear from the face of walls. Ideally, stairs should be 4 feet wide to permit the movement of bulky furniture.
- Provide a minimum of 7 feet 6 inches of headroom throughout the stair run.
- Provide 7-inch maximum riser height and 11-inch minimum tread depth.
- Ensure stairs comply with current local and national codes. Comply with historic requirements to maintain architectural style when appropriate.
- Carpet runners are permitted over hardwood treads.
- Lighting should be incandescent, ceiling- or wall-mounted, or recessed. As needed, lighting should be provided at the top and bottom of each stairway and throughout hallways.
- Crown molding, chair rails, wainscoting, and wallcovering appropriate to the architectural style of the home may be used in stairways and hallways only when they form a visual part of the foyer.
- Neutral color wallcovering is permitted in stairways and hallways below the chair rail only when they are an integral part of the foyer. Ensure the wallcovering is of adequate weight strippable vinyl to withstand point impact and provide good cleanup characteristics. If applying wallcovering on plaster walls, ensure walls are properly prepared to preserve the wall.
- Crown molding, chair rails, wainscoting, and wallcovering are not allowed in other hallways and stairways that are not an integral part of the foyer or entertainment areas.
- Floor material should be carpeting, hardwood, or tile and should not be replaced before reaching the end of its life expectancy. Life expectancy should be clearly defined in the construction specifications and local base standards.

Laundry Room/Area

8.14

The laundry area provides space for clothes washers and dryers, and provides occupants an organized utility/work station for miscellaneous housekeeping and maintenance tasks.

Design Considerations

- The laundry room or laundry area should have a door to block views and isolate noise.
- Provide shelves or cabinets that are at least 12 inches deep above or adjacent to the appliances. When feasible, add a clothes rack between shelves or cabinets for drying or sorting clothes. Use adjustable vinyl coated steel wire or wooden shelving.
- When feasible, provide laundry rooms instead of laundry closets.
- Provide at least two GFCI 110-volt electric receptacles.
- Drain the washer through a 2" minimum standpipe with the mouth 3' above the floor. Provide a clean-out trap a minimum of 4" above the floor.
- Provide standard plumbing connections and water hammer arrestors for washers.
- Provide a special purpose 220v electric receptacle and/or gas source for the dryer as required.
- Vent the clothes dryer through an exterior wall with a 4-inch diameter vent terminating in a weatherproof wall hood with a back draft damper. Provide no more than 20 feet of run with no more than three 90-degree turns. Ensure that the dryer vent is accessible for cleaning.
- Do not discharge the dryer or exhaust vent to an attic, balcony, deck, breezeway, porch, or patio, near entry doors, or near an air conditioner compressor unit.
- Provide fluorescent or incandescent ceiling mounted overhead lighting, and maximize available daylight where possible.
- Avoid locating laundry closets in or near the food preparation area of the kitchen or opening into an entertainment area or bathroom.
- Provide a floor drain, or other method of containing water overflows, especially for laundry rooms or areas located on upper stories.
- Provide water- and slip-resistant floor covering, such as tile or seamless sheet vinyl.
- Provide wall base materials that complement the flooring. Avoid the use of vinyl or rubber base materials.
- Do not use particleboard floor underlayment.
- Laundry closets should be sized to provide adequate wall and working clearances based on typical appliance sizes. Do not custom design the laundry area for one specific model.

8.15 Basements

Normally, the Air Force does not program basements for GOQs. This is due to the fact that, historically, the economic cost is higher than the benefit to the Air Force. By formal definition, a basement is a space that is either partially above or fully below grade, and is located below the primary living level of the dwelling unit. Basements are typically used for storage and utility purposes (laundry area or workshop), to house mechanical and electrical equipment, but sometimes contain finished habitable space (family room, Arctic recreation room, or bedroom). The basement, if unfinished and used for storage or utility purposes as outlined above, will not be calculated as part of the dwelling unit's authorized net living area. If the basement contains finished habitable spaces such as family rooms or Arctic recreation rooms, such spaces must meet life safety requirements, and are counted against the unit's authorized net living area. Habitable spaces, even if finished through self-help, such as family rooms, Arctic recreation rooms, or sleeping rooms must be protected by the appropriate fire separations/assemblies and conform to the more restrictive of either the NFPA Life Safety Code or locally accepted building code requirements. A local registered architect must certify this compliance.

All existing basements that are finished and cannot be further renovated to meet life safety requirements will be phased-out at the end of their useful life and returned for use as storage or utility space.

For new construction, AF/ILEH will consider special cases where installations can justify providing basements based on life cycle costs related to energy efficiency, operations and maintenance, structural integrity, or site constraints. If basements are approved, they must be listed as a separate line item cost in each project/phase on the programming documents. Documentation must be provided to AF/ILEH, through the MAJCOM, that demonstrates:

- The climatic conditions support or dictate the use of a basement for energy efficiency, safety, or life-cycle cost reasons.
- Locating mechanical equipment within the dwelling unit envelope will decrease energy consumption of the units by at least 10 percent and/or the efficiency of the overall site plan by at least 20 percent by decreasing the building to open land ratio.
- The structural integrity of the overall building system is compromised if a basement is not provided.
- Soil-bearing conditions are sufficient for the intended design. A local registered professional engineer must certify such conditions.

Attics 8.16

The attic, when used for other than habitable space, will not be calculated as part of the dwelling unit's authorized square footage. All finished attics used for habitable space, even if finished through self-help, must meet life safety requirements and count towards the net allowable floor area in the GOQ.

All existing attics that are finished and cannot be further renovated to meet life safety requirements will be phased-out at the end of their useful life and returned for use as storage or utility space.

Arctic Recreation Room 8.17

Arctic recreation rooms are a special class of recreation space recognized by the FY 92/93 National Defense Authorization Act (P.L. 102-190, Section 2808) that amends USC 2826. The purpose of the policy is to provide interior recreation space for family housing in locations where "a harsh climate severely restricts outdoor activity for a significant portion of each year."

- Authorized Air Force installations with GOQs include: Eielson, Elmendorf, Grand Forks, Cavalier, Minot, and Malmstrom Air Force Bases.
- The amendment provides up to an additional 300 square feet of net living area for recreational use, which will not be counted against the maximum applicable net living area of a dwelling unit. This space should be included only for use as recreation space and should not be used to augment other function spaces.
- In addition, the related FY 92/93 Authorization Conference Report (102-311) encourages the military Services to convert basements, attics, and other space within existing or planned GOQs to provide this requirement.
- A harsh climate is defined as having more that 7,500 heating degree days annually.
- Locate this space so to maximize daylighting and solar heat gain where possible.
- Provide the space near the family room when basements are not available. Avoid locating Arctic recreation rooms near the entertainment area.
- Consider converting unfinished basements, attics, or other areas into Arctic recreation rooms. If the additional space is provided with the family room, the space must function as a separate room.

8.18 Interior Bulk Storage

Storage space is an essential and integral part of daily activities. Consider this when designing or modifying GOQs to ensure storage spaces are not afterthoughts but rather elements designed to support the efficiency of the home. Indoor storage is generally needed for items that do not keep well in non-conditioned space. Other interior storage space such as bedroom closets, pantries, linen closets, etc. are included in the authorized net floor area. The dedicated interior bulk storage space is an additional area which does not count against the authorized net floor area, and is authorized when the resident does not have usable unfinished attic or basement space for storage.

Design Considerations

- Provide a maximum of 100 SF interior bulk storage space. This limitation only applies to new interior storage spaces provided through renovation or new construction. Homes with existing areas larger than the maximum area limitation may remain unchanged.
- This space does not necessarily occur all in one location, but is apportioned throughout the house where most convenient.
- Provide modular adjustable vinyl-coated steel wire or wooden shelving. Do not use sheet metal or particleboard.
- Flexibility may be applied within this guideline to allow the increase of the interior bulk storage area beyond the 100 SF limit provided the combined (interior and exterior) non-countable bulk storage areas do not exceed 200 SF (see section regarding Exterior Bulk Storage).

Interior Design Guidelines

9.0

9.1 General Requirements

When used correctly, colors, textures, and finishes create a warm, inviting, and flexible atmosphere for the GOQ occupant. By emphasizing durability, simplicity, and neutrality, the GOQ residents can maximize the use of their existing furnishings.

- 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 occupant convenience and satisfaction. Emphasize neutral colors such as off-whites, beiges and taupes for the selection of carpet, paint, window treatments and window coverings, wallcoverings, and furnishings. Neutral colors should also be selected for ceramic tiles, hard surface floorcoverings, built-in cabinetry, bathroom fixtures and kitchen appliances.
- Use gypsum wallboard (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 and garages.
- Provide floor coverings of hardwood, sheet vinyl, carpet, or ceramic tile. Do not use indoor carpet in kitchens, bathrooms, entry areas and steps, patios, porches or decks exposed to the weather.
- Hard-surface floor coverings, such as ceramic tile and wood, should be of a quality to last a minimum of 15 years or until the next whole house renovation.
- For ceramic tile, select a complimentary grout color to coordinate with the tile color. Ensure that it is properly sealed to prevent excess soiling. Also ensure high slip resistance.
- If hardwood floors are specified, use vinyl-impregnated or polyurethane finishes.
- For sheet vinyl coverings, use high-quality resilient flooring with an inlaid pattern.
- Provide a 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 vinyl or rubber baseboards.
- See AFI 32-6004 for supplemental furnishing allowances.
- Do not use acoustical suspended tile ceilings. White flat ceiling paint is the standard. Existing wood ceilings and architecturally significant wood features should not be painted unless paint was the original finish.
- Decorative architectural millwork such as crown molding, chair rails, and wainscoting may be used to enhance the architectural style of the GOQ when appropriate. Such millwork is encouraged as a more permanent cost-effective wall treatment than wallcovering on a life-cycle basis. Architectural millwork is limited to the entertainment functional areas of the living room, family room, dining room, and foyer. Compatible architectural millwork may be installed in hallways, stairwells and stairways provided they form a visual part of the foyer. Architectural millwork may be painted or stained.
- Neutral color wallcovering and decorative borders are authorized in the kitchen, powder room and bathrooms, and neutral color wallcovering may also be installed below any chair railing in the designated entertainment functional areas. Ensure the wallcovering is of adequate weight strippable vinyl to withstand point impact and provide good cleanup characteristics. If applying wallcovering on plaster walls, ensure walls are properly prepared to preserve the wall. Wallcoverings should have a life expectancy of at least seven years. The pattern and color should be compatible with the decor of successive occupants.
- Do not use wallcovering on ceilings or paneling.
- The resident may install borders and accents over painted walls. They are installed and removed at their own expense. Walls must be returned to their original condition when borders or accents are removed.
- Do not use exposed or colored concrete masonry as an interior finish for a GOQ.
- Use professional installers for all wall and floor covering installation work.

Paint 9.2

- Residents are encouraged to use neutral pre-approved colors in accordance with the local base paint color and type standards.
- Residents are responsible for repainting any custom colors or faux finishes at the end of their occupancy.
- Doors, windows, their frames, and trim paint should be stripped periodically before applying new coats.
- Satin or flat finish latex paint should be used for all walls except in the kitchen, laundry, baths, and utility areas. Kitchen, laundries, baths, utility areas, woodwork, trim, doors, and painted wood moldings should be painted with semi-gloss paint
- Architectural millwork should be painted, stained, or naturally finished in accordance with base standards.
- Ceilings should be painted in a white flat or satin finish.
- If latex paint is being used over an existing oil-based paint, the surface will require priming.
- Paints with texture additives are not allowed due to difficulties in refinishing without removal of the texture.

9.3

Carpeting

This Section offers guidance to be used for selecting wall-to-wall carpeting for Air Force GOQs. Carpeting should be of a quality to provide a minimum seven-year life expectancy in GOQs. Carpeting should be used in lieu of hard floor finishes and not installed over finished floors.

Air Force Carpet Policy

- Indoor carpet may be installed in all living areas except in kitchens, bathrooms, powder rooms, patios/porches, and areas exposed to weather. Give special care to the foyer area by using an impervious, slip-resistant material instead of carpet.
- Air Force carpet standards are specified in the most current Engineering Technical Letter (ETL) titled Air Force Carpet Standards, and in AFI 32-6003, General Officers Quarters. ETLs are available on the HQ AFCESA web site under publications at www.afcesa.af.mil, and the HQ AFCEE web site under interior design guidance at www.afcee.brooks.af.mil.
- The most current ETL on Air Force Carpet Standards provides detailed technical and aesthetic selection criteria for acquisition, installation, maintenance, and eventual disposal of broadloom carpet and carpet pad.

Carpet 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.
- Replacing carpet in GOQs more often than every seven years requires approval in advance from the MAJCOM/CC in accordance with established policy. This authority will not be further delegated. In no case will the individual exercising this authority make a decision about his or her own dwelling or the dwelling of a person senior in rank. The senior installation commander must certify that the carpet is beyond repair and needs replacement in all instances.

Carpet Selection

- Carpet must be a neutral color, such as beige, taupe, or off white in a light to medium value that provides a flexible background that can integrate with the decor of successive occupants. Do not use pure whites or dark shades. Use solid colors or very muted tone-on-tone tweeds.
- Federal agencies are required by law, Executive Orders (EO), the Federal Acquisition Regulations (FAR), Defense Federal Acquisition Regulations (DFAR), and Air Force policy, to consider environmentally preferable products. This includes items that are reused and certain Environmental Protection Agency (EPA) designated carpet products manufactured with recycled or recovered materials.
- Minimum Carpet Wear Classifications for carpet in GOQs is considered light to moderate.
- There is no restriction on pile height in family housing except within units designated as accessible.
- Refer to the most current ETL on Air Force Carpet Standards for detailed information regarding fibers, pile height, minimum pile weight density, minimum gauge, minimum tuft bind, backings, fade resistance and fire resistance.

Installation

Reference the Air Force Carpet Selection Handbook for descriptions of the various methods of installing broadloom carpet.

- 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, unless the pad is in exceptionally good condition.
- Direct "glue-down" is not authorized.
- Provide transition strips or protective edges where carpet meets other flooring materials.
- All work is to be performed by contractors/installers who are Certified Floor covering Installers (CFI).

Proper environmental conditions must be maintained before, during, and after installation. Provide adequate ventilation during installation, and 48 to 72 hours thereafter to dissipate new carpet odors.

The BCE will keep the following information for each carpet installation:

- Location (address, building number, and room)
- Name of carpet manufacturer, pattern, and color
- Carpet certification/record that the carpet conforms to the Air Force Carpet Standards (most recent ETL)
- Date of installation
- Method of installation and substrate
- Disposal certification

Maintenance

Carpet should be cleaned and maintained according to manufacturer's recommendations. Both preventive and corrective maintenance must be performed to retain original appearance and antimicrobial characteristics.

Identify and remove stains and spillage immediately.

Establish a maintenance program for periodic vacuuming and professional cleaning.

Regular vacuuming will remove light soils that can damage carpet fibers.

Obtain carpet manufacturer's guidelines for frequency of professional cleaning. Hot water extraction methods, using only hot water, are recommended for most carpets. Do not use detergents, shampoo, or liquid cleaning chemicals. Do not saturate carpet.

Do not mix dry cleaning chemicals with hot water cleaning materials.

Remove furniture before cleaning, or place plastic or aluminum foil under and around furniture to prevent rust and stains from forming on the carpet. Leave plastic or foil in place until carpet is completely dry.

Removal and Disposal

In accordance with EPA guidelines to reduce landfilling, provide for carpet and carpet installation waste handling in the overall waste management plan of a project. When feasible, all disposal of carpet and carpet installation waste should require a certification that the products were not deposited in a landfill. There are carpet reclamation centers in most major cities. Costs for using these centers compare favorably with landfill costs.

Carpet containing hazardous substances must be disposed of in accordance with hazardous waste regulations.

Assistance

* Further assistance may be requested from your installation or MAJCOM interior designers

9.4 Window Coverings and Treatments

- Decorative window treatments may be provided by the Air Force for the public entertainment areas of GOQs and may include drapery, curtains, sheers, valances, cornices, and the hardware to support these treatments.
- Special Command Position quarters may have government furnished window treatments throughout.
- GOQ window coverings may include shades, shutters, vertical blinds, or horizontal blinds. Blind slats should be constructed of aluminum, vinyl, or wood.
- All window coverings should be of a neutral shade or wood tone matching stained millwork in order to be acceptable to successive residents.
- Decorative window treatments should be a neutral color such as white, off-white, light beige or light taupe that should have a life expectancy of at least seven years. Window coverings are expected to last 10 to 15 years.
- All window treatments, other than those initially issued to the GOQ, are considered furnishings and are subject to the $6,000 per year and $20,000 furnishings limit for any five-year period.
- Provide drapery hardware support as required for all window openings that are 5 feet or more in width. Provide traverse-type drapery rods or vertical blinds over all sliding patio/atrium doors, and hardware as required over all other doors with glass panes, such as French doors.
- As part of initial construction or during subsequent renovations/repairs, evaluate the option of providing window coverings in accordance with base standards.
- All window coverings are considered non-furnishing items. They are installed M&R items and are counted toward the $35,000 M&R limitation.

Utilities and Mechanical Systems

10.0

10.1

Electrical, Lighting, Telephone, and TV Systems

Quality utility and mechanical systems are an important aspect of GOQ designs to ensure comfort, convenience and safety. These systems should be selected based on their efficiency and functionality.

Exterior Electric Service

- Ensure electrical systems conform to the most current edition of the National Electrical Code.
- Provide master-metered electrical service. Make provisions to facilitate the installation of individual electric meters at a later date by providing a blanked-off meter base at an out-of-view appropriate location.
- Provide at least 200 amp electrical service.
- Provide weatherproof GFCI duplex convenience outlets at decks, patios, garages, carports, etc.

Interior Electric Service

- Locate the service panel within the dwelling unit, easily accessible to the occupant, but not in areas such as living rooms, dining rooms, bedrooms, or in clothes closets.
- All circuits must be clearly labeled in the service panel.
- Provide a GFCI duplex convenience outlet behind gas ranges to supply power for the range clock, timer, and lights.
- Provide separate, dedicated branch circuits as required by Code.
- Provide GFCI duplex convenience outlets as required by Code for wet areas such as kitchens and bathrooms.

Lighting

- Provide lighting that is not only efficient and economical but also simple in design and compatible with the architectural character of the GOQ.
- 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. See following chart. Consider using motion detectors to control exterior security lighting.
- Refer to each functional area listed in Chapter 8 for interior lighting requirements.
- Pre-wire and provide structural support for ceiling fans at the locations specified in Chapter 8 and for a chandelier in the dining room.
- In rooms without ceiling fixtures provide a wall-switched control for one-half of a duplex outlet in two separate locations. Likewise provide two switch-controlled half outlets in each bedroom in addition to the bedroom's installed light fixtures.
- Coordinate lighting specifications with local security and force protection requirements. While exterior lighting should enhance the architecture of the house and the landscape design, it should also address requirements of general safety and force protection requirements.
- Provide exterior site and architectural lighting systems, permanently and professionally installed, and in compliance with the installation's design standards.
- Lighting systems may be activated by motion detectors, photo cells, or timers as appropriate.
- Exterior lighting may be used to illuminate the following items/areas:
  - Walkways, porches, patios, decks and significant site features such as specimen trees and architectural features.
  - Entrances, house numbers, flag poles, and parking areas.
  - Areas identified by force protection threat assessments as required for additional security.
  - Other areas around the home that may require additional security.

GOQ Lighting Requirements

Area	Acceptable Installed Fixture Types, Lamp Type	Function / Illumination Intensity (footcandles)	Suggested Supplemental Lighting Furnished by Occupant
Bedrooms	Ceiling or ceiling fan mounted, Incandescent	General area lighting / 10-30	Table, floor, desk lights for reading
Bathrooms	Recessed, ceiling mounted or vanity lighting, Incandescent	Grooming / 20-50 General area lighting / 10-30	Vanity top for makeup
Kitchen	Recessed, vent hood, under-cabinet lighting, Incandescent	Countertops / 50-100 Range / 20-50 Sink / 50-100 Pantry / 10-20	
Secondary Eating Areas	Recessed, ceiling mounted, ceiling suspended, Incandescent	Dining / 10-20	
Laundry	Ceiling mounted, Incandescent or Fluorescent	Laundry prep / 20-50 washing / 20-50 ironing / 20-50	
Dining Room	Ceiling suspended, Incandescent	Entertainment / 10-20 Dining / 10-20	
Living and Family Rooms	Ceiling or ceiling fan mounted, Incandescent	Entertainment / 5-10	Table, floor, desk lights for reading
Foyer, Hallways, Closets/Storage Areas	Ceiling mounted, Incandescent	Greeting guests / 5-10 Passageway / 5-10	
Main Entry, Rear Stoop, Stairs	Ceiling or wall mounted, Incandescent	General house access / 50	
Outdoor Living Areas	Ceiling, ground or wall mounted, Incandescent	Public access / 2-5 Safe passage / 5-10 Entertaining / 10-20	
Walkway	Decorative pathway lighting, Incandescent	Public access / 2-5	
Security Lighting, Garage/Carport Exterior Lighting	Motion detector flood lights, Incandescent	Security / 5-20	
Garage/Carport Interior Lighting, Bulk Storage Areas	Ceiling mounted, Incandescent	Safe access / 5-10 Simple visual orientation / 5-10	Plug-in task lighting for temporary work, reading

Telephone and Cable Television Service

- Provide pre-wired, flush-mounted telephone jacks in kitchens and bedrooms. Install jacks in all bedrooms, and the family and living rooms. As a general rule, the base communications provider will provide service to a junction box located within the facility where the pre-wiring connects for service. Refer to AF/ILEH website for additional guidance on communications.
- The number of phone lines that can be provided to the house is determined by the local communications squadron commander. It is recommended that a minimum of one telephone line be provided for family usage in addition to the military requirements.
- For new construction, provide two telephone lines, two CATV lines, 1 fiber optic line, and 1 UTP, where available in the local community.
- Any resident-owned antennas or satellite dishes are subject to base regulations for installation and placement. The installation of antennas and satellite dishes are regulated by both base architectural compatibility guidance and base communications regulations.
- Locate satellite dish away from public view.

10.2 Water Supply and Sewage Disposal Systems

Design Considerations

- Provide a master meter to monitor water consumption within GOQ projects.
- For basic design criteria, refer to HUD Minimum Design Standards for Community Water Supply Systems 4940.2.
- For water supply and distribution, provide a stop and waste valve with a drain inside the house on the water supply line entering each GOQ. 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 occupant.
- Provide hose bibs with backflow prevention devices in easily accessible locations at the front and rear of each ground floor GOQ. In areas subject to freezing, provide frost-proof hose bibs as well as interior shutoff valves.
- Install a 50-gal gas or an 80-gal electric water heater in all GOQs. In new construction, provide a circulating pump to continually deliver hot water to the dishwasher, washing machine, kitchen and bathroom faucets. Equip all gas water heaters with American Gas Association (AGA)-approved ignition devices, including electronic pilot-less ignition.
- Provide cold water supply cutoff valve to each water heater.
- Design water supply piping to avoid water hammer.
- Provide plumbing access panels for all bathtubs and showers when feasible.
- Where water conditions dictate, the installation of a whole house water conditioner is recommended.
- To the maximum extent possible, locate plumbing vents to the rear of the housing units out of public view.
- Provide accessible clean-outs for wastewater lines.
- Provide acceptable supply and wastewater piping that meet local codes. Do not use lead piping.
- 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" minimum diameter standpipe, with the top of the pipe 3' above the floor and the bottom of the trap a minimum of 4" above the floor.
- Ensure that the domestic water valve system conforms to the Uniform Plumbing Code.
- Provide clean-outs for sewer lateral lines. Provide a box with a hinged cover in outdoor locations.

Heating and Cooling Systems

10.3

The design and selection of heating and cooling systems for GOQs is based on efficiency, climatic conditions, design load, ease of maintenance, durability, and their ability to provide a comfortable living environment. Heating and cooling systems for GOQs vary from other types of housing due to the entertainment requirement.

Heating System - Design Considerations

- Select heating systems based on the lowest life-cycle cost using appropriate locally available fuels.
- Heating systems should not be replaced before reaching the end of their life expectancy. Life expectancy should be clearly defined in the construction specifications and local base standards.
- Consider heat pump systems in climates that can optimize heat pump efficiency.
- Plan for an indoor design temperature of 68° F (20° C) for new or retrofit heating systems.
- Design the system in accordance with the latest ASHRAE Standards 90.2P, Energy Efficient Design of New Low-Rise Residential Buildings.
- Consider including provisions for humidification in areas having more than 3,000 (Fahrenheit) or 1,660 (Celsius) heating degree-days.
- Equip all gas-fired furnaces with American Gas Association (AGA)-approved ignition devices, including electronic pilot-less ignition.
- Do not provide portable room heaters, floor furnaces, or floor heat lamps. If appropriate, install ceiling-mounted heat lamps in bathrooms.
- Do not install ductwork within or below the floor slab.
- Ensure that duct systems are installed based on industry standards and that they are balanced for optimum performance.
- Programmable thermostats are recommended for gas-fired heating units.
- For 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 primary means of heating.
- Use of window or through-wall units is discouraged. They are unsightly, difficult to seal, and energy inefficient.
- Where economically justified and to improve energy efficiency, provide a 2-zone heating system with independent thermostats or two separate systems to condition the entertainment area separate from the living quarters.
- The use of baseboard heat is discouraged. Existing systems should be removed during whole house renovations.
- For new forced-air systems in two story GOQs, consider running ducts in the space below the second floor to avoid exposing ductwork to the temperature extremes common in attics.
- Provide adequate make-up air for all appliances and equipment as required by code.

Air Conditioning System Design Considerations

- Air-conditioning units shall conform to the Uniform Mechanical Code and the latest ASHRAE Guide.
- Air-conditioning systems should not be replaced before reaching the end of their life expectancy. Life expectancy should be clearly defined in the construction specifications and local base standards.
- Plan for an indoor design temperature of 78° F (26° C) for new or retrofit air-conditioning.
- As indicated in AFM 88-29, provide air-conditioning in areas where the ambient temperature during the six warmest months meets any one of these conditions:
  - 67° F (20° C) wet bulb (WB) for 800 or more hours.
  - 80° F (27° C) dry bulb (DB) for 350 or more hours.
  - 93° F (34° C) dry bulb (DB) for 155 or more hours.
  - Balance the above criteria with actual local climatic conditions.
- Window or through-the-wall air-conditioning units are discouraged, as they are unsightly, difficult to seal, and inefficient. Where practical and feasible, install forced air systems when performing whole house renovations.
- Roof mounted air-conditioning units are discouraged, as they are unsightly and difficult to maintain.
- Ensure that all air-conditioning systems up to 65,000 BTU per hour deliver a seasonal energy efficiency ratio (SEER) of not less than 10 BTUH per watt input.
- Obtain values for SEER and high side pressure factor (HSPF) 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 thermostat for heat pumps to provide temperature control by the occupant in both heating and cooling modes. Programmable thermostats for conventional air-conditioning systems are recommended.
- Select systems with refrigerants that have an Ozone Depletion Potential of less than .05. Do not purchase Ozone Depleting Chemical (ODC) air-conditioning equipment.
- Replace ODC equipment at the end of its useful life with non-ODC equipment.
- Provide a 2-zone system arrangement with independent thermostats for HVAC equipment or a second separate HVAC system for energy efficiency and when economically justified.

Environmental Requirements

11.0

GOQs must comply with current criteria, regulations, and laws regarding their impact on the environment. This Section outlines the general criteria necessary for compliance. The focus is on making the GOQ safe for the residents while supporting the environmental goals of the installation.

Advanced Congressional notification is required for new and replacement construction and whole house improvement projects when environmental remediation causes reprogramming thresholds to be exceeded or when the $35,000 GOQ maintenance and repair (M&R) threshold per unit is exceeded. Reprogramming thresholds for new and replacement construction and whole house improvement projects are set at 125 percent of Programmed Amount or $2.0 million, whichever is less.

11.1 Asbestos and Lead-based Paints

Existing GOQs may contain friable and non-friable Asbestos Containing Material (ACM). Friable ACMs can easily release dangerous asbestos fibers, whereas the fibers in non-friable ACMs remain tightly-held in a binding material unless the material is broken, sanded, cut or otherwise separated. Common friable ACMs include sprayed-on or troweled-on coatings, joint compounds, insulation board, mastic adhesives, pipe wraps, paper tape, ductwork, flex connectors, and roof shingles. Non-friable ACMs have been used in siding, roofing, and piping, and in wall, floor, and ceiling materials.

The integrated pollution prevention, minimization, and management program extends to lead-based paint (LBP) in GOQs. Lead poisoning is traceable to several sources, one of which is LBP. While most lead poisoning results from ingestion of lead dust, some cases due to the ingestion of paint chips, especially by small children, have been reported. 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.

Considerations

- 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 occupants 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.
- 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 LBPs 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 (AAS) or other techniques approved by ASTM or other recognized testing authority. Paint with lead levels of 1.0 mg/cm2 when using the XRF or 0.5 percent by weight when using AAS 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.

11.2 Lead Contamination of Drinking Water

The quality of domestic potable water must comply with the 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, 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.

Considerations

- For guidance with respect to Air Force family housing, refer to Engineering Technical Letter (ETL) 87-l, Lead Ban Requirements of Drinking Water, 15 January 1987.
- 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 l988, 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 (*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. Take the first 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 resoldering 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.

Radon

11.3

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.

Considerations

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:
  - Engineering Technical Letter (ETL) 89-9, Radon Reduction in New Facility Construction.
  - EPA 86-004, Citizens' Guide to Radon, l986, U.S. Environmental Protection Agency, Office of Air and Radiation, Washington, DC.
  - EPA 520/1-90-017, The National Radon Contractor Proficiency Program, July l990, 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.

11.4 Freon and Chlorofluorocarbons

The Air Force policy on ozone depleting chemicals and, specifically chlorofluorocarbons (CFC), is outlined in AFI 32-7080, Pollution Prevention Program. Freon, the most commonly used CFC, is used in air-conditioning equipment and refrigerators, and has been identified as a major contributor to ozone depletion. In 1987, the United States ratified the Montreal Protocol, a document intended to initiate a global ban on ODC production. Purchases of air-conditioning systems using Class I ODC refrigerants was prohibited as of June 1993. Target dates have been set to replace all equipment using ODCs at the end of its economic life with non-ODC equipment.

The Air Force goal is to prevent pollution by eliminating the release of CFCs into the environment. The intent is to accomplish this by employing new conservation methods, such as recovering, recycling, and reusing ODCs. In existing chillers and refrigerators, CFCs are in a closed system that can be viewed as a reusable resource. The Clean Air Act Amendment of 1990 requires the recycling or recovery of CFC refrigerants so that reclaimed or recycled CFCs can be reused.

In addition to refrigerants, CFCs were widely used as the propellant and gas filler for foam insulation. When damage or destruction of the insulation occurs, CFCs are released into the atmosphere. Manufacturers of both polystyrene and Styrofoam are converting to substitutes for CFCs.

Replacements for CFCs are not simply "drop-in" substitutes. Equipment that currently uses CFCs requires extensive conversion to accommodate the non-CFC chemicals. Tests on operating units have indicated a significant decrease in capacity and an increase in power consumption where substitute chemicals have been used. Another concern is that the new chemicals may be totally incompatible with existing refrigerant/oil combinations.

Considerations

- Specify CFC-free refrigerators, air-conditioning systems, and insulation options, where practical or required by law or regulation.
- During renovation projects, ensure that CFCs are recovered from HVAC units being replaced, and that foam insulation is disposed of properly.
- Prevent atmospheric discharges by requiring operating and testing practices and conservation measures, such as recovery, recycling, and reuse of ODCs.
- In renovations and repairs, ensure CFCs are captured prior to the removal of CFC-containing equipment.

Termiticides 11.5

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.

Considerations

- Ensure the likelihood of infestation is considered during new and renovation projects. Select the best method of prevention based on local conditions.
- Do not rely on chemicals to solve termite infestation. Be pro-active 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. Select proper level of pressure treatment.
- 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. See Engineering Technical Letter (ETL) 84-10, Air Force Building Construction and the Use of Termiticides.
- In revitalization projects, replace all HVAC ducts in or below the floor slab with an above-the-floor system.

11.6 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 GOQs, but also as part of the everyday lives of Air Force members.

Considerations

- At a minimum, use the following designated items which contain recycled and/or recovered material: concrete and cement containing fly ash; recycled paper products; re-refined lubricating oil; retread tires; and insulation-containing recovered materials.
- 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. Refer to the Air Force Environmentally Responsible Facilities Guide published by AFCEE (www.afcee.brooks.af.mil).

Fire/Life Safety

12.0

12.1 Codes

Ensuring that projects meet applicable industry standards and codes is the primary responsibility of design, engineering, and construction professionals. However, it is also 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 GOQs. Safety requirements specific to systems are discussed under their respective headings and in referenced documents.

Although the Air Force wants to conform to community building standards, in some cases, Air Force neighborhoods may be located outside the jurisdiction of any local code. In this case, a model code used within the region should be applied. There are many national, state, and local codes, as well as Air Force regulations governing fire and life safety. In the event of a conflict, use the most restrictive criteria.

Considerations

- Use the Council of American Building Officials (CABO) One and Two Family Dwelling 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 CABO code that are adequate for the purpose intended or that apply to the region typically served by other national/model codes. These include:
  - National Building Code, Building Officials Code Administrators International, Inc. (BOCA).
  - Uniform Building Code, International Conference of Building Officials (ICBO). Standard Building Code, Southern Building Code Congress International, Inc. (SBCCI).
  - Life Safety Code, National Fire Protection Association (NFPA 101).
  - National Electrical Code, National Fire Protection Association (NFPA).
- Use the following flame spread (FS) and smoke development (SD) ratings as called for by the locally accepted building code. Also, refer to the values listed in MIL-HDBK-1008, when tested in accordance with American Society for Testing and Materials (ASTM) Test E-84:

Material	FS	SD
Floor, Wall, and Ceiling Finishes		
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 MIL-HDBK-1008	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 standard and ensure all finished habitable space meets life safety requirements. Each GOQ Individual Facility Profile (IFP) identifies existing life safety requirements and should be used as a guide to correct deficiencies.
- Provide smoke and carbon monoxide detectors as specified in the next section.
- Provide automatic residential sprinkler systems as required for GOQs that are located in multi-family dwellings.
- In new projects, do not use kitchen range hood extinguishers (some existing devices may be left in place as permitted by Air Force Policy Letter, Policy on Kitchen Range Hood Fire Protection in Military Family Housing (MFH), 30 June 1993). Remove immediately all low-cost, throw-away 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 September 1993 until the housing unit is sprinklered or until the kitchen range fire protection device has reached the end of its service life.

12.2 Smoke Detectors and Carbon Monoxide Detectors

The installation of smoke detectors is an essential step in ensuring occupant safety. Public Law 102-522, Fire Administration Act of 1992, requires the installation of hard-wired smoke detectors in all housing units. In houses with a fireplace, fossil fuel burning systems or an attached garage, a carbon monoxide detector is required.

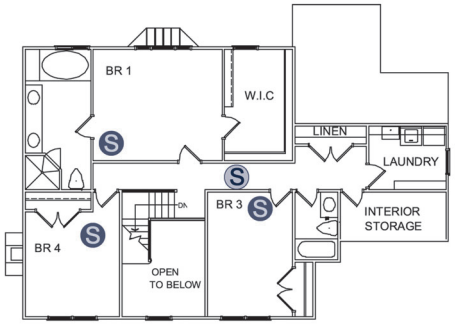
Smoke Detector Design Considerations

- Provide smoke detectors that are connected directly to an unswitched electrical circuit in the living unit (i.e., "hard-wired"). When possible, provide hard-wired smoke detectors with a battery back-up.
- Provide smoke detectors so that all sleeping areas/bedrooms are protected as illustrated in the following diagrams. In new construction, provide smoke detectors inside each bedroom unless the unit is equipped with a residential sprinkler system.
- Install smoke detectors on each additional story of the housing unit, including basements, but not in crawl spaces and unfinished attics. In split-level units, provide smoke detectors in the lower level only if it can be closed off from the upper level by a doorway.
- In new construction, wire smoke detectors so that operation of any one smoke detector will sound the alarm in all smoke detectors.
- Provide an audible-visible alarm device in addition to the required hard-wired smoke detectors where there is a vision or hearing-impaired occupant.
- Review and comply with the most recent edition of NFPA Standard 72, National Fire Alarm Code.

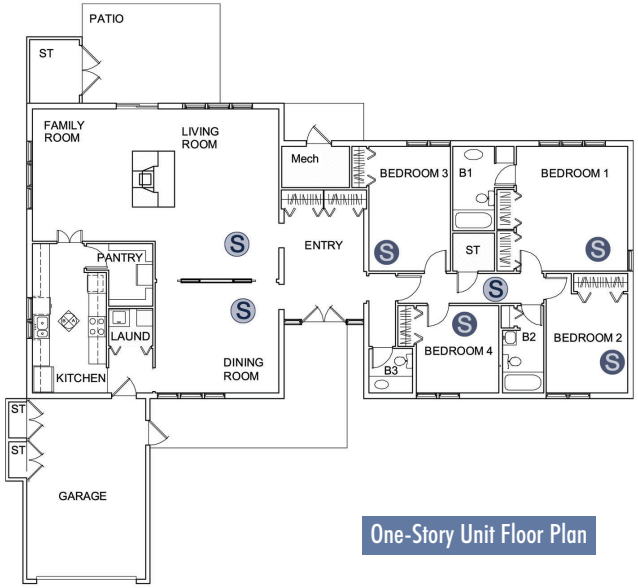
Smoke Detector Locations for One- and Two-Story Units

S Indicates required location of smoke detectors at all times for a unit

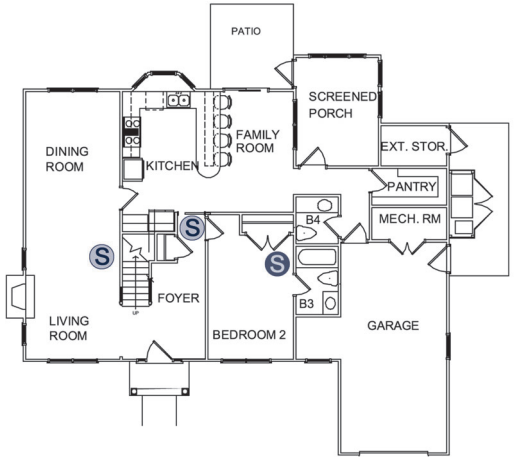
S Indicates required location of additional smoke detectors for new units (including Whole House improvements)



Two-Story Unit - Second Floor Plan



One-Story Unit Floor Plan



Two-Story Unit - First Floor Plan

Note: These diagrams are generic. Each GOQ must be separately evaluated to properly locate smoke detectors.

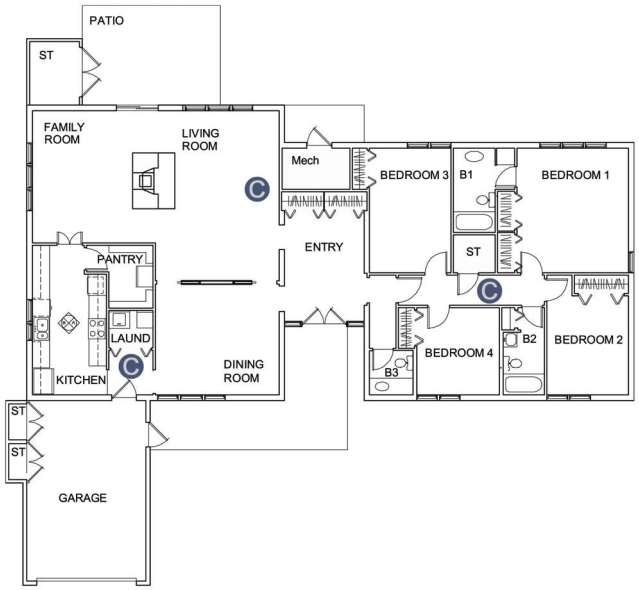
Carbon Monoxide Design Considerations

Air Force policy requires cost-effective measures to install carbon monoxide detectors in all Air Force owned and leased housing units, with natural gas, oil, or LPG fired systems such as furnaces, gas water heaters, ranges, clothes dryers, or fireplaces.

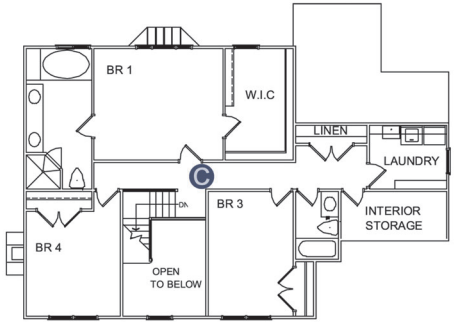
- One carbon monoxide detector is recommended per housing unit near the sleeping areas, as shown in the following diagrams. Install one carbon monoxide detector per floor in multi-story units.
- The Air Force's long-range policy is to provide hard-wired carbon monoxide detectors during new construction and major renovation projects. Permanent hard-wired detectors with battery back up and a detection element service life of not less than 5 years shall be used. Consider installing hard-wired combination smoke and carbon monoxide detectors when feasible.
- As an interim measure, use direct plug-in detectors with battery back up and a five-year warranty.
- Detectors shall be listed by Underwriters Laboratory to the UL Standard 2034, Single and Multiple Station Carbon Monoxide Detectors, October 1998 Edition. Detectors manufactured and listed in the 1992 and 1996 editions have significant false alarm problems and, more importantly, may not alarm at all under low humidity conditions as experienced during the winter heating season.
- When installing or issuing detectors, occupants should be given copies of manufacturer's instructions regarding operation, installation recommendations, and proper maintenance of the detectors.
- Be aware that proper routine maintenance of fossil-fuel burning systems is still the most effective method of preventing carbon monoxide poisoning. The presence of carbon monoxide detectors does not insure the absence of carbon monoxide.
- Carbon monoxide detectors are not an alternative for a well managed routine maintenance program of fuel burning appliances nor are they interim measures to the immediate repair or replacement of defective appliance. Facilities with natural gas, oil or liquid propane gas fired furnaces, water heaters, ranges, or clothes dryers should have routine maintenance checks performed annually, typically at the beginning of the heating season.
- Installations shall ensure routine appliance inspections are accomplished in accordance with National Fire Protection Association Standard 54, National Fuel Gas Code, Appendix H, Recommended Procedure for Safety Inspection. Fireplaces should also be checked to ensure safe operation.

Carbon Monoxide Detector Locations for One- and Two-Story Units

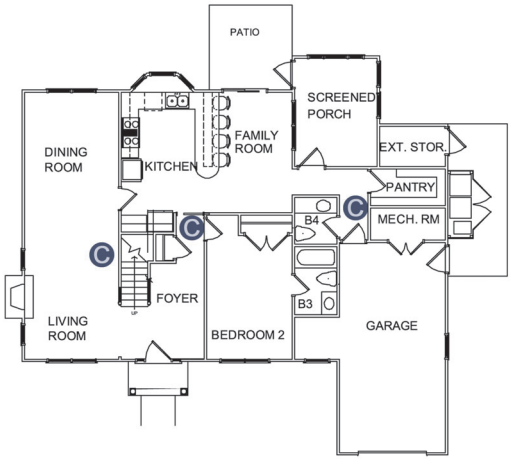
C Indicates required location areas requiring carbon monoxide detectors (for plug-in detectors use closest wall outlet to indicated location)



One-Story Unit Floor Plan



Two-Story Unit - Second Floor Plan



Two-Story Unit - First Floor Plan

Note: These diagrams are generic. Each GOQ must be separately evaluated to properly locate carbon monoxide detectors.

12.3 Fire Sprinklers for Multi-family Dwellings

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 codes in multi-family housing. Sprinkler systems activate before room temperatures and smoke/toxic gases reach critical levels, thus allowing occupants to escape. Public Law 102-522 requires sprinkler protection in multi-family GOQs having three or more residential units under one roof.

Fire sprinklers, however, are not required in all situations. Fire-rated assemblies may be used to cost-effectively contain the spread of fire.

Design Considerations

- Provide sprinkler protection (in accordance with MIL-HDBK-1008 and National Fire Protection Association (NFPA) Standards 13 or 13R for housing units having three or more residential units under one roof as follows:
  - For one, two, and three-story dwellings, provide fire sprinklers in all new GOQs.
  - Waive this requirement for townhouse-style (attached), multi-family housing units if all of the following apply:
    - The housing area is located within the recommended response time and distance of a local fire company according to Department of Defense Instruction (DoDI) 6055.6; and
    - The units comply with the most current accepted edition of the NFPA 101, Life Safety Code for residential occupancies; and
    - The units are constructed with a 2-hour fire-rated wall between units meeting the requirements of the most current edition of the Council of American Building Officials (CABO) One and Two Family Dwelling Code. This rated wall must be continuous from the foundation through the roof, and must be designed to allow the collapse of the construction on the fireside of the wall without collapse of the wall itself.
- Perform a life-cycle cost analysis, with the assistance of an Architect-Engineer (A-E) and/or design agent, to determine if the use of sprinklers or a firewall is more cost-effective.
- In dwellings with four or more stories, provide sprinklers when the units undergo whole house improvements, are replaced, or built new. If there is no whole house improvement or replacement project (P-713/P-711) programmed for existing buildings, program a maintenance and repair project (P-722) to install sprinkler protection.
- Always provide fire sprinkler protection in accordance with NFPA Standards 13, 13D, or 13R for all housing units (single-family, duplex, and multi-family) in a residential area under the following conditions:
  - When new housing areas are located outside the recommended response times and distances of a local fire company according to DoDI 6055.6; and
  - When an economic and risk analysis prove it is more beneficial to close an existing fire station or not to build a proposed fire station.
  - Analyze sprinkler installation and fire station closure in existing housing areas with 300 or fewer unsprinkled housing units.
  - Ensure that a mechanical engineer reviews drawings and specifications to ensure that adequate water supplies and pressures are available for new fire sprinkler systems.

Accessibility

13.0

The Americans with Disabilities Act (ADA) had mandated access to Federal facilities, including family housing, by the disabled. The Air Force has set a planning and procurement goal of 5 percent (with a minimum of one unit of each bedroom type/rank category per base) of all Air Force housing to be made accessible or easily modifiable to conform to accessibility requirements.

All GOQs with accessibility requirements must address the needs of those in wheelchairs, as well as the visually and/or hearing-impaired. Once an accessibility requirement is identified, give the highest priority to the necessary modifications.

The Americans with Disabilities Act Architectural Guidelines provide excellent, comprehensive documentation for use in accessibility design. This document is available at no cost through the Government Printing Office (GPO). Use the above points only to provide an outline for some of the key points of accessible design. The following criteria applies only when the need to provide an accessible GOQ is identified.

Design Considerations

- In providing accessibility in common areas, recreational facilities, outdoor developed areas, and GOQs, comply with criteria in the latest version of the Americans with Disabilities Act Architectural Guidelines.
- In the designs of new GOQs and the renovation of existing GOQs, 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 installation's latest Housing Community Profile to identify new construction requirements to accommodate persons with disabilities and the units that are most suitable for conversion.
- To meet accessibility standards, the net living area of a unit may be increased up to 75 SF, which does not count against the GOQs net floor area allowance. This allowance should not be used to increase the size of general living spaces, but should be applied to accessible hallways, bathrooms, entries, etc. Complete the necessary construction in a way that allows the house to be easily converted back to its previous state.
- Americans with Disabilities Act Architectural Guidelines apply to both the interior and exterior areas of GOQs.
- If a new GOQ has been identified as an accessible unit, it should be ADA adaptable.

Foyer

- 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. Provide landings in ramps at prescribed intervals in accordance with accessibility criteria.
- Design outdoor living areas with low thresholds and adequate turnaround space. Provide thresholds with a maximum height of ½-inch, with a beveled slope no greater than 1-inch rise in a 2-inch run.

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 above the floor. Provide accessible outdoor living spaces, such as patios, decks, and balconies, along with parking areas and walkways.
- Provide a main entry door with a clear width of at least 32 inches when the door is open 90 degrees. Provide a minimum of 60 inches diameter 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 36 inches wide and door clear widths are 32 inches. Provide lever-handled door hardware. Consult the Americans with Disabilities Act Architectural Guidelines for required door clearances.
- Provide windows that are within easy reach and 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.

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 with a seat height of 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 for wheelchair access. Mount the lavatory rim and surrounding counter 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.
- Where possible, 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.
- 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 to hold the shower spray unit during fixed shower use.

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 occupant 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 refrigerators that have 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 provided, 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 Considerations

- Ensure requirements for the visually and hearing impaired are considered.

Energy Conservation

14.0

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 practical. Additionally, Congress has mandated the use of solar systems, to the extent that they are economically feasible.

Executive Order 12902, Energy Efficiency and Water Conservation at Federal Facilities, dated 8 March 1994, establishes the guidelines that apply to all family housing. The Air Force has set an overall goal to achieve a reduction of 30 percent in energy consumption in its family housing (measured on a gross square footage basis) by the year 2005 using FY 85 as the baseline.

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 in using petroleum products.

References & Assistance

- Consult the Design Guide for Energy Efficient Revitalization of Military Family Housing for Improvement and New Construction for energy efficiency inspection guidelines. This guide was developed by the National Association of Home Builders (NAHB) and Oak Ridge National Laboratory to provide residential energy design and inspection guidelines needed to achieve energy efficient designs and higher energy savings.
- Homes with more than 0.5 air changes per hour (ACH) are considered unacceptable. Houses with natural infiltration rates between 0.3 and 0.5 ACH are in the acceptable range. Below this range, the indoor air quality is at risk and mechanical ventilation may be warranted. Consult any of the following for information on air infiltration issues:
  - latest ASHRAE Handbook of Fundamentals, ASHRAE Standard 90.1.
  - NAHB Research Center, Insulation Handbook.
  - NAHB Research Center, Moisture in Homes Handbook.
- Consult any of the following for information on thermal protection of the building envelope:
  - ASHRAE Handbook of Fundamentals (ASHRAE Standard 90.2P) Energy Efficient Design of New Low-Rise Residential Buildings.
  - NAHB Research Center Insulation Handbook.
- The U.S. Department of Housing and Urban Development HUD-CPD 1269 Energy in Housing and Community Development/Guide to Performing Energy Retrofit during National Multi-family Property Rehabilitation, October l990, provides an informative discussion of various issues relevant to housing renovations.

Mechanical/Electrical Hardware and Appliances

- Conduct a life-cycle cost analysis for the selection of efficient and cost-effective systems. The selection of equipment generally represents a compromise between system efficiency and net installed costs. Many different combinations of systems may be appropriate for a given project.
- Select energy-efficient appliances, such as refrigerators, ranges, and dishwashers. All appliance manufacturers are required to make the energy rating, known as the "Energy Guide," available. Use these ratings in the selection of home appliances.
- Also consider the energy efficiency of lighting by using fluorescent fixtures with high-efficiency ballasts and lamps for interiors, where appropriate.

Force Protection

15.0

General Officer Quarters may need renovations or improvement projects that are identified through local threat assessment. Refer to the Air Force Installation Force Protection Guide for general guidance and further references. Also consult with local Security Forces and Communications personnel for specific force protection requirements.

The Under Secretary of Defense (Comptroller) (USD(C)) has released guidance regarding the funding of force protection and communications requirements in MFH. The USD(C) policy letter states that all operation costs and maintenance and repair accomplished in MFH shall be funded solely from MFH Operations and Maintenance (O&M) accounts. The policy letter further states: "The terms 'repair and maintenance' shall apply to any work performed on family housing structures or family housing areas, which include security and antiterrorism measures, but excludes communication equipment required by the occupant to perform his or her mission."

The MFH appropriation shall be used to fund permanently installed communications requirements such as fiber optic cables. Communications equipment that is readily removable and mission-required shall be funded with non-MFH funds.

Historic/Cultural Resources

16.0

Air Force Instruction (AFI) 32-7065, Cultural Resources Management, is the Air Force guidance on complying with the requirements established in the National Historic Preservation Act of 1966. The Act and subsequent executive orders require the Air Force take into account the consequences of its actions on historic housing facilities, both listed and eligible for listing on the National Register of Historic Places.

While the Air Force is required to evaluate and mitigate adverse effects on cultural resources, historic properties are not exempt from current building codes and life safety requirements. The key to managing historic facilities is an approved Cultural Resources Management Plan (CRMP). The CRMP identifies all known cultural and historic resources, to include archeological sites, which are listed or eligible for listing on the National Register of Historic Places. The CRMP also contains standard operating procedures, and historic maintenance, upgrade, and renovation plans that incorporate the Department of the Interior Guidelines for Rehabilitating Historic Buildings and Structures. Additionally, the CRMP outlines procedures for consulting with the State Historic Preservation Officer (SHPO), Advisory Council on Historic Preservation, and other interested parties pursuant to Section 106 of the National Historic Preservation Act.

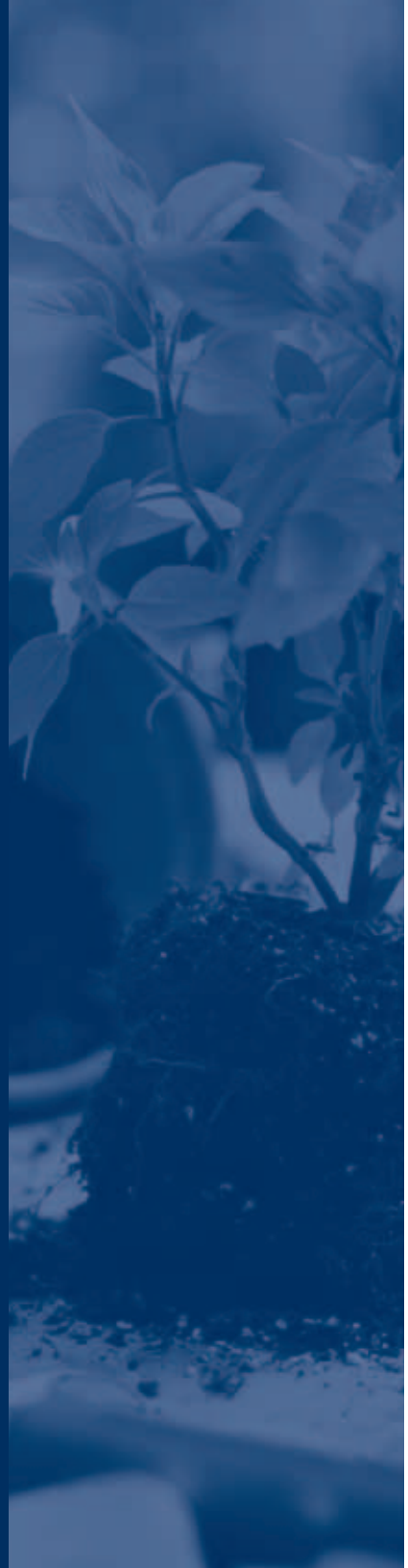
The Section 106 process is summarized in Chapter 5 of AFI 32-7065, Cultural Resources Management. The Section 106 consultation process is designed to allow the SHPO, the Advisory Council on Historic Preservation, and interested parties an opportunity to comment on federal actions relating to historic resources. The CRMP should outline the installation's responsibility to include public involvement strategies and the procedural steps to take when the installation and the SHPO cannot agree on historic facility designation, management, renovation, maintenance, or other proposed actions. In the event the installation and SHPO cannot reach agreement, the Advisory Council on Historic Preservation serves to mediate and resolve conflict. The final arbitrator is the Federal Preservation Officer and the Advisory Council on Historic Preservation. For the Air Force, the Federal Preservation Officer is the Deputy Assistant Secretary of the Air Force (Environment, Safety and Occupational Health), SAF/MIQ.

Design Considerations

- Inventory and document historic and potentially historic GOQs according to the guidance in AFI 32-7065.
- When a programmatic agreement is not in effect, work on historic units needing repair or improvement must be coordinated with the SHPO.
- Avoid alterations that detract from the design integrity of historic GOQs and their setting, such as inappropriate building modifications, and intrusion of incompatible structures.
- When altering a historic GOQ, make a reasonable effort to retain, uncover, and restore, where practical and economically justifiable, as much of the original materials, details, and character of the house as feasible.
- When introducing new parts or mixing old with new elements on the building exterior, preserve the original design character by using competent professional design assistance.
- Restore, where practical and economically justifiable, deteriorated architectural details.
- Surface cleaning of structure should be undertaken by a restoration professional.
- Landscaping should preserve and protect plantings of historic value.
- Install fire/smoke detection, suppression systems, and other life safety systems per current code requirements.
- Mechanical and electrical system must be upgraded to current code requirements.
- Temper historic preservation with the functional nature of the homes.
- Funded projects to provide a better quality of life for the occupants (e.g. air-conditioning) should be planned in a manner that retains the historic integrity of the home and/or includes appropriate measures to mitigate adverse impacts.

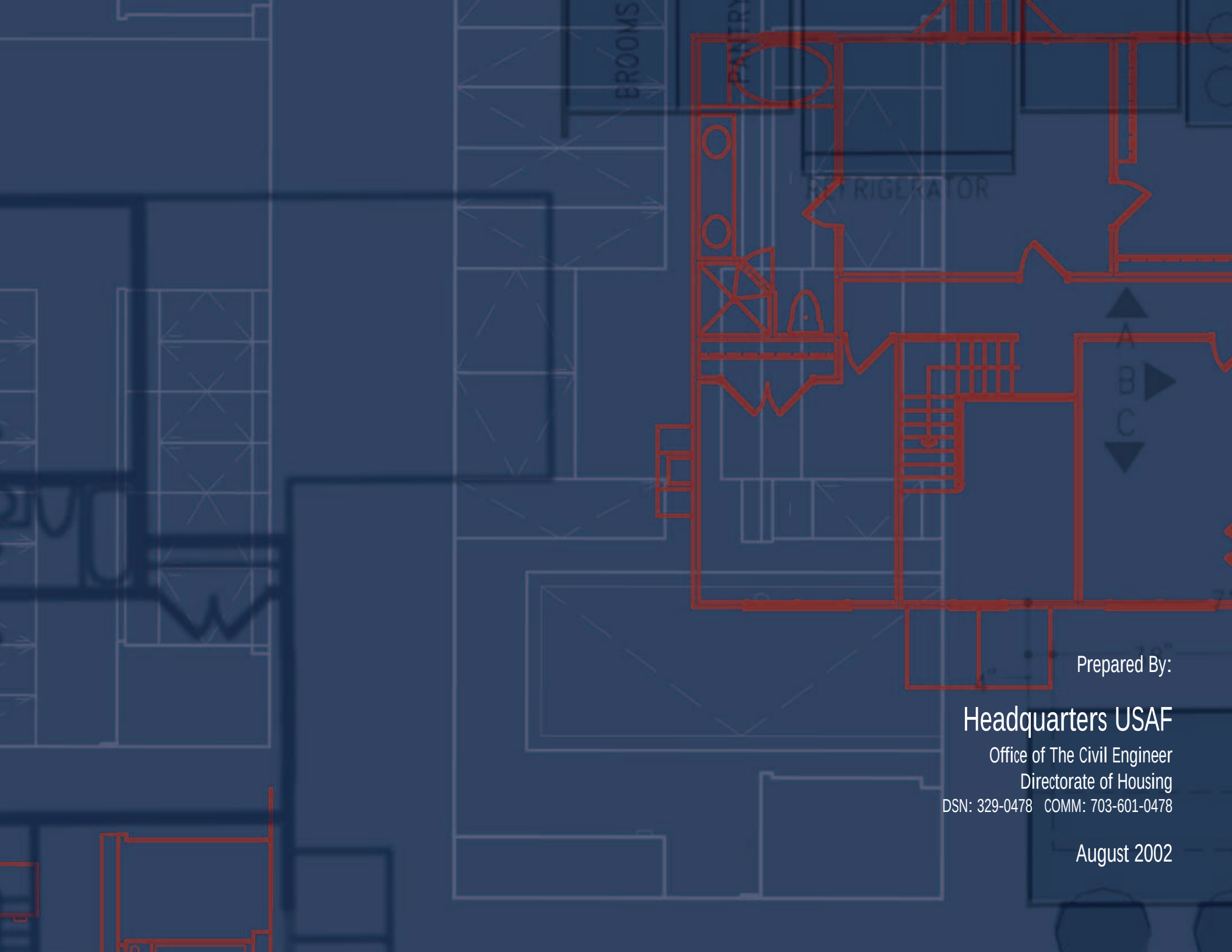
Self-Help Improvements

17.0



The Air Force provides self-help for all housing residents for two main reasons. The first is to address housing occupants' minor maintenance needs within the house. The second is to allow residents to provide minor improvements to their unit. The Air Force strongly supports self-help projects that are consistent with codes and standards, safety, and functionality. Self-help minor improvement projects are subject to approval by the Base Civil Engineer, and if approved, become the property of the Air Force. The Air Force not only accepts these projects as property, but also accepts the responsibility for maintaining the property in the future. The Base Civil Engineer may approve self-help projects with the condition that the house is returned to its pre-occupancy condition. In this case, the occupant may be financially liable for restoring the GOQ to its original condition before the resident leaves the home. If self-help is performed, the resident must contact the GOQ management team representative or housing flight chief for assistance.

The Base Civil Engineer is responsible for ensuring self-help construction work is executed by qualified personnel, especially regarding life safety issues, local codes, and ordinances regulating electrical and plumbing work. All self-help work to convert unfinished space to habitable space must meet life safety requirements. All self-help work must comply with the GOQ's Individual Facility Profile. Materials for self-help work count against the GOQ's annual $35,000 maintenance and repair limit.



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