



DEPARTMENT OF THE NAVY

NAVAL FACILITIES ENGINEERING COMMAND
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IN REPLY REFER TO

NAVFACINST 11101.85H
HFH-CSC
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NAVFAC Instruction 11101.85H

From: Commander Naval Facilities Engineering Command

Subj: NAVY FAMILY HOUSING PROJECT STANDARDS

Ref: (a) Military Handbook 1035

Encl: (1) Navy Family Housing Project Criteria

1. Purpose. To prescribe uniform standards and criteria for the design, construction, acquisition improvement and repair of Navy Family Housing and associated facilities.
2. Cancellation. NAVFAC Instruction 11101.85G, of 30 October 1997 is hereby canceled and superseded. This instruction also replaces and supersedes reference (a) for Navy Family Housing.
3. General. This instruction is intended to codify criteria for Family Housing and associated facilities, thereby standardizing the Navy's approach to the residential construction industry. Enclosure (1) standards are based on Life-Cycle Cost analysis, Value Engineering studies, Post-Occupancy Evaluations and independent research studies recommendations. Enclosure (1) also incorporates energy conservation and sustainable development objectives.
4. Policy. It is the policy of the Commander, Naval Facilities Engineering Command to utilize the standards and criteria set forth in the enclosure to this instruction for all Family Housing design, construction, acquisition, improvement and repair projects. Family Housing Privatization projects should utilize those standards specified in Appendix F of enclosure (1). Family Housing Operations and Maintenance (O&M) practices should also utilize these standards, specifically for equipment, appliance and systems replacements.
5. Deviations from Standards. It is recognized that no set of standards or criteria can be developed which would cover every possible situation. Accordingly, the enclosure to this instruction is written to allow project flexibility. Editing notes and criteria options have been included in enclosure, set aside with []'s, to aid in project document development. Deviations from enclosed standards, except for those required by Law, Regulation or higher authorities, should be supported by Life-Cycle Cost analysis.

6. Action. Effective with the date of this instruction, the standards and criteria set forth herein shall be utilized in the design, construction, acquisition, improvement, repair and maintenance of Navy Family Housing.



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FONT COLORS:

BROWN – CHOICE REQUIRED

BLUE – [NOTES TO EFD]

GREEN – DESIGN OBJECTIVES

RED – REQUIRED BY LAW, REGULATION OR HIGHER AUTHORITY

ACRONYMS

A/C	Air Conditioning
AAMA	American Aluminum Manufacturers Association
AATCC	American Association of Textile Chemists and Colorists
ABS	Acrylonitrile Butadiene Styrene
AC	Alternating Current
AC	Asphalt Concrete
ADAAG	American with Disabilities Act Accessibility Guidelines
ADP	Automated Data Processing
ADT	Average Daily Traffic
AE	Architect/Engineer
AFUE	Annual Fuel Utilization Efficiency
AGA	American Gas Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASB	Asbestos
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BHMA	Building Hardware Manufacturers Association
BR	Bedrooms
BTU/SF/DD	British Thermal Units/Square Foot/Degree Day
c.f.m.	Cubic Feet per Minute
CDD	Cooling degree Days
CFR	Congressional Federal Register
CGO	Company Grade Officers
CMU	Concrete Masonry Unit
CO	Carbon Monoxide
CO/IC	Commanding Officer/Installation Commander
COP	Coefficient of Performance
dB	decibels
DHW	Domestic Hot Water
DODI	Department of Defense Instruction
Dtd	dated
ECO	Energy Conservation Options
EFD	Engineering Field Division
EPA	Environmental Protection Agency
f.c.	Foot Candles
FAU	Forced Air Unit

FGO	Field Grade Officers
FHCC	Family Housing Community Centers
FM	Factory Mutual Corporation
FMHCSS	Federal Manufactured Housing Construction and Safety standards
FY	Fiscal Year
gpm	Gallons per Minute
HDD	Heating degree Days
HP	horsepower
HQIS	Head Quarters Information System
HUD	Housing and Urban Development
HVAC	Heating, Ventilation, Air Conditioning
HWC	Housing Welcome Centers
Hz	hertz
ICBO	International Congress of Building Officials
IIC	Impact Isolation Class
JEM	Junior Enlisted Men
KV	Kilavolts
Kwh	Kilawatt Hours
LBP	Lead Based Paint
LP	Liquid Proprane
LPW	lumen per watt
MA	mill amperage
MC	International Mechanical Code
MDF	Medium Density Fiberboard
MHP	Mobile Home Parks
Mil	Millimeter
MIL-HDBK	Military Handbook
MPH	Miles Per Hour
NAVFAC	Naval Facilities Engineering Command
NEC	National Electric Code
NEMA	National Electric Manufacturers Association
NFPA	National Fire Protection Act
NFRC	National Fenestration Rating Council
NKCA	National Kitchen Cabinet Association
NWMA	National Window Manufacturers Association
NWWDA	National Wood Window & Door Association
O&M	Operations and Maintenance
OMB	Office of Management and Budget
OSB	Oriented Strand Board
Oz	Once
pCi/l	pico Curries per Liters

PDPS	Policy and Design Planning Statement
PDPS	Policy and Design Planning Statement
PE	Polyethylene
PET	Polyethylene Terephthalate
PPV	Public Private Venture
Psf	Pounds Per Square Foot
Psi	Pounds per Square Inch
PVC	Polly Vinyl Chloride
PWO	Public Works Officer
'R'	resistance values of building materials
RFP	Request for Proposal
ROICC	Resident Officer in Charge of Construction
SCP	Special Command Position
SEER	Seasonal Electric Efficiency Rating
SEM	Senior Enlisted Men
SF	Square Feet
SHC	Self Help Centers
SM	Square Meters
SO	Senior Officers
SQFT	Square Feet
STC	Sound Transmission Class
STR	Standard Coefficient Rating
TV	Television
'U'	U-Value, reciprocal of resistance values of multiple layers of building components.)
U.S.C.	United States Code
UBC	Uniform Building Code
UFAS	Uniform Federal Accessibility Standards
UL	Underwriters Laboratories
USCPSC	United States Consumer Products Safety Commission
VCP	Vitreous Clay Pipe

APPENDIX A FAMILY HOUSING

1.0 PROJECT CRITERIA

1.1 SCOPE OF WORK

1.1.1 Objective

It is the intent of the Government to obtain quality Family Housing for military personnel and their families, within funds available. Work shall include design **[construction]** **[acquisition]** **[improvement]** of a complete and useable project. Specific attention shall be given to Sustainable Development implementation. See NAVY FACILITIES Policy and Design Statement 98-01, 98-02, 98-03 and 98-04.

1.1.2 Sustainable Development Requirements

In compliance with Executive Order 13123 (Jun 1999), OPNAVINST 1100016.B (Draft Apr 2000) and NAVFAC Design Policy letter (Jul 1998), all Navy Family Housing Construction, Improvement, Repair and Privatization projects shall incorporate Sustainable Development principles. Application of these principles will reduce consumption of energy, and other non-renewable resources; minimize waste of water and materials; prevent pollution and associated environmental impacts and liabilities, increase energy and resource efficiency, and improve human health. The result will reduce life-cycle operating costs for Navy Families.

1.2 CRITERIA

To better accomplish the project's objective, the criteria specified herein are divided into two categories Requirements and Design Objectives. [Notes to EFDs are indicated in the "BLUE" font and provide guidance, interpretation or highlight required data input.]

1.2.1 Requirements

Material, equipment, and spatial/area criteria are required, and will be reviewed and evaluated on an objective basis. [Note: "Requirements" specified in Las, Regulation or by higher authorities are indicated in "Red" font.]

1.2.2 Design Objectives

Aesthetic and relational criteria will be reviewed and evaluated on a more subjective basis than "Requirements." [Note: "Objectives" are indicated in "GREEN" font.]

1.2.3 Minor Irregularities

Minor irregularities in these Requirements and Design Objectives may be accepted if they are found to have merit and benefit the overall project quality.

1.3 SITE

The site[s] [is/are] described on the project drawings and includes approximately [...] acres. This project shall be developed within the project boundary indicated on those drawings. These drawings indicate existing topography, site conditions, and locations of utilities. The Contractor shall be responsible for confirmation of drawing information. [EFD to insert acreage and specific site conditions] [EFD use of previously developed sites(s), or “Brown Field” is encouraged.]

1.4 BUILDINGS

The dwelling units shall be **one, [two, or three–story structures or any combination thereof (single, duplexes, townhouses or garden style apartments). Three, four or five bedroom units shall be limited to one/two–story structures.]** Interior hall/corridor access apartments, or back-to-back units, are prohibited. No unit entrance or living area shall require more than one story walk up or down from grade. Generally, use of dwellings requiring elevators are not desired or recommended.

1.5 SITE DENSITY

The densities for new Family Housing projects, expressed in units per acre are as listed below. Various categories of housing types in surrounding locations enter into the selection of densities. The selection of densities shall be determined after detailed consideration of the neighborhoods that will adjoin the Navy project. Low density is usually associated with single units and medium/high with urban settings that range from low to mid-rise configurations.

Site Density	Units Per Acre
Low	4 – 6
Medium	7 – 10
High	11 – 15

Table 1.5-1.2.3-1. Site Density for New Family Housing Projects

The value of underlying land must be considered. On-base project densities may well be determined by the amount of available land.

1.6 ACCESSIBILITY DESIGN

Construction and Improvement projects and Activities shall comply with Uniform Federal Accessibility Standards (UFAS) and the American with Disabilities Act Accessibility Guidelines (ADAAG).

- New construction projects shall be designed and constructed to provide 5% of each unit type, but not less than one of each unit type, either accessible or adaptable. Additionally, 2% of each accessible unit type, but not less than one of each unit type shall be designed and constructed adaptable for individuals with hearing disabilities. Unit type being defined as grade and number of bedrooms (JEM-2, SEM-3, CGO-3, etc.). ADAAG Section 13, Accessible Residential Housing, provides appropriate residential accessibility standards. Adaptable units shall be designed and constructed to allow conversion to accessible standards with a minimum of effort for kitchens and baths, (i.e., adjustable cabinets, blocking for grab bars, etc.) Replacement construction projects may vary the percent of accessible/adaptable units, depending on total number of existing accessible units required at the Activity.
- Improvement/Improvement projects shall comply with ADAAG accessibility standards, for the part of the unit improved, when the scope of those projects constitute an "Alteration", until the overall Activity accessibility requirement is satisfied. An Alteration is defined as work that changes structural elements (load bearing walls, etc.) or plan configurations (functional arrangement) (per ADAAG 3.5 and UFAS 3.5). Additionally, the entire unit shall comply with accessibility standards when the project includes "Substantial Alterations". Substantial Alterations is defined as a project where the unit improvement costs exceed 50% of the building replacement cost (5'-line), per UFAS 4.1.6(3)(d). As with replacement construction, the percent of accessible/adaptable units per project may vary depending on total number of existing accessible units required at the Activity.
- Construction and improvement projects shall be planned to satisfy the Activity's overall requirement of a representative 5% of all non-billet-specific housing being accessible/adaptable, per UFAS 4.1.3(3). For the purpose of this section, an Activity is defined as the area of responsibility of the housing office. Existing units are "grandfathered" until they are replaced or revitalized, as noted above. Billet-specific units, that is, units assigned to specific command positions, shall be designed and constructed, or improved, in accordance with ADAAG 13.2.1(3). Additionally, when needs exist modifications to existing units shall continue to be a high command priority, in accordance with UFAS 4.1.3(3) and DOD 4165.63-M.

1.7 UNIT COMPOSITION

This project is composed of the following dwelling unit design types:

TYPE	NO.OF UNITS	MAX. GROSS SM	MAX. NET SM	MAX. NET SF
07 + (SCP) 4BR	[EFD INSERT]	266	215	2310
07 + 4BR		242	195	2100
06-4BR (CO/ICO)		215	174	1870
06-4BR		196	158	1700
04-05-4BR		179	144	1550
04-05-3BR		161	130	1400
E1-E9/W1-03-5BR		179	144	1550
E7-E9 (INST. SNCO)		184	148	1595
E7-E9/W1-03-4BR		167	135	1450
E7-E9/W1-03-3BR		156	125	1350
E1-E9/W1-03-2BR		109	88	950
E1-E6-4BR		156	125	1350
E1-E6-3BR		139	111	1200

(Net and Gross metric areas are used for project pricing only)

Table 1.2.3-1. Floor Area and Design

1.8 NET AREA

Maximum Net SF area, as defined by 10 U.S.C. 2826, is the space within a unit, with the following exclusions:

- Exterior and party walls.
- Half thickness of interior walls adjacent to utility and laundry rooms.
- Interior and exterior bulk storage.
- Washer and dryer closet (not to exceed 30 SF) (2.7sm).
- Furnace, domestic water heater and solar equipment spaces.
- Stairways, finished space under stairs not exceeding 4 feet 6 inches (1.37 m) in height and landings at each floor (not to exceed 10 SF (0.81 sm.) each).
- Walls and interior spaces specifically designed for passive solar systems (other than required habitable areas).
- Unfinished attic and basement space.
- Patios/balconies, porches and terraces (unconditioned and uninsulated).

- Carports and garages.
- Additional area required solely to comply with accessibility standards (not > 75 SF) (6.75 sm.).
- Severe weather entry vestibule (not to exceed 20 SF)(1.6 sm.).
- In harsh climates (>7500 heating degree days) the net floor are may be increase up to 300 square feet for indoor recreation space.

1.9 UNITS PER STRUCTURE

Unit Type	Apartments	Townhouses	Duplex/Detached
JEM 2 & 3	to 6	to 6	—
JEM 4 & 5	to 4	to 4	—
SEM/W/O 2	—	to 6	—
SEM/W/O 3 – 5	—	to 4	—
CGO	—	to 4	2
FGO 3 & 4 BR	—	to 4	2
SGO/FLAG	—	-	1

Table 1.2.3-1. Number of Units per Structure

[Note: Maximum units per structure and Maximum Gross SF shall be used for construction projects]

1.10 APPLICABLE STANDARDS

The design and **[construction] [improvement] [repair]** should be in accordance with sound construction practices, and the latest addition of the following codes: **[except as provided herein]**

- Manufactured Housing: Federal Manufactured Housing Construction and Safety Standards (FMHCSS), as applicable.
- National Electric Code, NFPA No. 70, [insert year] Edition.
- Uniform Building Code (UBC), [insert year] Edition. (UBC, IBC when adopted)
- International Mechanical Code (IMC), [insert year] Edition.
- International Plumbing Code (IPC), [insert year] Edition.
- National Fire Protection Association (NFPA) Life Safety Code, NFPA 101.
- MIL-HDBK-1008, current edition.

- NFPA 13, 13R, 13D current edition.
- NFPA 24 Private Fire Service Mains.
- NFPA 54 National Fuel Gas Code.
- NFPA 72 Household Fire Warning Equipment.
- NFPA 720 Recommended Practice for the installation of Household Carbon Monoxide (CO) Warning Equipment.
- Uniform Federal Accessibility Standards (UFAS).
- Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- Factory Mutual Corporation, (FM) Factory Mutual Approval Guide.

(Note: Proposers **[specifications]** shall clearly indicate the engineering code(s) utilized. If Manufacture or Factory-Built Housing is used in the design, state-prescribed inspection procedures shall be followed.)

[Note: EFD insert applicable local/State requirements as appropriate].

1.11 CONSTRUCTION AND LIFE SAFETY

Construction shall conform to the fire resistance, area and height limitations of the UBC, except as noted herein. Structures shall conform to the exit facilities, means of egress and hazard protection requirements of NFPA 101 & 720. Fire protection systems (i.e., smoke and automatic fire sprinklers) shall comply with NAVFAC Design Policy 96-02, dated December 20 1996. **[Note: In accordance with MILHDBK 1008]**

1.12 FAMILY SIZE

As required for Building Code compliance, the following family size criteria shall be used for planning purposes and not be construed as relating to activity assignment policy:

Size of Unit	Number of Persons
2 Bedroom	3
3 Bedroom	5
4/5 Bedroom	6

Table 1.2.3-1. Family Size Criteria

1.13 ENERGY EFFICIENCY

[New units shall be certified “Energy Star Homes”.] In compliance with Executive Order 13123, energy consumption shall be reduced by 35 percent, below the FY85 levels, by FY 2010. [Improvement projects shall strive to incorporate All cost effective

conservation opportunities and shall also comply with EPA’s “Energy Star” standards for all items within their scope.] *[Note: HQIS “Energy Auditor” software provides the analysis tool to comply with this requirement for construction/improvement projects.] [EFD insert (BTU/SF/DD-Annual), Target.]*

1.14 SUSTAINABLE DEVELOPMENT RATING & REPORTING

Per section 1.1.2, all Construction, Improvement, Repair and Privatization projects shall incorporate Sustainable Development principles. The attached Navy Residential Sustainable Development worksheet provides the basis for verifying compliance with, and extent of, Sustainable Development in Family Housing Construction and Improvement projects. A minimum of a “Bronze” rating is required for all Construction and Improvement projects. An integrated systems design approach is encouraged to achieve a higher rating (“Silver”, “Gold” or “Platinum”), within program funding limits. *[Sustainable Development ratings will also be used in Design-Build evaluations (Appendix G). In accordance with OPNAVINST 11000.16A, post construction Sustainable Development Case studies shall certify new or improved units meet standards set by DOE’s Energy Star Homes program and document the Sustainable Development rating achieved.]*

1.15 FORCE PROTECTION & ANTI-TERRORISM

Beginning in FY03 all Construction and Whole Neighborhood Improvement projects shall be designed and constructed in accordance with DOD standards. *[Note: DoD standards still under review.]*

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2.0 SITE PLANNING AND DESIGN

2.1 BUILDING ARRANGEMENTS

2.1.1 General

Site plan shall be designed by a Registered Architect or Professional Engineer, experienced in Sustainable Development. Solar gain and prevailing breezes should be considered the principle objectives in determining building orientations. Passive solar gain is obtainable from a number of sources, i.e., planning for effective deciduous shade trees, roof color, trombe walls, direct gain to interior mass walls and earth berm sheltering. Housing units should be oriented so that the majority of windows and major sections of the roof face within 30 degrees of South to optimize control of direct solar gain. Withstanding solar and prevailing breeze constraints, **building arrangements should be informal and imaginative; a balancing of view, privacy, variety and convenient access for guests. Design shall conform to varying terrain conditions to provide attractive residential patterns and streetscapes.** [Note: Consider future solar and photo voltaic application in building and roof orientations.]

2.1.2 Land Use

Site development should provide an optimum balance of unit floor area, open space, recreation space, pedestrian circulation, and vehicular parking and circulation, consistent with good land planning practices and economics. Paving and vehicular circulation area should be minimized.

2.1.3 Noise

Use techniques such as building location and orientation, window placement, and barriers (e.g., sound walls, earth berms, landscaping, etc.) to moderate predictable undesirable noise (e.g., vehicular traffic, playing fields and courts, military operations, or incompatible land uses).

2.1.4 Flood Plains and Areas

Family Housing shall be sited outside any 100-year-flood water line.

2.1.5 Building Setbacks and Spacing

- **Buildings**: Buildings shall be sited within setback limits indicated on drawings. **[Buildings shall be a minimum of the yard dimension, determined below, from the Site Boundary.]**
- **Setback/Yard**: Setback/Yard dimensions are measured from the building wall to an imaginary lot line around each building measured perpendicular to the building. Wall

lengths with horizontal offsets of 6-ft (1.83 m) or more are measured separately when determining wall length for required yard depth. Distance between buildings **[shall]** not be less than the sum of setbacks or yards as required.

2.1.5.1 *Wall Type*

- Wall 'A' - a wall which contains the dwelling unit's main entrance; or the principal window(s) in living/dining room, kitchen/eating/family room, or a balcony.
- Wall 'B' - a wall which contains window(s) other than wall 'A'.
- Wall 'C' - a wall which contains no windows.

2.1.5.2 *Minimum Dimensions*

- Building Setback (building-building = sum of setbacks)
 - Wall 'A' ————— [6 ft(1.83 m) + 2 ft (0.61 m) for each level + 5% wall length]
 - Wall 'B' ————— [4 ft(0.91 m) + 1 ft (0.35 m) for each level + 5% wall length]
 - Wall 'C' ————— minimum of 5 ft (1.98 m)
- Building to street (face of curb)
 - Wall 'A' ----- 20 ft (6.10 m)
 - Wall 'B' ----- 15 ft.(4.57 m)
 - Wall 'C' ----- 10 ft (3.05 m)
- Carport/Garage to street shall be a minimum 8 ft(2.43 m) (face of curb)
- Detached carports/garages may be located at the property line or project boundary
- Driveway length for parking, measured from face of curb
 - To park one car ----- 23 ft (7.01 m).

Note: Increase driveway length by 5 ft (1.52 m) when one-piece overhead garage doors are provided.

- Building to retaining wall with a height of 4 ft. or more
 - Wall 'A' ----- 15 ft. (4.55 m)
 - Wall 'B' ----- 7-1/2 ft. (2.29 m)
 - Wall 'C' ----- 5 ft. (1.52 m)
- Projections into required yards shall not exceed 40% of the setback (yard) distance.
- Building to slope (where slope is 3:1 or steeper)
- Building shall be a minimum of 15 ft. (4.55 m) from toe and/or head of slope.

- Courts, outer and inner, shall not be less than the sum of required yard distances. An inner court shall have minimum of 100 sq. ft. (9.0 sm.) for a one story building and an additional 50 sq. ft. (4.5 sm.) for each additional story.

2.2 FENCES AND SOUNDWALLS

[Note: insert specifications as required]

2.3 STREETS AND DRIVES

2.3.1 General

The street system should provide convenient and safe access and circulation (including collections, deliveries, and fire department vehicles) within the housing area, and should discourage through traffic. Intersections should be at, or near, right angles, and **[should]** **[shall]** be separated by a minimum of 125 feet (38.1 m). Driveways requiring cars to back out of garages/carports onto subcollector streets are prohibited. Street parking shall be in accordance with Government's soil report. [EFD: revise depending of site constraints]

2.3.2 Street Width Criteria

Provide a street system which is convenient with safe access and circulation (including trash collections, deliveries, moving vans, and fire protection) for vehicles and pedestrians within the housing area. Provide residential streets as an integral component of the neighborhood, and coordinated with pedestrian circulation. Street designation is based on Average Daily Traffic (ADT), assuming eight vehicle trips per unit, per day.

- Nonresidential Streets (1000 + ADT):
 - Arterial: Major street systems external to the residential area, but connecting to the neighborhood.
 - Collector: Feeder street connecting the external street system with residential streets in the development, or adjoining areas, subject to future development.
- Residential Subcollector Streets (250 to 1000 ADT):
 - Loop: Both ends open to traffic.
- Residential Access Streets (less than 250 ADT):
 - Cul-de-sac: Only one end open to traffic and a minimum 35 ft (**11 m**) radius or a minimum 50 ft (**15 m**) radius with curb parking, maximum 750 feet in length.
 - Court: A compact cul-de-sac providing common parking for overflow.

(Note: Use of metric measurements as follows: m = meters, cm = centimeters, and mm = millimeters)

Figure 2.3-1 illustrates the minimum street and width (feet) standards. [Note: adjust widths to comply with local standards as required]

(On-Street Parallel Parking)				
TYPE OF STREET	No Parking	One Side	Both Sides	Curb Radius
Non-Residential	30 ft (9.0 M)	32 ft (9.8 m)	40 ft(12 m)	30 ft (9 m)
Residential Sub-Collector	24 ft (7.3 m)	32 ft (9.8 m)	36 ft (11 m)	25 ft (7.6 m)
Residential Access	20 ft(6m)	30 ft (9 m)	30 ft(9m)	20 ft (6 m)

Table 2.3.2-1. Minimum Street Width Standards

2.3.3 Curb and Gutters

Streets shall be provided with concrete curbs and gutters. Curbs shall be depressed at entrance to driveways, intersections and crosswalks. [EFD revise for snow conditions as required.]

2.3.4 Unit Driveways

Driveways servicing carports or garages shall be a minimum 9 ft (2.74 m) wide for each lane of traffic. Pavement for the driveways shall be in accordance with the Government's soil report. Where drives/driveways are separated by less than three feet, the area between the drives shall be paved with similar material.

2.3.5 Common Drives/Driveways

Driveways serving more than four units (8 cars) shall be designed as a street, for paving section only. Sufficient vehicular circulation and turnaround space should be provided. As a minimum, T-shaped turnarounds shall be provided; approximately 60 ft x 15 ft (18.29 m x 4.57 m) wide. Siting more than 16 units on a common drive/driveway is prohibited. Parking area with angled spaces shall be provided with separate entrance and exit drives. [Note: Revise/delete common drive criteria at locations with heavy snow removal].

2.3.6 Parking

Parking space shall be provided at a rate of two off-street spaces per dwelling unit. See Table 2.3-1 for covered parking requirements. In addition, one guest parking shall be provided for every three units. Open parking spaces shall be a minimum of 9 ft. x 18 ft. Indented gang parking, where cars back into street, shall be limited to four spaces. Planting median separating indented parking shall be at least 6 ft wide.

2.3.7 Recreation Vehicle Storage

A storage lot for recreational vehicles shall be provided to accommodate [] vehicles such as trailers, campers, boats, etc. Spaces shall be a minimum 9 ft. x 25 ft. Minimum aisle width is 25 ft. The storage area shall be enclosed with a 7 foot high chain link perimeter fence with a lockable access gate, compacted gravel base course (6 inch minimum thickness), and a paved drive to the access gate. The lot shall have security flood lighting with a minimum of 0.25 foot-candle illumination level at fence. Storage lot(s) shall be located in area(s) indicated on drawings.] [Note: insert as required by project scope]

2.4 PEDESTRIAN CIRCULATION

2.4.1 General

Walkways should be designed as an internal network separated from, but connected to, vehicular circulation systems. Sidewalks are required at a minimum on one side of the street. Increased emphasis should be placed on safer pedestrian accessibility to recreation areas, as well as appropriate off-site amenities. Walkway design is as important as street design. The walkway system should not be designed merely as a bordering frame for the road system, but rather as an alternative circulation to vehicular. It should allow occupants to move and walk safely to various elements of the neighborhood without being tied to the road edges. **Ensure all elements of the walkway system to conform to the Americans with Disabilities Act Accessibility Guidelines (ADAAG).** Sidewalks and walkways shall be in accordance with Government's soil report.

2.4.2 Sidewalks and Walkways

Sidewalks shall be a minimum of three feet wide, exclusive of curb width, non-reinforced concrete, with a minimum thickness of four inches. Walkways shall be a minimum three feet wide, **[non-reinforced concrete] [bituminous paving (asphalt)] [crushed stone or other pervious material].**

2.4.3 Unit Walks

Provide non-reinforced concrete walks to each housing unit, a minimum three feet. **Unit walks shall provide an appropriate connection between unit parking and the residential unit.**

2.4.4 Crosswalks

Provide five feet wide crosswalks, marked with appropriate striping, where walkway system crosses residential streets. Provide ramp, with textured surface, by depressing street curbs and adjacent sidewalk at all crosswalks.

2.4.5 Street Signs

Street name and traffic control signs (i.e., NO PARKING, CAUTION CHILDREN AT PLAY, etc.) shall be provided and shall conform to requirements of Bureau of Public Roads Manual, Uniform Traffic Control Devices for Streets and Highways. The street names will be provided by the Navy.

[2.4.6 Protection at Retaining Walls and Exterior Steps

Handrails and guard railing shall be provided at all exterior steps, retaining walls and top of slopes, adjacent to walks and/or units, where finish grade separation is 24 inches, or greater and slope is 3:1 or greater. Chainlink fencing, in-lieu-of guard railing, is [prohibited] [undesirable]. Tread and riser design shall be based on the following: twice the riser plus the tread equals 26 inches ($2R + T = 26''$).]

2.5 RECREATION FACILITIES

2.5.1 General

Recreational facilities shall be designed and constructed in accordance with DOD standards (The Technical Manual Children's Outdoor Play Areas, Navy P-383). Recreational facilities shall be provided for three age groups:

- Tot Lots Ages (2 years to 5 years)
- Play lots Ages (6 years to 9 years)
- Playfields Ages (9 years & above)

2.5.2 Accessibility

Design outdoor play areas convenient to the walkway system. At a minimum, provide 5 ft (1.525 m) wide accessible routes with ADAAG approved solid surface material, ramps, and transfer points at outdoor play areas. Locate accessible outdoor play areas, so that when viewed in their entirety, they may be approached, entered, and used by residents with varied physical abilities. Activities such as swinging, sliding, and climbing should be available to all. Outdoor play areas should be designed to stimulate the development of both abled and less-abled users, and encourage the less-abled to feel like and become a part of the mainstream activity.

2.5.3 Tot Lots, Play Lots and Picnic Areas

Tot Lots, Play Lots and Picnic Areas should be located convenient to each other and dwelling units. Afternoon shade, either by structures or landscaping, should be provided at each location. Because they are designed for occasionally unsupervised children, recreational facilities shall be located so that every residential unit has access to the most adjacent play lot without having to cross a collector street.

Tot Lots	One Tot Lot per 50 units or less.
Play Lots	One Play Lot per 100 units or less.
Play Fields	One acre per 100 units is desirable.
[Picnic Areas]	One picnic area per 50 units.]
[Tennis Courts]	One full court per 150 units.]
Basketball Courts	One full court per 100 units, minimum; Add One-half court per 50 units.
Jogging Course	One per project.
<i>[Note: Adjust ratios for "younger" or "older" families]</i>	

Table 2.5.3-1. Recreational Facilities Per Number of Units

2.5.4 Tot Lots

Design Tot Lots to accommodate 8+ children and provide a variety of play activities, including:

- One multi-activity, with a minimum of two platforms (maximum height of 48 inch **(1.2m)**), one wheel chair accessible.
- One four-unit kindergarten swing set, 8 ft **(2.4 m)** high. Two "baby swing" seats, and two belt swing seats.
- One spring mounted plastic rider (don't use coil spring).
- Benches on a paved base, sloped to drain.

2.5.5 Play Lots

Design Play lots to accommodate up to 16 children, and provide a variety of play activities, including:

- One multi-activity climber, with a minimum of three platforms, maximum height of 60 in., **(1.5m)**, one covered and one wheel chair accessible.
- One four-unit swing set, 8 ft **(2.4 m)** high, with belt swing seats.
- Benches on a paved base sloped to drain.
- **[Concrete play walk, 20 ft (6m) x 4 ft(1.3m) separate from the walkway system, stamped for hop-scotch, and accents (i.e., imprints of dinosaur feet, children's feet, horses' hoofs, etc.).]**

2.5.6 Equipment

Tot Lot and play lot equipment shall be factory finished institutional quality, in compliance with the American Society for Testing and Materials (ASTM) F 1487-93, Playground Equipment for Public Use, and United States Consumer Products Safety

Commission (USCPSC) Guidelines for Public Playgrounds, Navy P-383, and ADAAG. Use acrylic or metal construction equipment, powder coated or vinyl/PVC coated galvanized steel, and high-density polypropylene non-wood components. Wood structures are prohibited.

2.5.7 Use & No Encroachment Zones

Equipment shall be sited to provide use and no encroachment zones in accordance with ASTM F 1487-93.

- A use zone is a clear, unobstructed area under and around play equipment where a child would be expected to land when jumping or falling from a piece of play equipment. Requirements for use zones vary for the age group and for different pieces of equipment. All use zones for play equipment shall be shown on the site plan to ensure there is no conflict between play activities on the ground and swinging or jumping from the equipment.
- The No-encroachment zone is an additional area beyond the use zone where children using the equipment can be expected to move about and should have no encroaching obstacles. This area will vary according to the types of adjacent equipment, and their orientation to one another. However, a 72 inch minimum no-encroachment zone shall be provided at the active end of each piece of equipment
- Tot Lot and Play Lot surfaces shall be bordered with pressure treated wood or concrete curbs.

2.5.8 Surfacing Materials

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

2.5.9 Playing Courts

Basketball courts shall be sized and marked according to high school standards. Wood backboards are prohibited. Court surface shall be a colored polyurethane elastomeric resin system.

2.5.10 Picnic Areas

Design picnic areas to accommodate up to [eight] people. Picnic areas shall include tables, with benches, on a concrete base(s) sloped to drain and permanent barbecue grill(s). [Shading structures or trees are desirable.] Additionally, separate receptacles shall be provided for trash, recycling and barbecue ashes. All site furnishings shall be permanently attached to concrete paving.

2.6 LANDSCAPE DESIGN & MAINTENANCE

2.6.1 General

In accordance with Presidential direction, dated 26 April 1994, landscape design shall:

- Use regionally native plants to the extent possible
- Minimize adverse effects on the natural habitat
- Reduce use of fertilizers and pesticides
- Implement water-efficient practices

2.6.2 Landscape Plan

The Landscape Plan shall be designed by a registered landscape architect, experienced in residential site planning and planting design **[and xeriscape design principles.]**. The design should reflect appropriate groupings, foundation plantings, and street tree plantings to define the open spaces to ensure a complete landscaped project. Design should incorporate existing greenery of site if possible **[Note: include site specific project requirements]**. Provide a commercial soil analysis with interpretations and recommendations indicating type and amount of soil amendments required separately for turf, ground cover areas and planter bed backfill.

[Option I] Provide a complete design package (plans, specification and cost estimate) suitable for separate bid by the Government, including lawn, groundcover, shrubs/bushes, trees [, and irrigation system] for the entire project site, except undisturbed areas which shall remain natural.

[Option II] Provide complete landscaping consisting of lawn, ground cover, trees, shrubs/bushes, [and irrigation system]. Lawn and/or ground cover shall be provided for the entire site except undisturbed areas which shall remain natural.

2.6.3 Plant Materials

A minimum of **[75]** percent of plant material shall be native to project location or region. Plant materials, and minimum sizes, shall be in accordance with the following tables. Plant materials shall be chosen on the basis of plant compatibility, water requirements, climate, soils condition, low maintenance, and aesthetic suitability. Planting or seeding shall occur during seasons when most beneficial results will be obtained. Plant pits shall be excavated and backfilled as recommended by ANSI Z60.1.

2.6.4 Plant Size and Number

[EFD: insert acceptable plant materials. (Examples only) Size and number will vary by projects.]

Plant type	No. of plants	Plant size
Yard Trees	1 Per 1000 SF Landscaped Area	24" box/1"-2"diameter
Specimen Trees	1 Per 5000 SF Landscaped Area	[24"][36"] Box
Shrubs/Bushes	1 Per 500 SF Landscaped Area	[5] Gal

Table 2.6.4-1. Plant Size & Number

Landscaped Area = Project site area - buildings & hard surfaces - undisturbed areas.
 [Note: Adjust plant to area ratio, downward, as appropriate]

2.6.5 Trees & Shrubs

Plant varieties shall be nursery or plantation grown stock conforming to ANSI Z60.1. Plants shall be grown under climatic conditions similar to those in the locality of the project or climatized a minimum 10 weeks prior to installation. Trees should not be installed within 10 feet, laterally, of buildings, above or below-grade utilities. Trees that are 24" box and smaller shall be double staked. Trees larger than 24" box shall be guyed.

2.6.6 Turf & Ground Covers

Ground Cover plants shall be provided with the minimum number of runners and length of runner as recommended by ANSI Z60.1. Groundcover should have heavy, well-developed and balanced tops with vigorous well-developed root system, and furnished in containers and flats. TURF: A satisfactory stand of turf is dependant on planting process:
 [Note: Adjust for local conditions.]

- For seeded areas – a minimum of 160 grass plants per square meter. Bare spots shall be no larger than 6 inches square. The total bare spots shall not exceed two (2) percent of the total seeded area.
- For sodded areas – living sod uniform in color and texture. Bare spots shall be no larger than 2 square inches.
- For sprigged areas – a minimum of 20 sprigs per square meter. Bare spots shall be no larger than 9 square inches.

2.6.7 Planting Areas/Beds

Planting areas/beds adjacent to lawn areas shall be bordered with a hard surface mowing edge to minimize edging and maintenance efforts.

[2.6.8 Irrigation

Provide a complete permanent automatic irrigation system with controllers covering all common areas and slopes if this is normal practice in this microclimate. System shall be designed using [] psi water pressure. Lawns shall be watered with low precipitation rate pop-up heads. All other areas shall be watered by automatic

controlled drip irrigation and/or pop-up heads. Sprinkler heads with small radius coverage shall be used in tight areas to avoid overwatering structures and pavement and designed to provide complete coverage.]

2.6.9 Maintenance

Contractor shall provide plant and grounds maintenance during both the planting operation and the plant establishment period. The plant establishment period shall extend one full growing season after completion of planting, a minimum of 30 days, not to exceed one year.

- Maintenance during planting operation: Installed plants shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed and shall continue until the plant establishment period commences. The typical growth habit of individual plants shall be retained. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off."
- Maintenance during establishment period: The maintenance of all planting areas shall include:
 - straightening
 - tightening of tree stakes and guying material
 - moving and edging of turf
 - protecting plant areas from erosion
 - maintaining erosion control material
 - supplementing mulch
 - fertilizing
 - removing dead or broken tip growth by pruning
 - maintaining edging of planter beds
 - checking for girdling of trees
 - watering, weeding, removing and replacing unhealthy plants
 - controlling pests, diseases, fungi and rodents
 - Fourteen (14) days prior to the end of the maintenance period, Contractor will mow and edge lawn and water and fertilize all plant materials.

2.6.10 Warranties

All trees shall be guaranteed for a period of one year after final acceptance of the project, or area/site.

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3.0 SITE ENGINEERING

3.1 GRADING AND DRAINAGE

3.1.1 General

All work with the exception of grading and drainage **[utility connections]** **[access roads]** shall be confined within the project boundaries indicated on the attached drawings. Under no circumstances shall work be performed off the Government property. Storm drainage design shall be by the rational method using 10-year one-hour storm frequency. All runoff onto the site from adjacent properties shall be included in the storm drainage calculations. The Contractor is responsible for capping and/or relocation of all existing utility systems, not remaining in service. Minimize site disruption and grading to maximum **[20]** feet from building, roads or other improvements. **[Note: Modify as required and insert site specific requirements.]**

3.1.2 Government Soil and Foundation Report

A Soil and Foundation report is included as part of the Request for Proposal (RFP). The requirements contained in the Government's soil investigation report are mandatory. Proposed or requested changes to the Government requirements shall be submitted with appropriate technical data and are subject to approval by the Contracting Officer. **[Note: Report should specify paring thickness and strength.]**

3.1.3 Contractor Soil and Foundation Report

The Contractor shall provide a separate independent report: The independent soils and foundation report, including logs of exploration locations, additional soil borings, and testing and investigation shall be furnished with the Contractor's initial design submittal. A registered professional or geotechnical engineer experienced in soil mechanics shall prepare the report and certify the adequacy of the soil and foundation aspects of the design including but not limited to: **[Note: Modify as required to include special conditions, including testing by a cathodic engineer at locations with known or suspected corrosive soils]**

- Earthwork construction
- Cut and fill slopes
- Streets and pavement design
- Surface and subsurface drainage
- Erosion and siltation prevention during and after construction
- Foundation stability
- Settlement or heave
- **[Cathodic testing]**

3.1.4 Site Materials Management

Cleared topsoil and grading material **[should] [shall]** be stockpiled on-site for reuse. Contractor shall dispose of excess clearing, grubbing, surplus earth, stripping, and similar materials at an offsite approved location at no additional charge to the Government. Recyclable material (i.e., concrete, asphalt pavement, etc.) shall be recycled vs. disposed of. **[On-station depository locations will be designated by the Contracting Officer.]**
[Note: EFD to designate areas if available.]

3.1.5 Minimum and Maximum Grades

Surface drainage:

- 0.5% minimum gutters, streets and small lined ditches
- 10% maximum allowable street grades
- 1.0% minimum small unlined ditches and swales
- 2.0% minimum unpaved area drainage
- 1.0% minimum other paved surfaces
- 12 % maximum allowable drive/driveway grade
- 2.0% minimum street crown or cross slope
- 5.0% maximum street crown or cross slope
- 5.0% minimum for first 10 feet away from building
- **[33 % maximum unlined ditch/swale side slopes]**
- **[33 % maximum cut/fill slopes (3:1)]**

3.1.6 Erosion Control Measures

[Note: EFD insert project specific requirements]

3.1.7 Surface Storm Drainage

Drainage system shall be properly coordinated with surrounding properties to insure that runoff does not cause damage to other properties. Ponding on the site is prohibited **[except where indicated on site drawings]**. Surface drainage, of more than 10,000 square feet, shall not be channeled between adjacent buildings in open drainage swales or ditches. Surface collection swales or open ditches, draining more than the area between two buildings, shall be no closer than 10 feet to any building. The site shall be graded so that no drainage flows across a driveway or walk to reach a storm drain inlet, except at street intersections. Under walk, or drive, culverts are prohibited. **[Note: Coordinate with local storm water management standards.]**

3.1.8 Cross Gutters

Where drainage system requires cross gutters at street intersections, cross gutters shall be concrete (6 inches minimum thickness) over granular base course (8 inches minimum thickness). **[Note: Coordinate this para. with soil report]**

3.1.9 Maximum Gutter Flow

Maximum flow in all gutters shall be restricted to the quantity which will cause flooding of 1/2 of the adjacent traffic lane (maximum 6 feet) at the design storm. When this flow is reached, it shall be intercepted by catch basins.

3.1.10 Underground Storm Drainage

When flowing half-full, collection and disposal systems shall be designed to provide a minimum flow velocity of three (3) feet per second. Culverts and underground storm lines shall be either reinforced concrete pipe (RCP) or plastic approved for the intended use. Discharge areas shall be protected to prevent erosion. Curved storm drains are prohibited. [\[Note: delete where underground drainage systems are not practical/possible\]](#)

3.1.11 Minimum Pipe Size

Storm drains, culverts, and downdrains shall have a minimum diameter of 10 inches. Storm drain manholes or catch basins shall be provided at changes in alignment and at junctions with mains or laterals. Yard drains shall be a minimum six (6) inch diameter, and shall drain a maximum of 10,000 square feet per inlet.

3.1.12 Catch Basins and Grates

Side opening catch basins are preferred. Where grating must be used, they shall be of "Bicycle Proof" design. **[Catch basin and drain opening shall be designed to avoid being an attractive nuisance, and shall be sized to restrict access to children to the storm drainage system.]**

3.1.13 Site Information

[\[EFD to Insert\]](#)

3.1.14 Coordination

[\[EFD to insert\]](#)

3.2 WATER DISTRIBUTION SYSTEM

3.2.1 General

Provide a water distribution system, which will meet both domestic and fire flow requirements. Connect it to the existing utility system as indicated on the drawings. The Contractor is responsible for coordinating with the local **[utility] [base]** and paying any connection fees or charges. Provide tracer wire for all non-metallic underground water lines, both mains and laterals. Provide marker tape 12 inches above underground water mains. Laterals, between mains and buildings, shall be either copper or PVC, schedule

80. Minimum unit service shall be 3/4 inch diameter. [Note: define limits of Contractor's responsibilities concerning fees, charges, and/or services, as required]

3.2.2 Mains

Mains shall be considered as that part of the distribution system supplying fire hydrants or fire hydrant laterals. Water distribution mains shall be looped with no dead ends **[except as noted below]** and be adequately sized to satisfy both domestic and fire flow requirements. **[Water distribution mains may be radial, non-looped, where they are limited to a maximum of 500 feet and serve only one hydrant.]** Minimum main size is eight (8) inches. Sufficient sectional control valves shall be provided so that no more than two fire hydrants will be out of service in the event of a single break in a water main. The pipe, valves, and all other materials shall meet the American Water Works Association (AWWA) standards for a 150psi. working pressure system, and shall be disinfected in accordance with AWWA C651. **[Provide sacrificial anodes for all metal valves and pipe.]** [Note: revise as required]

3.2.3 Flow Requirements

Shall be in accordance with MIL-HDBK-1008C.

3.2.4 Trenches

Water and gas mains may be installed in the same trench with the gas main placed on a shelf at least 12 inches above and to one side of the water mains. Water mains shall have a minimum of three (3) feet earth cover. [EFD to coordinate with local gas utility supplier to determine system acceptability].

3.2.5 Fire Hydrants

Hydrants shall conform with the MIL-HDBK-1008C. Fire flow shall conform with the DODI-6055.6.

3.2.6 Shutoff Valves

Each dwelling building and unit shall be provided with a separate service and main shutoff valve. Unit services/shutoffs shall be in a manifold behind building shutoff. Valves shall be readily accessible to maintenance and emergency personnel. Shutoff valves are prohibited in walks.

3.2.7 Metering

Provide a master meter and provisions for future individual unit metering devices. [EFD to insert requirements].

3.2.8 Coordination

All existing work and new water lines are to be coordinated by Contractor with [...]. [EFD insert PWO, ROICC, Utility Co., etc.].

3.2.9 Site Information

[EFD to insert]

3.3 SANITARY SEWAGE SYSTEM

3.3.1 General

Contractor shall provide a new sewage collection system connected to the existing sewer as indicated on the drawings. The Government plans to negotiate and enter into contract with **[local sewage company]**. Provide tracer wire for all non-metallic underground sanitary sewer lines for mains and laterals. Provide marker tape 12 inches above all sanitary lines. [EFD to insert specific project requirements and define limits of Contractor's responsibilities concerning fees, charges, and/or services.]

3.3.2 Design Criteria

Sewage system shall be designed and constructed in accordance with **[community base]** requirements. All design flow will be calculated using the Manning formula. Manholes are required at all changes of direction and spaced not more than 500 feet apart. A drop pipe type manhole shall be provided where a sewer line enters 24 inches or more above the manhole invert, at change of alignments and/or pipe size, end of line, and sewer intersections. The minimum manhole diameter is 42 inches, with 24 inch diameter cover. Mains shall be a minimum of **[six (6")]** inches diameter. Curved sewers are prohibited. Pipes shall be designed to flow full and maintain a velocity of **[2.0]** feet per second. Velocity shall not exceed 15 feet per second. **[If siphons are used, two (2) lines of equivalent capacity will be used with cleanouts. Force mains will be sized to minimize pumping head, with a 3.0 to 5.0 feet per second velocity]** [EFD to insert as required.]

3.3.3 Sewer Mains

Design shall be based on an average daily per capita flow of sanitary sewage of 100 gallons per day with a peak hourly factor of four (4). Sewers shall be vitreous clay pipe (VCP) or plastic intended for this service. Mains shall be designed and installed to provide gravity drain laterals from all units.

3.3.4 Sewer Laterals

Each building lateral shall be connected directly to a sewer main. Combining multiple building laterals is prohibited. Units within a building may use a single building lateral.

Two-way cleanouts shall be provided on every lateral as it exits the building, to allow cleaning of all lines to grade. Cleanouts, in yard areas, shall be set in a box with hinged cover that can be secured. Laterals from one building shall not cross under another building. Laterals serving one or two units shall be a minimum of four (4) inches in diameter and laterals serving three or more units shall be a minimum of six (6) inches in diameter. Laterals shall be VCP or plastic intended for this service.

3.3.5 Trenches

Sewer and water lines, mains and/or laterals shall not be placed in the same trench. Separate trenches shall maintain a minimum 10 feet lateral separation. Where sewers cross water mains, the top of the sewer shall be a minimum 18 inches below the bottom of the water main; or the water main shall be constructed with a mechanical joint pipe for a distance of 10 feet on each side of the sewer.

3.3.6 Coordination

All work on existing and new sewer line to be coordinated by contractor with [EFD to insert PWO, ROICC, Utility Co., etc.].

3.3.7 Site Information

[EFD to insert]

3.4 GAS DISTRIBUTION SYSTEM

[EFD to delete if not required]

3.4.1 General

Contractor shall provide a gas distribution system connected to existing systems indicated on the drawings, and designed in accordance with ANSI Z223.1 **[and] [local codes] [Activity requirements]**. Shutoff valves shall be provided on the exterior of the buildings. A gas regulator shall be provided for each dwelling unit or building structure. Provide flexibility and strength to the piping at building/unit service entrance. Isolation fittings to prevent electric current shall be provided. **[The Government plans to negotiate and enter into contract with [local gas utility] for gas service.]** Provide tracer wire for all nonmetallic underground gas distribution lines. Provide marker tape 12 inches above all gas distribution lines. [EFD to define limits of Contractor's responsibilities concerning fees, charges, and/or services, as required]

3.4.2 Drips

[EFD to delete if natural gas is used.] Drips shall be installed at the low points, immediately following reduction from high pressure to medium pressure (at supply points) and at occasional low points throughout the system to provide for blowing out the lines.

3.4.3 Valves

Plug valves shall be installed at intersections of mains and other locations so that interruptions to service can be confined to not more than 30 units.

3.4.4 Mains/Service Lines

Lines shall not be placed under any buildings. Lines shall be placed with a minimum of 24 inches of earth cover. Protection shall be provided from superimposed street or heavy traffic loads.

3.4.5 Materials

Materials and appurtenances shall be free of defects and suitable to accomplish the stated objectives of gas distribution systems. Pipe shall be polyethylene (PE) ASTM-D2513, with fittings complying with ASTM D2683 or D2513, or reinforced epoxy resin gas pressure pipe and fittings, complying with ASTM D2517. Connections to metal pipe shall comply with ANSI B16.5 or manufacturer's recommended standards. Risers to buildings shall be wrapped steel or iron pipe. **[Provide sacrificial anodes for all metal valves and pipe.]** [Note: revise as required]

3.4.6 Testing

The Contractor shall prove the entire system, of gas mains and service lines, to be gas tight by air test, in accordance with ANSI B31.8. Test shall continue for at least 24 hours between initial and final readings of pressure and temperature.

3.4.7 Metering

[Provide a master meter and provisions for future individual unit metering devices.][Provide individual unit metering devices]. [Meters] [Meter bases] shall be visually screened from roads, common parking areas and recreational facilities. [EFD to revise as required in compliance with local requirements].

3.4.8 Coordination

All work on existing and new gas lines to be coordinated by contractor with [EFD to insert PWO, ROICC, Utility Co., etc.].

3.4.9 Site Information

[EFD to insert].

3.5 ELECTRICAL DISTRIBUTION

[EFD to add special requirements if provided by utility company].

3.5.1 General

Contractor shall provide new electrical distribution system for this project and connect at the location shown on the drawings. Available power is [...] **KV [overhead] [underground] (wire, [...] phase/[...] volts, 60 hertz primary).** **[The Contractor is responsible for terminating and/or relocation of all electrical systems.]** **[The Government plans to negotiate and enter into contract with [local power co.] for electrical service.]** [EFD to define limits of Contractor's responsibilities concerning fees, charges and/or services as required and add project specific requirements.]

3.5.2 Design Criteria

The electrical on-site distribution system shall be designed as an **[underground] [above ground]** system. Service drops shall be underground. **[System shall conform to National Electric Code (NEC), ANSI C2, and NFPA 70.]** [EFD to insert local requirements and other design criteria in RFP as appropriate.]

3.5.3 System Design

System shall be radial in design with disconnects on each major feeder. Primary feeder cables shall have all conductors insulated for **[15] [5] KV**. Secondary cables shall be copper. High voltage conductors shall be shielded with overall PVC jacket. Provide a separate neutral continuous through each transformation. High voltage cable shall be buried a minimum of 30 inches below grade with cable markers 12 inches above grade of cable. [EFD to add derating requirements for extreme heat.] [Note: looped system excluded based on Value Engineer analysis.]

3.5.4 Transformer

Transformer shall be pad-mounted. The high voltage compartment of the transformer shall include a load break switch with fused circuit for the transformer. The transformed secondary voltages shall be 120/240 volts, single phase, three wires, and solid neutral service to housing units. The demand load calculated for the transformer shall not exceed 90 percent of the nameplate rating of the transformer. The transformer primary overcurrent protection shall be sized in accordance with the NEC, Article **[450–3 (a)].**

3.5.5 Service Entrance

Only one service entrance per building shall be provided. Service entrance conductor shall be buried a minimum of 24 inches below grade with a minimum separation of 12 inches from telephone or TV cables. Service entrances shall be designed not to exceed 10,000 amperes fault current.

3.5.6 Minimum Allowable Demand Factor

The minimum allowable demand factors which are used in calculating loads on primary service equipment, primary feeders, and transformers, shall comply with the NEC, Table **[220–32]**, using connected loads for each living unit calculated in accordance with Article **[220–32 (b)]**.

3.5.7 Length of Service Laterals

The length of secondary distribution service laterals from transformer secondary to building service entrances shall be minimized.

3.5.8 Underground Splices

Underground connection or splices are prohibited, except in boxes or manholes. Splices shall be in a self-draining rodent resistant box.

3.5.9 Street/Area Lighting

Residential street and area lighting shall be provided throughout the site[s]. Street and area lighting shall maintain an average maintained level of illumination of 0.5 f.c. for roads, walks, Tot Lots, and open/common parking areas. Average maintained level of illumination shall be measured five (5) feet above finish grade or paving. Walks, jogging trails, path lighting and Tot Lot lighting may be lit with solar photo voltaic systems. [\[EFD to specify acceptable lamp types as required.\]](#)

3.5.10 Metering

Provide **[a master meter and individual unit metering bases.]** **[Individual metering with total billing]** **[Meters]** **[Meter bases]** shall be visually screened from roads, common parking areas and recreational facilities. [\[EFD to determine most advantages form of metering to the Government\].](#)

3.5.11 Telephone

[Telephone company] will furnish and install **[direct burial]** site distribution cables. Where conduit is required between underground terminal boxes and the buildings, the Contractor shall furnish and install the boxes and conduit at the Contractor's expense. Trenching and associated backfill required to install cables shall be provided by the Contractor. Terminal boxes, splice boxes, conduit, and trenching shall be coordinated and comply with criteria of **[the local company.]** The Contractor is responsible for processing permit fees that are incurred during the final design and construction phase. [\[EFD to modify as required, and insert company name, telephone number and point of contact.\]](#)

3.5.12 Television

Contractor shall provide all trenching, conduit, boxes and associated backfill required to install commercial cable. [EFD to modify for local requirements]

3.5.13 Fire Alarm

Fire alarm system is required if building configuration is apartment style or townhouse with only 1-hour unit separation unit. [Use NAVFAC P & D 96-02.]

3.5.14 Coordination

All work on existing and new electrical and telephone and commercial TV lines to be coordinated by Contractor with [...]. **[Utility trenches shall be adequately sized for joint use by the commercial telephone and commercial TV underground distribution systems.]** The Contractor shall coordinate trenching, telephone **[and TV cable]** installation and backfill all trenches, with the appropriate companies. [EFD to insert PWO, ROICC, Utility Co., etc.]

3.5.15 Site Information

[EFD to insert]

4.0 DWELLING UNIT DESIGN

4.1 DESIGN PARAMETERS

4.1.1 General

Design shall be within the gross areas authorized, see paragraph 1.6. Arrangement of floor area for food preparation, living/dining, sleeping, bathing, circulation (halls), clothes storage (closets), and services should be in balance with, and a function of, the unit size and purpose served.

4.1.2 Energy Efficient Design

Building envelopes and systems should minimize energy consumption through the application of energy-efficient materials, construction details, and equipment selections. The building envelope is the selective pathway to take advantage of climatic resources for heating, cooling and lighting. Careful use of glazing, daylight, insulation, thermal mass, and building systems significantly reduces building energy use. Building efficiency shall be evaluated based on criteria specified in paragraph 1.13.

4.1.3 Design

4.1.3.1 *Functional Arrangement*

The dwelling unit design should provide efficient circulation, area relationships, and furniture placement. The logistics of household management including kitchen access, trash removal, laundry, childcare and maintenance shall be considered in design.

4.1.3.2 *Circulation*

The **[living/dining] [living]** area should be accessible from the front entrance area **[and the kitchen]**, without passing through another room, or long hall. **[The family room (if provided) shall be adjacent and open to the kitchen]**. Patios and balconies shall have direct access from living areas. Bedrooms, and at least one full bath with tub, shall be directly accessible from a hall.

4.1.3.3 *Indoor/Outdoor Integration*

Consideration shall be given to size, layout and location of patios, balconies, sun spaces, yards, views and features that encourage family use of outdoor area. Use of a sliding glass door as a primary unit entry is prohibited. Balconies shall not be built over habitable rooms.

4.1.3.4 Exterior Appearance

The appearance of the total project should provide variety and interest in building exteriors, setbacks, rooflines, materials, textures, fenestration details and color schemes. All project components should be visually integrated and compatible. "Barracks-like" featureless elevations are unacceptable.

[EFD: insert project/site specific features are required to be compatible with local standards. AVOID duplicating design objectives noted above or adding restrictive requirements].

4.1.4 Minimum Dimensions/Areas

The following dimensions and areas are the minimum requirements. See paragraph 4.1.5 for handicap unit exceptions.

Unit/Room Configuration	2 Bedroom	3 Bedroom	4/5 Bedroom		
Living Area	11'-8"(200 SF) 3.55m(18 sm)	—	—		
Kitchen/Dining/Family	9'-6"(150 SF) 2.90 m(13.5 sm)	—	—		
Living/Dining Area	—	11'-8"(215SF) 3.55m (19.35 sm)	11'-8"(225 SF) 3.55 m(20.25 sm)		
Family Room	—	9'-6" (100 SF) 2.90 M(9.0 sm)	10'-6"(125 SF) 3.20 m(11.25 sm)		
Kitchen	—	8'-0"(85 SF) 2.44 m(7.65 sm)	8'-0"(100 SF) 2.44 m(9.0 sm)		
(D = depth; W = width; H = height; SF = square feet)					
Room/Area/Space		Minimum Requirements			
Kitchen Dimension		4'-0" in front of cabinets and/or between cabinets			
Washer/Dryer Space		3'-0"D x 6'-0"W			
Occupant-Owned Freezer Space <i>(Prohibited in Kitchen)</i>		2'-6" x 6'-0"H			
Refrigerator Space		2'-6"D x 3'-0"W x 6'-0"H			
Entry Area		4'-0"			
[Flag Dining Area]		12'-0"W]			
Carports/Garages <i>(if provided)</i>		12'x20' x 7'-6"H			
Balconies <i>(if provided)</i>		6'-0" (72 SF)			
Patio		8'-0" (120 SF)			
BEDROOMS:					
- Master		11'-8" (150 SF)			
- 2 nd Room		10'-0" (120 SF)			
- All Others		9'-6"			
Bathroom (half)					
- Vanity		3'-0"W 2'-0"W			
Kitchen Cabinets		nominal SF of shelf, drawer or counter space			
	Wall	Base	Drawer	Counter*	Pantry

Flag, SO	32	32	20	24	30	
Other 4 & 5 Bedrooms	26	26	16	20	18	
2 & 3 Bedrooms	20	20	16	18	12	
*Exclusive of sink and range area.						
Closets Width (L.F.)						
Closet Depth: Minimum inside clear dimension 2'-0" (1'-6" Linen)						
	Coat	Master	2nd BR	Other BR	Linen	Broom
Flag, SO	5	16	10	6	4	3
FGO	4	12	8	6	3	2
Other	3	10	8	6	2	2
Bulk Storage:						
Interior: Minimum Dimension 2'-6" x 6'-"H						
	2 BR	3 BR	4BR	5BR		
Minimum Floor Area	16	26	36	46		
Minimum Shelf Area	10	14	18	22		
Exterior: Minimum Dimension 4'-0" x 6'-6"H						
	2BR	3BR	4BR	5BR		
Minimum Floor Area	30	40	50	60		
Minimum Shelf Area	16	20	32	32		

Table 4.1.4-1. Minimum Dimensions and Areas

4.1.5 Handicap Unit Requirements

(See 1.1.2 for project requirements)

4.1.5.1 Circulation

Unit circulation, interior and exterior shall comply with UFAS and ADAAG. Interior doors shall be a minimum of 2'-10" wide. Halls shall be a minimum three feet four inches (3'-4") wide. Entry door shall be 3'-0" wide and provided with a second viewer located 42" above finish floor.

4.1.5.2 Design Criteria

Accessible/adaptable unit designs shall comply with the ADAAG requirements for Bathrooms and Kitchens, offset tub controls, door lockset/latchset hardware, and handicap operable window types. Additionally, accessible/adaptable units shall conform to the UFAS and ADAAG for wall switch and thermostat locations, receptacles for interior and exterior visual and audible warning devices (devices not required), and wall blocking for future grab bars and handicap fixtures; Smoke Detectors, Carbon Monoxide alarms, and door bells shall be configured with flashing strobe alarms.

4.1.5.3 Garage/Carport

Where attached garages/carports are provided they shall be a minimum 14 feet wide by 24 feet long, and shall include a direct accessible route to unit entrance in compliance

with ADAAG (at least seven feet to the passenger side of a vehicle inside the garage/carport shall be free of obstruction and on the accessible route). Garage doors shall be a minimum nine feet wide by nine feet high. An overhead garage door opener shall be provided for each accessible/adaptable unit. Maximum slopes for driveways and entrance walks shall not exceed 1/12 slope.

4.2 KITCHEN

4.2.1 Design

Kitchen design should provide an efficient work triangle. Provide a non-combustible plastic laminate or enameled metal backsplash behind range, extending to underside of range hood, color to match range and range hood. See paragraph 4.1.5 for accessible/adaptable unit design requirements. The dishwasher shall be installed adjacent to the kitchen sink.

4.3 LIVING/DINING/FAMILY AREAS

4.3.1 General

Living areas enhance individual and family group recreation, leisure, and entertainment.

4.3.2 Living/Dining Areas

Living/dining areas **[should] [shall]** be designed to be furnishable as a **[single] [separate area.]**

4.3.3 Family Rooms

[Family rooms] and [Dining/Family] areas should be adjacent and open to the kitchen. [Dining/Family areas should be designed to allow flexibility in living/entertainment and furniture placement]. [Family rooms should be designed to allow for joint and/or concurrent activities and flexibility in unit furnishings].

4.3.4 Flag and SO (CO/ICO) Dining Areas

[A separate formal dining room shall be provided for all flag quarters. Dining room shall be accessible from living room, hallway and kitchen, and shall be designed to accommodate seating for twelve. Visual and acoustic separation between dining room and kitchen is required.]

4.4 PATIO/BALCONY AREAS

4.4.1 General

A patio or balcony may be provided for each dwelling unit. **Design and layout shall enhance indoor/outdoor living.** As a minimum, privacy screening/fencing shall be provided between units at each patio and/or balcony, and at building ends. Patio/balcony privacy screening/fencing should be compatible with building exterior finish and design. Chainlink fencing is prohibited. Covered patios or balconies are desirable. **[Outdoor/Patio eating area shall be provided for all Flag and SO (ICO) quarters].**

4.5 BEDROOMS

4.5.1 General

Bedrooms shall be designed to accommodate a king size bed in master bedrooms and twin beds in other bedrooms. Privacy, both visual and acoustic, is required (i.e., use of closet, bathroom, and/or sound insulation) between adjacent bedrooms and also between sleeping and living areas (i.e., Living/Dining, Kitchen/Family, etc.). Minimum bedroom door width shall be 2'–8". **Window, door, and closet placement shall enhance furnishability.**

4.5.2 Emergency Egress

Emergency egress shall comply with requirements of NFPA 101.

4.6 BATHROOMS

4.6.1 Design

Emphasis should be placed on size, furnishings, layout, and privacy. [Direct access to a bathroom from the master bedroom is required for three –[, four–] [and five–bedroom units]. **Compartmentalize bath design, for family and guest use, is encouraged.** See paragraph 4.1.5 for accessible/adaptable unit design requirements. Tubular skylights are desired in each bathroom. Tubs/showers and showers shall not be placed under windows.

4.6.2 Bathroom Criteria

Number of bathrooms to be provided shall be based upon the following criteria shown in Table 4.6-1: **(Additional bathrooms are prohibited).**

No. of Bedrooms on Floor	No. of Bathrooms on Floor with habitable areas *
None	1/2
1 to 2	1
3 to 5	2
*No bathrooms required on a floor with only garage, utility, storage, entrance, etc.	

Table 4.6.2-1. Bathroom Criteria

4.6.3 Required Fixtures

A full bath shall contain a water closet, lavatory, and either a tub with shower assembly or a shower stall. One full bath in each unit shall include a tub with shower assembly. A half bath contains a lavatory and a water closet.

4.6.4 Bathroom Accessories

Bathroom accessories shall include a toilet-paper holder, soap dish, combination tumbler and toothbrush holder, soap dish and grab bar at tub or shower stall, bathrobe hook, and towel bars totaling not less than 48 inches for a full bath and not less than 36 inches for a half bath. A mirror, the width of the vanity and a minimum 42 inches high, mounted over vanity shall be provided at all baths.

4.6.5 Medicine Cabinet

A recessed medicine cabinet shall be provided in each full bathroom. Cabinets shall be corrosion-resistant with mirror doors. Recessed wall cabinets are prohibited in party walls, fire rated partitions and fire walls.

4.6.6 Tub/Shower Enclosures

Showers, and tubs with shower assemblies, shall be provided with **[shower curtain rod] [and a tempered glass or scratch proof plastic enclosure. Shower and tub enclosures shall be trackless design.]**

4.7 LAUNDRY AREA

4.7.1 Design

[Closet space off hallway is acceptable in 2-bedroom units only.] [Separate laundry/utility room areas are required for 3–bedroom, and larger units.] [Laundry/utility areas may be located in attached garage where there is no chance of freezing and there is direct unit access.] Provide both gas (if gas is provided to unit) and electricity hookups for tenant owned clothes dryer.

4.7.2 Access

Laundry closets shall have a minimum net clear door width of five feet four inch (5'-4"). Laundry/utility rooms shall have a minimum two feet eight inch (2'-8") door.

4.7.3 Accessories

Provide a full length, center supported shelf and closet pole, or a combination of wall cabinet, shelf and pole. Shelving shall be a minimum 12 inches deep (nominal), rated for a minimum 50 pounds per linear foot. Particle board and Oriented Strand Board (OSB) shelves are prohibited. Plywood and Medium Density Fiberboard (MDF) shelving shall be sanded, sealed, and varnished or painted, and fully edge banded. Integral plastic coated wire shelves and pole are acceptable in lieu of separate shelf and pole.

4.8 STAIR WIDTH

Stairs shall be a minimum 3'-6" wide and the design should take into consideration furniture movement with the emphasis on turns and adequate areas at top and bottom landings.

4.9 CLOSETS

4.9.1 Design

Closets shall be located to permit placement of furniture in the corners of the rooms by providing an 18-inch return adjacent to a furnishable wall.

4.9.2 Clothes Closet

Closets shall be provided with one 16-inch deep shelf, a 1 ¼-inch diameter closet pole and one 12-inch deep shelf (mounted above the 16-inch deep shelf). A second closet pole and additional shelving is desirable.

4.9.3 Broom Closet

Provide a vertical section and a minimum 12 inch wide storage section, with adjustable shelves.

4.9.4 Coat Closet

Coat closet shall be located convenient to the unit entrance.

4.9.5 Linen Closet

Provide a minimum of five adjustable shelves.

4.9.6 Closet Shelving

Shelving shall be a minimum 12 inches deep (nominal) and rated for a minimum 50 pounds per linear foot. Particle board and oriented strand board (OSB) shelves are prohibited. Plywood and Medium Density Fiberboard (MDF) shelving shall be sanded, sealed, and varnished or painted, and fully edge banded Formaldehyde-free shelving material is **[required] [desired]**. Integral plastic coated wire shelves and poles are acceptable in lieu of separate shelf and pole.

4.10 BULK STORAGE

4.10.1 Storage Types

Each dwelling unit shall be provided with an interior and exterior bulk storage space. Interior storage shall be provided in a separate room, or combined with the utility/laundry area. Exterior storage may be provided in a garage, a separate exterior enclosure or within the living unit with access from the exterior. Six (6) full wall shelves, located on one wall of the storage area, adjacent to the door, are required. Mechanical equipment (gas heating and/or water heaters) shall be separated from bulk storage areas to avoid fire hazards.

4.10.2 Shelving

Shelves shall be a minimum 16 inches deep, rated for a minimum 50 pounds per linear foot, and designed for storage. Particle board and oriented strand board (OSB) shelves are prohibited. Plywood and Medium Density Fiberboard (MDF) shelving shall be sanded, sealed, and varnished or painted, and fully edge banded. Formaldehyde-free shelving material is **[required] [desired]**.

4.11 CARPORTS AND GARAGES

4.11.1 General

A single covered parking space (attached carport) is required for each dwelling units. Two car carports/garages are required for Flag or General Officers. Two car garage/carports are prohibited for other grades. If trash, mechanical, washer/dryer or bulk storage areas are co-located in garage, such areas are in addition to the required car storage area, and should be located to minimize damage to vehicle and personal property. [\[EFD may require garages at locations with severe weather.\]](#)

4.12 ACCESSORIES

4.12.1 Trash/Recycle Area

Paved and sight screened trash areas shall be provided for **[three]** 30-gallon containers at each dwelling unit. Trash/recycle area may be located in attached garage/carport. **[Provide trash collection facilities at the rate of one for every [eight] units, in lieu of individual container spaces. Minimum facility includes concrete slab six feet deep by ten feet wide (6'D x 10'W) with wheel stops. Concrete apron extending eight feet in front of gate and flaring out at 15 degrees from side walls; concrete Masonry Unit (CMU) walls on three sides minimum four feet, eight (4–8) inches high; screening gates (wood or metal; chainlink prohibited); and shall be accessible to units and collection trucks].** [Note: Edit to match size of trash pick-up containers].

4.12.2 House Numbers

Each dwelling unit shall be provided with **[four]** inch high, illuminated house numbers. The Contractor is responsible for obtaining the house numbering system from the Contracting Officer. [EFD modify to comply with local requirements].

4.12.3 Mail Boxes

Contractor shall coordinate with local post office to determine type of local mail delivery; and shall provide approved weatherproof mailboxes for each unit.

4.12.4 Fireplaces

Fireplaces are prohibited.

4.12.5 Clothes Drying Facilities

[Provide a twelve (12) inch long/two (2) inch diameter sleeve complete with hinged cap for rotary (umbrella) type clothes line for each unit. Set sleeve in concrete flush with adjacent grade or slab.]

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5.0 UNIT ENGINEERING

5.1 CONSTRUCTION AND MATERIALS

5.1.1 Foundation System

- **Foundations/Slabs-On-Grade:** Permanent foundations and/or slabs-on-grade, with concrete footings and masonry or concrete foundation walls, are required. See soil report for foundation, slab, and reinforcement requirements. Foundations shall be seismically designed in accordance with the UBC (this requirement is not waived by FMHCSS structural criteria). Provide a positive reinforcing connection between the foundation wall and footing.
- **Manufactured Homes:** The finished perimeter of a manufactured unit shall give an appearance of a permanent perimeter foundation. Material used for closure shall be weather and rot resistant. This closure between the bottom edge of the unit's exterior siding and the finish grade shall be a minimum of eight inches (8") in height. Tongue, wheels and carriage shall be removed and shall remain the property of the Contractor. The enclosed space under the unit shall be vented, and provided with an access panel.

5.2 FLOOR SYSTEMS

5.2.1 Vapor Barrier

- For slabs-on-grade, a 10 mil vapor barrier shall be installed between the gravel base and the slab.
- For crawl spaces, a 10 mil vapor barrier shall be installed over the earth surface.
- For floors over unheated spaces (basements, garages, etc.), a 10 mil vapor barrier shall be installed on the warm side of floor insulation.

[5.2.2 Radon Mitigation

Provide passive sub-slab depressurization systems. The system shall allow for easy conversion to an active mode, with electric power available in attic adjacent to evacuation pipe. System shall be designed and constructed in accordance with EPA document "Model Standards and Techniques for control of Radon in New Residential Buildings", Federal Register 59 CFR 13402 dated 21 March 1994.]

[Note: Include in all projects located in Environmental Protection Agency (EPA) "Priority Area No. 1" (Predicted average radon levels above 4pCi/l). Documents are available from the EPA] IAQ Clearing 1-800-438-4318 or www.epa.gov/iae/construc.html.]

5.2.2 Garage/Carport Floors

Garage/carport floors shall be concrete, **[minimum five inches (5) actual thickness]**, with a construction joint between floor and driveway. Floor shall have a **[six]** inch high raised slab wheelstop, with **[six]** inch high perimeter stemwall, and shall be sloped to drain towards entrance and away from unit. The vertical surface separating slabs shall be painted for safety. The finish wheel stop slab elevation shall be a minimum of four inches below the adjacent unit finish floor. Bulk storage and/or trash slab level, if provided in garage/carport, shall be above garage floor slab, and a minimum of four inches below the adjacent unit finish floor. **[Minimum slab reinforcement shall be 6x6-1010 Welded Wire Fabric]**. See soil report foundation requirements.

5.2.3 Party Floor/Ceiling System

Party floors separating different dwelling units shall have a topping slab of a minimum 1 1/2 inch lightweight concrete. Party floors shall have a minimum one-hour fire resistance rating, in accordance with ASTM E-119. Floor/ceiling construction between dwelling units (party floors) shall be designed to provide the following sound transmission ratings in accordance with ASTM E90 and E492:

- Sound Transmission Class — STC-52
- Impact Isolation Class — IIC-60*
- Floors between dwelling units and garages — STC-50

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

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

Officer may require additional field-testing if it is determined that the quality of construction warrants additional testing.

5.2.4 Laundry/Utility Area Floors

Where floor drains are required, above first floor slab, floors shall have a topping slab of 1 1/2 inch lightweight concrete, sloped to drain.

5.2.5 Balcony Floors

Balcony and upper floor porches, over walks, patios, or private yard areas, shall have sealed solid decking, with an ICBO approved waterproof, slip resistant wear surface. Gutters and downspouts away from patios and/or walks located below shall divert runoff.

5.2.6 Sheathing

Floor sheathing shall be ICBO approved material. Particle board is prohibited. Minimum floor sheathing thickness is 5/8 inch.

5.2.7 Underlayment

Wood floor systems shall be provided with underlayment below all resilient flooring.

5.2.8 Insulation

Insulation shall be any of those listed under Underwriter's Laboratory, Inc. as having a flame spread rating of 25 or less and a smoke development rating of 50 or less. Injected polyurethane is prohibited as an insulation material.

5.2.9 Floor Covering

Bedrooms, halls and living/dining/family room areas shall have **[resilient floor tile, or] carpet**. Kitchens/eating areas, and bathrooms, shall have seamless sheet vinyl flooring **[or, resilient floor tile]**. **[Entry vestibules shall have quarry or ceramic tile.] [Overseas location may utilize local flooring materials and trades to match local methods.]** Seams shall be limited to doorways and passageways between rooms/areas and protected by metal threshold. Floor seams within a room/area are prohibited. Utility and interior storage rooms shall have resilient flooring. Seams in carpet and sheet vinyl (dry areas only) shall be minimized. Materials shall meet the following minimum requirements:

- **Resilient Floor Tile:** 3/32" thickness, ASTM F1006, Standard Specification for Vinyl Composition Floor Tile, Composition 1, Class 2 through pattern.
- **Sheet Vinyl Flooring:** .080" gage and .050" wear thickness, ASTM F1303, Standard Specification for Sheet Vinyl Floor Covering with Backing, Type II, Grade 1, Class A

fibrous back. Flooring shall be installed as a monolithic material with seams welded or bonded for a seamless installation.

- Carpeting: Carpet shall be branded type 6 or type 6.6 nylon or polyethylene terephthalate (PET) 25-100 percent recycled fiber, minimum 26 oz pile weight, 1/10 gauge. Carpet shall have neutral color base with multiple accent colors and be provided with a 10-year stain and soil protection warranty. Carpet shall be provided with either integral urethane cushion, 0.125 inch thick, 18 pounds per cubic foot density or separate padding, 1/2 inch bonded urethane/vinyl, minimum 6-pound density. If separate pad, carpet shall be installed with standard aluminum binder bars and plywood carpet grippers (tack strips). Carpet wear classification shall be “Heavy”.
 - Carpet systems (carpet and cushion tested together, as they will be installed) shall have a minimum average critical radiant flux of 0.25 watts per square centimeters when tested in accordance with ASTM E 648 and CPSC 16 CFR 1630.
 - Fade Resistance standards. Provide carpet complying with ratings for the AATCC 16-1992 Colorfastness to light, for dark colors, a gray scale rating of 4 or better after 180 standard fading hours as compared to AATCC Gray Scale for evaluation of change in color.
 - Static electricity build-up shall be permanently less than 3.5 KV 70 degrees F with 20 percent relative humidity as determined by American Association of Textile Chemists and Colorists (AATCC) Test Method 134, Electrostatic Propensity of Carpets.
 - Provide a minimum tuft bind of 10 pounds for loop pile and 5 pounds for cut pile in accordance with ASTM D 1335.
- Interior Thresholds: Provide interior threshold of nonferrous material where flooring materials or floor levels change.

5.2.10 Stair Finishes

All interior stairs shall be stained hardwood with clear finish or softwood with carpeting. [\[EFD revise as required\]](#).

5.3 WALL SYSTEMS

5.3.1 Party Wall Construction Requirements

[\[Insert applicable Party-wall standards in accordance with NAVFAC Policy and Design Planning Statement \(PDPS\) 96-02, dated 19 December 1996\] \[Per NAVFAC Counsel opinion, these standards are applicable to Privatization projects.\]](#)

5.3.2 Sound Attenuation

Party walls shall provide a minimum sound attenuation rating of STC-55, as determined in accordance with ASTM E90. Walls between dwelling units and garages shall have a minimum STC rating of 52.

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

5.3.3 Exterior Wall Finish

Emphasis should be placed on use of low-maintenance, durable materials. **Use of feature materials for architectural variety is encouraged.** The exterior wall finish material selected shall be applied over waterproof building paper **[or infiltration barrier]** and secured to the wall framing system. Metal siding, painted stucco, paint grade plywood and cement asbestos material are prohibited. All exterior finishes shall be kept a minimum six inches (6") above adjacent finish grade. Factory finish siding shall have a **[25]** year warranty on finish.

- Stucco, cement plaster or synthetic shall be divided into panels with control joints of no greater than 150 square feet. Control joints shall be spaced no more than 10 feet on center.
- Brick shall conform to ASTM C216, Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale). Provide brick cap and flashing for all offset brick veneer. For grade beam design, the brick shall run a minimum of one course below the finished floor and shall be flashed at that level.
- Vinyl siding shall conform to ASTM D3679, rigid Poly Vinyl Chloride (PVC) Siding, minimum 0.044 inch thick, maximum five inch exposure (double-four,

double-five, triple-four sidings are desirable). Vinyl siding shall be installed over a minimum one-inch expanded polystyrene foam insulation. Joints between foam shall be taped and sealed in accordance with manufacture's recommendations.

- Fiber Cement siding, minimum 5/16 inch thick, Factory primed.

[Note: Add/delete material as appropriate].

5.3.4 Interior Wall Finish

Interior wall finish material shall be gypsum wallboard.

- Gypsum Wallboard: Gypsum wallboard shall be 1/2 inch minimum thickness and shall be installed at all walls and all sides of plastic tub and shower stall wainscots. Gypsum wallboard at full bathrooms shall be water-resistant.
- Bathroom Walls: Bathtub/shower combinations and shower stalls shall have a minimum of 6 feet high wainscot.
- All finished interior spaces, including closets, shall be provided with ceramic wood tile or vinyl base.

5.3.5 Sustainable Framing

Wall framing should be constructed to maximize building envelope efficiency. Wall plates shall be provided with double bead of sealant and foam gaskets to minimize perimeter air infiltration. Provide continuous sealant between wall board and exterior wall top and bottom plates, and door and window openings. Building framing should minimize thermal bridging. Where metal framing is used, a minimum of one-inch expanded polystyrene foam insulation shall be provided around perimeter of building envelope. Joints between foam shall be taped and sealed in accordance with manufacture's recommendations. Maximum use of engineered wood material is encouraged. Insulated headers are required in exterior walls. Compressible foam gaskets or expanding urethane foam shall be provided to seal gaps between window and door frames and wall rough openings. Use of alternative building systems (i.e., Structural Insulated Panels, Foam-Form Concrete, Autoclaved Aerated Concrete, etc.), where cost effective, is desirable. [Note: Use/requirement of alternative building system prototypes is encouraged. Prototypes shall look and operate similar to conventionally framed units, and shall NOT impact total project cost.]

5.3.6 Vapor Barrier

A vapor barrier shall be installed at the warm side of exterior walls, including walls between living unit and carport/garage. Vapor barrier shall be lapped and sealed at all corners and between floors. **[Provide a dew point analysis for vapor barrier location performed by registered Architect or Professional Engineer.]**

5.3.7 Insulation

Insulation shall be any of those listed under Underwriter's Laboratory, Inc. as having a flame spread rating of 25 or less and a smoke development rating of 50 or less. Injected polyurethane is prohibited as an insulation material.

5.4 ROOF AND CEILING SYSTEMS

5.4.1 Minimum Slopes

Minimum slopes for roofs shall be as follows:

- Shingle/Tile roofs - 4 inches in 12 inches
- **Metal/Single-Ply roofs — 2 inches in 12 inches**
- **Detached Carport/Garage — ½ inch in 12 inches**
- **Single Ply and Modified Bitumen — ½ inch in 12 inches**

[Note: Consider future solar and photovoltaic applications in roof orientation and slopes.]

5.4.2 Roof Surface

Roof surface shall be light colored, provided with continuous ridge vent, and limited to the following material(s):

- Class A, type fiberglass shingles, with minimum 25 year warranty, conforming to ASTM D3018. [Note: Fungus resistant shingles may be specified in South East or areas with high seasonal humidity.]
- **Minimum 320 pound Class A, laminated or “Architectural” fiberglass shingles, with minimum 25 year warranty, conforming to ASTM D3018.**
- **Minimum of 540 pound, standing or flat seam, metal roofing: .027 inch thick Zinc-Copper-Titanium alloy.**
- **Clay, concrete, metal or fiber glass tile.**
- **Aluminum standing seam 0.032 inch thick.**
- **Seamless membrane, Class A.**
- **Two-ply modified Bitumen membrane system, Class A**
- **Wood shakes or shingles and parapets are prohibited.**

[Note: Modify roof surfaces/slopes, as required].

5.4.3 Gutters & Downspouts

Gutters and downspouts shall be provided for all roof, landing and balcony areas. Downspouts draining onto a lower roof shall have metal or plastic splash deflectors. Splash blocks shall be provided under downspouts, where downspouts are not connected to the storm drainage system.

5.4.4 Roof Soffits, Fascias and Rakes

All soffits and gable end rakes shall be enclosed with factory finished metal or vinyl panels, minimum 0.024 inch thick. Soffit panels shall allow for adequate attic ventilation, and shall be compatible with building finish. Fascias and rake shall be one-inch nominal with solid blocking, or two-inch nominal without. Plywood, hardboard, or gypsum board is prohibited for soffits, fascias or rakes.

5.4.5 Sheathing & Radiant Barrier

Roof sheathing shall be International Congress of Building Officials (ICBO) approved material, minimum 1/2 inch thick. A radiant barrier shall be installed at roof sheathing in accordance with manufacturers' recommendations. (This requirement is not waived by FMHCSS structural criteria).

5.4.6 Roof Trusses

Roof trusses shall be of a "raised-heel" design to allow full thickness of attic insulation over exterior walls and maintain a minimum of two inches (2") above insulation for ventilation.

5.4.7 Vapor Barrier

A vapor barrier shall be installed on the warm side of ceiling/roof insulation.

5.4.8 Ceiling

Ceiling shall be a minimum 1/2" gypsum board.

5.4.9 Insulation

Insulation shall be any of those listed under Underwriter's Laboratory, Inc. as having a flame spread rating of 25 or less and a smoke development rating of 50 or less.

5.4.10 Tubular Skylights

Use of tubular skylights in interior rooms or spaces (i.e., hallways, storage rooms, bathrooms, etc.) to introduce natural lighting is desirable. Skylights and roof windows are prohibited.

5.5 DOORS

5.5.1 Exterior Doors

- **Entrance Doors:** Exterior doors shall be 1-3/4 inches thick, thermal metal. Minimum entry door width is three feet (3'-0"). Weather-stripping shall be factory applied, and limit infiltration to 0.25 cubic ft/min/square foot in accordance with ASTM E283. **A decorative door and a sidelight at unit entry are desirable. [Provide a corrosion-resistance finish at harsh coastal locations.]**
- **Garage/Carport/Unit Door:** Door between garage/carport and dwelling unit shall be a minimum 1-3/4 inch thick, thermal metal, with a three quarters (3/4) of an hour fire rating. Weather-stripping shall be factory applied, and limit infiltration to 0.20 cubic ft/min/square foot, in accordance with ASTM E283.
- **Bulk Storage Door:** Exterior bulk storage door shall be a minimum 1-3/8" thick metal. Door may be deleted when storage area is located in garage.
- **Sliding Glass & Patio Doors:** Sliding glass doors shall be aluminum, conforming to AAMA 101-86 Grade SGD-R15, and provided with an anodized finish or factory baked enamel finish conforming to 44-C-22431, in accordance with requirements of the National Association of Architectural Metal Manufacturer's "Metal Finishes Manual." Sliding panels shall be equipped with screens having extruded aluminum frames mitered at corners, channel-shaped corner angle reinforcement and rollers, top and bottom. Doors shall have interior operated latch, and securing pin or throw-bolt in frame. Screening shall be nonferrous, with protective grill on the lower half. Sliding glass doors shall be double-glazed, with a minimum 1/2" (nominal) space between panes and low 'e' glass. Emissivity ('e') shall be no greater than 0.18. Weather-stripping shall be factory applied, and limit infiltration to 0.25 cubic ft/min/square foot, in accordance with ASTM E283. [Note: modify glazing type where life cycle cost effective (i.e., inert gases, "Heat Mirror" technology, etc.), in accordance with 10 CFR 436, Methodology and Procedures for Life Cycle Cost Analyses.] [Exterior side hinged French style patio doors may be substituted if Activity requires and weather and energy considerations are equal to sliding units.]
- **Aluminum Screen [and Storm Doors]:** Screen [and self storing storm] doors shall be provided for all dwelling unit exterior hinged doors. Frames shall be a minimum of 1-1/4 inch thick and 2 inches wide aluminum alloy material, a minimum of 0.05 inches thick. Doors shall have solid bottom panels (kick plate), and protective grills

between latch and kick plate. **[Weather-stripping shall be factory applied.]** Screening material shall be nonferrous. **[Note: Provide storm doors where heating degree-days exceed 4000.]**

- Weather-Stripping/Exterior Thresholds: Provide nonferrous metal and vinyl weather-stripping for all unit exterior doors. Provide vinyl magnetic weather-stripping for metal door.
- Garage Doors: Garage doors shall be roll-up sectional design. Metal doors shall have 24 **[20]** gauge galvanized steel skins. **Windows or glazed sections in garage doors are desirable.** **[Verify with local command]**. Minimum door width is nine feet, with clear opening height of seven feet, except for handicap units.

5.5.2 Interior Doors

- Room and Closet Doors: Interior passage doors shall be 1-3/8 inches thick, hollow core wood or pre-finished molded acrylic or fiber glass doors. Solid core doors are prohibited. Doors may be faced with stain grade wood veneer, or factory finished and embossed hardboard (i.e., multiple panel, wood grain, etc.). Metal closet doors shall have top, bottom and middle horizontal stiffeners, and shall have a maximum warp and twist of 1/4 inch, as defined by NWMA.
- Sliding Glass & Patio Door Coverings: All sliding glass doors and patio doors shall be provided with vertical blinds. Vertical blinds shall have 3-1/2 inch neutral color PVC vanes, extruded aluminum head channels with wheeled vane carriers, chain pull turning control with auto-rotate mechanism, and separate weighted pull cord. Blinds for French patio doors shall be supported at a maximum 36-inch. on center.

5.6 WINDOWS

5.6.1 General

Windows shall be certified by the National Fenestration Rating Council (NFRC). Windows above the first floor shall have the operable sections that tilt-out or are removable for cleaning purposes. **Bedroom windows shall comply with NFPA 101 for emergency egress.** Windows shall conform to:

- Vinyl Clad Wood Windows: NWWDA I.S.2-87 / Grade R15.
- All Vinyl Windows: AAMA-101V-86 / Grade R15.

[Note: Insert Sustainable composite window types where life-cycle cost effective.]

5.6.2 Window Performance

Minimum window performance standards, certified by NFRC, are:

Weather Regions	U-Values	Solar Head Gain Coefficient	Visual Transmission	Air Leakage
1-3	0.36	0.52	0.53	0.20
4-7	0.32	0.30	0.50	0.25

Weather Regions defined in Table 6.1.1-2.

[Note: modify glazing type where life cycle cost effective (i.e., inert gases, “Heat Mirror” technology, etc.), in accordance with 10 CFR 436, Methodology and Procedures for Life Cycle Cost Analyses]

5.6.3 Screens

Provide screens at all operable sashes. Screens shall be nonferrous and of window manufactures standard design. Aluminum screens shall comply with AAMA 1002.10.

5.6.4 Window Coverings

All windows shall be provided with mini-blinds. Provide blocking at all windows to receive occupant-supplied rods. Mini-blinds shall have one inch (1”) neutral color PVC slats, separate tilt and height controls, metal trucks and head channels and shall be provided with valance.

5.7 HARDWARE

5.7.1 Standards

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

- **Hinges:** BHMA 101, 4-1/2 by 4-1/2 inches at exterior doors, 3-1/2 by 3-1/2 inches at interior doors.
- **Locks and Latches:** BHMA 601, series 4000, grade 2 at exterior doors, grade 2 or 3 at interior doors. Provide trim of wrought construction.
- **Auxiliary Locks:** BHMA 501, series 4000, grade 2, provide trim of wrought construction.
- **Interconnected Lock And Latch:** BHMA 611, grade 2, provide trim of wrought construction.
- **Lock Cylinders:** Cylinders shall have six pin tumblers. Cylinders shall have interchangeable cores which are removable by a control key. Provide a master keying

system. Locks within each family unit, including exterior storage and garage door(s), shall be keyed alike. Contractor shall provide one extra set of cores for each 25 units.

- Keys: Furnish four keys for each key change and for master key system and control key.
- Closers: BHMA 301, series C02000, grade 2 at garage/carport to unit door.
- Closet Doors: Clothes closet doors shall be provided with both top and bottom door guides.
- Door Stops: Stops shall be provided for all doors. Wall mounted stops shall be rubber ball type, mounted at door handle height. Hinge type stops shall be provided where two adjacent doors are located in a common corner. Wall base and door mounted stops are prohibited.
- Dead Bolts: Exterior doors shall be provided dead bolts of matching finish, single master keyed to rest of house.

5.7.2 Applications

- Exterior hinged doors shall have 1-1/2 pair of hinges with non-removable pins (NRP), lockset BHMA 601 and auxiliary lock BHMA 501 or interconnected lock and latch BHMA 611, and viewer mounted at eye level, at entrance door only.
- Exterior bulk storage door shall have 1-1/2 pairs of hinges and lockset BHMA 601.
- Interior doors shall have one pair of hinges and latchset BHMA 601, with F75 or F76 operations.
- Garage door shall have keyed bar lock.
- Doors in fire rated walls and unit-to-garage/carport doors, shall have 1-1/2 pairs of ball bearing hinges, lockset BHMA 601 and auxiliary lock BHMA 501 or interconnected lock and latch BHMA 611 and closer BHMA 301.
- Garage side doors shall have 1-1/2 pair of hinges and lockset BHMA 601.

5.7.3 Coordination

Provide a master keying system compatible with existing base system. Current keying system is based on []. [EFD insert existing master key system].

5.8 PAINTING

5.8.1 Interior Finishes

Interior surfaces, except factory prefinished material, shall be painted a minimum of one prime coat and two finish coats. All walls and ceilings shall be painted with satin or eggshell finish. Trim and doors shall be finish painted with either gloss or semigloss. Blown-on acoustic finish is prohibited.

5.8.2 Exterior Finishes

Exterior surfaces requiring painting shall be minimized. When required, surfaces shall receive a minimum of one prime coat and two finish coats of paint. Wood, trim, frames, etc., shall be back primed. Exterior semitransparent stains, two coats, are acceptable, where appropriate for wood, plywood, etc.

5.8.3 Color Selection

Material colors shall be submitted by the Contractor, and approved by the Contracting Officer and the Housing Authority.

5.8.4 Lead Free

All paints and stain, including color pigments, shall be approved for residential use and shall be 'lead-free'.

5.8.5 Indoor Environmental Air Quality

Paints, shall have a volatile organic compound (voc) concentration of not more than 100g/l. Sealants and Adhesives shall have a voc concentration of not more than 250g/l

5.9 CABINETS AND COUNTERTOPS

Cabinets and countertops shall have a flame spread that does not exceed 200 when tested, in accordance with ASTM E84 and E162. Cabinets shall be factory manufactured, wood or metal.

5.9.1 Wood Cabinets

- Wood cabinets shall comply with ANSI A1.61.1, as modified by the following criteria:
 - Cabinets **[shall]** **[should]** be constructed with formaldehyde-free material.
 - Cabinets shall have frame fronts. Brace top and bottom corners with hardwood blocks, glued and nailed in place.

- Base cabinet bottoms: Cabinet bottoms shall be a minimum 3/16 inch hardwood plywood, or MDF with laminated finish or finished wheat board. Bottoms shall be provided under sinks and lavatories.
- Doors: Minimum 5/8 inch glued-up hardwood or minimum 5/8 inch hardwood frame with hardwood plywood panels.
- Drawer Fronts: Minimum 5/8 inch hardwood, matching doors.
- Drawer Box and Bottoms: Drawer sides and back shall be a minimum 1/2 inch hardwood. Drawer bottoms shall be a minimum 1/8 inch hardwood plywood. Drawers over 15 inches wide shall be braced bottoms, with wood members glued in place.
- Shelves: 5/8 inch hardwood plywood, or 3/4 inch furniture grade particle board or MDF with laminated finish or 3/4 inch wheat board. Shelves shall be supported on ends and on 24 inch centers. Plywood shelf edges which are exposed when doors are open, shall be edge banded. Shelving shall be adjustable.
- Finish: Cabinet front and ends, doors, and drawer, cabinet interiors and shelves shall be factory finished.
- Pull out hardwood cutting boards and lazy susans are desirable.

5.9.2 Metal Cabinets

Metal cabinets shall have double wall, sound deadening doors and drawer fronts, adjustable hinges and baked enamel exterior finish. Cabinet interiors shall be either enameled metal finish or molded plastic lined. Construction shall conform to the National Kitchen Cabinet Association (NKCA) standards.

5.9.3 Cabinet Hardware

Drawers shall be mounted on minimum 20 gauge metal side guides. Hinges shall be spring loaded, self-closing, adjustable cup type, minimum 105 degree swing. Self-adhesive rubber or soft plastic bumpers shall be provided on inside of all doors and drawer fronts.

5.9.4 Countertops

Countertops shall be **[ceramic tile] [high pressure laminated plastic] [solid surface veneer] [solid surface]**. Laminate countertops shall be .043 inch for post-formed tops or 0.05 inch for countertops with separate backsplash, and shall be applied with heat resistive adhesive. Minimum backsplash height is four inches (4"), integral with countertop. **[Note: Alternative countertop materials (i.e., solid surfaces, solid surface**

laminate, etc.) are acceptable provided substitution is justified by a life cycle cost analysis.]

5.9.5 Wall Cabinets

Wall cabinets and pantries shall be mounted flush with ceiling, or shall be provided complete with soffit enclosure between cabinet and ceiling. Access to soffit area, for additional or seasonal storage, is desirable.

5.10 STRUCTURAL STANDARD AND DESIGN

5.10.1 General

- Standards: Structural design (materials and construction) shall comply with the Uniform Building Code (UBC), except for structures which qualify as "Manufactured Homes" under the Federal Manufactured Housing Construction and Safety Standards (FMHCSS), or as specified herein.
- Design Criteria: Structures shall be designed and engineered to the following minimum criteria:
 - Floor live load — **40 psf**
 - Balcony live load — **60 psf**
 - Roof live load — **[EFD insert (20 psf typical)]**
 - Dead load — **Actual**
 - Snow Load **[EFD insert]**
 - Wind load — **[EFD insert load in MPH or psf]**
 - Seismic zone — **[EFD insert]**

Note: Loads may be reduced as permitted by the UBC. This criterion is NOT waived by FMHSCC structural criteria. (See section 7.0 for tie down requirements) TRI-Service TI 809-04 of Dec 98 is applicable.

5.10.2 Lateral Forces

Walls, when used or required for lateral resistance to wind or seismic loads, shall be considered bearing walls and full foundations.

5.10.3 Slope Variations

Allowable variations from level, or specified slopes, shall be as follows: for overall length of surface of 10' or less + 1/8"; up to 20' + 1/4"; up to 40' + 3/8".

5.10.4 Embedded Steel

Nonstructural steel (handrails, etc.) embedded in concrete shall be galvanized or painted wrought iron. All damaged galvanized areas shall be repaired prior to embedding.

5.10.5 Floor System

Wood flooring systems shall be glued and screwed. Glue lines shall not be considered for stress transfer in diaphragm.

5.11 MAJOR APPLIANCES

The Contractor shall provide the following equipment in accordance with specifications listed, one each per dwelling unit:

[Note: These standards are applicable to O&M appliance replacement.]

5.11.1 Refrigerators

Refrigerators shall conform to UL250, two-door, top-mounted frost-free freezer type, with adjustable shelves, separate refrigerator and freezer temperature controls, energy savings switch, separate meat tender and vegetable crispers, and four rollers. [Icemakers are desirable.] Side-by-side models, and models with ice through the door are prohibited. Minimum refrigerator size shall be 20 Cu. Ft. and **consume less than 600 kwh/year** (nominal sizes).

5.11.2 Range and Oven

- **Gas Range:** [Gas Ranges shall be 30", with clock/timer, oven light, removable reflector bowls, black glass window door, broiler pan, self-lock racks, infinite-control switches, and with AGA approved electronic ignition.] Standing pilot flames are prohibited. [06 CO and FLAG unit ranges shall be double oven type.] Over-under microwave/conventional will satisfy double oven requirement. [Ranges shall conform to Federal Specification S-R-440044E.]
- **Electric Range:** [Electric Range shall have four tubular plug-in surface elements of minimum 4,500 watt, removable reflector bowls, rear mounted infinite-control switches, and range indicating lights. Equip oven with a minimum 2,000-watt tubular broil element and one minimum 700-watt tubular bake element, oven indicating light, automatic oven-heat control, utensil drawer, and 1,440-watt grounding-type appliance outlet conforming to NEMA WD 1 configuration 5-15R.]
 - **Cook Top:** UL 858 and UL listed, spill-catching seamless electric cooktop with removable elements and bowls for cleaning.

- **Oven: UL 858 and UL listed continuous cleaning, electric oven. Equip oven with black-glass window door, broiler pan, self-lock oven racks, digital clock with one-hour timer, automatic oven light, oven cycling light, and tempered glass control panel].**

[Note: Modify as required depending on availability of natural, or LP, gas]

5.11.3 Range Hoods

Provide a metal range hood, the same length and finish as range, with separately switched light and exhaust fan.

5.11.4 Dishwashers

Dishwashers shall conform to UL 749 electric type, with air gap, racks, lift out utensil holder and sound insulation. **Dishwashers shall have a minimum Energy Factor of 0.52.** Unit shall include Water Saver and No-Heat Dry features. Unit shall include a water heater booster, with automatic thermostat set for 140 degrees F. Plug connector is required.

5.11.5 Color and Manufacture

Appliances shall be of the same manufacture and have matching neutral finish. **[Appliances in existing on-base housing are [_____].**

5.12 MECHANICAL, ELECTRICAL, PLUMBING

All units and support facilities shall be designed and constructed in compliance with the United States Environmental Protection Agency’s “Energy Star Homes” program requirements. All units shall be provided with “Energy Star Homes” labels.

5.12.1 Mechanical

[Note: These standards are applicable to O&M equipment replacement.]

5.12.1.1 *Equipment*

All materials and equipment furnished shall be the standard cataloged products of manufacturers regularly engaged in production of such materials and equipment, and shall be manufacturers' latest standard design. Equipment shall comply with the requirements of Underwriters' Laboratories, Inc. (UL), American Gas Association (AGA), Air Conditioning and Refrigeration Institute (ARI 210/240-1989), National Electric Manufacturers Association (NEMA), American National Standards Institute, or other national trade association as applicable. [EFD modify/delete standards as required].

5.12.1.2 Design Criteria

The heating **[cooling]** system [s] shall comply with International Mechanical Code, except as provided below. Equipment shall be sized in accordance with Air Condition Contractors association, Manual J. Mechanical systems design shall provide the minimum sized equipment to satisfy design criteria. Room unit heaters, room A/C units, floor furnaces and heat lamps are prohibited. Design of the systems shall be based on the following conditions:

- Winter outdoor design temperature ° F
- Winter indoor design temperature 72 F
- Mean wind speed MPH
- Prevailing wind direction [Compass Heading]
- Summer indoor design dry bulb temperature 78 F
- Summer outdoor design dry bulb temperature ° F
- Daily temperature range ° F
- Heating Degree Days [Number]
- Cooling Degree Days [Number]
- [EFD to insert Activity specific weather data]

5.12.1.3 Heating

Output of heating units shall be adequate to maintain interior design temperature of 72 degrees F.

This project shall be designed for **[Gas-fired forced air heating] [Heat Pump] [Boiler]**.

- **[The force air unit (FAU) shall incorporate an AGA approved electronic ignition, variable speed fan [Sealed combustion Chambers] and unit return air design. FAUs shall have a minimum Annual Fuel Utilization efficiency (AFUE) rating of 90 percent.]**
- **[Boilers: [Heating fuel] [Natural gas] fired sealed combustion boiler, with forced circulation hot water baseboard system. Minimum boiler efficiency is 82 percent. A single boiler shall be provided for each unit, with each individual living space (living/dining, kitchen/eating/family, bedrooms, etc.) thermostatically controlled by means of a three-way diverting valve, or similar approved method. Circulation shall be by means of a three pipe reverse return system. Boilers shall be provided with automatic ignition systems, solenoid shutoff valves, stainless steel weather/draft vent stack and cap and outdoor combustion air intake. Boiler(s) location shall be accessible from the building exterior (not requiring entry to unit for service).] [In addition, boilers shall have built-in heating coil for domestic hot water supply].**
- **[Heat Pumps: Heat pumps shall deliver a minimum SEER of 12 and HSPF of 7.5. Heat pumps shall be provided with supplementary electric resistance heat in**

accordance with manufacture’s recommendation. Electric resistance heaters in excess of 5 kw shall be staged by means of an outdoor thermostat. Outdoor thermostat shall be installed and operated in accordance with the heat pump manufacturer's instructions.] [Note: Selection of heat pumps shall include a thorough analysis of all available energy sources and systems alternatives. Air to air heat pumps shall only be considered at locations with Winter outdoor design temperatures greater than 30 degrees F.]

- **[Geothermal Heat Pumps: Geothermal, or ground source heat pumps shall deliver a minimum SEER of 14.5 and HSPF of 7.9. Heat pumps shall be provided with supplementary electric resistance heat in accordance with manufacture’s recommendation. Electric resistance heaters in excess of 5 kw shall be staged by means of an outdoor thermostat. Outdoor thermostat shall be installed and operated in accordance with the heat pump manufacturer's instructions.]** [Ground source heat pumps shall be used at any Activity where their operating efficiencies result in a simple payback of 10 years or less.]

[5.12.1.4 Cooling

All air conditioning systems shall deliver a minimum "SEER" of 12.0. In order to establish this rating, the Air Conditioning Refrigeration Institute publication "Directory of Certified Unitary Air Conditioners," latest edition, shall be the sole determination and only the information for units coded [RCU-A-C] [RCU-A-CB] shall be used.

Outdoor condenser units shall be grouped together, where practical, and shall be placed on a concrete slab(s). Condenser units shall not be placed under windows of habitable rooms or adjacent to exterior doors. Condenser units shall be screened from unit entries.

Condenser units shall have copper tubes with either plate copper or plate aluminum fins. If aluminum fins are provided, the entire coil shall have a factory applied phenolic coating, dipped and baked to a minimum 1.5 mill thickness.] [EFD insert only when AC is authorized, per OMB Circular A-45, dtd, 20 Oct 1993].

5.12.1.4 Thermostats

[Heat-cooling thermostats shall have separate temperature sensing elements for each system]. Thermostats shall be microprocessor-based, with built-in key pads for scheduling of day and night temperature settings, conforming to NEMA DC3, have an operating range from 55-90 degrees, and shall contain the following selector switches for the system: **[COOL-OFF-HEAT] [System Auto-Off]** and FAN: AUTO - ON. Systems shall be manually changed from heating to cooling. Thermostats shall be a 24 hour setback type with two stages (normal/setback) and shall have a heat anticipator matched to gas valve. [Note: Delete setback requirement air-to-air heat pumps; edit as appropriate].

5.12.1.5 *Air Distribution*

Provide systems conforming to recommendations of the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRE) Engineering Guide. Ducts **[should] [shall]** be placed within the building's conditioned envelope. Ducts shall be zinc-coated steel or factory manufactured flexible, fibrous glass. Fibrous glass duct wall thickness shall be a minimum one inch (1), nominal. Fibrous glass ducts shall be the standard products of a manufacturer regularly engaged in the production of fibrous glass ducts. **[Ducts placed outside the conditioned building envelope shall be provided with a minimum one and one-half inch (1.5") fibrous glass insulation.]** Mechanical fasteners and mastic sealants are required at all duct joints. Supply registers shall have front fixed directional fins and rear volume dampers, operable from the face of the register. **[Location of supply registers shall be coordinated with fire sprinkler system design.]** Returns shall be provided at each living level within a unit. Plastic and/or floor mounted registers are prohibited. Ducts are prohibited within or below on grade slabs. **[Ducts placed outside of conditioned building envelope shall be tested and certified to have less than five perctn (5%) leakage.]**

5.12.1.6 *Humidification*

Provide a self flushing, rotating drum type humidifier with humidistat.] [Note: insert where more than 5000 heating degree days].

5.12.1.6 *Exhaust Fans*

Exhaust Fans and Ducts. Bathroom, Laundry room and Kitchen fans shall be the exhaust types ducted to the outside and provided with a back draft damper. Fans shall be tested and rated in accordance with AMCA 210, provided with AMCA seal and shall operate with 120 volt, 60 hertz, single phase power source.

- Bathroom and laundry room exhaust fans, wall or ceiling mounted, shall be sized to provide a minimum 10 air changes per hour in the space to be ventilated. Fans shall be wall switch operated and have a maximum sound level of 2.0 Sones.
- The range hood exhaust fan shall be provided with a washable filter(s), and have a capacity of not less than 125 c.f.m. Hood fans shall be **[two] [variable]** speed with a maximum sound level of 5 Sones.
- Exhaust fan covers shall be removable or hinged to allow access to fans and motors for replacement and repairs.

[Note: Per NAVFAC pdps 96-OZ , dtd 19 Dec. 1996, Kitchen range hood extinguishing systems are discouraged. However, if they are provided, they shall be installed in compliance with NFPA 96 and shall shut down the heat source of the cooking equipment (gas or electric) upon discharge. Retro Fit Range Hood Extinguishers (small self-contained devices that mount magnetically to the underside of the range hood) are prohibited for safety reasons.]

5.12.1.7 *Ceiling Fans*

Wall switch operated, UL approved, flush mount ceiling fans in living/dining area, family room and bedrooms are **[prohibited] [desired]. [Fans shall be provided with three-speed reversible motors with permanently lubricated ball bearings and four blades. Fans shall be sized in accordance with manufacture’s recommendations, and maintain 12 inch clearance between ceiling and fan. Except for Dining Room, wall mounted light fixtures (sconces) shall be provided in rooms with ceiling fans. Fan mounted light fixtures are prohibited.]**

5.12.1.8 *Dryer Vents*

Provide a four inch (4") dryer vent with discharge to the exterior for connection to occupant-owned dryer (one dryer to a vent). The vents shall be rigid aluminum, with exterior wall cap and back draft damper. Vent pipes shall be a maximum 25 feet long, with no more than two right angle elbows (with minimum six-inch radius), and have a maximum vertical run of 12 feet. Dryer vents shall not exhaust in the immediate vicinity (minimum of six feet) of the air conditioning compressor units, entry doors or patios/balconies.

5.12.2 Electrical (Interiors)

The code for the electrical system shall conform to the National Electric Code (NEC), except as provided below. [\[Per NAVFAC Policy and Design Planning Statement \(PDPS\) 96-02, dated 19 December 1996\]](#) [\[Per NAVFAC Counsel opinion, these standards are applicable to Privatization projects\]](#)

5.12.2.1 *Carbon Monoxide Alarms*

Provide CO alarms in accordance with UL 2034, NFPA 720 and NFPA 101 in all housing units utilizing carbon-based fuels for heating, hot water, cooking, or clothes drying. An alarm shall be provided on each habitable floor. Detector shall be located immediately outside of the bedrooms on the wall and shall have digital display, peak level memory, hand-wired AC power w/ battery back-up. Alarms shall be mounted at least five feet above finish floor level. Overseas units shall be battery powered if 120V, 80 mA max, if 60 Hz is not available. If available, use hard-wired units. Project work shall include 3% extra alarms as spares. Alarms shall have minimum 80db alarm. [\[See NFGS-13856\]](#)

5.12.2.2 *Fluorescent Lamps and Ballasts*

Lighting fixtures shall be provided complete with T-8 730 (70+ Color Rendering Index and 3,000 Correlated Color Temperature) straight, U-shaped or Cicle lamps, or T-4 827 compact fluorescent lamps (CFL)’s. All lighting fixtures shall be provided with instant start electronic ballasts. Unit lighting fixtures shall have a minimum overall lumen per watt (LPW) rating of 60, including ballasts. Minimum individual lighting fixture LPW

rating is 50, including ballast. [Note: These standards are applicable to O&M lighting replacement.]

5.12.2.3 Telephone

Contractor shall prewire dwelling units in accordance with local telephone provider's requirements. Duplex wall outlets shall be provided in living room, and bedrooms. Provide a wall mounted outlet in kitchen/family area. Telephone wiring for each outlet shall terminate in a lockable exterior enclosure (one enclosure per building). [Note: Duplex outlets, combined with standard twisted pair wiring shall allow for access to second phone line or dedicated modem outlets.]

5.12.2.4 Television

Contractor shall prewire dwelling units in accordance with local cable television provider's requirements. Duplex coaxial television outlets shall be provided in living room, kitchen/family area, and bedrooms. TV wiring for each outlet shall be terminated and tagged in a lockable exterior enclosure (one enclosure per building).

5.12.2.5 Door Bell

Front entrance to each unit shall be provided with a low voltage bell. Bell shall be centrally located in unit.

5.12.2.6 Smoke Detectors

Provide smoke detectors in accordance with NFPA 72 and 101. [Improvements projects shall be provided with detectors in each bedroom.]

5.12.3 Plumbing

5.12.3.1 Code

The plumbing system shall conform with International Plumbing Code (IPC), except as provided below.

5.12.3.2 Material-Piping

Water piping under concrete slabs shall be copper tubing, type K annealed. Joints under the slabs are prohibited. Interior water piping shall be type K or L, hard-drawn, copper, PVC or CPVC Plastic Pipe, conforming to ASTM D2846, SDR II. Fittings for annealed copper tubing shall conform to ANSI B16.22. PVC and CPVC pipes larger than 3/4 inches shall be schedule 40, in accordance with ASTM D 1785 with schedule 80 fittings. Solvent cement used for joining PVC and CPVC pipe and fittings shall bear the National Sanitation Foundation Seal of Approval for use in potable water system. All PVC and CPVC pipe to metal fittings to be frictional type (threaded or union). Under-slab supply piping shall be limited to unit service entrance only. Lead solder is prohibited.

5.12.3.3 *Material-Gas Connections*

The use of semirigid tubing and flexible connectors for gas equipment is prohibited, except for the flexible connection to the range. Range connections shall conform to ANSI Z21.45 with a maximum 40 inches length. Interior gas piping shall be black iron. Galvanized pipe is prohibited. Provide accessible gas shutoff valve and coupling at each gas equipment and appliance, including tenant owned dryer. [Note: revise to comply with local/seismic codes].

5.12.3.4 *Plumbing Fixtures*

Fixtures shall be provided complete with fittings, and chromium-, or nickel-plated brass (polished bright or satin surface) trim. All fixtures, fittings, and trims shall be from the same manufacture and shall have the same finish. Access panels shall be provided for all tubs and showers, except at exterior and party walls, and where tub and/or showers are back to back.

- Traps: Traps for lavatories and sinks shall be chromium-plated, adjustable-bent tube, 20-gauge brass, or plastic (ABS).
- Faucets: All faucet handles shall be single control washerless types with aerators, seals, and seats combined in one replaceable cartridge: designed to be interchangeable with all lavatories, bathtubs, and kitchen sinks; or having replaceable seals and seats removable by either as a seat insert or as a part of a replaceable valve unit. **Faucets shall be provided that limit flow to 2.0 gallons per minute.** [Note: These standards are applicable to O&M equipment replacement.]
- Showers And Shower/Baths: Shower/bath combination shall be controlled by diverter valve. Waste fitting Type II pop-up, concealed with all parts removable and renewable through the overflow and outlet openings in the tub. **Showers and shower/baths shall be equipped with a combination valve and flow control device to limit the flow to 2.2 gallons per minute.** [Note: These standards are applicable to O&M equipment replacement.]
- Piping: All piping shall be concealed. Stops will be provided on all water supply lines to all plumbing fixtures, except for tubs and showers.
- Wall And Floor Penetrations: Piping which penetrates fire rated walls or floor/ceiling assemblies shall be completely metallic for a minimum distance of six inches (6") on either side of the assembly. Penetrations shall be sealed to maintain fire resistance integrity as tested, per ASTM E-814.

5.12.3.5 *Water Closets*

Water closets shall be in accordance with Specification ANSI A112.19.2, with trim conforming to A112.19.5. Closets shall be provided with close coupled siphon jet, floor

outlet with wax gasket, closed front seat and cover, glazed trap and an antisiphon float valve. **Water consumption shall be not more than 1.6 gallons per complete flushing cycle.** Air assisted flush design is desirable.

5.12.3.6 *Lavatories*

Lavatories shall be acrylic molded counter top with integral bowl (cultured marble), in accordance with ANSI Z124. Lavatories shall have Type I pop-up drains.

5.12.3.7 *Bathtubs*

Bathtubs shall be in accordance with specification ANSI A112.19.1 (porcelain-cast iron), A112.19.4 (porcelain-steel). Tubs shall have porcelain on steel panels, or acrylic wainscot. Integral bathtubs and wainscots and one-piece wainscots are prohibited. Shower head and one piece temperature/flow valve shall be included in bathtub assembly. **[Solid surface tub surrounds may be provided when justified by a life-cycle cost analysis.]**

5.12.3.8 *Showers*

Shower stalls shall be cross-linked acrylic (solid surface). Fiberglass shower pans shall be set in mortar, plaster or other bedding material, in accordance with manufactures' recommendations. One-piece shower units are prohibited.

5.12.3.9 *Kitchen Sinks*

Kitchen sinks shall meet specification ANSI 112.19.3, Type 302 stainless steel, 20 gauge minimum, seamless drawn, and sound deadened. Sinks shall be double bowl (minimum 33 x 21 inches), self-mounting without mounting rings, complete with stainless steel cup strainer and plug. Hose/sprayer with faucet is desirable.

5.12.3.10 *Garbage Disposals*

Garbage disposals shall conform to UL 430, minimum 1/2 horse power (HP) motor, stainless steel grinding elements, two 360-degree stainless steel swivel impellers, manual motor reset, and sound insulation. Plug connector is required.

5.12.3.11 *Clothes Washer Connections*

Hot and cold water supply and drain line shall be provided for occupant owned automatic clothes washers. Washer connection, complete with 2" drain, 3/4" hose thread supplies shall be provided in standard manufactured recessed wall box with single face plate. Boxes constructed of sheet steel shall have a corrosion resistance epoxy enamel finish. Boxes shall be mounted a minimum 2'-10" above finish floor. Electrical outlets are prohibited in supply/drain boxes. Floor drains shall be provided where clothes washers are located above the first floor. Floor drains shall be drained as indirect waste, and shall be provided with required protection from sewer gas infiltration.

5.12.3.12 *Water Heaters*

Water heaters shall be in accordance with **[ANSI Z21.10.1 (gas)] [UL-174 (electric)]**. Water heaters shall be glass-lined, steel tank types with polyurethane foam insulation, replaceable anodes. Selected combustion water heaters are **[desired] [required]**. **[Gas water heaters shall have a minimum Energy Factor of 0.62.] [Electric water heaters shall have a minimum Energy Factor of 0.92.]** Water heaters shall be factory set at a maximum 115 degrees F. **Water heaters shall be provided with heat traps, either integral to tank or as part of plumbing system.** Combination drip pans and floor drains, or a drip pan and separate drain, shall be provided where water heaters are located above the first floor, and shall drain to the exterior. **[Water heaters shall be seismically strapped/braced]**. Combination pressure and temperature relief valves shall be provided, and shall drain to the exterior or indirect waste. **[Note: These standards are applicable to O&M equipment replacement.]**

Unit type	Water heater (gas)	Waters heater (elec)
2 BR	30 Gal.	30 Gal.
3 BR	40 Gal.	50 Gal.
4 & 5 BR	50 Gal.	60 Gal.

Table 5.12.3-1. Water Heater Standards Per Unit

5.12.3.13 *Hose Bibs*

Hose bibs shall be provided at the front and rear of each building (adjacent to the patio), for each ground level living unit. **[and shall be frost proof] [provide with backflow prerenters]**.

5.12.3.14 *Piping Insulation*

All plumbing piping running in crawl spaces, attics or exterior walls, and all hot water piping shall be provided with 0.5-inch insulation jacket.

5.12.3.15 *Shock Absorbers*

Shock absorber units, to control water hammer, are required at clothes washer and dish washer supplies. Air chambers are unacceptable.

5.12.4 Automatic Sprinklers

[Automatic residential fire sprinklers shall be provided in accordance with NFPA [13D] [or] [13R], as required by section 5.A.3.a.] [Note: In compliance with 1992 Fire Safety Act (15 USC 2227) and NAVFAC PDPS 96-02, dtd 19 Dec. 1996]

Whole House Improvement Project: Residential sprinklers are not required unless the improvement cost of a multi-family housing unit exceeds 70% of the initial replacement value of the unit (5' line cost)] [Note: In compliance with 1992 Fire Safety Act (15 USC 2227) and NAVFAC PDPS 96-02, dtd 19 Dec. 1996]

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6.0 ENERGY REQUIREMENTS

6.1 REQUIREMENTS

Improvement projects shall incorporate Energy Conservation Options (ECO's) with a simple payback of 10-years, or less, as estimated by Family Housing Energy Auditor software.

6.1.1 Standards

This project shall be designed in accordance with the following standards:

6.1.1.1 Composite 'R' Values

Minimum composite 'R' values for Wall, Roof, Floor (over unconditioned space) and Slab assemblies, exclusive of openings.

Weather Region	Cooling/Heating	Walls	Roofs	Floor	Slabs ¹
1	<2000 — >7000	R-19	R-60	R-30	R-10/8 ft
2	<2000 — 5500-7000	R-19	R-49	R-19	R-10/4 ft.
3	<2000 — 4000-5499	R-19	R-49	R-19	R-10/4 ft.
4	<2000 — 2000-3999	R-13	R-38	R-11	R-5/2 ft.
5	<2000 — <2000	R-13	R-30	R-11	R-5/2 ft.
6	>2000 — <2000	R-13	R-30	R-11	R-5/2 ft.
7	>2000 — >2000	R-19	R-38	R-11	R-5/2 ft.

Table 6.1.1-1. Degree Days

Minimum 'U' values, as certified by NFRC:

- Windows *See Section 5.6.2*
- Sliding glass doors 0.35
- Entry doors 0.43

6.1.1.2 Infiltration

Dwelling units shall be designed and constructed to limit uncontrolled air leakage (infiltration) to a maximum of 0.33 air changes per hour (ACPH) natural and 2.5 ACPH at 50 Pascals.

6.1.1.3 Energy Budget

The Contractor shall provide computer models certifying that the project has been designed to a energy budget of not more than [] BTU/Net Square Foot/Year for heating **[and cooling]**. Computer models shall be run using DOE-2, BLAST-3, HOT2000 or

¹ Perimeter insulation/distance returned under foundation.

REM/Design energy simulation software packages. [Note: insert applicable energy budget from table below.]

WEATHER REGIONS	CDD	HDD	BUDGET
1	<2000	>7000	60
2	<2000	5500-7000	50
3	<2000	4000-5499	45
4	<2000	2000-3999	45
5	<2000	<2000	40
6	>2000	<2000	55
7	>2000	>2000	60

Table 6.1.1-2. Energy Budgets² (BTU/SF/YR)

6.1.1.4 *Air-to-Air Heat Exchanger*

[Conditioned spaces shall be wrapped with an air infiltration barrier, installed in accordance with the manufactures’ recommendations. An air-to-air heat exchanger shall be provided to maintain a 0.5 air change per hour.] [Note: insert when HDD exceed 6000]

6.1.1.5 *Solar*

[The project shall be designed with Passive solar energy system(s).] [Minimum domestic solar hot water systems contribution is 45%.] [Minimum solar space heating systems contribution is 25%]. [EFD insert were solar energy system has a payback of \leq 10 years.

²[Includes: Heating, Cooking, Domestic Hot Water, (DHW), cooking and plug loads. Calculate DHW consumption at 17 gallons per person per day.]

APPENDIX B MANUFACTURED HOUSING AREAS

7.0 MANUFACTURED HOUSING AREAS

7.1 GENERAL REQUIREMENTS

Manufactured housing areas may be provided for privately-owned and government-owned manufactured homes where a need has been determined. This section provides the basic criteria for construction and improvement of Manufactured Housing Parks (MHP). Provide MHP's complete with roads, parking areas, storage and support facilities, and all required utility systems.

7.1.1 Site Selection

The same factors used in selection of sites for conventional housing (i.e., hazards, noise, distance, etc.) should be considered in determining the suitability of a site for a manufactured housing area. Where possible new MHP's shall be located adjacent to existing parks.

7.1.2 Site Planning

In developing layouts, the following shall be considered:

7.1.2.1 Street Layout

Streets shall be designed to allow movement of housing units, and to minimize cut and fill.

7.1.2.2 Landscaping

Retain existing trees and groups of trees where possible. Landscape plans shall include work to be included as part of the basic park construction and any phased future landscaping.

7.1.2.3 Parking

Parking space shall be provided at a rate of two off-street spaces for each dwelling unit. In addition, one guest parking shall be provided for every four units.

7.1.2.4 Density

Plan to a density of approximately 6 units per gross acre.

7.1.2.5 Clearances

Minimum separation between units of not less than 15 ft (4.57 m).

7.1.2.6 *Paved areas*

Site paving shall be minimized. Paved pads under mobile homes shall not be provided; however, care shall be taken to prevent the creation of ruts and other damage to soil by mobile home wheels during moves in and out. Foundations, tie-downs, and skirting for mobile homes is the responsibility of individual owners.

7.1.2.7 *Walkways*

Concrete sidewalks or walkways shall be provided on both sides of streets within the park.

7.1.2.8 *Parking And Patios*

Patios, unit access, parking and storage shed foundation shall be incorporated in a maximum 10-ft x 50-ft paved strip, adjacent to unit.

7.1.2.9 *Exterior storage*

Provide individual storage sheds, on concrete slabs, for each unit. Sheds shall be a minimum of 40 square feet (Min. Dimension: 4'-0" x 6'-6"H).

7.1.3 Utilities and Street Lighting

Utility and street lighting requirements for MHP's are the same as for a conventional housing neighborhood. For design purposes, assume all units have three bedrooms. Unless there are overriding considerations (e.g., bedrock, etc.), place secondary electric services underground. All utility connections shall terminate within the rear one-third of the mobile home space. Electrical connections shall terminate 65 ft (19.8 m) from the front and 15 ft (4.6 m) from the curb side of each manufactured housing unit space.

7.1.3.1 *Meters*

Individual meter bases shall be installed for each utility provided.

7.1.4 Recreational Areas

Recreational facilities shall be designed and constructed in accordance with DOD standards (The Technical Manual Children's Outdoor Play Areas, Navy P-383). Recreational facilities shall be provided for three age groups:

- Tot Lots — (Ages 2 years to 5 years)
- Play lots—(Ages 6 years to 9 years)
- Playfields — (Ages 9 years & above)

7.1.4.1 Accessibility

Locate outdoor play areas convenient to the walkway system. At a minimum, provide 5 ft (1525 mm) wide accessible routes with ADAAG approved solid surface material, ramps, and transfer points at outdoor play areas.

7.1.5 Laundry Building

A laundry building may be included in the basic design. Buildings shall be sized for one washer and one dryer per four manufactured housing spaces. [Note: Dependent on the non-availability of existing facilities at nearby on-base locations or off-base commercial establishments]

APPENDIX C COMMUNITY CENTERS

8.0 COMMUNITY CENTERS

8.1 GENERAL

This section provides criteria for Family Housing Community Centers (FHCC).

8.1.1 FHCC Design Objective

A FHCC serves as a neighborhood or community's **social focal point**. **The building's exterior appearance should be compatible with adjacent housing units**. Likewise, the building should be integrated into the neighborhood's pedestrian circulation pattern.

8.1.2 Building Size

Building size is based on the number of families it supports.

Number of Families	Maximum GSF
< 99	2000
100 - 199	4000
200 - 500	6000
[Note: FHCC support should be limited to no more than 500 families]	

Table 8.1.2-1. Building Size Per Number of People

8.1.3 FUNCTIONAL DESIGN

Room sizes, configurations and design need to be responsive to end users' varying requirements. Consideration may be given to multipurpose **spaces divisible by movable partitions where overlapping or similar functions are required**. FHCC design considerations should include the following:

- Energy Efficiency, Sustainable Design and Recycling
- Access (Pedestrian, Vehicular and handicapped)
- Security/Area Lighting
- Landscaping
- Recreational areas
- Assembly space and meeting rooms
- Kitchen size and equipment
- Trash Disposal
- Appropriate support spaces (i.e., public toilets, lobby, etc.)

8.2 ACCESSIBILITY REQUIREMENT

FHCC's shall be designed as accessible facilities in accordance UFAS and ADAAG.

8.3 TYPE OF CONSTRUCTION

Construction shall conform with the requirements for assembly occupancy.

APPENDIX D WELCOME CENTERS

9.0 WELCOME CENTERS

9.1 GENERAL

This section provides the basic criteria to be used in the design of Housing Welcome Centers (HWC's).

9.1.1 Housing Welcome Center Image

The Welcome Center is often the first impression military members and their families have of their new duty station. The image portrayed is important in creating a sense of welcome. As such, it should set a tone of quality service and professionalism. The overall appearance of the interior and exterior of the building, and the arrangement of staff workspaces are essential elements of this effort. The HWC should convey an appearance which promotes pride and commitment to customers and staff.

9.1.2 Planning Considerations

Project development should take into account the current and projected authorized staff sizes, the existing and proposed HWC spaces and their adjacencies or inadequacies, the potential for retention and renovation of existing facilities, and the need for additions or new construction. HWC projects shall also incorporate Energy Efficiency, Sustainable Design and Recycling.

9.1.3 Functional Design

Daily functions performed by a HWC are divided between areas requiring extensive one on one contact with military customers and areas requiring limited customer interaction. Functions requiring contact with customers include Assignment/Termination, Housing Referral/Departure, Receptionist, Furnishings, Lease Negotiations, and self-help. Functions requiring limited customer interaction include Housing/Deputy Housing Directors, Project Managers, Budget and ADP. Office design layout should incorporate functional responsibility, the degree of customer interaction, general office flow, and some areas that offer a degree of customer/counselor privacy.

9.1.3.1 Support Areas

HWC may also include the following support areas. These include a children's play area, break room/kitchen, conference room, storage and file rooms, Automated Data Processing (ADP) area, waiting room, Phone banks, mechanical and electrical room, rest rooms (with diaper changing areas), and vestibule.

9.1.4 Space Allowances

The size of a HWC is a function of the authorized staffing level.

9.1.4.1 Space Criteria Summary

The Space Criteria Summary recommends square footage functional areas, and minimum dimensions for all functional office areas which will vary in accordance with the activity sizes.

9.1.4.2 Office Area Allowance

The following tables provide a guideline, by functional areas, for space requirements and activity sizes.

Offices	Area (SF)
Housing Director	140
Facility Manager/Personnel Support Manager	120
Site Manager	120
Inspectors/Budget Finance	100
ADP Specialist	120
Secretary/Receptionist	100
Counselors/Interpreters	100
Clerks/Self-Help/Volunteers	100
Referral Specialist	120

Table 9.1.4-1. Guidelines by Functional Areas

Functional Areas	Small **	Medium	Large
Waiting	200	250	350
Counseling	200	250	350
Play Area	80	150	250
Conference	120	250	350
Storage	50	100	200
Break Room	50	80	120
File Space	50	120	300
Self-Help	100	250	350

**Smaller HWC's may not have all of these areas.

Table 9.1.4-2. Guidelines for Space Requirements

Activity	Size
Small	has fewer than 200 housing units
Medium	between 200 and 1000 units 120
Large	has more than 1000 units 120

**Includes government owned, leased and controlled housing in your total assets.*

Table 9.1.4-3. Activity Size by Units

9.1.4.3 *Additional Functions*

In addition to the provision of area for individual functional areas, space should be allotted for the following functions and items:

- Brochures/maps/touch screen information station with (24 hour access)
- Bulletin Boards
- Fax and Copy Machines
- Circulation
- Video viewing for housing referral, assignment, departure services, etc.
- Self-help Area and training room (where included in HWC)

9.1.4.4 *Co-Located Functions*

Local conditions may require the co-location of the following additional functions within the HWC:

- Housing Furniture/Equipment Storage
- Contractor Office Area
- Military Desk
- Overseas - Interpreters, Legal, and Utility Counselors.

9.1.4.5 *Site Managers Office*

When a site manager is located away from the HWC, a separate office should be provided using the guidelines in the Space Criteria Summary for staff, reception, common area and storage.

9.1.5 Design Considerations

In addition to floor area allowance, it is important to consider requirements for customer satisfaction and staff productivity and morale. **Considerations should include:**

- An open design that facilitates staff availability to the customer and provides visibility into the waiting room, children's play areas, and other public areas.
- Oversight of children in play area: The customer should be able to visually check on the status of children without leaving the counseling session.
- Privacy. The ability to conduct business or counsel families in an area away from coworkers and other customers.
- Counseling. Provision of adequate space for family of four to meet with a counselor, view computer screens, and fill out forms, and review maps and diagrams.

- Locate the break room, janitor's closet, mechanical/electrical room, and public toilets near each other to minimize utility costs.
- Entrances: There are two that requires the main entrance with vestibule at the front of the building and a second entrance for staff only.

9.1.6 Children's Play Area

Children's play areas entertain children accompanying the customer to the HWC. Additional connection with an outdoor play area is encouraged. An important consideration in any design of a supervised play area is the establishment and maintenance of visual connectivity between the parents and the children. This may include a shatter-resistant viewing window where parents can see their children playing. The play area should be designed to accommodate a television, located high on a wall out of reach of the children.

9.1.7 Signage

Signage begins with the street approach to the facility. Upon entering the base, customers should encounter signs directing them to the "Housing Welcome Center." Entry to parking areas should be clear. If the opportunity exists, separate parking should be provided for customers and government/staff vehicles. From the parking area, signage should provide clear directions to the entry and receptionist. All exterior signs should be well lighted for viewing during night hours.

9.1.8 Facility Location

The following should be considered in siting a new HWC:

- Relative convenience to the supporting facilities a family would be using during the check-in and check-out procedures. Consult the Base Master Plan for recommendations on site development.
- The HWC may be co-located with a Community Center, Self-Help Store, or the Furnishings Warehouse. Co-locating the HWC with other activity functions, such as the Family Services Center or Household Goods, is recommended.
- c. Consider local conditions, climate and orientation of spaces to maximize the use of sunlight for interior lighting and winter heating and exterior shading to reduce summer cooling load. Priority should be given to energy conservation and savings in determining HWC location and configuration.

9.1.9 Architectural Appearance

Each Activity, climate and site will influence the appearance and layout of the HWC. The architectural design of the facility should be in keeping with the base exterior

architectural standards and guidelines. The interior design should complement the overall building design. The use of natural light sources help project a feeling of openness and welcome.

9.1.10 Accessibility Requirements

HWC's shall be designed as accessible facilities **in accordance UFAS and ADAAG.**

9.1.11 Type of Construction

Construction shall be permanent type conforming to the requirements for assembly occupancy.

APPENDIX E

SELF-HELP CENTERS & WAREHOUSES

10.0 SELF-HELP CENTERS & WAREHOUSES

10.1 GENERAL

This section provides the basic criteria for Family Housing Warehouse and Self-Help Centers (SHC).

10.2 SHC DESIGN OBJECTIVE

The building's exterior appearance should be compatible **with adjacent neighborhood[s]**. The SHC should be sited convenient to both the neighborhoods pedestrian circulation pattern and the Welcome Center.

10.3 BUILDING SIZE

SHC size, including Warehouse area, should be based on the number of units it supported:

No. Units	Maximum GSF ³
50 - 199	2000
200 - 499	4000
500 - 999	6000
>1000	8000

Table 9.1.11-1. Building Size by Number of Units

10.4 FUNCTIONAL DESIGN

Building configuration and design need to be responsive to Activity specific requirements. Special consideration should be given to self-help training and issue spaces. SHC design considerations should include the following:

- Energy Efficiency, Sustainable Design and Recycling
- Access (Pedestrian, Vehicular and handicapped)
- Security/Area Lighting
- Landscaping
- Trash Disposal
- Appropriate support spaces (i.e., toilets, mechanical, etc.)

10.5 ACCESSIBILITY REQUIREMENTS

SHC's shall be designed as accessible facilities in accordance UFAS and ADAAG.

10.6 TYPE OF CONSTRUCTION

Construction shall conform to the requirements for warehouse occupancy.

³ Self-Help area should approximately ¼ of building area.

APPENDIX F

PUBLIC, PRIVATE VENTURE (PPV)

11.0 PUBLIC, PRIVATE VENTURE (PPV)

[Note: These and requirements are intended for PPV development on Government land where local building and zoning authorities don't have jurisdiction or standards.]

11.1 DESIGN CRITERIA

(New/Replacement Construction & Improvement): **[On and Off-Base Construction and Improvement]**

11.1.1 Unit/Building Design and Sustainable Development

The appearance of the total project shall provide variety and interest in building exteriors, massings, building setbacks, rooflines, materials, textures, fenestration details and color schemes. All project components shall be visually integrated and compatible. No unit entrance should require more than one story walk up or down from adjacent parking grade. Laundry area, bulk storage space and covered parking for each unit is desirable.

11.1.2 Energy Efficient Design

Newly constructed units shall be certified "Energy Star Homes." Improvement and repairs shall comply with U.S. Environmental Protection Agency "Energy Star" program standards for Building envelopes, HVAC, DWH, lighting systems, and Appliances. Use of Sustainable Development principles is required. A minimum "Bronze" rating, on attached Sustainable Development workbook [Tab G] is required for all Construction and Improvement work.

11.1.3 Multi-Family Housing

Multi-Family housing buildings, with more than two units under one roof, shall be designed and constructed in accordance with the Public Law 102-522, 15 USC 2227. Additionally, party walls should be designed with minimum STC rating of 55 and party floors/ceilings should be designed with minimum STC and IIC of 52 and 60, respectively.

11.1.4 Accessibility Design

Project shall be designed in compliance with the American Disabilities Act Accessibility Guidelines (ADAAG). & Uniform Federal Accessibility Standards (OFAS). [Insert applicable portions of Appendix – A criteria.]

11.1.5 Site Design

Building arrangements should be informal and imaginative, providing a balance of view, privacy, variety and convenient access for guests. Design should conform to varying terrain conditions to provide attractive residential patterns and streetscapes. Solar orientation shall be incorporated into overall Design. The street and walk systems should

provide convenient and safe access and circulation (including collections, deliveries, and fire protection) within the housing area.

11.1.6 Recreational Facilities

Age based on appropriate facilities should be provided.

Tot lots	One Tot lot per 50 units.
Picnic Areas	One picnic area per 75 units
Basketball Courts	One full court per 150 units

Table 11.1.6-1. Recreational Facilities per Units

11.1.7 Building Sites

Housing site shall be located within **[30-minutes] [One-hour]** from **[main gate or address]**. Housing is prohibited within a 100-year-flood water line **[,specify other prohibitions such as sewage treatment plants, highways, etc.]**.

11.2 UNIT PARAMATERS

[Should be adjusted to include existing units.]

11.3 UNIT SIZES

Per 10 USC 2880, units acquired or constructed via PPV are not subject to maximum NSF size limitations of 10 USC 2826.

- The Secretary concerned shall ensure that the room patterns and the floor areas of military family housing units are generally comparable to the room patterns and floor areas of similar housing units in the locality concerned.
- Inapplicability of Limitations on Space by Pay Grade shall not apply to military family housing units acquired or constructed under this subchapter.

11.4 CONSTRUCTION CRITERIA

[Note: These standards should only be applied to construction and/or improvement work on Government property (on or off-base) – construction, or private developer provided, land is subject to local zoning, planning and building codes and standards. Insert applicable portions of Appendix A criteria.]

11.4.1 Site

The site[s] and existing units are described on the enclosed RFP drawings and includes approximately [...] acres and [...] units. This project shall be developed within the project boundary indicated on the enclosed drawings. These drawings indicate existing

topography, site conditions, units and locations of utilities. The Developer shall be responsible for confirmation of drawing information.

11.4.2 Applicable Standards

Design, construction and improvement shall be in accordance with the latest addition of the following codes:

- National Electric Code, NFPA No. 70, [insert year] Edition .
- Uniform Building Code (UBC), [insert year] Edition.
- International Mechanical Code (MC), [insert year] Edition.
- International Plumbing Code (MC), [insert year] Edition.
- National Fire Protection Association (NFPA) Life Safety Code, NFPA 101.
- NFPA 24 Private Fire Service Mains.
- NFPA 54 National Fuel Gas Code.
- NFPA 72 Household Fire Warning Equipment.

11.4.3 Construction and Life Safety

Construction shall conform to the fire resistance, area and height limitations of the UBC, except as noted herein. Structures shall conform to the exit facilities, means of egress and hazard protection requirements of NFPA 101.

11.4.4 Family Size

For planning purposes, the following family size criteria shall be used:

Size of Unit	No. Persons
2 Bedroom	3
3 Bedroom	5
4 & 5 Bedroom	6

Table 11.4.4-1. Units per Family Size

11.5 STREETS AND DRIVES

Intersections [should] [shall] be separated by a minimum of 125 feet. Cars backing out onto subcollector streets are prohibited.

11.5.1 STREET WIDTH CRITERIA

Street designation is based on Average Daily Traffic (ADT), assuming eight-vehicle trips per unit per day.

- Nonresidential Streets (1000 + ADT):
 - Major street systems external/connecting to residential area.
- Residential Subcollector Streets (250 to 1000 ADT):

- Both ends open to traffic.
- Residential Access Streets (less than 250 ADT):
 - Where only one end open to traffic and a minimum 35 ft (11 m) radius, or 50 ft (15 m) radius with curb parking, maximum 1000 feet in length.

(On-Street Parallel Parking)				
TYPE OF STREET	No Parking	One Side	Both Sides	Curb Radius
Non-Residential	28 ft (8.5 M)	32 ft (9.8 m)	40 ft(12 m)	30 ft (9 m)
Residential Sub-Collector	24 ft (7.3 m)	32 ft (9.8 m)	36 ft (11 m)	25 ft (7.6 m)
Residential Access	20 ft(6m)	30 ft (9 m)	30 ft(9m)	20 ft (6 m)

Figure 11.5-1. Minimum Street Width Standards

11.5.2 Parking

Parking space shall be provided at a rate of **[two]** off-street spaces for each dwelling unit. In addition, one guest parking should be provided for every **[four]** units.

11.6 PEDISTRIAN CIRCULATION

- **Street Signs:** Street name and traffic control signs (i.e., NO PARKING , STOP, CAUTION CHILDREN AT PLAY , etc.) shall be provided and shall conform to requirements of Bureau of Public Roads Manual, Uniform Traffic Control Devices for Streets and Highways. Names of Streets will be provided by Navy.
- **Protection At Retaining Walls And Exterior Steps:** Handrails and guard railing shall be provided at all exterior steps, retaining walls and top of slopes, adjacent to walks and/or units, where finish grade separation is 24 inches, or greater and slope is 3:1 or greater. Chainlink fencing, in-lieu-of guard railing, is **[prohibited]** **[undesirable]**. Tread and riser design shall be twice the riser plus the tread equals 26 inches ($2R + T = 26"$).

11.7 RECREATIONAL FACILITIES

Recreational facilities shall be designed and constructed in accordance with Consumer Product Safety Commission Standards.

11.7.1 Accessibility

Provide accessible routes with ADAAG approved solid surface material, ramps, and transfer points at outdoor play areas.

11.7.2 Surfacing Materials

A playground safety surface, in accordance with ASTM F355, Shock-Absorbing Properties of Playing Surface Systems and Materials, ASTM F1292, Impact Attenuation of Surface Systems Under and Around Playground Equipment shall be provided throughout.

11.8 LANDSCAPE DESIGN & MAINTENANCE

Landscape design shall:

- Use regionally native plants
- Minimize adverse effects on the natural habitat
- Require reduced use of fertilizers and pesticides
- Implement water-efficient practices

The Landscape plan shall be designed by a registered landscape architect, experienced in residential Xeriscape site planning and planting design. The design shall reflect appropriate groupings, foundation plantings, and street tree plantings to define the open spaces to ensure a complete landscaped project. Provide complete landscaping consisting of ground covers, trees, shrubs/bushes, [and irrigation]

11.9 GRADING AND DRAINAGE

All work, except grading, drainage, [utility connections], and [access roads], shall be confined within the project boundaries indicated on the attached drawings. Under no circumstances shall work be performed off the Government property. Storm drainage design shall be by the rational method using [10-year one hour] storm frequency. All runoff onto the site from adjacent properties shall be included in the storm drainage calculations. The Developer is responsible for capping and/or relocation of all existing utility systems, not to remain in service. [Note: modify as required and insert site specific requirements.]

11.9.1 Government Soil and Foundation Report

A Soil and Foundation report is included as part of the RFP Appendix [] The requirements contained in the Government's soils investigation report are mandatory. Proposed, or requested, changes by the Developer shall be submitted with appropriate technical data, and are subject to approval by the Contracting Officer.

11.9.2 Developer Soil and Foundation Report

The Developer shall provide a separate independent report. The independent soils and foundation report, including logs of exploration locations, and additional soil borings, testing and investigation shall be furnished with the Developer's design submittal. This report shall be prepared by a registered professional civil/geotechnical engineer,

experienced in soil mechanics, and shall certify the adequacy of the soil and foundation aspects of the design, including but not limited to: [Note: modify as required to include special conditions, including testing by a cathodic engineer at locations with known or suspected corrosive soils.]

- Earthwork construction
- Cut and fill slopes
- Streets and pavement design
- Surface and subsurface drainage
- Erosion and siltation prevention during and after construction
- Foundation stability
- Settlement or heave
- Cathodic testing]

11.9.3 Surplus Materials Disposal

Developer shall dispose of clearing, grubbing, surplus earth materials, stripping, and similar materials, off site and at no additional charge to the Government. Recyclable material (i.e., concrete, AC pavement, etc.) **[should] [shall]** be recycled. Developers shall include a recycling plan with their 60% design submittal. [On-station depository locations will be designated by the Contracting Officer.]

11.9.4 Minimum and Maximum Grades:

- Surface drainage:
 - 0.5% minimum gutters, streets and small lined ditches
 - 10% maximum allowable street grades
 - 1.0% minimum small unlined ditches and swales
 - 2.0% minimum unpaved area drainage
 - 1.0% minimum other paved surfaces
 - 12 % maximum allowable drive/driveway grade
 - 2.0% minimum street crown or cross slope
 - 5.0% maximum street crown or cross slope
 - 5.0% minimum for first 10 feet away from building
 - [33 % maximum unlined ditch/swale side slopes]
 - **[33% maximum cut/fill slopes (3:1)]**

11.9.5 Surface Storm Drainage

Drainage system shall be properly coordinated with surrounding properties to insure that runoff does not cause damage to other properties. Ponding on the site is prohibited **[, except where indicated on site drawings]**. Surface drainage, of more than 10,000 square feet, shall not be channeled between adjacent buildings in open drainage swales or ditches. Surface collection swales or open ditches, draining more than the area between two buildings, shall be no closer than 10 feet to any building. The site shall be graded so that no drainage flows across a driveway or walk to reach a storm drain inlet.

11.9.6 Maximum Gutter Flow

Maximum flow in all gutters shall be restricted to the quantity which will cause flooding of 1/2 of the adjacent traffic lane (maximum six feet) at the design storm. When this flow is reached, it shall be intercepted by catch basins.

11.9.7 Underground Storm Drainage

Collection and disposal systems shall be designed to provide a minimum flow velocity of three (3) feet per second when flowing half full. Discharge areas shall be protected to prevent erosion. [Note: delete where underground drainage systems are not practical/possible]

11.9.8 Site Information

[EFD to insert]

11.9.9 Coordination

[EFD to insert]

11.10 WATER DISTRIBUTION SYSTEM

Provide a water distribution system capable of meeting both domestic and fire flow requirements. Connect to the existing utility system as indicated on the drawings. The Developer is responsible for coordinating with the local **[utility] [base]** and paying any connection fees or charges. Provide tracer wire for all non-metallic underground water lines, both mains and laterals. Provide marker tape 12 inches above underground water mains. [Note: define limits of Developer's responsibilities concerning fees, charges, and/or services, as required]

11.10.1 Mains

Mains shall be considered as that part of the distribution system supplying fire hydrants, or fire hydrant laterals. Water distribution mains shall be looped with no dead ends. Minimum main size is eight (8") inches. Sufficient sectional control valves shall be provided so that no more than two fire hydrants will be out of service in the event of a single break in a water main. The pipe, valves, and all other materials shall meet the American Water Works Association (AWWA) standards for a 150 p.s.i. working pressure system, and shall be disinfected in accordance with AWWA C651. **[Provide sacrificial anodes for all metal valves and pipe.]** [Note: revise as required]

11.10.2 Flow requirements

Water must be supplied by mains of appropriate capacity to provide 500 g.p.m. at one-story units, 750 g.p.m. at two-story structures, [and 1,000 g.p.m. at three-story structures] for a flow duration of 1-1/2 hours. This mandatory flow is over and above

domestic requirements. Pressure shall be a minimum of 20 p.s.i. at each outlet after allowing for friction, elevation, and other pressure losses. Pressure shall not exceed 135 p.s.i. at any point in the system. Pressure entering each unit shall not exceed 75 psi. Units exceeding 75 psi. shall be equipped with pressure reducing valves (PRV) between main and the unit.

11.10.3 Trenches

Water and gas mains may be installed in the same trench, with the gas main placed on a shelf at least 12 inches above, and to one side of, the water mains. Water main shall have a minimum of three (3'-0") feet earth cover.

11.10.4 Fire Hydrants

Developer shall coordinate with [base] [local fire department] for type and style of fire hydrants. Hydrants shall conform to AWWA standards [C502 dry barrel] [C503 wet barrel], valves shall conform to AWWA standards C500. A minimum of two fire hydrants shall be provided within 500 feet of each building as measured via route of fire apparatus travel. No dwelling unit shall be more than 350 feet, by paved road, from a hydrant; measured from the furthest portion of the building (i.e. far rear corner). Hydrant laterals shall be 6 inch minimum size, shall not exceed 50 feet in length, and shall have an underground shutoff valve. Valve box, at each lateral, shall be located within 10 feet of the hydrant, and shall not be located where obstructed by parked vehicles, shrubbery, etc. Hydrants shall be located three to seven feet from pavement, and shall not be located in sidewalks or where obstructed by parked vehicles, shrubbery, etc. Guard post barriers shall be provided where hydrant locations are subject to vehicle damage.

11.10.5 Shutoff Valves

Each building and unit shall be provided with shutoff valves.

11.10.6 Coordination

All work on existing and new water lines is to be coordinated by Developer with [...].
[EFD insert PWO, ROICC, Utility Co., etc.].

11.10.7 Site Information

[EFD to insert].

11.11 SANITARY SEWAGE SYSTEM

Developer shall provide a new sewage collection system and connect to the existing sewer as indicated on the drawings. Provide tracer wire for all non-metallic underground sanitary sewer lines, both mains and laterals. Provide marker tape 12 inches above all sanitary lines. [EFD to insert specific project requirements and define limits of Developer's responsibilities concerning fees, charges, and/or services.]

11.11.1 Design Criteria

Design flows shall be calculated using the Manning formula. Manholes are required at all changes of direction and spaced not more than **[500]** feet apart. The minimum manhole diameter is 42 inches, with 24 inch diameter cover. Pipes shall be designed to flow full and maintain a velocity of **[2.0]** feet per second.

11.11.2 Sewer Mains

Design shall be based on an average daily per capita flow of sanitary sewage of 100 gallons per day with a peak hourly factor of four (4). Mains shall be designed and installed to provide gravity drain laterals from all units.

11.11.3 SEWER LATERALS

Each unit or building lateral shall be connected directly to a sewer main. Laterals from one building shall not cross under another building.

11.11.4 Trenches

Sewer and water lines, mains and/or laterals, shall not be placed in the same trench. Separate trenches shall maintain a minimum 10 feet lateral separation. Where sewers cross water mains the top of the sewer shall be a minimum 18 inches below the bottom of the water main, or the water main shall be constructed with mechanical-joint pipe for a distance of 10 feet on each side of the sewer.

11.11.5 Coordination

All work on existing and new sewer line to be coordinated by Developer with [\[EFD to insert PWO, ROICC, Utility Co., etc.\]](#).

11.11.6 Site Information

[\[EFD to insert\]](#).

11.12 GAS DISTRIBUTION SYSTEM

Developer shall provide a gas distribution system, connected to existing systems indicated on the drawings, and designed in accordance with ANSI Z223.1 **[and] [local codes] [Activity requirements]**. A gas regulator shall be provided for each dwelling unit or building structure. Provide tracer wire and marker tape 12 inches above all gas distribution lines. Provide [\[EFD to define limits of Developer's responsibilities concerning fees, charges, and/or services, as required\]](#)

11.12.1 Valves

Plug valves shall be installed at intersections of mains, and other locations so that interruptions to service can be confined to not more than 30 units.

11.12.2 Mains/Service Lines

Lines shall not be placed under any buildings. Lines shall be placed with a minimum of 24 inches of earth cover. Protection shall be provided from superimposed street or heavy traffic loads.

11.12.3 Materials

Pipe shall be polyethylene (PE) ASTM-D2513, with fittings complying with ASTM D2683 or D2513, or reinforced epoxy resin gas pressure pipe and fittings, complying with ASTM D2517. Connections to metal pipe shall comply with ANSI B16.5 or manufacturer's recommended standards. Risers to buildings shall be wrapped steel or iron pipe. . **[Provide sacrificial anodes for all metal valves and pipe.]**

11.12.4 Testing

The Developer shall prove the entire system, of gas mains and service lines, to be gas tight by air test, in accordance with ANSI B31.8. Test shall continue for at least 24 hours between initial and final readings of pressure and temperature.

11.12.5 Metering

Provide individual unit metering devices.

11.12.6 Coordination

All work on existing and new gas lines to be coordinated by Developer with [EFD to insert **PWO, ROICC, Utility Co., etc.**].

11.12.7 Site Information

[EFD to insert].

11.13 ELECTRICAL DISTRIBUTION

Developer shall provide new electrical distribution system in compliance with NEC, ANSI C2 and NFPA 70, with connection[s] at location[s] shown on the drawings. Available power is [...] KV **[overhead] [underground]** (wire, [...] phase/[...] volts, 60 hertz primary). **[The Developer is responsible for terminating and/or relocation of all electrical systems.]** [EFD to define limits of Developer's responsibilities concerning fees, charges and/or services, as required, and add project specific requirements.]

11.13.1 Transformer

The demand load calculated for the transformer shall not exceed 90 percent of the name plate rating of the transformer. The transformer primary overcurrent protection shall be sized in accordance with the NEC, Article **[450-3 (a)]**.

11.13.2 Service Entrance

Only one service entrance per building shall be provided. Service entrances shall be designed not to exceed 10,000 amperes fault current.

11.13.3 MINIMUM ALLOWABLE DEMAND FACTOR

The minimum allowable demand factors which are used in calculating loads on primary service equipment, primary feeders, and transformers, shall comply with the NEC, Table **[220-32]**, using connected loads for each living unit calculated in accordance with Article **[220-32 (b)]**.

11.13.4 Underground Splices

Underground connection or splices are prohibited, except in boxes or manholes. Splices shall be in a self draining rodent resistant box, with a plastic or concrete cover.

11.13.5 Street/Area Lighting

Residential street and area lighting shall be provided, with an average maintained level of illumination of 0.5 foot candles (fc) for roads, walks, tot-lots, and parking areas. Average maintained level of illumination shall be measured five feet and above finish grade, mid point between light fixtures.

11.13.6 Metering

Provide individual meters.

11.13.7 Telephone

Terminal boxes, splices boxes, conduit, and trenching shall be coordinated with, and comply with criteria of, **[the local company]**. The Developer is responsible for processing/permit fees that are incurred during the final design and construction phase. **[EFD to modify as required, and insert company name, telephone number and point of contact.]**

11.13.8 Television

Developer shall provide all trenching, conduit, boxes and associated backfill required to install commercial cable. **[EFD to modify for local requirements]**

11.13.9 Coordination

All work on existing and new electrical and telephone and commercial TV lines to be coordinated by Developer with[....].

11.13.10 Site Information

[EFD to insert as required].

11.14 BUILDING ACCESSORIES:

11.14.1 Trash/Recycle Area

[Paved and sight screened space shall be provided for [three] 30-gallon containers at each dwelling unit.] [Provide sight screened trash dumpster and recycle collection facilities at the rate of one for every [eight] units, in lieu of individual container spaces.]. [Select method].

11.14.2 House Numbers

Each dwelling unit shall be provided with [] four inch high, reflecting or illuminated house numbers. The Developer is responsible for obtaining the house numbering system from the Contracting Officer. [Modify to comply with local requirements].

11.14.3 Mail Boxes

Developer shall coordinate with local post office to determine type of local mail delivery; and shall provide approved weatherproof mailboxes for each unit.

11.15 BUILDING SYSTEMS

11.15.1 Foundation Systems

11.15.1.1 Foundations/Floors

See soil report for foundation, slab, and reinforcement requirements. Foundations shall be seismically designed in accordance with the UBC (this requirement is not waived by FMHCSS structural criteria). Provide 10 mil vapor barrier under slabs and floors over unheated spaces.

11.15.1.2 Insulation

Insulation shall comply with UL Standards., having a flame spread rating of 25 or less and a smoke development rating of 50 or less.

11.15.1.3 Radon Mitigation

Provide passive sub-slab depressurization systems for projects located in EPA "Priority Area No. 1. System shall be designed and constructed in accordance with EPA document "Model Standards and Techniques for control of Radon in New Residential Buildings", Federal Register 59 CFR 13402 dated 21 March 1994. Documents are available from the EPA Radon Information Center, (703) 356 5346, IAQ Clearing House at 1-800-438-4318 or www.epa.gov/iaq/construc.html. [Note: Include as required.]

11.15.2 Wall Systems

11.15.2.1 Fire Partitions/Walls and Sprinkler Systems

- **Fire Protection:** Multi-Family housing building, with more than two units under one roof, shall be designed and constructed in accordance with Public Law 102-522, 150SC 2227. See www.hsgnavfac.com for specific requirements.
- **Vapor Barrier:** A vapor barrier and/or building wraps shall be installed at all exterior walls and ceilings. Vapor barrier and building wraps shall be lapped and sealed at all corners and joints in accordance with manufactures recommendations. [Provide adew point analysis for vapor barrier location.] [EFD modify for extreme climates (i.e., SE where warm moist air is on outside.)]
- **Insulation:** Insulation shall comply with UL Standards, having a flame spread rating of 25 or less and a smoke development rating of 50 or less.

11.16 STRUCTURAL STANDARD AND DESIGN

11.16.1 Standards

Structural design (materials and construction) shall comply with the Uniform Building Code (UBC), except for structures which qualify as "Manufactured Homes" under the Federal Manufactured Housing Construction and Safety Standards (FMHCSS), or as specified herein.

11.16.2 Design Criteria

Structures shall be designed and engineered to the following minimum criteria:

- Floor live load **40 psf**
- Balcony live load **60 psf**
- Roof live load **[EFD insert (20 psf typical)]**

- Dead load **Actual**
- Wind load **[EFD insert load in MPH or psf]**
- Seismic zone **[EFD insert]**

Note: Loads may be reduced as permitted by the U.B.C. This criteria is NOT waived by FMHSCC structural criteria.

11.16.3 Lateral Forces

Walls, when used or required for lateral resistance to wind or seismic loads, shall be designed and constructed as bearing walls.

11.17 MECHANICAL

11.17.1 Design Criteria

The heating[/cooling] system[s] shall comply with International Mechanical Code. Design of the systems shall be based on the following:

- Winter outdoor design temperature **F**
- Winter indoor design temperature **72 F**
- Mean wind speed **MPH**
- Prevailing wind direction **[Compass Heading]**
- Summer indoor design dry bulb temperature **78 F**
- Summer outdoor design dry bulb temperature **F**
- Daily temperature range **F**
- Heating Degree Days **[#]**
- Cooling Degree Days **[#]**

[\[Note: Provide air conditioning in locations where authorized by OMB Circular A-45.\]](#)

11.18 ELECTRICAL (INTERIORS)

11.18.1 Code

The electrical system shall be designed and constructed in accordance with the National Electric Code (NEC), NFPA 70.

11.18.2 Special Outlets

240v electric outlets for occupant-owned electric dryer, where in-unit laundry areas are provided is required.

11.18.3 Smoke Detectors

Provide smoke detectors in accordance with NFPA 72 and 101. **[For Whole House Improvement Projects, hard-wired smoke detectors will be provided in every sleeping room.]**

11.18.4 Lighting

Interior and exterior building lighting shall comply with EPA Energy Star Standards.

11.18.5 Appliances

All provide appliances shall comply with EPA Energy Star Standards.

11.19 PLUMBING

11.19.1 Code

The plumbing system shall be designed and constructed in accordance with the International Plumbing Code.

11.19.2 Automatic sprinklers

Automatic residential fire sprinklers systems when required, shall be designed and constructed in accordance with NFPA **[13D] [or] [13R]**, as required by paragraph 15.b.1

[Whole House Improvement Project: Residential sprinklers are required when improvement cost of a multi-family housing unit exceeds 70% of replacement value of the unit.]

12.0 ENERGY AND ENVIRONMENTAL MANGAGEMENT

[Coordinate this section with PPV RFQ/P Appendix __.]

12.1 RADON

- [Navy Housing Radon studies indicated [no Radon exposure recorded above the Environmental Protection Agency's (EPA) recommended action level of 4 PC/L] [...insert summary of test results...]. Activity is located in an EPA Radon Zone [1] [2] [3] (see attached map). Accordingly, [no mitigation or management actions are required] [...insert specific mitigation design, construction and management requirements...].
- [Housing shall be managed in accordance with EPA recommended testing and mitigation practices. EPA's Radon home page can be found at: www.epa.gov/iag/radon.]

12.2 LEAD-BASED PAINT (LBP)

- [Insert LBP assessment Activity "Executive Summary" findings and recommendations; mitigation and management.]
- Housing constructed prior to 1978 shall be managed and maintained in accordance with the United States Department of Housing and Urban Development (HUD) guidelines, "Guidelines for the Evaluation and Control of Lead-Based paint Hazards in Housing" (HUD USER (800) 245-2691), EPA/HUD Real Estate Notification and disclosure Rule of 6 March 1996 (4 CFR part 35 and 40 CFR part 745), and other applicable Federal regulations.
- HUD's Office of Lead Hazard Control home page can be found at: www.hud.gov/lea/leahome.html.
- Disposal or conveyance of existing Navy housing units is subject to requirements of USC.

12.3 ASBESTOS (ASB)

- [Insert ASB assessment Activity "Executive Summary" findings and recommendations; mitigation and management.]
- Housing shall be managed and maintained in accordance with EPA regulations, "Purple Book".

12.4 ENERGY STANDARDS

- New and Replacement construction and Improvement of existing units shall comply with EPA's Energy Star Homes program requirements.
- Sustainable Development principles should be incorporated in all proposed Construction and Improvement. The United States Department of Energy's (DOE) Sustainable Design home page can be found at: <http://www.sustainable.doe.gov>.

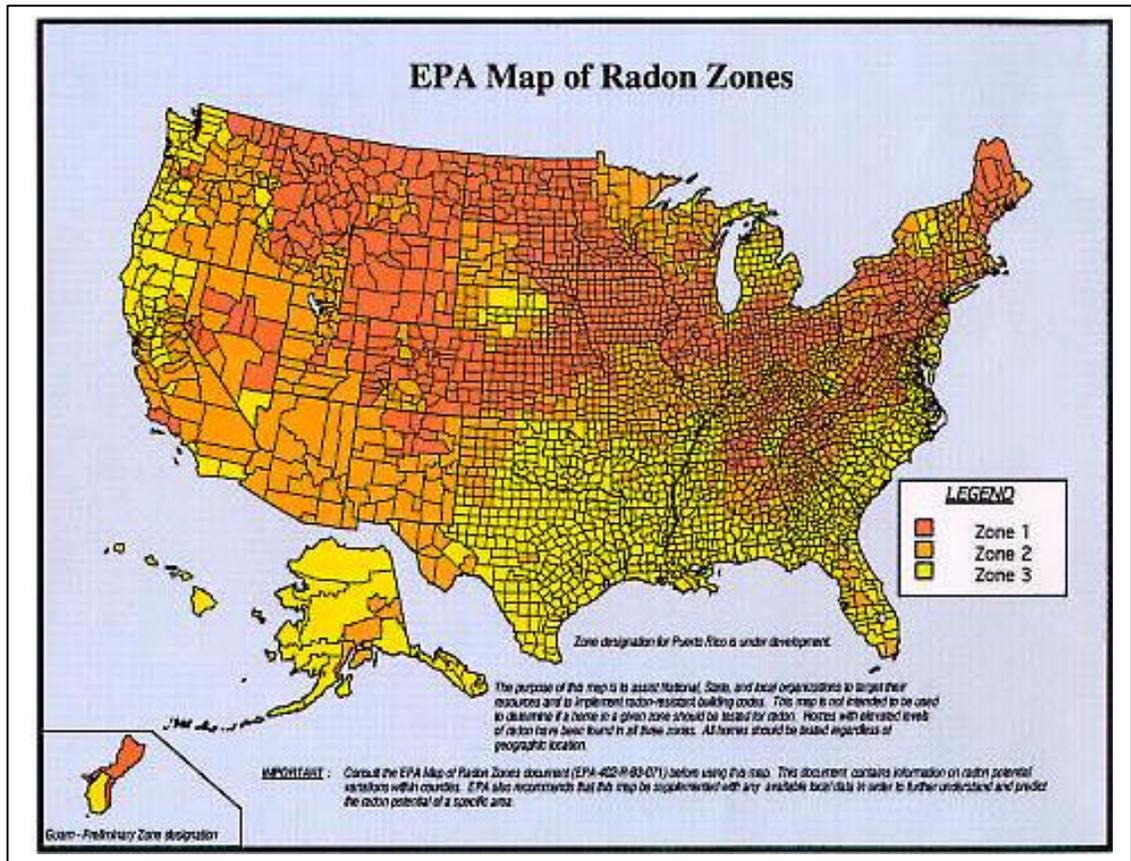


Figure 12.4-1. EPA Map of Radon Zones

APPENDIX G

TECHNICAL EVALUATION MANUAL

13.0 EVALUATION FACTORS FOR AWARD AND PROPOSAL SUBMISSION REQUIREMENTS

The contract resulting from this solicitation will be awarded to that responsible offeror whose offer, conforming to the solicitation, is determined to be the most advantageous to the Government considering price and technical evaluation factors. Technical factors combined will be given approximately equal weight with price in evaluating proposals. Technical ratings will be assigned based on five major factors: (1) Project Design; (2) Sustainable Development, Material Quality, Maintainability, and Life-Cycle Cost (3) Past Performance; (4) Experience; and (5) Commitment to Small Businesses.

PART 1 – TECHNICAL EVALUATION FACTORS.

The factors (1) Project and Design (2) Sustainable Development are approximately equal in weight followed by factors (3) Past Performance; (4) Experience; and (5) Commitment to Small Business which are approximately equal in weight. Subfactors are arranged in descending order of importance.

Technical evaluation factors are more fully defined as follows:

13.1 FACTOR (1) PROJECT DESIGN:

The design demonstrates solid comprehension of the functional and technical requirements and offers viable solutions. The aspects related to the design solutions which will be considered include: suitability, creativity, efficiency, functionality, desirability and attractiveness.

- Dwelling Unit Design and Layout
- Exterior Appearance
- Building Configuration and orientation and streetscape
- Landscape and Irrigation
- Recreation
- Pedestrian and Vehicular Traffic Pattern and Circulation
- Grading and Drainage
- Utility Systems

13.2 FACTOR (2) SUSTAINABLE DEVELOPMENT MATERIAL QUALITY AND MAINTAINABILITY AND LIFE CYCLE SUSTAINABILITY COST:

The design demonstrates sustainability cost: maintainability, quality, reliability, and of the engineering aspects of the design.

- Quality of Material
- Construction/Components/Systems
- Environmentally Sensitive Design
- Energy Efficiency

- Appliances and Equipment
- Mechanical and Plumbing Systems
- Electrical Systems

13.3 FACTOR (3) PAST PERFORMANCE:

[NOTE: EFD INSERT DEFINITION]

13.4 FACTOR (4) EXPERIENCE:

[NOTE: EFD INSERT DEFINITION]

13.5 FACTOR (5) COMMITMENT TO SMALL BUSINESSES:

[NOTE: EFD INSERT DEFINITION]

14.0 TECHNICAL SUBMITTAL REQUIREMENTS

14.1 FACTORS (1) PROJECT DESIGN AND (2) SUSTAINABLE DEVELOPMENT, MAINTAIN ABILITY AND LIFE CYCLE COST:

14.1.1 Division 1 – General

- Completed Sustainable Development Rating Worksheet [Attachment 1]
- All catalog cuts, technical information, and manufactures' literature shall be clearly marked (Hi-lighted, stamped arrow, etc.) noting item(s) proposed or alternatives.

[Note: EFD may insert other proposer worksheets as appropriate.]

14.1.2 Division 2 – Sitework

- Playfield Equipment and Structures
- Play Area, Tot-Lot Surfacing Materials
- Site and Street Furnishings
- Irrigation Equipment: Sprinkler Heads, Controllers
- Other Sitework Items Proposed
- Utility Piping Type

14.1.3 Division 6 – Wood and Plastics

- Glass Fiber and Resin Fabrication (Shower and Tub Surrounds)

14.1.4 Division 7 – Thermal and Moisture Protection

- Insulation
- Exterior Insulation and Finish Systems (EIFS)
- Shingles and Roofing Tiles
- Siding
- Gutters and Downspouts
- Skylights
- Other Thermal and Moisture Protection Materials Proposed

14.1.5 Division 8 – Doors and Windows

- Exteriors Doors (Standard Hinged Type)
- Interior Doors (Standards Hinged Type)
- Sliding Wardrobe Doors
- Sliding Glass Doors
- Swinging Glass Patio Doors
- Sectional Overhead (Garage) Doors

- Garage Door Operators
- Access Doors
- Screen Doors
- Door Hardware (Locks, Latches, and Deadbolts)
- Windows
- Storefront
- Other Doors, Windows, and Related Materials Proposed

14.1.6 Division 9 – Finishes

- Ceramic Tile
- Stucco
- Resilient Flooring
- Carpet
- Resinous Flooring (Deck/Balcony Coatings)
- Other Finishes Proposed

14.1.7 Division 10 - Specialties

- Mail Boxes
- Bath Accessories
- Shower and Tub Doors
- Other Specialties Proposed

14.1.8 Division 11 - Equipment

- Appliances
- Range Hoods
- Exhaust Fans
- Other Equipment Proposed

14.1.9 Division 12 - Furnishings

- Kitchen and Bathroom Cabinets
- Horizontal/Vertical Louver Blinds
- Other Furnishings Proposed

14.1.10 Division 15 – Mechanical

- Hot Water Heaters
- Plumbing Fixtures and Faucets
- Heating, Ventilating, and Air Conditioning Equipment
- Fire Sprinkler Equipment
 - Sprinkler Heads
 - Alarm Switch, Bell and Boxes
 - Smoke Detectors

- Alarm Switch, Bell, and Boxes
- Other Mechanical and Plumbing Equipment Proposed

14.1.11 Division 16 – Electrical

- Interior Light Fixtures
- Exterior Light Fixture
- Ceiling Fans
- Smoke Detectors
- Carbon Monoxide Alarms
- Other Electrical Items Proposed

14.1.12 Drawings

Proposal shall include the following information. Originals shall be drawn on 22" x 34" (D size) format. All drawings shall include a graphics scale and north arrow as required.

14.1.12.1 Site Layouts

- General Site Plans: Delineate streets, buildings, parking, tot-lots, picnic areas, other recreation amenities, mailbox clusters, bus stops, signs, and other major site features. One-story buildings shall be clearly delineated. (Scale 1" = 100').
- Grading and Drainage Plans: Submit buildings pad Elevations, indicate slopes exceeding 3:1, and a grading plan at 1-foot contour intervals. Submit general drainage system including typical yard drains, street drainage, pipe systems, ditches, and direction of flow for drainage. (Scale 1" = 100').
- Earthwork Management Plan: Proposer shall provide a management plan for earthwork which shall provide raw cut, raw fill, select import, and select import for landscape volumes in cubic yards on a 8-1/2" x 11" map. Briefly describe the sequence of earth movement to include borrow pits to be used.
- Utilities Plan: Indicate Sanitary sewer system, water system including fire hydrants, electric and gas distribution systems, transformers, street lights and area lighting (walkways, tot-lots, parking, etc.). (Scale 1" = 100').
- Landscape Plans: Submit concept landscape plan including plant material, both botanical and common names and size. Indicate natural vegetation to remain. Provide a matrix of plant types, indicating type of plant, symbol used, and number of plants provided. Provide a map of existing trees to remain along with a count of total trees, trees to be relocated, trees to remain and new trees to be added. (Scale 1" = 100').

14.1.12.2 Floor Plans

Provide floors plans for each dwelling unit type.

- **General Floor Plan:** Floor plan for each unit type shall include overall and room dimensions, plumbing fixtures, kitchen layout, door swings, location of electric lights, equipment, and all other built –in equipment. Indicate floor finishes on the plan. Provide finish schedule, door schedule, window schedule, and light fixture schedule either on one sheet or on each sheet of each unit type. Each sheet shall also have a “GENERAL NOTES” (item call-outs) column for items referenced on floor plan. In addition, provide single line drawings showing furnishing layout for each room/area as required by the RFP. Elaborate detailing of fixtures, furniture, and accessories is unwanted. All information for each unit type shall be one floor plan. (Scale ¼” = 1’-0”).
- Desired items and items exceeding the minimum RFP requirements shall be noted on one sheet preceding the Floor Plans.

14.1.12.3 Building Plan

Provide floor plans for each building Type. Indicate wall type (A/B/C) and required setbacks from each wall and courtyard setbacks on plans. (Scale 1/8” = 1’0”).

14.1.12.4 Building Elevations

Provide typical building side and rear elevations at 1/8” = 1’0”. Note that typical refers to the most frequently utilized building elevations with a minimum of 4 required. Elevations shall have all materials and design features noted. If ¼” elevation does not fit on sheet, reduce scale proportionally to fit elevation on sheet.

14.1.12.5 Building Cross Section

Provide typical building cross section noting all construction materials and building heights. (Scale 1” = 1’0”).

14.1.12.6 Wall Sections

Provide typical building wall section noting all construction materials and building heights. (Scale 1” = 1’-0”).

NOTE: IF DRAWINGS REQUIRED IN(2.1.12.2) AND (2.1.12.6) ABOVE ARE COMMON FOR MORE THAN ONE TYPE OF BUILDING OR DWELLING UNIT, SIMPLY INDICATE SO ON THE DRAWING. FOR EXAMPLE: “SAME FOR 2 BR JEM DUPLEX” OR “SAME FOR ALL TWO-STORY MULTI-FAMILY BUILDINGS.”

14.2 FACTOR (3), PAST PERFORMANCES :

[NOTE: EFD INSERT REQUIREMENTS]

14.3 FACTOR (4) EXPERIENCE:

[NOTE: EFD INSERT REQUIREMENTS]

14.4 FACTOR (5), COMMITMENT TO SMALL BUSINESS:

[NOTE: EFD INSERT REQUIREMENTS]

15.0 PART 3 – TECHNICAL PROPOSAL FORMAT

15.1 THE WRITTEN TECHNICAL PROPOSAL SHALL ADDRESS ALL ITEMS LIST ABOVE IN PART 2, TECHNICAL SUBMITTAL REQUIREMENTS.

15.2 NUMBER OF SETS

- Proposers shall submit ten (10) complete submittal packages for Factors 1 and 2.
- Proposers shall submit an original and two (2) copies for the submittal of Factors 3, 4 and 5.
- Eight (8) half-size sets of drawings and two (2) full size sets of drawings shall be submitted. Proposers shall also submit ten (10) sets of Technical Data Submittals which shall incorporate all required exhibits, technical information, and catalog cuts into three-ring view binders. Binders shall be similar in color for each proposal. All exhibits, technical information, and catalog cuts three technical information, and catalog cuts shall be separated into 16 division CSI Master format as outlined above.

16.0 PART 4 – PRICE EVALUATION FACTORS

[NOTE: EFD INSERT REQUIREMENTS]

17.0 PART 5 – PRICE PROPOSAL FORMAT

[NOTE: EFD INSERT PRICE PROPOSAL FORMAT AS APPROPRIATE]

18.0 PART 6 - SUSTAINABLE DEVELOPMENT WORKBOOK INSTRUCTIONS

Sustainable Development Workbook Instructions

- 1 Enter data in cells that are shaded light yellow.
- 2 On the Sustainable Development Worksheet, identify the project:
 - ? Project Location
 - ? Project Number
 - ? Project Title
 - ? Fiscal Year
 - ? Project Type (type "x" for Construction or Improvement Project)
 - ? EPA Radon "Priority Area" (1, 2, or 3)
- 3 Complete the Sustainable Development Worksheet for ALL projects.
Complete the Improvement Project Worksheet ONLY for Improvement projects.
- 4 Selection of **Project Type** and completion of the Improvement Project Worksheet (if applicable) determines the **Required Elements** and **Available Points** applicable to the project.
- 5 Earning points:
 - ? Insert a value in the **Earned Points** from the **Available Points** that apply to each **Program Element** per the instructions shown. Example: for Site Element Item Number 2.3, one point can be earned if the refrigerators consume less than 600 kWh per year. A project proposal includes refrigerators that consume 580 kWh per year, so "1" is entered under **Points Earned** for that item.
 - ? **Points Earned** are automatically summed, allowing for comparative analysis of alternative proposals (i.e., "what if's").
- 6 **Rating** is based on the percentage of **Available Points** that the Design Proposal has **Earned**:
 - Platinum > 80%**
 - Gold = 71 - 80%**
 - Silver = 61 - 70%**
 - Bronze = 51 - 60%**
 - Fail < 50%**

18.1 SUSTAINABLE DEVELOPMENT WORKBOOK

Project Location: Light yellow Fill Color cells are for data entry.

Project Number:

Project Title:

Fiscal Year:

Project Type: **Construction Project (x)** Indicate type (construction or improvement) with an "x"

Whole Neighborhood Improvement Project (x)
(Complete Improvement Project Worksheet)

EPA Radon "Priority" Area: Enter 1, 2 or 3

Rating: Silver

Points and Rating based on Project Type, Project Scope and Design Proposal

Item No.	Program Elements:	Available Points:	Earned Points:
		36	24

1.0 Site Elements Required Elements and Available Points are Project Scope Sensitive (R = Required Elements)

1.1 Site Planning and Design

1.11	Use previously developed site (Brownfield) and, when Life Cycle Cost effective, infrastructure			
1.12	Reduce "Heat Islands" by preserving/planting one tree per 1000 SF of paved surface, OR, use of high albedo material (≤ 0.5) on 80% of pedestrian paving, OR, use of light colored aggregate on vehicular paving			
1.13	Design site to minimize need for private auto and encourage use of public transportation, biking and walking to services within or adjacent to site			
1.14	Restore or expand previously degraded native habitat			

Enter Earned Points from Available Points for each site element as applicable to the Design Proposal

1.2 Site Development & Landscaping

1.21	Protection of existing trees: protect trees identified on site plan	R	1	1
1.22	Minimize site disruption: limit clearing and grading to maximum 20 feet from buildings			
1.23	Erosion control measures	R	1	1
1.24	Stockpile and reuse topsoil			
1.25	Xeriscape Landscape Design (choose one):			
	...Use at site perimeters	R	1	
	...Use at site perimeters & common areas		2	2
	...Use at site perimeters, common areas and adjacent to buildings		3	

1.3 Site Water Management

1.31	Use 75% native plant material and Xeriscape design principles	R	1	1
1.32	Use drip irrigation system for all plant beds and ground cover		1	
1.33	Provide rainwater catchment for irrigation use			
1.34	Use pervious material for walkways and parking areas		1	
1.35	Minimize turf to 50% of landscaped area		1	1

1.4 Site Energy Management

1.41	Solar access:			
	...Majority of building glazing within 30° of south			
	...Minimum of 75% of glazing within 30° of south			
	...More than 25% of glazing within 30° of east or west			
1.42	Solar shading: provide summer shading or sun control for all south and west facing glazing		1	
1.43	Solar orientation:			
	...Long building axis within 30° east-west			
	...Provide site buffers in direction of prevailing winds		1	

2.0 Building Elements

2.1 Building Envelope Design

2.11	Envelope components: Minimum window performance per DOE's Efficient Windows Collaborative (EWC) and rated by National Fenestration Rating Council (NFRC): Northern & Central = U < .36, SHGC < .52, VT > .53 and Air Leakage < .20; and Southern = U < .32, SHGC < .30, VT > .50 and Air Leakage < .25 "Tuned" unit glazing to maximize building envelope performance Southern roof overhangs designed to minimize Summer heat gain Use of raised heel roof trusses Minimum 25% of exterior walls earth sheltered Use of roof radiant barriers Use of uninsulated or unsealed recessed ceiling lights or skylights	R	1 1 -1	1
2.12	Envelope performance: Limit maximum infiltration to 0.35 Air Changes per Hour (ACH) Exceed Model Energy Code (MEC) requirements by a minimum of 30%		2	2

2.2 Building HVAC & DHW Design

2.21	HVAC systems: Sealed combustion gas fired furnace with minimum AFUE efficiency of 90% Air conditioner with minimum SEER rating of 12 Air conditioner with minimum SEER rating of 15 Air-to-Air Heat pump with minimum SEER rating of 12 and HSPF rating of 7.6 Geothermal Heat Pump with minimum SEER rating of 14 and HSPF rating of 7.9 HVAC equipment sized in accordance with ACCA Manual 'J' All duct work located within conditioned envelope Installation of programmable thermostat Installation of Energy Recovery Ventilators (ERV's) Duct leakage less than 7.5%	R	1 1 2 1 2 1 1 1 1	1 1 1 1 1 1 1 1
2.22	DHW systems: Sealed combustion gas fired water heaters with minimum Energy Factor (EF) of 0.61 Sealed combustion gas fired water heaters with minimum EF of 0.66 Electric water heater with minimum EF of 0.92 Electric water heater with minimum EF of 0.95 "Heat Trap" piping installed on water heater inlet and outlet Minimum R-6 insulation provided on all hot water piping and around water heater tank Water heater centrally located to minimize runs and line losses Installation of drain water heat recovery system Supply 50% of units DHW load through solar water heating system			
2.23	Combined HVAC and DHW systems Geothermal Heat Pump with minimum SEER rating of 14, HSPF rating of 7.9 and DHW EF of 0.90 Condensing sealed combustion gas fired DHW system combined with FCU space heating system			

2.3 Building Appliances & Lighting

Install refrigerators that consume less than 600 kWh per year	R	1	1
Install dishwashers with a minimum EE of 0.52	R	1	1
Supply 20% of units' energy load through integrated or direct-connected renewable energy systems			
Install indoor lighting with an average lighting efficiency ratio (Lumens per Watt) of 60			
Install incandescent room light fixtures			
Employ efficient daylight management (light colored ceiling, walls and floors; use of light tubes in interior windowless spaces, clerestory windows, light shelves, etc.)		1	

2.4 Building Water Management

Provide occupant with educational material on water conservation measures	R	1	1
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2.5 Material/Resource Management

2.51 Use of efficient framing techniques: (Check "x" to all that apply. Selection of 3 to 5 items = 1 point. 6 to 7 items = 2 points. and 8 or more items = 3 points)	0		0
... Framing at greater than 16 inches on center			
... Two-stud corners			
... Two foot wall modules			
... Insulated exterior wall headers			
... Efficient window and door framing design			
... Detailed framing and cutting plans			
... Single top plate			
... Engineered wood products comprise a minimum of 50% of framing			
... Ladder backing and/or use of drywall clips			
2.52 Material selection			
Minimum 20% of material/components are manufactured within 300 air miles of project site (percentage of total material cost)		1	1
... Use of material with more than 50% post-consumer recycle content		1	
... Use of certified wood products		1	
... Minimum 35 year roof manufacturer's warranty			
Use of life cycle cost effective and resource efficient alternate structural systems (i.e., SIPS, ICF, etc.)			

3.0 Indoor Environmental Quality

3.1 Provide occupant with Indoor Environmental Quality manual	R	1	1
3.2 Install formaldehyde-free sheathing, cabinets and countertops		1	
3.3 Provide passive Radon mitigation measures			
EPA Radon "Priority" Area:	2		
3.4 Install Carpet and Rug Institute (CRI) "IAQ" labeled carpet, pad and adhesives		1	1
3.5 Install central air purification systems in 10% of units		1	
3.6 Provide garage-to-house separation to prevent infiltration of Carbon Monoxide via: 1) detached garage or carport; or 2) installation of garage exhaust fan and sealed separation wall and gaskets around garage/carport-to-house door			
3.7 Minimum 5% of homes designed and built to American Lung Association's "Health House" standards			
3.8 Use of low VOC adhesives, sealants, and paints and coatings		1	1
3.9 Mitigate Lead Based Paint (LBP) and Asbestos hazards			

4.0 Waste Management

4.1	Provide occupants with recycling system (minimum 3 containers)	R	1	1
4.2	Develop construction and deconstruction waste management plan	R	1	1
4.4	On-site recycling of appropriate construction waste as soil amendments		1	1

MAXIMUM AVAILABLE POINTS	36
TOTAL EARNED POINTS	24

RATING **Silver**

18.2 Whole Neighborhood Improvement Project Scope

Project Location:
 Activity Name

Project Number:
 H-

Project Title:
 i.e., Number & Type of units to be Constructed or Improved

Fiscal Year:
 FY

Scope Items:	Included:
Regrade site	X
Provide new site/foundation landscape	X
Provide or modify irrigation system	X
Provide new house & common area walkways	X
Replace windows	X
Replace exterior finish	X
Install exterior wall insulation	X
Install ceiling/roof insulation	X
Replace roofing	X
Redesign roof/replace roof sheathing	X
Provide or modify HVAC systems	X
Provide or modify DHW systems	X
Modify or update plumbing system	X
Replace appliances	X
Provide or modify building lighting	X
Modify or update electrical system	X
Replace kitchen and/or bath cabinetry	X
Replace or install new carpet	X
Radon mitigation required	X
Lead Based Paint and/or Asbestos mitigation required	X

Check "x" for each Scope Item that is **Included** in the Improvement Project.