MASSACHUSETTS
MULTIFAMILY NEW CONSTRUCTION

DESIGN REQUIREMENTS & GUIDELINES

To be Used for Special BHCD Initiatives

A collaboration of the Department of Housing and Community Development (DHCD)-Bureau of Housing Development & Construction (BHDC), MassHousing, Massachusetts Housing Partnership (MHP), and the Department of Neighborhood Development(DND)

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Developed by BHDC, DND, MassHousing, and MHP

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i. INTRODUCTION & PURPOSE

This document was developed in conjunction with the Department of Housing and Community Development (DHCD) -- Bureau of Housing & Construction, MassHousing, Massachusetts Housing Partnership (MHP), and the Department of Neighborhood Development, along with other design and construction professionals with the express goal of consolidating standards from various affordable housing agencies into a single document.

The following **DESIGN REQUIREMENTS & GUIDELINES** are intended to promote the construction of affordable multi-family residential dwellings of high quality, which are cost-effective to build and operate, use reliable materials and systems, and support the activities of renters and buyers.

A major goal of these requirements and guidelines is to encourage the creation of multi-family residential dwellings which:

- Result in prudent and economical construction
- Are sensitive to existing residential building types, existing massing, setbacks, siting and open space elements of the neighborhood.
- Make intelligent use of the interior and exterior space to enhance the quality of life of residents and neighbors.
- Encourage sustainability strategies which result in low maintenance costs, energy efficiency, and minimal environmental impact on public infrastructure.

This document makes a distinction between **Design Requirements** - minimum requirements for the design and construction of new affordable multi-family residences which Architects and Developers must incorporate regardless of the specific conditions of the project; and **Design Guidelines** –design principles that provide guidance in the design and construction of affordable multifamily residences. Architects and Developers should adhere to these guidelines; however their actual application may differ based on the specific conditions of the project.

This document distinguishes four levels of compliance, which are described in descending order as follows:

- Compliance with Local, State, and Federal regulations
- Compliance with Priorities
- Compliance with Design Requirements
- Compliance with Design Guidelines

1. CODE COMPLIANCE

Projects must comply with the design and construction requirements of the most recent prevailing Federal, State and local codes and regulations, as applicable without limitation to the following list. Where there is conflict, the more stringent requirement should be applied.

A. FEDERAL

- ☐ Federal Fair Housing Amendments Act
- ☐ Section 504 of the Federal Rehabilitation Act
- ☐ Uniform Federal Accessibility Standards
- ☐ Americans With Disabilities Act
- ☐ U. S. Department of Energy
- ☐ Federal HUD Section 8 Housing Quality Standards
- ☐ Federal Environmental Protection Agency Regulations

B. MASSACHUSETTS

- ☐ MA State Building Code and Related Codes
  - Fuel Gas and Plumbing
  - National Electrical Code
  - MA Fire Regulations/National Fire Protection Agency
  - MA Elevator Regulations
  - MA Architectural Access Board Regulations
  - MA Stretch Code
  - MA State Sanitary Code
- ☐ MA Department of Environmental Protection
- ☐ MA Department of Public Health/ State Sanitary Code
- ☐ State HOME, HSF, FCF, and LIHTC Programs

C. LOCAL MUNICIPALITY

- ☐ Municipal Zoning Ordinances
  *(Note: For **Boston**, this **may** include Zoning Article 80 Project Review and Article 37 U.S. Green Building Council's LEED Certification Equivalency)*
- ☐ Local Historical Regulations and Restrictions
- ☐ Other regulatory guidelines from municipal agencies

D. EXISTING STRUCTURES

Where projects incorporate existing structures, the following also **may** apply:

- ☐ Federal Department of the Interior Standards for Rehabilitation
- ☐ Federal HUD Cost Effective Energy Standards in Rehabilitation Projects
- ☐ MA Historic Commission

2. PRIORITIES

A. ENERGY CONSERVATION AND SUSTAINABILITY

It is recognized in the industry that the performance and durability as well as operating savings, resident comfort and resident health can be significantly improved when appropriate energy conservation and sustainability measures are integrated into the design. Many sustainable measures and benchmarks for performance are required as part of building code compliance, and there are many opportunities to go beyond minimum code requirements that developers are encouraged to explore. The sustainable design and green building practices which are embodied within the Design Guidelines reflect industry best practice related to energy, water, and materials use efficiency, operating cost reduction, durability, health, and comfort.

EPA Energy Star

Compliance with an Environmental Protection Agency (EPA) Energy Star residential program is required. To determine which EPA multifamily program is applicable to your project, utilize the EPA's Program Decision Tree (https://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_mfhr_bldg_eligibility).

Note: While the decision tree indicates that the Energy Star Certified Homes and Energy Star Multifamily High-Rise programs are for new construction residential buildings only, for the purposes of compliance with this requirement, these programs will also be utilized to the greatest extent possible given the scope of work on rehabilitation projects. The proponent must provide a summary of the program requirements that are not feasible given the scope of rehabilitation work. Please disregard the portion of the flow chart that directs projects to the Energy Star Buildings and Plants program, as this is a program for existing commercial buildings.

If the Decision Tree indicates that your project should utilize the Energy Star Multifamily High-Rise pathway, the project team can either show compliance with the prerequisites and testing and verification requirements of that EPA program, or utilize the alternative compliance pathway outlined by EA Prerequisite: Minimum Energy Performance: Whole Building Energy Simulation and Commissioning for Multifamily Midrise buildings under the LEED for Homes V4 rating system.

LEED and Enterprise Green Communities

While certification is not required, all projects must demonstrate that they have been designed to be certifiable by either LEED or Enterprise Green Communities 2015. The most appropriate LEED rating system must be selected by following the LEED Decision Tree and then the project must be certifiable at the Silver level. For Enterprise Green Communities, the project must demonstrate it is certifiable with a minimum of 60 points.

Passive House

Passive House is a rigorous, voluntary standard for building energy efficiency in a building dramatically reducing its carbon footprint. It results in ultra-low energy buildings that require little energy for space heating or cooling. Passive House standards are enumerated by two certifying bodies: Passive House Institute US (PHIUS) or Passive House International (PHI). Exploring and integrating the benefits of PHIUS Standards into the design and obtaining Passive House Certification is encouraged. The Passive House Software is an approved alternative energy performance method in the Massachusetts State Building Code.

Alternative Energy

Teams should actively evaluate and incorporate alternative/highly efficient energy generation and storage approaches (such as cogeneration, solar thermal, photovoltaics, fuel cells, battery storage, etc.) if they can be shown to reduce energy use and operating cost and increase building resiliency. Life cycle cost analysis should be used to comprehensively evaluate both the capital and operating cost and carbon impacts of integration.

Incentives through agencies such as the Massachusetts Clean Energy Center (CEC) and MassSave should be integrated into the analysis of the costs and benefits of these systems.

Commissioning

Commissioning will be in accordance with building code regulations and as required through Energy Star, LEED or Enterprise Green Communities. This is to ensure systems are working as intended to achieve maximum efficiency.

B. UNIVERSAL DESIGN

The application of "universal design principles" to newly constructed dwelling units is an important way to plan for the long term livability of dwelling units over the lifetime of residents. Development proposals are to focus on the creation of bathroom and kitchen layouts which normalize universal design principles and enhance accessibility across all project dwelling units.
(See Appendix A: Example Unit Layout Diagrams and reference the Enterprise Aging in Place guidelines 2016 https://www.enterprisecommunity.org/resources/aging-place-design-guidelines-18245

3. DESIGN REQUIREMENTS

This section sets forth the minimum **Design Requirements** for the design and construction of new affordable multi-family residences. Architects and Developers must incorporate these requirements into the design and construction of affordable multifamily residences regardless of the specific conditions of the project. *If any of these Design Requirements cannot be met, a narrative explanation must be provided.*

A. DESIGN REQUIREMENTS FOR RESIDENTIAL OCCUPANCY

(See Appendix A: Example Unit Layout Diagrams for graphic illustrations of the Design Requirements and Guidelines.)

MULTI-FAMILY HOUSING DIMENSIONAL DESIGN REQUIREMENTS

This section sets forth the minimum **Design Requirements** for major room sizes. Architects and developers must prepare furniture plans to ensure rooms can be reasonably furnished with clear space to maneuver around the furniture. It is recognized that in existing buildings and adaptive reuse circumstances meeting room sizes may not be possible.

(See Section 4.B. Interior layouts & Dimensional Design Guidelines for overall Unit areas.)

Note: Be mindful of HVAC/ FP obstructions when considering furniture layout (e.g., ceiling fans at proposed bunk bed locations)

Primary Bedroom
- 12’ x 10’ clear dimension minimum (120 square feet minimum)
- 2 occupants

Secondary Bedrooms
- 10’ x 10’ clear dimension minimum (100 square feet minimum)
- 2 occupants

Living Room Area
- 12’ minimum clear dimension along an exterior wall with access to natural light x 10’ clear minimum dimension in the opposing direction (150 square feet minimum)
- Accommodates a 6 foot couch, 2 easy chairs, coffee table, 2 side tables and a place for a television in a location viewable from the seating
- Locate living and dining areas in the corner of the building in corner units to benefit from windows facing multiple directions.

Dining Room Area
- 10’ x 10’ clear dimension minimum (100 square feet minimum)
- Accommodates an 8 person table in 3 bedroom, 6 person table in 2 bedroom, 4 person table in 1 bedroom
- In studios and 1- and 2-bedroom units only, the dining room may overlap with the living room as long as the total living and dining area is not less than 200 square feet with a 12’ clear width.

Circulation
- Unit circulation cannot require passing through the kitchen work area, except where practical in studio units.
- Minimize excess circulation to maximize unit efficiency.
- Provide furniture plans in order to confirm circulation between furniture, closets, doors and walls.

Closets

- Closets in bedrooms shall be a minimum of 4'-0" x 2'-0" deep.
- An entry closet shall be provided and shall be a minimum of 3'-0" x 2'-0" deep.
- Closet shelving shall allow for a full bearing, white, vinyl coated steel shelf or similar w/ integral clothes rod.
- A dedicated linen closet is not required, but linen storage is to be provided as a cabinet or shelving within a closet. Linen storage should ideally not be located within a full bathroom, since residents may be reluctant to store any linens besides towels there due to moisture concerns even if the bathroom is well-ventilated.

BATHROOMS

- Adequate storage shall be provided for bathrooms in the form of a medicine cabinet and a vanity or other cabinet with space for items like toilet paper.
- No more and no less than one full bathroom shall be provided in 0, 1, or 2-bedroom units.
- One full-bathroom and one half-bathroom are required in 3-bedroom units, and neither bathroom can be en suite. If cost effective, a 3-bedroom unit may provide a shower in the half bathroom. If two full bathrooms are provided in a 3-bedroom unit, one may be en suite.
- Two full bathrooms are required in 4-bedroom units, and neither bathroom can be en suite. A shower stall may be substituted for one bathtub.
- Flooring under removable base cabinets in bathrooms must be installed at initial construction.
- Vanities should have "Severe Use" cabinet construction, high pressure plastic laminate or solid- wood formaldehyde-free doors/frames, and door and drawer pulls.
- All full bathrooms shall receive at minimum two 24" towel bars minimum, one robe hook, a shower curtain rod, a toilet paper holder, and a mirror-front medicine cabinet.
- All half bathrooms shall receive at minimum two towel bars, one robe hook, a toilet paper holder, and a wall mirror.

UNIT VENTILATION

- Ducting shall run straight to the exterior, pulled tight without kinks or bends, with insulated duct discharging through a galvanized steel or aluminum wall or roof cap with a back draft damper, insect screen and wind hood.
- Range hoods shall be vented to the outdoors.
- Bathroom exhaust systems should operate continuously at low speed and include switching to boost discharge ventilation following occupant use by at least 50%.
- All bathroom doors shall be undercut 1/2" to promote required air changes throughout the unit.
- Fresh air must be mechanically-supplied to all units.
- Exterior wall caps should be detailed and located to be as inconspicuous as possible.

KITCHEN

- All applicable kitchen appliances shall be Energy Star rated.
- Ranges and range hoods shall be 24" minimum width in studio and one bedroom units, and 30" minimum in two, three and four bedroom units and be electric.
- Garbage disposers where provided shall be 1/2 HP minimum.
- Dishwashers where provided shall have water use of 6.0 gallon or less per cycle.
- All refrigerators shall be frost-free and shall have a separate freezer door and be 12 Cu. Ft. minimum in studio and one-bedroom units, 18 Cu. Ft. minimum in two- and three-bedroom units, and 20 Cu. Ft. minimum in four-bedroom units.
- Kitchen sinks shall be 22" x 30" x 6" minimum, 20 gauge minimum stainless steel accommodating a single handle faucet with spray attachment. A double sink is required if no dishwasher is to be provided.
- Countertops should be one-piece square-edged, .050" thick minimum high pressure laminate, with 4" integral "post-formed", coved backsplash. Adhesives should be water-based.

- Cabinets shall have high pressure laminate or solid wood formaldehyde-free doors and drawers with pulls and frames complying with ANSI/KCMA A161.1 cabinetry specificatons. Thermofoil and particle board cabinets are not allowed.
- All medium-density fiberboard (MDF) used in cabinetry and countertops shall be formaldehyde free.
- Finish flooring shall continue under refrigerators, stoves, dishwashers, and removable base cabinets in kitchens.
- Provide 18" to 24" minimum linear counter space on both sides of the range and sink. Where the range abuts a side wall (e.g. in an existing kitchen), there must be a washable, easily cleaned back material to provide protection against heat and grease, with ceramic tile or stainless steel prefered.
- A dishwasher is required in three- and four-bedroom units.

LAUNDRY

- One or more common laundry spaces may be required by individual agencies. Laundry within units is not permitted for rentals without Funding Agency approval.
- When supplied, washing machines must have braided stainless steel flex connection lines as a means of protecting against overflow and leaking that would damage other units.
- Laundry areas must have plumbed drainage pans.

WINDOWS

- Window treatments must be provided in all units, regardless of affordability. All window treatments must be cordless for child safety. All windows should receive properly sized window shades: fiberglass-coated, vinyl plastic, fire-retardant, fade-resistant roller shades with large diameter cotton cord attached to slat. Mini blinds are discouraged since the blinds themselves may pose a choking risk, but if used, it must be verified that the selected product is safe for children.

Safety and Security

- Exterior security bars and grills are not permitted. Where safety is of concern, provide door and window contacts for security alarm systems at ground floors and easily accessed lower floors.
- Window guards must be incorporated. Window limiters may not take the place of window guards. In the City of Boston, special concern must be paid to window guards where children age 6 or under will be living or visiting, which may be any unit. Guards should be operable-type interior aluminum or steel bars, clear window opening should be fully protected with no openings greater than 4 inches, tested to withstand 150 pounds pressure; with quick-release mechanism for emergency exiting without use of tools or force. Guardian Angel Window Guards meet the requirements of the "Kids Can't Fly" standard and are preferred by some fire departments. Guards should be located where the sill height is accessible to children (either from the ground or from furniture placed against the exterior wall) and is more than 10 Ft. above the finish grade at the window. Heavy gauge "safety" screens do not meet guidelines for fall protection as suggested above. Window limiters that cannot be removed by tenants and that limit the openings to less than 4" are acceptable in lieu of guards.

FINISHES

- The use of wood laminate flooring is not permitted.
- Homeownership units are required to have hardwood or engineered wood floors throughout except in kitchens, bathrooms, and mechanical or unfinished spaces.

SOUND CONTROL

- Architects and Developers are required to review construction detailing and materials for compliance with Code requirements for sound control.

GENERAL ELECTRICAL DESIGN REQUIREMENTS

- Individual electric metering shall be provided.
- Switched ceiling-mounted lighting fixtures are required in building common areas, entry foyers and unit hallways, stairwells, kitchens (including additional fixture over sink), dining areas, unit primary bedrooms, bathroom ceilings and over mirror, walk-in closets, and basements, including in renovation projects.
- Lighting in unit secondary bedrooms and living rooms shall be at minimum by switched control of one receptacle in a duplex receptacle box for connection to an occupant-furnished lamp.
- Provide appropriate technology for current telephone, data, and communications systems.
- Provide projects receiving low-income housing tax credits with a high-speed data network.
- Provide 20 amp circuits under windows for AC units in living room and master bedroom.

GENERAL MECHANICAL, ELECTRICAL & PLUMBING DESIGN REQUIREMENTS

For the following points, provide a narrative summary describing the parameters of the system, including but not limited to rationale for system and fuel selection, energy efficiency, metering (individual or common), controls, maintenance, operation, first cost vs. life cycle costing, utility cost impacts on owner and residents, utility or other rebates, and relationship to building envelope design. Calculations for systems may be requested by funding agencies.

- HVAC Design, Maintenance, and Operation
- Electrical and lighting designs
- Plumbing Fixtures and Fittings

Note the following HVAC requirements:

- Through-wall AC units are not permitted.
- Electric systems are to be used.
- If baseboard heating is used, piping must be offset below the floor so that wall space can be kept clear of dummy trim for furniture placement. Heating element locations must be coordinated with functional furniture layouts. In bedrooms, there must be space to place beds against walls without baseboard heating.

4. DESIGN GUIDELINES

The following **Design Guidelines** explain the context for Section 3, DESIGN REQUIREMENTS, and are intended to complement them in the production of quality housing that is attractive, comfortable, and marketable to prospective residents or buyers. Project Developers and Architects should demonstrate compliance with the Design Guidelines described below. It may not be feasible to comply with all of these Design Guidelines, but the project sponsor or architect is encouraged to contact the funding agency to discuss their application where compliance is not possible.

A. DESIGN GUIDELINES FOR SITE AND BUILDING PLANNING

The following section outlines commonly understood principles for the building planning and site design of multifamily residential buildings. These principles are not applicable to every context, neighborhood or city, however they provide specific guidance intended to shape a development team's proposal early in the development process.

SITE SELECTION AND DESIGN

- It is a primary concern that all housing developments fit into and enhance existing neighborhoods.
- In general, sites available for development are within the context of existing communities. Over time each of these neighborhoods has developed a unique character. Developers are encouraged to build upon the uniqueness of these neighborhoods and should seek to infill and knit together the residential fabric. Developers should consider the proximity of existing publicly-accessible or community-based open space, public transit and other basic community resources that are within walking distance of any proposed development.

STREET BOUNDARIES

- Use of clear boundaries to define public and private space can create a sense of security and comfort, especially in dense urban neighborhoods. The public (sidewalk edge) boundary of the property should be defined using fencing, walls, hedges, line of trees, or other landscape material. Street edge fencing material and height should match fencing in the neighborhood or complement with decorative metal picket fencing. Street edge fencing should not be opaque (solid) and should allow visual penetration. Project open space must still be accessible and inviting to the residents.
- Street trees should be provided within the sidewalk or along the property line. The trees should match the existing street trees in type and planting detail. Existing rows of trees along a street should be maintained. Missing street trees should be provided, one tree per 25 lineal feet of street frontage. The caliper width should be not less than 3" diameter. Trees should be of indigenous species and of a growth form suited to their intended location and function. Tree species selection and locations should consider their proximity to underground utilities and overhead wires. Street and parking lot trees should be provided at a typical spacing of one tree per 15 ft for columnar shaped trees, 25 ft for small to medium height shade and ornamental trees, and 35 ft for large, spreading shade trees. Trees planted in close proximity to sidewalks should be deep-rooting species. Tree root varriers should be installed to protect adjacent pavements from tree root damage. Local zoning may take precedence over recommendations.

OPEN SPACE

- It is important that development proposals design open space for residents particularly for families and children who occupy the building(s). Areas for active and passive outdoor activities such as play

space, sitting areas, and areas dedicated for gardening are highly desirable. In addition the public face of the project is to improve the quality of life along the street creating public spaces which are both accessible and sustainable. Patios, front yards, porches, or balconies are smaller open spaces that assist in creating the community interaction of larger open spaces.

- Porch platforms for typical housing are best designed with a minimum drop of 6" below the first finished floor level, and for adaptable units, flush with the first finished floor level.
- All exterior dwelling entrances perform better in weather when they have weather-protected entries such as canopies, covered porches or recessed alcoves.

PLACEMENT & ORIENTATION OF BUILDINGS ON SITES

- New buildings should align with the front edge of existing buildings along a street. At a corner, buildings should be placed to align with existing buildings facing both streets. Foundation wall heights should mirror the foundation wall height of residential buildings within the neighborhood context. On sites without existing buildings, new buildings should be placed to be compatible with the neighborhood. Building siting should take into account pedestrian and vehicle access to the site, maintenance such as snow storage and trash areas.
- When appropriate to the context, buildings should be placed on the site with consideration to optimum solar orientation and wind direction for natural ventilation and wind buffering. Methods for providing summer shading for south-facing walls and the implementation of photovoltaic systems on the south-facing area of the roof should be considered. Interim measures such as solar-ready conduit runs, structural provisions, space allocation for converters and other equipment, etc., as part of the original construction are highly desirable.

PARKING

- The zoning requirements for off-street parking should be achieved with parking layouts designed to minimize curb cuts and minimize area of pavement (impervious surfaces).
- Parking lots should be buffered from adjacent properties with landscaping. It is preferable that parking lots be concealed from the street.
- Bicycle storage is desirable in designated covered and secured parking areas.

STORM WATER MANAGEMENT

Surface Drainage

- The area around the existing foundation should be graded away from foundations and compacted to insure proper drainage with emphasis on protecting the abutting properties or the public walkway. Where setbacks limit space to less than ten feet, provide swales or drains designed to carry water away from the foundation. Grade changes between existing properties are discouraged (mounds, retaining walls, etc.).
- Projects should attempt to maximize storm water management on-site through the use of low-impact development (LID) techniques such as rain gardens, bioswales, and permeable paving.

Subsurface Drainage

- Where required by site conditions, subsurface drainage should provide a continuous system connected to an engineered, subsurface drainage system. Piping should be surrounded with washed or clean gravel that is fully wrapped with fabric cloth.
- Sump pumps if required should have mechanically attached covers with full gasket seal.

LANDSCAPING

- Landscaping should be compatible with the neighborhood, compliment the building, provide an important visual amenity to the residents, and provide adequate dedicated space for children to play. Landscaping should maximize the use of active and passive open space areas. All new planting should be allergy reducing. Landscape elements should be designed to reduce the heat island effect, assist in storm water management of the site, reduce the overall irrigation water demand and water budget, and provide opportunities for snow storage in the winter.

- A landscaping plan should be provided showing detailed drawings of landscaping, i.e., fencing, planting beds, trees and shrubs (species and sizes) retained and removed, play areas, lighting, seating, and all features adding to the aesthetic quality of the site and optimizing the use of the existing property. Planting should not be permitted in July or August unless an appropriate watering/maintenance plan is provided. All plant material should be warranted for one year.
- All unpaved areas should be landscaped and planted. Landscaping materials and vegetation should conform to xeriscaping standards – a low maintenance landscaping methods which use 90% or more indigenous species that are drought-tolerant to conserve water used for irrigation to 20% or more reduction. Native plants and trees should be used. If portions of the lot are located on a steep slope, control erosion and reduce long-term runoff effects through use of terracing and retaining walls. The goal of these strategies should be to reduce overall irrigation demand by at least 55% of the overall irrigation water demand water budget. The estimates should be calculated and prepared by a landscape professional.
- The use of conventional turf should be limited to 20% or less of the total landscape area. Do not use turf in densely shaded areas and in areas with a slope of 25. When restoring grade, a 6" minimum deep planting bed of clean loam/topsoil should be included. New grade should slope away from buildings and fit the existing neighboring grades, particularly at street or sidewalk. Provide clean screened loam raked free of 1" or larger stones, building debris and other non-organic materials as needed. All lawns should be maintained by the general contractor until after the first mowing. Six inch plant cover should be maintained at sloped areas which are prone to washout. Avoid leaving straight sloped areas – instead try to include landform grading which is more resistant to erosion.
- Drip irrigation systems should be used if irrigation is required.
- Rainwater harvesting is strongly recommended.
- Parking birms, where employed, should be designed with more robust materials than sod, such as low maintenance shrubs or ground covers.

BUILDING COMPOSITION, CHARACTER AND MATERIALS

- The building's characteristics and materials should focus on detailing of high quality rather than the use of many different materials for the exterior envelope. A single material should compose the majority of the building envelope. The character of the building is to be consistent on all sides of the building and offer the same engagement to the pedestrian at the front and the rear where appropriate.
- Blank, unfenestrated elevations should be avoided especially along public streets.
- Where possible the building composition should allow for cross ventilation.
- The ground floor commercial and retail uses are typically composed of taller spaces with large windows and signage bands above. They create a uniform character at the street edge and can be lit at night so as to contribute to ambient street lighting. Mechanical and parking areas should be located away from the street edge and should have little to no street frontage. Materials at the ground floor should be durable and are typically composed of masonry for longevity.
- Floor plans are more economical when they stack vertically.
- Generally, communal facilities are located on the ground floor.
- Buildings should provide visual and noise barriers between public and private spaces. Sound control between units and public hallways or common spaces should be carefully considered.
- Basements should be provided as needed for mechanical systems, additional storage areas or programmatic spaces. However, areas subject to flooding may need to explore other options.
- Where applicable, extending eaves 18 inches to 2 feet keeps water away from the building.
- Historical District guidelines should be met where applicable. Wherever possible, window configuration and size should conform to that of the surrounding neighborhood. Where wood sashes are employed as an element due to historical considerations, it is preferred that these windows be supplied with true divided light configuration, and not snap-in muntin grilles.

B. DESIGN GUIDELINES FOR UNIT LAYOUTS AND INTERIOR DIMENSIONS

This section sets forth the minimum Design Guidelines for overall Unit areas.

(See Section 3.A. Design Requirements for Residential Occupancy for major room sizes and Appendix A: Example Unit Layout Diagrams for graphic illustrations of the Design Requirements and Guidelines.)

TARGET UNIT SIZES

- Unit square footage is measured from the inside face of the units' bounding walls and includes usable storage space, stairwells and hallways inside the unit, as well as space occupied by interior walls within the unit. Fifty percent of the area under sloped ceilings with greater than 5'-0" clearance and less than 7'-6" clearance should be included in the unit square footage when considering the following guidelines:

Studio	500 square feet
One bedroom	600 square feet
Two bedroom	750 square feet
Three bedroom	1000 square feet
Four bedroom	1,100 square feet

- These square footages represent target sizes. Units much larger or smaller than these targets will be questioned in terms of livability or excess cost.
- Architects and Developers are reminded that accessible (Massachusetts Architectural Access Board Regulations, Group 1) bathrooms are required in all units, unless the unit is fully accessible or a hearing/vision impaired unit. Provisions for adaptable bathrooms as defined in Federal Fair Housing Amendments Act should be incorporated in all designs.

UNIT LAYOUT BEST PRACTICES

- The type and configuration of kitchens in a development should be standardized to the greatest extent possible in order create efficiencies for purchasing cabinetry, appliances, equipment, and finishes. Provide 12" – 18" vertical pantry cabinetry for storage rather than small closets.
- Circulation spaces should be designed efficiently and kept to a minimum and access to bedrooms and bathrooms should only be from circulation spaces.
- Living, dining, and kitchen areas should be proportional to the number of bedrooms. For example, 3 bedroom units should have larger common living spaces than 2 bedroom units. In family units, the living and dining areas must be distinct spaces.
- Bedrooms and living/dining areas must have direct access to natural light. Kitchens should also have direct access to natural light where possible, but if necessary can receive indirect natural light. Bathrooms and closets/mech. spaces are the best elements to locate farthest from natural light.
- Layout of buildings and units should optimize the use of space, provide spacious, furnishable main living areas, and provide adequate storage. Project Architects and Developers must provide furniture plans and demonstrate compliance with general principles for efficient layout of furniture commensurate with the probable number of occupants.

UNIVERSAL DESIGN PRINCIPLES

Circulation

- Stairways and ramps should have continuous handrails at switchbacks, and handrails should extend past the immediate end of the stair. Highlight the edges of stair treads, ramp edges, and landings to improve visibility.
- Consider providing a seating area near the elevators for residents who have difficulty standing for a long period of time.
- Consider providing power-assisted entry doors into the building.
- Provide flush thresholds and wide interior doors (3'0").
- Provide door hardware that can be operated without tight grasping or twisting. U-shaped handles and levers are preferable to door knobs.
- Provide signage with high light-on-dark visual contrast, using a legible and approriately sized font.
- Ensure all controls and devices are within accessible reach ranges. Provide light controls with large flat panels instead of small toggle switches.

Kitchen

- Provide lazy susans in corner base cabinets for more accessible storage. Provide drawers instead of base cabinets for easier access to storage.
- Provide under-cabinet lighting for increased visibility on kitchen work area.

Bathrooms

- Specify non-slip tile for flooring.
- Provide blocking in bathrooms for future installation of grab bars and shower seat.
- Ensure all tub and shower controls can be operated without tight grasping or twisting. Provide hand-held shower spray units instead of fixed shower heads.

C. DESIGN GUIDELINES FOR MATERIALS AND SPECIFICATIONS

The following are minimum Design Guidelines for the use of materials and specifications applied to multifamily new construction. The construction methodology or best practices may require a similar but alternative methodology that exceeds these Design Guidelines.

TESTING

- Concrete and soil compaction tests should be performed by a qualified testing lab for all buildings where applicable. Water leakage and/or masonry tests may be required in certain buildings.

SITE WORK

Demolition

- The removal of all hazardous materials such as asbestos containing materials (ACM's) and lead based paint should be carried out according to all applicable State and Federal regulations, including but not limited to the Massachusetts Department of Public Health, Massachusetts Department of Environmental Protection and U.S. Environmental Protection Agency.
- The Developer should have a complete understanding of the scope of shoring or other site or building stabilization should they be required.
- The demolition and excavation scope is to include strategies which divert usable soils and debris from landfills through recycling or reuse where acceptable.

Soil Remediation – 21 E's

- A summary and an accurate estimate of the 21-E soil remediation plan should be provided including grading plans and soil tests.

Fencing

- If used, fencing at the street edge should typically be decorative metal. Use of vinyl-covered chain link fencing should be restricted to property edges that do not face a public street. If used, a typical product would be heavy-duty vinyl-covered chain link fencing at least 48" high, with 2" diameter, black, hot-dipped galvanized posts no more than 10'-0" apart and set in concrete footings 8" in diameter and at least 30" below finish grade. Provide top and bottom rails as recommended by manufacturer. Include gates as required for access to walkways.

CONCRETE

Foundation

- Provide damp-proofed foundations resting on proper footings on undisturbed or properly compacted soil. Install Code-compliant thickness or greater extruded polystyrene at exterior of foundations from footing to grade level, after damp proofing has dried and prior to backfill.

Basement Slabs

- Install basement concrete slab on 4” bed of 0.5” diameter or greater clean or washed gravel, covered with minimum 6 mil polyethylene sheeting lapped minimum of 12” at joints; or alternately a minimum of 4” uniform layer of sand, overlain with a layer or strips of geo-textile drainage matting, covered with polyethylene sheeting lapped a minimum of 12” at joints. Two inch or greater Code-compliant thickness of expanded polystyrene rigid insulation (EPS) or extruded polystyrene insulation (XPS) is to be installed under the entire slab to inhibit heat loss and moisture problems.
- Control /isolation joints should be provided in basement slabs. One inch XPS should be installed vertically at slab edge, 4” high, to provide a thermal break between the slab and the foundation wall.

Moisture Content

- Where flooring is to be installed above concrete or other poured installations (for example to control sound or provide fire protection), the moisture content should meet flooring manufacturers’ installation and warranty requirements. Adhesives used in the installation of flooring are subject to failure where concrete moisture content is present. Therefore, high performance concrete admixtures and/or spray moisture barriers free of all volatile organic compounds (VOC’s) and mold and bacteria growth inhibitors should be used to ensure moisture content acceptable for all flooring applications anticipated for the project.

Walkways

- Walkways should be 4" thick 4,000 psi (air-entrained) w/ broom finish, set on a 6" base of 3/4" crushed stone at all front entrances.

Retaining Walls

- Cast in place concrete, concrete interlocking concrete masonry units or fieldstone may be considered. The use of pressure-treated timbers is not allowed.

ROUGH CARPENTRY

Lumber

- Preservative pressure treated wood (PPT) should be used at all locations where framing joins exterior concrete. Where PPT lumber is used, this lumber should be arsenic free. Use alternatives to chromated copper arsenate treated wood (CCA).
- Wood product sheathing should be installed in strict accordance with manufacturers’ exposure, spacing, and span ratings and should be stamped by a recognized agency to show those ratings.

Wood Blocking

- Prior to insulating and finishing walls, solid 2” nominal blocking should be installed where accessories such as grab bars, towel bars, soap dishes and toilet paper holders are to be located. Insulation

materials should be cut to fit around such blocking. Solid blocking should also be installed for future access accommodations such as installation of grab bars, adjustable counters, and hardware in conformance with FFHAA.

FINISH CARPENTRY AND MILLWORK

Cabinetry

- Cabinet drawers should be full-length (minimum of 18") and designed with a durable, full length, side-mounted, double runner suspension system with manual positive stops. A full-length steel system with nylon wheels is prefered. Monorail systems are not recommended.
- Drawer bottoms should have a minimum thickness of: 1/8" tempered hardboard or plywood, or 1/4" inch hardboard or high-density particle board. Drawer sides should have a minimum thickness of 7/16".
- Cabinet bottoms should have a minimum thickness of: 1/4" tempered hardboard or plywood, or 3/8 if hardboard or high-desntiy particle board. Cabinet sides should have a minimum thickness of ½". Toe kicks should be totally enclosed.
- Wall cabinets should have a minimum of two wood nailing strips (top and bottom). Minimum dimensions for nailers should be ¾" x ½".
- All cabinet interiors should be treated with a water resistant substance.

Interior Door & Window Casing

- Window aprons and casings should be a painted softwood such as pine. Head and jamb with a minimum dim of 11/16"x2-1/2". All window trim is to be back primed.

Baseboard Trim

- One piece softwood such as pine molding, finger- jointed and primed, is preferred. Wood base should be used within units and is acceptable in all areas. "Speed-Base" or approved equal medium-density fiberboard (MDF) is also acceptable for painted applications.

BUILDING ENCLOSURE

Thermal and Moisture Protection

- An agency may request calculations to indicate the most cost-effective insulation level or require other thermal and moisture protection measures, testing or inspection in conjunction with priorities or initiatives of the agency (See Section 2, Priorities).
- Alternatives to fiberglass batt insulation such as cellulose (recycled newsprint), cotton, wool, low-density open-cell polyurethane foam, and recycled-content glass fiberglass should be fully explored. On interior below grade walls, avoid using a separate vapor barrier or below grade wall insulation that can trap moisture inside wall systems.
- Please refer to http:/www.buildingscience.com/resources for residential wall assembles.

Masonry

- Masonry veneer walls should be designed and constructed in conformance with the Brick Institute of American Technical Note 28B. This note requires among other items: 9-gauge corrosion resistant wire ties spaced a minimum of 24" on center vertically and horizontally securely attached to the stud for all veneer construction above 3 stories, air space be a minimum of 1" and be kept clear of mortar droppings, and flashing be provided at all horizontal surfaces including floor lines.
- Gypsum sheathed backup walls should be covered with 15# felt or have all penetrations and joints in the waterproof paper coating covered with mastic waterproofing.
- Aluminum flashing embedded in masonry should be protected against corrosion by protective coating.

Drainage Plane

- Provide a drainage plane between exterior cladding and house wrap material.

Ice Damming

- A self-adhered bituthene product should be used on the first 3'-0" of the roof sheathing on all pitched roof applications as well as 3'-0" to both sides of valleys and cheek walls prior to installing the metal drip edge, felt paper and shingles. Roof pitches less than 5 in 12 should be completely covered with the modified bitumen underlayment.

Flashing and Sealing Materials

- All plumbing, electrical and other penetrations of walls and floors should be sealed with polyurethane caulk. The use of exposed anodized aluminum flashing anywhere other than step flashing at dormer and cheek walls is strongly discouraged.
- The following lists of metals are suggested for the appropriate locations:
    - Chimney and cricket locations: sheet lead flashing.
    - Roof parapet cap flashing, EPDM coping or gravel stop, skylight flashing and base flashing, roof junctures, edges, windows, doors and other exterior openings: lead coated copper, or .050 Ga. factory-painted aluminum flashing.
- Provide continuous roll flashing at shed roofs. Flashing should be factory painted – no mill finish.
- All windows should receive pan flashing including pan flashing at sills, side flashing. Install pan flashing over building paper at sill and corner patches.
- All sealants should consist of low or no VOC's.
- Seal all wall, floor, and joint penetrations with rodent-proof materials
- All visible pipe penetrations through walls, floors, and cabinets (including interiors) should be sealed and covered with escutcheons.

Roof

- Provide step flashing at intersections of roof and walls with the exception of continuous flashing at metal and rubber membrane roofs. Use metal kick out flashing at the end of roof/wall intersections to direct water away from the wall.

Gutters and Downspouts

- All pitched roofs including porches should have gutters. Vinyl gutters are strongly discouraged. Gutters should be sized per Code requirements, and either seamless 0.032 Ga., factory-painted aluminum or match existing, securely fastened with straps of the same material and color as the gutters and sealed per manufacturer's recommendations. Gutters/downspouts should not discharge into gutters or roof below.
- Downspouts should be sized to required roof surface area and should be .027 Ga. minimum. Downspouts with type 'A' and 'B' elbows should be securely fastened to the sidewall with straps of the same material and color as the downspouts. Divert run-off water away from the structure at the base of each downspout using pre-cast concrete splash guards tied into the storm drainage where required, emptying to a lateral pipe that deposits water on a finish grade a minimum of 5' from the foundation, connected to a pre-cast drywell, or tied into a storm water drainage system. Downspouts should not discharge at or near entryways or sidewalks. Follow storm water code requirements.

Asphalt Roof Shingles

- Fiberglass/asphalt roof shingles or equivalent, with a minimum 25 year warranty.

Flat Roofing

- Flat roof applications should receive light colored, fully adhered compounded rubber sheet elastomeric (EPDM) single membrane 0.060" thick sheets installed by the manufacturer's certified installer, and applied per manufacturer's warranted specifications. Large roof areas may consist of mechanically fastened and ballasted EPDM.

Siding

- All exterior siding materials should be back primed as required. All cladding material should be installed according to manufacturer's specifications. When using trim with cementitious siding and/or panel, use 5/4" minimum thickness trim. The use of vinyl siding is not allowed.

WINDOWS

- All windows should be Energy Star rated. Calculations may be requested by an agency to indicate the most thermally cost-effective window type.
- High performance window glazing – argon filled (Low-E) – is suggested, meeting or exceeding the following requirements: windows should have a National Fenestration Rating Council (NFRC) rating, Code-compliant Solar Heat Gain Coefficient (SHGC), and U-Factor to meet Energy Star rating.
- Caulk all window and door units with ethylene copolymer caulk, using backer rod closed cell polyethylene as needed. Window shim spaces should be filled with low-expanding foam sealer.
- Windows should have architecturally appropriate exterior casings on 3 sides and a protruding sill.
- All the aluminum windows should conform as a minimum to American Architectural Manufacturers Association (AAMA) commercial type and be for wind load based on AAMA formulae.
- For insulating glass, the warranty period should be 5 years after seal date permanently imprinted on unit, but not less than 5 years after date of substantial completion.

DOORS

Steel Doors

- Provide 18-gauge interior door frame minimum and 16 gauge exterior door frame when set in exterior and interior masonry door sets.
- Exterior doors shall be 'embossed,' rather than use decorative plastic applied molding, to prevent sagging when used in conjunction with storm doors.

Storm/Screen Combination Exterior Doors

- The use of combination storm and screen doors at entries, front and rear is suggested for rental units, including rental units in one-to-three-family owner-occupied houses. Such doors should be properly sized for the opening and the frame caulked with a phenolic caulking material (color to match).

Unit Entry Doors

- Provide steel entry doors. A peep hole shall be provided.

Interior Doors

- Provide solid core wooden doors.

Egress to Patio or Deck

- Sliding doors accessing the exterior are discouraged as they pose safety, security, and energy issues. Hinged doors with adjacent windows or sidelights are preferred. Patio/deck doors should step down to allow out-swinging doors to open when snow is present. Accessible units should have flush thresholds to the deck.

Door Hardware

- Exterior doors should be provided with 2-3/4" backset, lever handle hardware locksets, aluminum and hardwood adjustable thresholds and weather-stripping.
- Interior unit entry doors should be provided with 2-3/4" backset, lever handle hardware locksets, keyed-alike deadbolts and hardwood thresholds.
- Bathrooms / Master bedrooms should provide privacy sets.
- Other interior unit doors (passage) may have knobs when not required to have lever handles at accessible units, but levers are encouraged throughout for universal design.
- Exterior and interior doors should have a baseboard-mounted stop to prevent damage to wall finishes. Stop finish should match door hardware finish.

FINISHES

- All finishes should be durable, easy to maintain, provide a long useful life, and eventually be recyclable. In addition, finishes should not contribute to respiratory ailments due to off-gassing over time. All adhesives should consist of low or no VOC's.

Ceramic Tile

- At bathroom walls where ceramic tile is to be installed, tiles should be at least 4 1/4" square and installed in thin-set mortar on a cement backer board of 1/2" thick glass fiber-reinforced cement tile backer substrate installed with galvanized roof nails per manufacturer's recommendations. The use of moisture resistant drywall (MR board or 'green board') is discouraged as a tile backer.
- MR wall board is recommended in areas without tile in full bathrooms.
- At bathtubs, the tile should extend a minimum of 6'-0" above the finish floor, complete with all necessary trim pieces and caps, including a soap dish without a grip bar. Seal all openings behind tub and shower enclosures to minimize airflow.
- Bathroom floors should be either tiled with a floor grade ceramic tile, non-slip glazed or unglazed, and include a ceramic sanitary base (tile trim piece or cap) at all wall and floor junctures; or "inlaid" with linoleum sheet goods with one-piece painted wood or MDF baseboard.

Linoleum

- To ensure minimum out-gassing and durability, where desirable, linoleum is allowed in common stairs and hallways of multifamily buildings and in kitchen, bathroom, entry and vestibules within dwelling units.

Vinyl Composition Tile (VCT) and Vinyl Plank:

- Vinyl composition plank or tile flooring is allowed when it is highly durable, easy to maintain, made of recycled materials, and able eventually to be recyclable.
- Water based adhesives should be used. VCT adhesives should have VOC content less than or equal to 50 g/L less water. Vinyl composition flooring where provided is recommended to be a minimum 1/8 inch thick in conformance with "high traffic" recommendations of HUD Minimum Property Standards.

Engineered Wood & Hardwood Flooring

- Engineered wood/hardwood floor is allowed throughout dwelling unit except for kitchen and bathroom.

Carpet

- The use and location of carpeting should be limited sharply due to asthma, respiratory, maintenance, and life cycle concerns.
- All carpeting and padding should meet the Carpet and Rug Institute (CRI) indoor air quality guidelines and "Green Label Plus Program".
- Carpeting when provided is recommended to have the following specifications in conformance with HUD Bulletin, UM 44-D (http://portal.hud.gov/hudportal/HUD?src=/program_offices/administration/hudclips/bulletins/umbs):
  - Use of Type 1, Class 2 for unit interiors
  - Use of Type 11, Class 2 for elderly or handicapped units and public spaces.
- A separate pad in conformance with applicable flame spread and material standards should be provided in all but handicapped units and public spaces.

Painting

- All paint or stains or varnishes should be limited to low (50g/L) or no VOC except as noted below. Paint products should be applied at the rate specified by the manufacturer with the following minimum applications.

  Gypsum Drywall – Ceilings – 1 coat of latex-base primer and 1 coat latex-base interior flat (ceiling white) paint. Kitchens and bathrooms should receive 1 coat primer and 2 coats semi gloss odorless

Alkyd enamel. Existing ceilings should receive stain/mold kill primer. Sand finish ceilings should not be applied in kitchens or bathrooms.

Gypsum Drywall – Walls – 1 coat latex-base primer and 2 coats interior latex-base egg shell paint. Kitchens and bathrooms should receive 1 coat primer and 2 coats semi gloss odorless Alkyd enamel. Existing ceilings should receive stain/mold kill primer.

Plaster Ceilings – 1 coat latex-base primer and 2 coats latex-based interior flat (ceiling white) paint. Kitchens and bathrooms should receive 1 coat primer and 2 coat semi gloss odorless Alkyd enamel.

Plaster Walls – 1 coat latex-base primer and 2 coats latex-based egg shell paint.

Stained Woodwork – 1 coat oil-base interior wood stain and 2 coats satin or semi gloss polyurethane varnish. VOC content less than or equal to 250 g/L. All stain should be low or no VOC.

Natural Finish Woodwork – 1 coat sanding sealer and 2 coats satin or semi gloss polyurethane varnish. Clear wood finishes should contain VOC content less than or equal to 350 g/L (varnish) and 550 g/L (lacquer). All varnish should be low or no VOC.

Painted Woodwork – 1 coat interior enamel undercoat and 2 coats interior semi gloss odorless alkyd enamel.

Ferrous Metal – 1 coat rust-inhibiting (such as by Rust-o-leum or equal) primer, 1 coat interior enamel undercoat and 1 coat interior semi gloss odorless alkyd enamel. Anticorrosive and antirust paints applied to interior ferrous metal substrates should contain VOC contents less than or equal to 250 g/L.

Painted Wood Finish (Exterior) – 1 coat exterior primer and 2 coats semi gloss alkyd enamel. All new exterior trim and siding should be back primed.

Transparent Wood Finish (Exterior) – 1 coat oil-base sealer and 2 coats spar varnish.

Zinc Coated Metal – Whenever using galvanized metal, the surfaces should be cleaned with a non-petroleum-based solvent, removing pre-treatment, oil and contaminants from the surface prior to applying 1 coat galvanized metal primer, 1 coat interior enamel undercoat and 1 coat interior semi-gloss odorless alkyd enamel.

GENERAL MECHANICAL AND ELECTRICAL GUIDELINES

- To reduce review and approval time and allow for the economies of scale inherent in larger purchases, to the extent possible Architects should specify system components from a single manufacturer/distributor.
- Architects should specify three acceptable and equivalent manufacturers for equipment in order to obtain competitive pricing.

PLUMBING

- All sanitary lines below floor slabs should be cast iron bell and spigot or equal. PVC is not recommended.
- Spaces with appliances and equipment that may leak substantial amounts of water such as water heaters and clothes washers should be provided with a floor drain or floor pan and drain.
- Air cushions should be provided at least every set of fixtures to prevent water hammer.
- Bath lavatory and faucet: 'cultured marble' integral bowl with front overflow and backsplash. U.S. Environmental Protection Agency (EPA) WaterSense labeled single lever chrome washerless faucet with aerator, flow restrictor, lift rod, and pop-up drain. 0.5 gpm is recommended.
- Kitchen faucet: Single handle faucet with spray attachment, 1.75 gpm is recommended.

- Toilet: two piece close-coupled siphon jet vitreous china (white), EPA WaterSense labeled, round bowl toilet, 12" rough, solid plastic closed seat and cover, chrome supply and flexible riser. 750 minimum solid gram removal is recommended.
- Bath tub and fittings: white porcelain finish steel with sound-deadening polymer backing, non-slip bottom, chrome plated drain/waste/overflow with strainer. Enameled steel tubs and fiberglass tubs with integral surrounds are discouraged. EPA WaterSense labeled chrome, pressure-balancing, anti-scald bath/shower valve and diverter, spout, and shower head.

Water Supply

- Underground water service: Type K copper ¾" minimum diameter
- Hot and cold water piping: Type L
- Drain, waste, and vent piping: Type DWV.

Hose Bibs

- Hose bibs should be of the freeze-proof type and lockable for water conservation.

HEATING

- Electric systems should be used.
- Central boiler controls should allow building management to easily control the following functions:
    - To shut off distribution when outside temperature reaches a pre-set temperature.
    - To modulate delivered water temperature in response to outside temperature
    - To modulate delivered water temperature in response to time of day.
- Design and size HVAC equipment properly using the latest editions of ACCA Manuals J, S, &D, respectively, the ASHRAE Handbook of Fundamentals, or an equivalent computation procedure.
- Space and water heating equipment that involves combustion should be designed and installed with closed combustion (i.e., sealed supply air and exhaust ducting.) Combustion systems need emission comparison and Agency approval prior to design.

Heating Equipment

Note: The following paragraphs describe examples of systems frequently used in residential construction. Electric systems are to be provided. ***Note however, if a system other than an electric system is proposed, an energy and greenhouse gas comparison to an electric system will need to be provided and the fossil fuel system approved. Justification for systems which have higher greenhouse gas emissions than the alternative electric system will need to be provided for review by the Agency:***

Typical Example of Sealed-Combustion Forced Hot Water Systems – Requires Approval by Agency

- Keep the system (including boiler and distribution pipes) entirely within the conditioned envelope. Provide high efficiency sealed-combustion gas-fired boiler with an Annual Fuel Utilization Efficiency (AFUE) of 85% or better. Domestic hot water heater should be an insulated stainless steel storage tank with tempering valve and separate zone valve and/or circulator, heavy duty hot water baseboard radiation element complete with bleeder valves and durable covers and trim. System should be complete and operational prior to occupancy. Particular attention to location of vent terminations relative to walkways and windows should be paid for design and Code compliance.

Typical Example of Forced Warm Air Systems – Requires Approval by Agency

- Provide a high efficiency or hydro-air system to heat warm air. Gas fired boiler should have an AFUE of 92% or better. Provide new flue pipe with sections fastened with sheet metal screws per Code. Provide new supply and return sheet metal plenums, required safety switches, thermostats and all wiring necessary for proper operation. Provide all sheet metal ducting, properly secured with straps, sealed with mastic, according to code on both supply and return with dampening capabilities to each habitable room. All ductwork should be sealed per MA State Building Code (780 CMR J4.4.8.2 Duct

Sealing), and Energy Star Homes guidelines. All ducts should be located within the envelope. All grilles and registers should meet specifications for their particular application, i.e., floor or wall discharge. The system should be adaptable to receive air conditioning at a future date. Domestic hot water should be provided by a device with efficiency (EF) greater than 6.1 with sealed or direct vent construction.

- For oil-fired applications, provide all the above, and include a retention head oil burner, 275 gallon oil storage tank with plastic-sheathed soft copper supply buried in the floor slab, and a 'kill switch' located near the basement stairs. Oil furnace AFUE should be 85% or higher.
- Limit duct air leakage outside the conditioned envelope. The tested duct leakage rate should be less than or equal to 3.0 cfm at 25 Pascals per 100 square feet of conditioned floor area (for each installed system).

Thermostat Controls

- Energy Star labeled programmable set-back thermostats are desirable.

VENTILATION

- A time clock or other device easily controlled by building management should be provided to shut off mechanical ventilation when not required.
- Where proposed, an agency may request an analysis of the cost-effectiveness of a Energy Recovery or Heat Recovery Ventilation Systems (ERV/HRV).

ELECTRICAL

Public and Common Metering

- Meters and Type "T" gang boxes at exterior walls should be mounted on backer boards such as molding-trimmed MDO fastened to the sheathing.
- Where applicable, locate the load center in a convenient location within each unit.

Wiring

- If aluminum wiring is used in code-permitted locations, connections should be made with appropriate compression fittings.

Lighting

- It is preferred that ceiling-mounted light fixtures be provided in addition to switched electrical receptacles.

FIRE PROTECTION

Fire Sprinkler Systems

- Drawings should be fully engineered based upon recent hydrant flow tests and bear the stamp of a licensed fire protection engineer.
- Standpipes and sprinkler piping are best when not exposed below finished ceilings. Use concealed pendant type sprinkler heads and trim plates.

APPENDIX A: EXAMPLE UNIT LAYOUT DIAGRAMS

This appendix is intended to supplement the Massachusetts Multifamily New Construction Design Requirements & Guidelines by provided visual examples of the principles described in that document. *(See Section 3.A. Design Requirements for Residential Occupancy and Section 4.B. Interior layouts & Dimensional Design Guidelines.)*

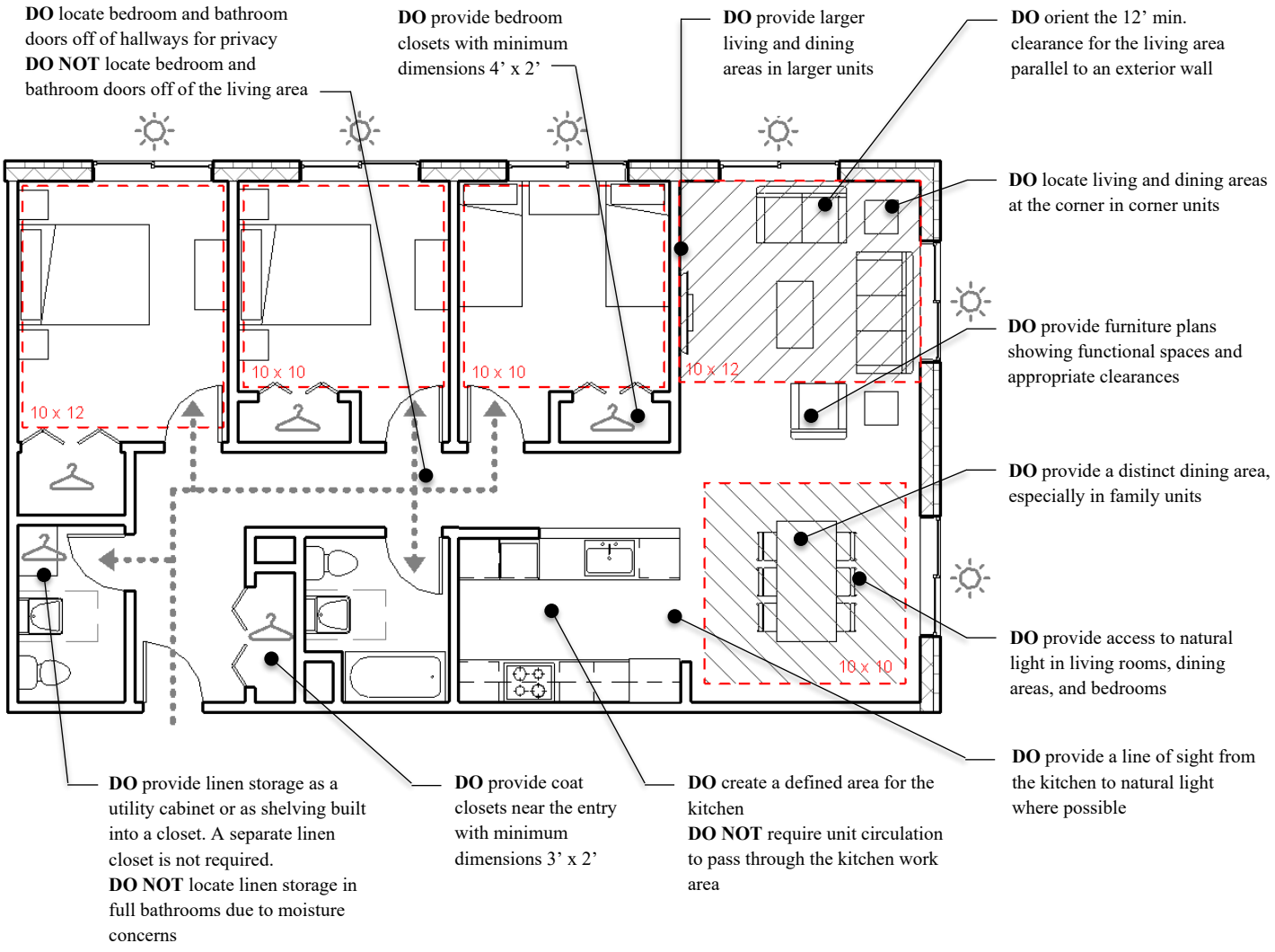
Unit Layout Design Considerations

- Minimum clearances in bedrooms
- Minimum clearances in living and dining
- Circulation
- Access to natural light
- Storage space

Guideline Unit Sizes

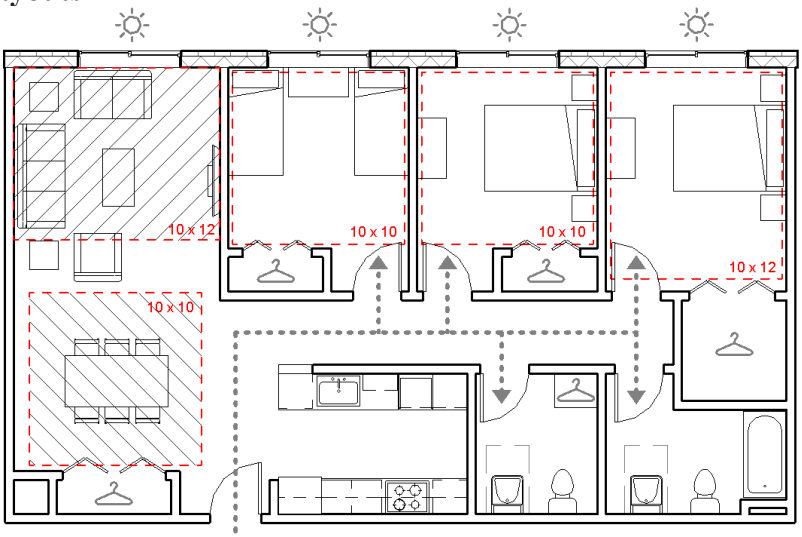
Studio	500 sf
One Bedroom	600 sf
Two Bedroom	750 sf
Three Bedroom	1000 sf
Four Bedroom	1100 sf

Example Unit (3 Bedroom Corner Unit)

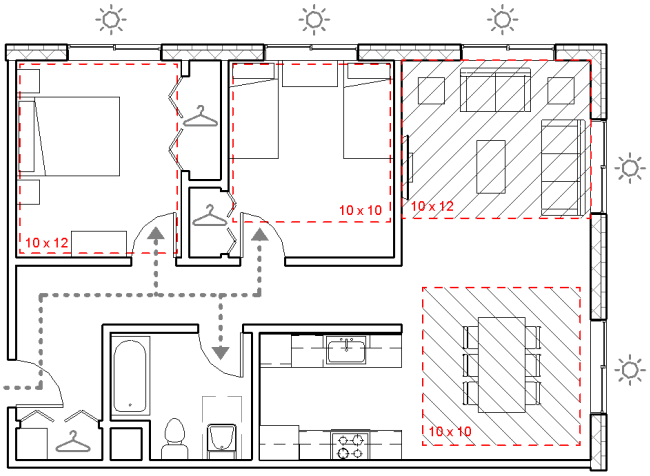


Example Unit Layouts

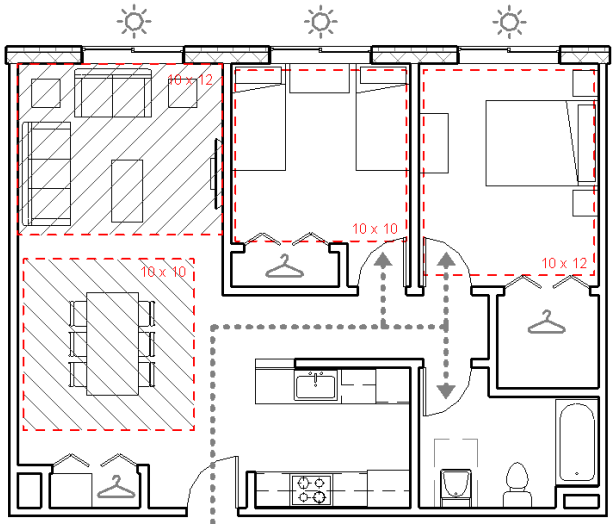
3 Bedroom
Typical Unit



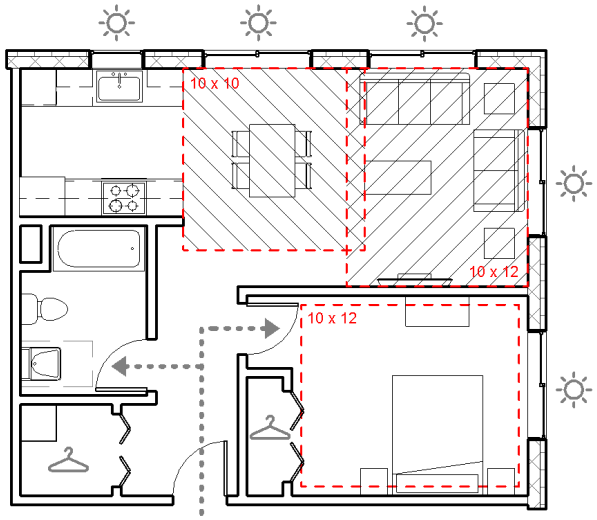
2 Bedroom
Corner Unit



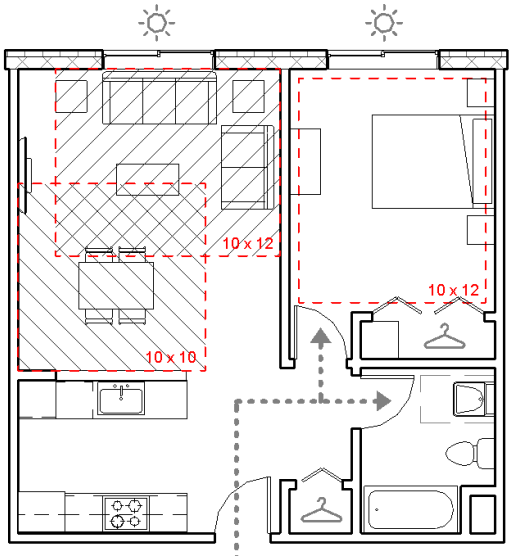
2 Bedroom
Typical Unit



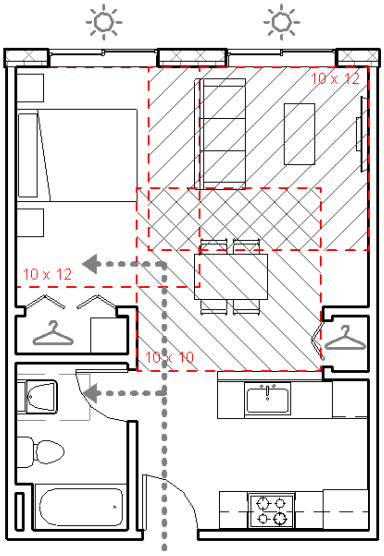
1 Bedroom
Corner Unit

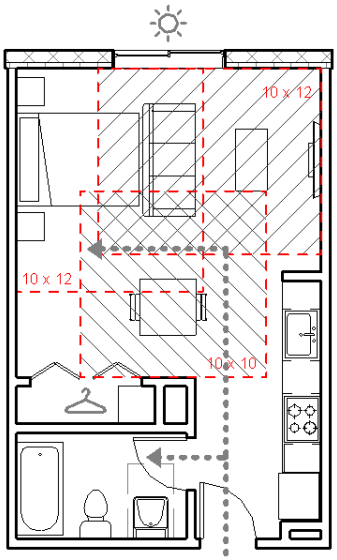


1 Bedroom
Typical Unit



Studio
Typical Unit



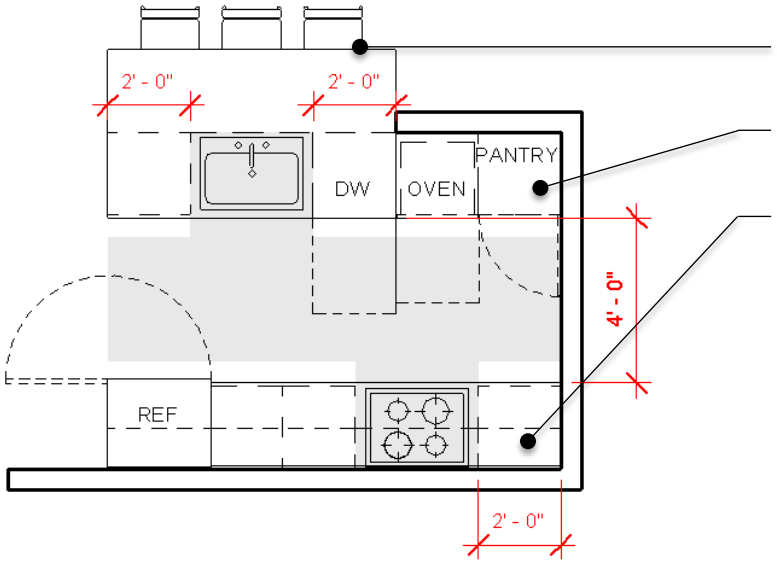


Kitchen Design Considerations

Accessible maneuvering space

Clearances for appliances

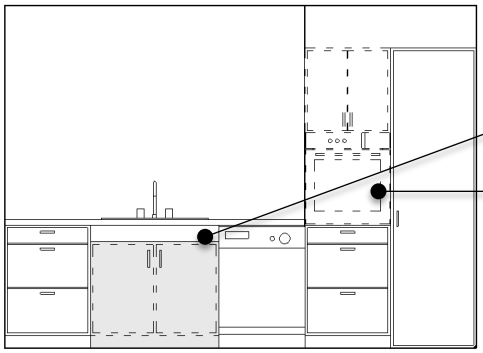
Example Kitchen Layout



DO provide counter seating

DO provide a tall pantry cabinet

DO provide 18" – 24" linear counter space on both sides of the sink and cooktop

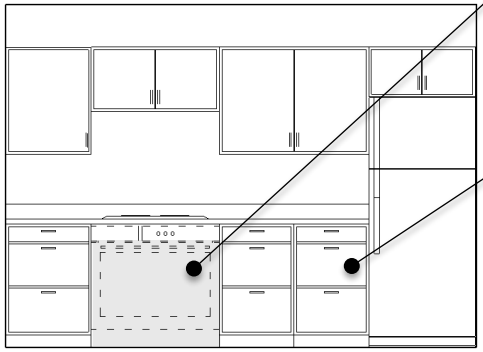


Accessibility:

The cabinet below the sink must be removed to ensure maneuvering clearances.

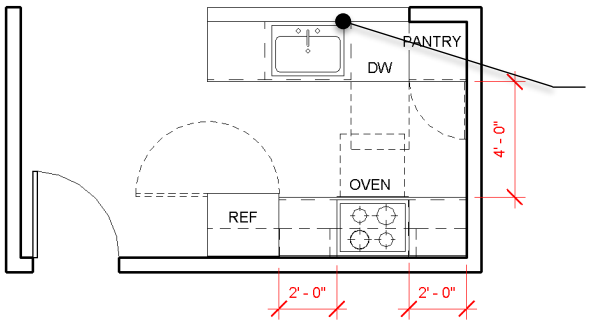
A wall oven must be installed.

The range must be replaced by a cooktop with clearance below.



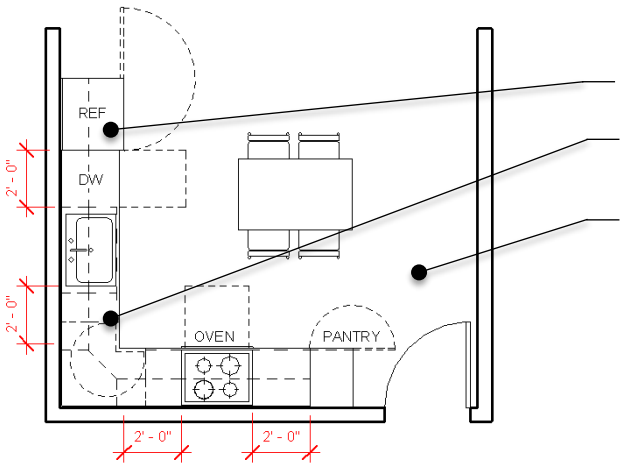
Universal Design:

Provide drawers instead of below counter cabinets for more accessible storage.



Galley Kitchen

DO consider opening kitchen with a half wall or extending the counter

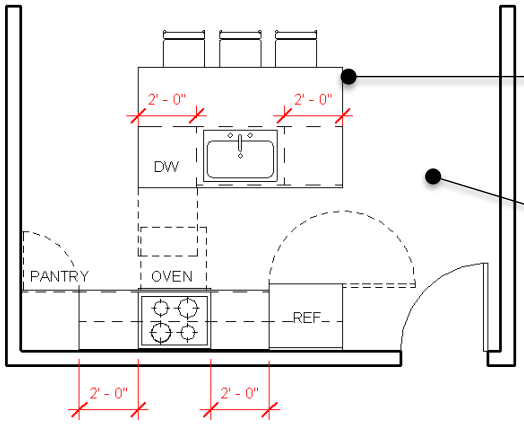


L Shaped Kitchen

DO place refrigerator away from the corner

DO provide a corner lazy Susan base cabinet for more accessible use of below counter space

DO NOT require unit circulation to pass through the kitchen work area. If the dining table is placed within "L" area, the primary circulation path must not require passing between the dining table and kitchen.

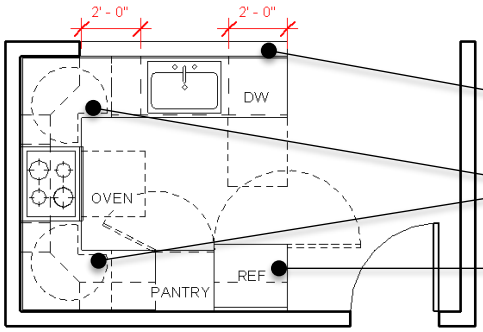


Island Kitchen

DO provide counter height seating at island

DO NOT consider island seating as a replacement for a distinct dining area

DO NOT require unit circulation to pass between the kitchen and island.



U Shaped Kitchen

DO consider opening kitchen with a half wall or extending the counter

DO provide lazy Susan base cabinets in the corners for more accessible use of below counter space

DO place refrigerator away from the corners

*****END OF MASSACHUSETTS MULTIFAMILY NEW CONSTRUCTION DESIGN REQUIREMENTS AND GUIDELINES*****

ii: AGENCY REQUIREMENTS

This section is intended to supplement the Massachusetts Multifamily New Construction Design Requirements & Guidelines with the requirements of individual funding agencies associated with the project being undertaken. Each of the attached requirements and processes included here are to be followed/completed on the project for which they are provided.

The exception to the requirements would be if the requirements are superseded by an advertised Request for Services and the designer is selected by the DHCD Designer Selection Committee.

Massachusetts Department *of*
Housing and Community Development

1. BUREAU OF HOUSING DEVELOPMENT & CONSTRUCTION DESIGN & CONSTRUCTION REVIEW REQUIREMENTS

DHCD DESIGN AND REVIEW REQUIREMENTS:

A. DHCD Design & Construction Submission Process

Projects will be reviewed by DHCD architecture, engineering and construction administrative staff during the design and construction process. Design reviews will include a "Kick-Off" meeting, Schematic Phase, and 100% Construction Documents Phase. During construction, DHCD Construction Administration will perform a review of requisitions and change order payments and participate in the construction process.

Each Project Phase may consist of one or more required submissions, and may include site visits, meetings with the Department and others, or other tasks as described.

The following submittal procedure applies to all Design and the Construction phases:

Each submission shall include a both a hard copy and electronic copy of the submittal delivered to DHCD with a subject heading **FISH #XXXXXX PEHO Grant – LHA Name**.

a. Submissions to DHCD that are made electronically should be uploaded to the DHCD Cap Hub system via an entry portal which will be provided to the developer and the design consultant. Hardcopy submissions to DHCD should be addressed to the attention of Sabrina Cotton, Senior Administrative Assistant, DHCD - Bureau of Housing Development and Construction, 100 Cambridge Street, Suite 300, Boston, MA 02114.
b. Document and explain the reasons for any proposed changes in the project scope, schedule or budget which have occurred since the approval of the preceding design submission.

c. Each Design Submission shall include a written response to any comments or recommendations included with the approval of the preceding phase.
d. Each Design Submission will be subject to the Massachusetts Multifamily New Construction Guidelines: Design Requirements & Guidelines.
e. DHCD will do a technical and management review of the submitted documents and must grant written approval before the project may proceed to the next phase. If after the review by DHCD, the submission is "Not Approved" the Designer will be required to re-submit the deliverables for each phase in accordance with the comments included in the non-approval letter.
f. DHCD construction managers will receive construction documentation and submittals according to the DHCD Construction Handbook found at: https://www.mass.gov/service-details/construction-handbook-with-forms.

B. DHCD Design & Construction Review Process

1. KICK-OFF MEETING

The Developer shall schedule, conduct and prepare minutes of a "Kick-Off" meeting with the DHCD representatives, relevant stake holders and the design consultants to review the project.

2. SCHEMATIC DESIGN PHASE MEETING & SUBMISSION

The Developer shall schedule, conduct and prepare minutes of a Schematic Design meeting with the DHCD Representatives, relevant stakeholders and the design consultants to review the project.

Prior to the meeting, the submission of the Schematic Design shall be made to DHCD and shall include sketches, plans and details which clearly show the premise on which the design is based and shall:

- Incorporate or respond to the information requested at the "Kick-Off" meeting;
- Provide a Summary of the codes and regulations that apply to the project, including MAAB and Fair Housing regulations;
- Include a cost estimate; and
- Include an updated schedule.

DHCD design reviews will be completed within 14 calendar days of receipt of the full phase design documents.

3. 100% CONSTRUCTION DOCUMENT PHASE SUBMISSION

Prepare and deliver a formal Construction Document Submission, which:

a. Incorporate or respond to the review from the Schematic Design Phase;
b. Document any additional design decisions made since the approval of the Schematic Design Phase;
c. Include a set of Contract Documents for Construction which shall include at a minimum:
    i. Drawings prepared which include plans, elevations, details, and cross sections as may be deemed necessary; and
    ii. A Project Specification Manual which includes:
        1. Procurement and Contracting requirements of DHCD; and
        2. Technical Specification sections formatted according to CSI MasterFormat.
d. Includes an update of the project cost estimate which tracks estimated cost revisions;
e. Include an updated schedule; and
f. If required by DHCD, meet to resolve any issues.

DHCD design reviews will be completed within 14 calendar days of receipt of the full phase design documents.

The final contract documents shall incorporate the comments from the 100% CD approval. These documents shall be archived: The Designer shall prepare and transmit a PDF version of the contract documents (including addenda) to BidDocsONLINE to be archived. (BidDocs is DHCD's vendor for digital archiving.) The PDF documents shall be forwarded via email to support@biddocsonline.com. If the documents are too large to email, please forward a CD to BidDocsONLINE, P.O. Box 51, Groton, MA 01450. All documents should be accompanied by a transmittal indicating the Housing Authority, the project name, the development name and number, the DHCD number and the Designer's contact information.

4. NOTICE TO PROCEED

DHCD will provide a Notice to Proceed with the Construction Phase once all of the design documents have completed the approval process and financing is confirmed.

5. CONSTRUCTION PHASE PAYMENT APPROVALS

The Developer shall schedule regular construction meetings. The Architect shall conduct the meeting and prepare and distribute minutes of the meeting. The DHCD construction management representative will be invited to attend the meeting. The DHCD construction management representative will also conduct inspections of the work as required to review and approve requisitions and change orders for payments as defined in the DHCD Construction Handbook. The Handbook can be found at

https://www.mass.gov/service-details/construction-handbook-with-forms. Meeting minutes from all meetings should be transmitted to DHCDDesignSubmission@mass.gov with a subject heading **FISH #057092 PEHO Grant – Chelsea.**

END OF BUREAU OF HOUSING DEVELOPMENT & CONSTRUCTION REVIEW REQUIREMENTS ***