

# MOH Design Standards

August 10, 2022

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# Acknowledgments

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# Table of Contents

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<b>Table of Contents</b>	<b>3</b>
<b>Introduction &amp; Purpose</b>	<b>7</b>
<b>Design Review Process</b>	<b>8</b>
Funding Round Design Submission Requirements	8
<b>Rehabilitation &amp; Preservation</b>	<b>10</b>
<b>Capital Needs Assessment</b>	<b>10</b>
Replacement Reserves	10
Green Building & Energy Performance	11
Rehabilitation Strategy Summary Chart	11
<b>Unit Modification / Reconfiguration</b>	<b>11</b>
Accessibility and Relocation	11
Adaptive Reuse and Gut Renovation	12
<b>New Construction - Sustainability</b>	<b>13</b>
LEED	13
<b>Zero Emissions Building (ZEB)</b>	<b>13</b>
Co2 Target Budget Requirements	14
Window U-value Performance, Window To Wall Ratio & Solar Heat Gain Coefficient	14
Air Tightness (ACH50/sf2 of gross envelope area)	15
Domestic Hot Water System Efficiency (COP)	15
Ventilation	15
Heat Recovery Ventilation	15
Heating System	15
Cooling System	15
<b>Application of Heating, Cooling and Ventilation Requirements (Small Buildings; where applicable)</b>	<b>15</b>
Roof, Wall, Floor and Slab R-Value - Thermal Bridge Free Shell & Optimized Insulation	16
On-site Photovoltaics	16
Lighting, Appliances and Metering	16
Application Of ZEB Requirements	16
Small Buildings - 6 units or less	16

6 to 40 units	17
Large buildings - 40+ units. (Alternative ZEB Compliance)	17
<b>Site &amp; Building Planning</b>	<b>18</b>
<b>Neighborhood Relations</b>	<b>18</b>
<b>Neighborhood Context</b>	<b>18</b>
Building Placement & Orientation	18
Parking and Mechanicals	18
Building Composition	18
Character and Materials	18
Foundation Wall Height	19
Site Work	19
Demolition	19
Soil Remediation - 21 E's	19
PPT Lumber	19
Foundation	19
Basement Slabs	19
Moisture Content	19
Building Enclosure	19
<b>Fenestration and Doors</b>	<b>20</b>
Rough Carpentry and Roofs	20
Open Space	21
Fencing and Buffers	21
Trees and Landscaping	21
Stormwater Management	22
<b>Curb Ramps</b>	<b>22</b>
<b>Interior Building &amp; Unit Layouts</b>	<b>23</b>
<b>Universal Design</b>	<b>23</b>
Accessibility	23
<b>Townhouses in Multifamily dwellings</b>	<b>23</b>
<b>Broadband Access</b>	<b>24</b>
Artist Live Work Considerations	24
<b>Artist Live Work Housing Preference - Tenant Selection and Home Buying Eligibility</b>	<b>24</b>
<b>Unit Dimensional &amp; Use Requirements</b>	<b>24</b>
<b>Amenity Space</b>	<b>24</b>
<b>In Unit Workspace</b>	<b>25</b>
<b>Unit Layout Best Practices</b>	<b>25</b>

<b>MOH Unit Size - Targets</b>	<b>25</b>
Unit Layout Best Practices	26
Unit Dimensional & Use Requirements	26
Bedrooms	26
<b>Application of Bedroom requirements</b>	<b>26</b>
Living Areas	26
<b>Application of Living Area requirements</b>	<b>27</b>
Kitchens	27
<b>Application of Kitchen requirements</b>	<b>27</b>
Closets and Pantries	27
Bathrooms	27
<b>Application of Bathroom requirements</b>	<b>27</b>
Laundry	28
<b>Interior Unit Diagrams</b>	<b>29</b>
Example Unit Layouts	30
Single Person Occupancy Types	35
Interior Unit Specifications	36
Rough Carpentry - Wood Blocking	36
Finish Carpentry and Millwork	36
Cabinetry	36
Sealants	36
Interior Door & Window Casing	36
Baseboard Trim	36
Doors	36
<b>Unit Entry Doors</b>	<b>36</b>
<b>Door Hardware</b>	<b>36</b>
Finishes	37
<b>Ceramic Tile</b>	<b>37</b>
<b>Engineered Wood &amp; Hardwood Flooring</b>	<b>37</b>
<b>Linoleum</b>	<b>37</b>
<b>Vinyl Plank and Vinyl Composition Tile (VCT)</b>	<b>37</b>
<b>Carpet</b>	<b>37</b>
<b>Painting</b>	<b>37</b>
Safety & Security	38
Plumbing	38
<b>Water Supply</b>	<b>38</b>
Electrical and Fire Protection	39

<b>Appendix</b>	<b>40</b>
<b>Other MOH Resources &amp; Policies</b>	<b>40</b>
<b>Federal</b>	<b>40</b>
<b>State</b>	<b>40</b>
<b>Local Municipal</b>	<b>40</b>
<b>Existing Buildings/ Structures</b>	<b>41</b>
<b>Universal Design Resources</b>	<b>41</b>
<b>Zero Emissions, Building Enclosure &amp; Other References</b>	<b>41</b>

# 01

## Introduction & Purpose

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The following DESIGN STANDARDS are intended to promote the construction of affordable 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 multifamily 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.
- Maximize accessible, welcoming, and safe spaces, with the understanding that people have different needs and abilities that can change over time.
- Encourage sustainability strategies which result in low maintenance costs, energy efficiency, and minimal environmental impact on public infrastructure.

# 02

## Design Review Process

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MOH Design pursues design excellence with a focus on improving life for the people of the city of Boston, particularly those with the greatest need. Through the Design Review Process, MOH partners with development teams to: 1. create affordable, equitable, and sustainable housing for residents and newcomers using design principles that contribute to a high quality of life; 2. preserve and enhance the urban fabric of the neighborhoods by building and supporting thriving communities; and 3. ensure that public resources are used to help as many people as possible.

MOH reviews each project's design and pricing progress at key milestones in the architectural process. These checkpoints serve to ensure that a project is meeting MOH's goals and to provide a framework for open communication about project challenges and changes. In order to assist development teams with the Design Review Process, MOH provides Design Review checklists for each review milestone listed below. The checklists are intended to make MOH's expectations at each design phase transparent and straightforward. Development teams must review their submission materials, fill out the appropriate checklist, and then submit it along with the past checklists (for reference) and the current design submission. Refer to MOH's Design Review checklists for more information. The key milestones with checklists are:

- Funding Application (if applying for funding) & Schematic Design
- Design Development
- Construction Documents & Bid Package
- Bidding & Contractor Selection
- Draft Construction Contract
- Closing (for materials needed for MOH's construction staff's use as the project transitions into construction)

The flowchart below illustrates MOH's Design Review Process and should be used in planning the development schedule. A more detailed description of the MOH Design Review Process can be found on the MOH Housing Policies webpage (see Appendix).

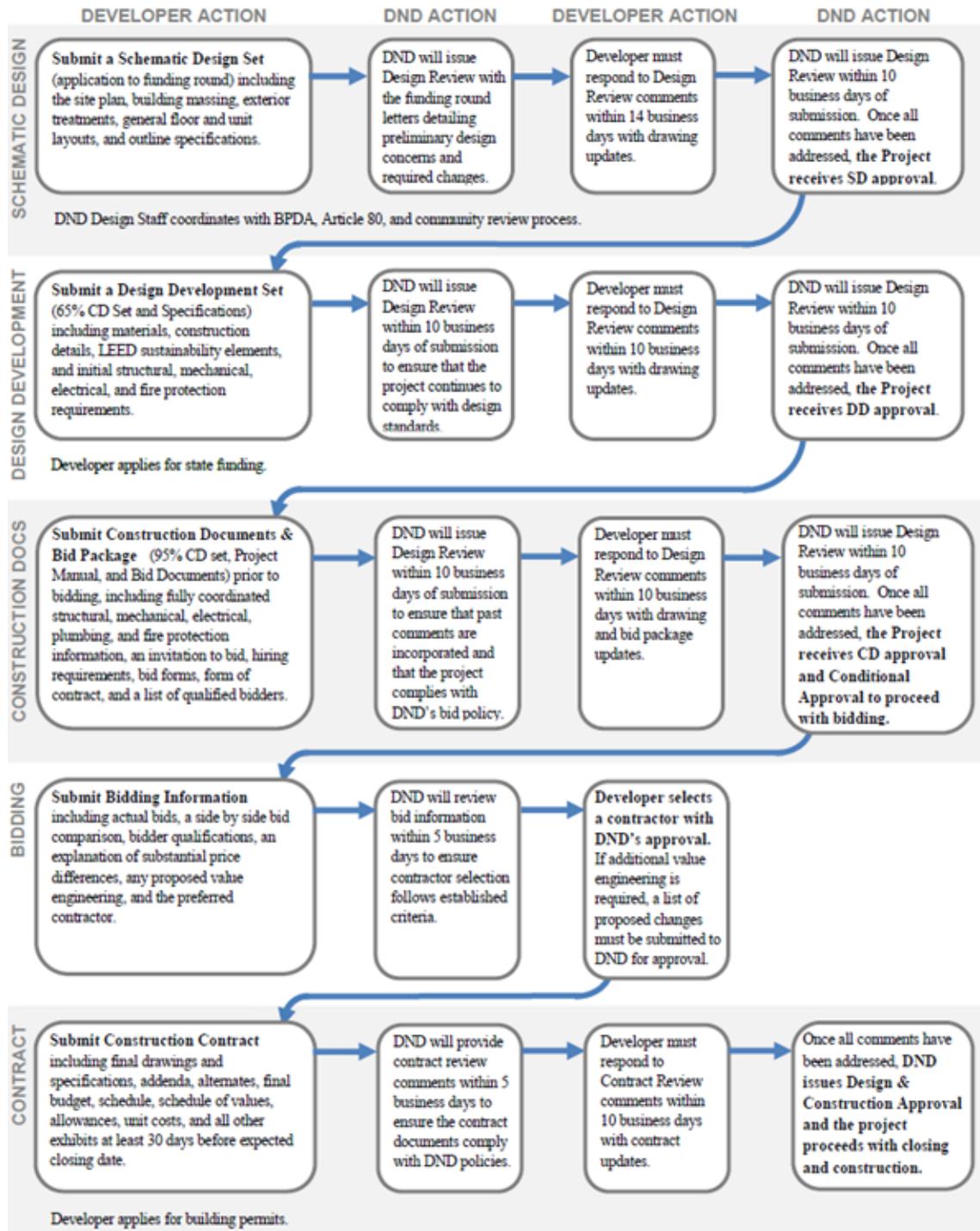
## Funding Round Design Submission Requirements

At the time of application for funding, the Design Submission is to consist of the following, to be submitted in digital format on a physical device such as a memory stick, as described in the funding RFP:

- Completed Funding Application & Schematic Design checklist
- Drawings with content described in the Funding Application & Schematic Design checklist
- Renderings of the proposed design
- Outline specifications with content described in the Funding Application & Schematic Design checklist
- Preliminary description of the Net Zero Emissions and Energy strategy
- Capital Needs Assessment if the project involves any existing structures

The design submission is to focus on the best description of the physical design of the proposed project. The set is to illustrate the site planning for the development and the building(s)' proposed relationship to contextual features and existing buildings. Documentation should focus on illustrating the massing, how the building will

meet the streetscape and provide an overall context in which to understand the scale of the building(s) and their exterior finish. The set is also to include the interior spatial layout of each floor, dimensioned unit layouts, and all building elevations. See Design Review checklists for specifics.



# 03

## Rehabilitation & Preservation

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Preservation project development teams are to provide a comprehensive rehabilitation strategy, which combines the established 20-year Capital Needs Assessment (C.N.A.) with practical green building and energy performance recommendations. Applicants are to provide a C.N.A. and the replacement reserve analysis which focuses on improving the quality of life of residents, ensuring the long-term stabilization of the building and protecting the health and safety of building occupants. Green building recommendations are to use LEED for Homes, Healthy Homes, and Energy star as a basis and pay particular attention to improving poor indoor air quality, inadequate ventilation and other unhealthy interior conditions for residents. The energy performance assessment is to evaluate where improvements can be made to reduce operating costs by improving the energy and water efficiency of the building(s). Considerable improvements can be obtained by providing workshops to introduce conservation strategies and healthy homes measures to residents. Where unit layout or reconfiguration is proposed, the rehabilitation strategy is to address these modifications.

### Capital Needs Assessment

The C.N.A. is to project the potential capital costs over a 20-year period using a quantity inventory of building components (including the age and expected life of these components), data on their current cost, assumed rates of inflation and a schedule of replacement. The C.N.A. must have been conducted by a qualified professional less than 2 years prior to the submission to this application for funding. Projects with multiple buildings must complete a C.N.A. for each building.

A complete C.N.A. will include a detailed 20-year capital needs worksheet. A report summarizing the existing property conditions with color photos, a description of projected needs as reflected in the C.N.A. and final replacement recommendations are to accompany the worksheet. In addition applicants are to provide the following:

- A chart or (bar) graph to summarize costs in each building system or major work category between years 1-20 as recommended by the C.N.A.
- A narrative summary of the following priority areas as reflected by the immediate replacement recommendations in the C.N.A. This narrative is also to focus on life safety upgrades required by code:
  - Building Stabilization – exterior envelope, structure, egress
  - Mechanical, Electrical, Plumbing & Fire Protection Systems
  - Hazardous Materials & De-leading
  - Ventilation, Indoor Air Quality – bath, kitchen, common area
  - Interior Quality & Finish – including healthy homes

### Replacement Reserves

The replacement reserve analysis is to project the funds required for capital improvements over a 20-year period. The analysis should include the prior 3 to 5 years reserves. Each of the following documents is to include a chart or (bar) graph to illustrate the analysis. Also include capital costs with the chart or graph for comparison:

- A replacement reserve projection based on existing reserves.
- A replacement reserve projection based on the reserves proposed in the rehabilitation strategy.

## Green Building & Energy Performance

Operating expenses are to specifically include utility costs for gas, electricity and water. Maintenance costs are to be included as an operating expense, if repairs to fixtures, heating equipment, appliances, lighting, etc. can be quantified. An analysis of existing operating costs should include historical trends 3 to 5 years prior and an energy audit conducted by a qualified energy auditor or home energy rater. More extensive thermal imaging and destructive exploration is to be conducted when known deficiencies exist in the building envelope (roof, floors, exterior walls, etc.) Operating savings are to be determined from identifying where “energy” improvements have the greatest cost benefit (life cycle cost compared to payback period.) These operating savings are to be projected over a 20-year period based on the rehabilitation strategy.

Use LEED for Homes, Healthy Homes and Energy star as a basis for Green building and pay particular attention to improving poor indoor air quality, inadequate ventilation and other unhealthy interior conditions for residents. A complete assessment will include a summary of the “green” and “energy” improvements with a description of expected resident benefits, operating cost reductions including utility savings. Thermal imaging, investigative photos & reports from the energy audit and detailed spreadsheets analyzing existing operating expenses and proposed operating savings (cost benefits) are to be provided. In addition applicants are to provide the following:

- A 20-year projection of operating cost savings based on the rehabilitation strategy.

## Rehabilitation Strategy Summary Chart

Please include a chart or (bar) graph, which combines operational savings, replacement reserves and capital needs over a 20-year period in a single illustration. Capital needs improvements are to be broken into categories based on the rehabilitation strategy. This graph is to reflect an understanding of the fund allocation within the capital improvements in comparison to the funds/savings allocated to replacement reserves.

## Unit Modification / Reconfiguration

Compliance with MOH’s unit size and room dimensions is not required for Moderate Rehabilitation Preservation projects where the interior layout of residential units remains unchanged and systems upgrades are the focus of the proposed project.

Rehabilitation strategies that minimize the reconfiguration of existing units are highly preferred and encouraged by MOH. However, MOH understands that there are cases where the existing residence serves a program or serves a particular target population and the existing accommodations are no longer adequate for the program. In addition, the characteristics of the building (dimensions, window locations, square footage, interior layout, circulation, etc.) provide specific constraints on the configuration of units. In these cases, the development teams are not required to meet the Target Unit Sizes listed in these Design Standards. However, the development team is encouraged to strive to meet the Target Unit Sizes and room dimensional requirements described in these Design Standards in areas that are being reconfigured where it does not greatly increase the scope of work to do so. The team is to schedule a site visit and meet with MOH design staff to explain the need for reconfiguration and discuss the approach to reconfiguration prior to submission to a funding round. The development team should reference these Design Standards and local code to assess whether proposed interior rooms are adequately sized.

## Accessibility and Relocation

Applicants are to clearly explain any need to modify the existing configuration of units for any reason including accessibility and life safety. Applicants are to determine whether the renovation scope of work (when compared to the building value) triggers compliance with accessibility regulations. A unit inventory listing the unit, unit square footage and number of bedrooms is to be provided in order to assess the impact of reconfiguration on the existing unit mix. Applicants are also required to summarize temporary or permanent displacement caused by the reconfiguration of units (Note URA requirements in the Application Process). Provide the following in addition to the narrative explanation described above:

- A unit inventory is to be provided, organized per building listing each unit’s major rooms, their dimensions and square footage.

## Adaptive Reuse and Gut Renovation

New construction requirements and guidelines described throughout these Design Standards are to be used where an existing building is being adapted from a nonresidential use to a residential use and when residential units are proposed to be completely gutted.

When residential units are proposed to be completely gutted, the development team must substantiate the need for this approach. The Rehabilitation Strategy narrative is the place to explain how the development team has verified that the Capital Needs and Useful life of systems and building components have reached the point of complete overhaul.

# 04

## New Construction - Sustainability

MOH has led the way with sustainability in affordable housing. Since 2008, MOH, working with the Boston Planning & Development Agency, Environment Department, energy providers, architects and affordable housing developers, has successfully facilitated a number of activities in pursuit of the City's Green Building Initiatives Program. We have long recognized that building performance, material durability, operating savings, resident comfort and resident health can be significantly improved when appropriate energy conservation and sustainability measures are integrated into the building design.

### LEED

All projects must be designed to be LEED "certifiable" at the Silver level at minimum. Certification by LEED in any way is not required. Compliance with an Environmental Protection Agency (EPA) Energy Star residential program is required as a prerequisite of LEED. Commissioning is required by MOH and in-field verification (except where required by LEED or Engerystar) is strongly recommended. Projects complying with Enterprise Green Communities must demonstrate equivalence with LEED sustainability measures. Incentives and rebates through agencies such as the Massachusetts Clean Energy Center (CEC) and MassSave are to be integrated into the sustainability strategy for the project.

### Zero Emissions Building (ZEB)

We have expanded the sustainable design and green building practices embodied within the Design Standards to reflect strategies to address climate change and the City of Boston's goals to reduce building carbon emissions to zero by 2050. The Building Emissions Reduction and Disclosure Ordinance (BERDO) sets requirements for large buildings to reduce their energy and water use data. The goal is to reduce their emissions gradually to net zero by 2050. BERDO applies to the following buildings:

- Non-residential buildings that are 20,000 square feet or larger.
- Residential buildings that have 15 or more units.
- Any parcel with multiple buildings that sum to at least 20,000 square feet or 15 units.

Buildings between 20,000 and 35,000 square feet or residential buildings with 15 to 35 units will need to begin reporting their energy use in 2022. While these buildings will not be subject to the emissions standards until 2031, reporting for 2030 emissions, MOH's ZEB requirements work to ensure new affordable housing funded by the City of Boston is prepared to meet these emissions goals upon their completion.

MOH's ZEB requirements are based on the recommendations contained within the 2020 guidebook for Zero Emission Buildings. The guidebook makes specific recommendations which provide a prescriptive path to a ZEB without extensive need for consulting and energy modeling. The following building assembly components were studied because they have the greatest impact on a building's EUI:

- Window U-value Window to wall ratio & Solar Heat Gain Coefficient
- Air Tightness (ACH50/sf2 of gross envelope area)
- Heat recovery ventilation efficiency
- Domestic Hot Water System Efficiency (COP)
- Heating + Cooling System Efficiency (COP & SEER/EER)
- Roof, Wall, Floor and Slab R-Value
- Photovoltaic system capacity (KW) and Roof Area percentage

The study team discovered that there is a total construction cost increase in the range of 2.5%. Incentives are available to offset engineering soft costs and utility rebates exist to lower total construction costs per unit. The long term operational savings means lower rents for residents and more sustainable hoa fees (repair & maintenance reserves) for homeowners. We see these requirements as an investment to make housing more economically sustainable for the future and address issues of equity in society. In the field, educational and training opportunities, partnering with Boston based apprenticeship, high school workforce training programs and simply engaging the immediate stakeholders of the project through social media and dedicated project websites are effective ways to address Equity in the development process. We want projects to build momentum toward the Mayor's 2050 Zero Carbon Vision and adoption of ZEB principles widely.

## Co2 Target Budget Requirements

All new MOH construction must be designed based on a Co2 target budget of 0.7-1.1 tons/person/year, or 1800kWh per person annually (*SITE energy, 5,040 KWH per person SOURCE energy (using a 2.8x multiplier for electricity)\** based on an occupancy of 2 occupants per bedroom) and must use electricity and on-site photovoltaics as the sole (or primary) fuel source. This target relates to the residential portion of a mixed use project. Commercial and significant areas of amenity space within a mixed-use or multifamily project must use electricity and on-site photovoltaics as the sole (or primary) fuel source.

*\*projects must use MOH's occupancy for calculation of occupants and miscellaneous electric loads (MELS) , which is equivalent to 2 persons per bedroom. Note this will be an increase in occupancy from PHIUS' "number of bedrooms+1" per unit calculation.*

Projects must simply implement the following prescriptive measures to meet the ZEB Requirement.

- A checklist, drawings and specifications documenting these elements
- A HERS checklist from a HERS rater
- Or a Passive House report submitted by a Certified Passive House Consultant

This is all that is required to comply with the Co2 Target Budget requirements. *MOH has phased the implementation of this prescriptive path based on feedback received during the study phase for Large projects. Refer to Application of ZEB Requirements for more information on ZEB compliance paths.*

## Window U-value Performance, Window To Wall Ratio & Solar Heat Gain Coefficient

All windows are to have a National Fenestration Rating Council (NFRC) rating (and be Energy Star rated.) Wood, wood-clad, aluminum, fiberglass and uPVC windows which meet the performance standards are acceptable for new construction.

Where window to wall ratios exceed these percentages, the window u-value must be determined by energy modeling. Window to Wall Ratio (%) of total surface area and the required u-value & window performance is shown below.

- 15 to 20% requires a window with a u-value of .22 or less
- > 20% requires a (triple glazed) window with a u-value of 0.18 or less
- All windows must have an Energy Star Air Leakage of <0.3 cfm/ft<sup>2</sup> @ 75 pascals.
- And a Solar Heat Gain Coefficient (SHGC) of .3 or less

Note: MOH prioritizes the composition of buildings fitting into their context. The building's composition is an important element of the design review process. MOH will work with architects to be certain that the window to wall ratio does not negatively impact the building design.

All windows should be sealed and receive pan flashing including pan flashing at sills, side flashing. Install pan flashing over building paper at sills using an industry approved water management system. For installation using other construction methods refer to the appendix. Caulk all window (and door) units with ethylene copolymer caulk, using backer rod, closed cell polyethylene and fill window shim spaces with a low-expanding foam sealer as required. The warranty period is to be a minimum of 10 years and be transferable to subsequent owners. *For insulating glass, the warranty period should be 5 years after the seal date permanently imprinted on the unit, but not less than 5 years after the date of substantial completion.*

## Air Tightness (ACH50/sf2 of gross envelope area)

Airtightness plays an essential role in terms of overall building and insulation performance. MA CMR requires all new construction to have air barriers and weather resistant barriers.

- Projects are required to provide third party Quality assurance (QA) and quality control (QC) (at the Project Management level) to ensure an air tightness of 0.06 ACH cfm/sf2 of gross envelope area @ 50 pascals is achieved.

## Domestic Hot Water System Efficiency (COP)

Domestic Hot Water systems with a Coefficient of Performance (COP) of 1 or greater are required. Domestic Hot Water systems may be centralized or unique to individual units. Options include:

- Instant-electric resistance hot water heaters (COP 1), or
- Heat-pump hot water heaters (COP 2+).

## Ventilation

Compartmentalized unit ventilation in conjunction with hrv or erv with direct venting to the exterior is preferred. In the unit erv/hrv may be connected to bathroom and kitchen area ventilation (non-combustion appliance required).

- Semi centralized ventilation per floor may be an acceptable alternative.
- Bathroom ventilation must be continuous and allow for variable control for odors unless the system can be shown to operate in a way to accommodate these conditions.
- Ductless range hoods with charcoal filters are to be Energy Star rated.

## Heat Recovery Ventilation

Small multifamily (6+ units)	57% + 0.77 watts per CFM
3 story multifamily (14+ units)	57% + 0.77 watts per CFM
4-5 story multifamily (40+ units)	80% + 0.77 watts per CFM(see large buildings)
6 story multifamily (50+ units)	80% + 0.77 watts per CFM(see large buildings)

## Heating System

Small multifamily (6+ units)	Heat pump 1 ton system/unit - ductless (preferred) - 3.0 COP (or more)
3 story multifamily (14+ units)	Heat pump 1 ton system/unit - 3.0 COP (or more)
4-5 story multifamily (40+ units)	see large buildings
6 story multifamily (50+ units)	see large buildings

Ducts should be located entirely within the building thermal envelope. The tested duct leakage rate must meet MA Residential IECC Energy Performance Testing requirements verified by a BPI or HERS Rater. Tested duct leakage should be less than or equal to 4.0 cfm at 25 Pascals per 100 square feet of conditioned floor area (for each installed system).

## Cooling System

Energy star rated -  $\geq 15$  SEER/  $\geq 12.5$  EER for split systems

Energy star rated -  $\geq 15$  SEER/  $\geq 12$  EER for single package equipment including electric package units.

## Application of Heating, Cooling and Ventilation Requirements (Small Buildings; where applicable)

- 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. (as applicable per building code.)
- Exterior wall caps are to be detailed and located to be as inconspicuous as possible.
- Where central AC is not provided, place 20 amp circuits under windows for AC units in the living room and bedrooms. Through-wall AC units are forbidden.
- 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.
- Note: Thermostat Controls - Heat pump thermostat control is to be based on manufacturer requirements. Where wired thermostats are used in multi-unit building systems, building level remote control is recommended. Programmable thermostats (in unit control) are to be used per Energy Star requirements.

### Roof, Wall, Floor and Slab R-Value - Thermal Bridge Free Shell & Optimized Insulation

Teams must examine the selected insulation products with low global warming potential (GWP). Many XPS products and high GWP closed-cell spray foam insulations are of concern. Excellent alternatives exist on the market that use low global warming potential blowing agents. One example includes closed cell spray insulation that uses HFOs as a blowing agent (see appendix). Cellulose (recycled newsprint), cotton, wool, low-density open-cell polyurethane foam, and recycled-content glass fiberglass are to be fully explored.

Drawings must contain a whole building and wall section diagrams illustrating a continuous insulation and air/vapor barrier without thermal bridges. Insulation values are to be as follows:

- Roof R60
- Walls R36 (R30 - Large Buildings)
- Slab R21

### On-site Photovoltaics

Buildings must be placed considering the optimal solar orientation (in addition to wind direction for natural ventilation and wind buffering). "Solar ready" buildings must indicate the clear roof area free of any obstructions that would hinder future PV installation. This area typically represents at least 75% of the roof area. Where buildings can only implement a portion of the required photovoltaics to reach zero emissions, the remaining percentage must be kept clear in order to increase on-site renewables over time. Solar-ready measures such as chases for conduit runs, structural provisions, space allocation for converters and other equipment, etc. must be included into the construction. Methods for providing summer shading for south-facing walls are to be considered.

The size of the Solar PV system must be indicated in kW to produce a ZEB. At minimum, the project must submit a PV Watts report (see appendix) showing the system capacity (monthly and annual Kwh production).

### Lighting, Appliances and Metering

Lighting and equipment requirements are to be consistent with the PHIUS multifamily calculator. All applicable appliances shall be Energy Star rated and meet Watersense Requirements. Individual electric metering shall be provided for units. Switched ceiling-mounted lighting fixtures are required in all interior unit rooms and in building common areas including stairwells.

## Application Of ZEB Requirements

### Small Buildings - 6 units or less

ZEB Small buildings will most easily meet the Carbon Neutral targets outlined in these requirements (and underscore the "portfolio concept" described within the study). Buildings in this category have the ability to produce energy to return to the grid, meaning the residents will have low electric utility bills. At a small %

increase in overall construction cost, these measures can be added within typical MOH subsidy limits. The PV system may be the only challenge to development teams. Therefore Buildings with 6 or fewer units (including 1 & 2 Family Dwellings) must factor in solar orientation and PV KW capacity in the conceptual design but are only required to be “ZEB ready.”

However, where MOH Standards are referenced in a request for proposals (RFP) , full compliance with ZEB requirements is mandatory. Projects in this category may demonstrate alternative compliance in the following areas, subject to MOH Design Review and Approval:

- Roof, Wall, Floor and Slab R-Value
- Window U-value Performance, Window To Wall Ratio & Solar Heat Gain Coefficient

### 6 to 40 units

Projects between 6 and 40 units must simply implement the prescriptive measures to meet the ZEB Requirement (*that's it.*) If any requirement is not met, modeling must be provided to demonstrate that an alternative approach to the requirement complies with the Co2 Target Budget Requirements.

### Large buildings - 40+ units. (Alternative ZEB Compliance)

A multifamily building 4 stories or more and 40+ units (**and other applicable projects**) may demonstrate **alternative ZEB** compliance with the ZEB Co2 target budget of 0.7-1.1 tons/person/year, or 1800kWh per person annually (**SITE energy, 5,040 KWH per person SOURCE energy (using a 2.8x multiplier for electricity)\*** ) by using a performance path. Such building projects must comply with the following:

- Assume 2 occupants per bedroom (not the standard 2+1 approach).
- Modeled results must be produced using WUFI+WUFI Passive or PHPP, or any simulation tool capable of simulating all 8760 hours of building performance such as EnergyPlus, DOE-2, IES-VE or Trane Trace .
- Lighting and equipment requirements are to be consistent with the PHIUS multifamily calculator (see Appendix) .
- Where electric DHW systems **are not** integrated into large buildings, the project team is to consider systems which can be adapted in the future for electrification.
- Must submit verified energy model data and a summary (PHIUS or PHI feedback forms. see appendix) based on the general requirements above and the building assembly elements composing the building's Energy Use Intensity (EUI, the building's annual energy use relative to its gross square footage).
- Are required to provide in the field educational and training opportunities by partnering with Boston based apprenticeship and high school workforce training programs (Equity and Inclusion). These programs and the ZEB principles being used within the project are to be documented on a publicly accessible website and via social media in order to promote ZEBs.

Passive house certification/precertification complying with the above criteria may be submitted to demonstrate performance within the ZEB Co2 target budget at application. Projects pursuing the passive house method of demonstrating compliance must certify their projects using Passive House Institute U.S. (PHIUS) or Passive House International (PHI).

- Project teams at application and during the design review process must submit energy model data and a summary using PHIUS or PHI feedback forms with the LOI from the PHIUS verifier.

# 05

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## Site & Building Planning

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

### Neighborhood Relations

Development teams should be aware of the condition of the buildings surrounding the site and strategize how to protect existing structures and communicate with neighbors. Community notifications, seismic testing, and other measures should be considered as applicable.

### Neighborhood Context

It is a primary concern that all housing developments fit into and enhance existing neighborhoods. In general, sites available for development in Boston are infill and set within the context of an existing neighborhood which has developed a unique character over time. Architects will be asked to demonstrate that they have analyzed the typology and composition of other buildings in the immediate vicinity of the site. The design concept should respond to the unique characteristics of this neighborhood analysis. Development proposals are to knit together the residential fabric through the project design. (*see Appendix for Design Principles Illustrations-future add*)

### Building Placement & Orientation

New buildings are to align with existing buildings and face primary and secondary streets. Buildings placed at corners are to consider how the building placement and the location of building or open space uses can enliven the street, both during the day and the evening.

### Parking and Mechanicals

Parking and mechanical areas are to be placed at the side or rear of the site away from and concealed from the street. Landscape buffers are to be used to maintain separation and privacy between neighboring properties. Parking layouts are to minimize the area of impervious pavement and curb cuts.

### Transformers

The location of transformers are subject to BPDA and MOH review. Transformers are located away from primary entries and building frontage.

### Building Composition

Architects must present a parti or a generative concept diagram for the building design.

### Character and Materials

The building's characteristics and materials are to focus on high quality detailing and material rather than the use of many different materials for the exterior envelope. A single material should compose the majority of the building envelope. Building materials on residential buildings must employ a level of detail that conveys a human scale and residential feel. 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 will not be allowed. Materials at the ground floor are to be durable (typically composed of masonry for longevity). Pitched rooflines are to extend eaves 18 inches to 2 feet and keep water away from the building. Whether contemporary or historical in nature, cornices, parapets and trim detailing must function to terminate the top of the building. All exterior dwelling entrances must have weather-protected entries such as canopies, covered porches, or recessed alcoves.

## Foundation Wall Height

Wall heights should mirror the foundation wall height of residential buildings within the neighborhood context. Use 1 to 20 grading to lift the first floor elevation to 18" to 24" where accessibility is required.

## Site Work

### Demolition

The removal of all hazardous materials such as asbestos-containing materials (ACM's) and lead-based paint must 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 it be required.

### Soil Remediation – 21 E's

A summary and an accurate estimate of the 21-E soil remediation plan is to be provided including grading plans and soil tests. The demolition and excavation scope is to include strategies which divert usable soils and debris from landfills through recycling or reuse where acceptable.

### PPT Lumber

Preservative pressure treated wood (PPT) should be used at all locations where framing joins exterior concrete. Where PPT lumber is used, this lumber is to be arsenic free. The use of chromated copper arsenate treated wood (CCA) is prohibited.

### Foundation

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. Provide damp-proofed foundations resting on proper footings on undisturbed or properly compacted soil. Install exterior insulation at foundation wall from the footing to grade level, after damp proofing has dried and prior to backfill.

### Basement Slabs

Install basement concrete slab on a 4" bed of 0.5" diameter or greater clean or washed gravel, covered with a minimum 6 mil polyethylene sheeting lapped a 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 thickness of expanded polystyrene rigid insulation (EPS) or extruded polystyrene insulation (XPS) that complies with ZEB requirements is to be installed under the entire slab to inhibit heat loss and moisture problems.

Control/isolation joints should be provided in basement slabs. A thermal break must be provided between the vertical slab edge 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 a moisture content acceptable for all flooring applications anticipated for the project.

## Building Enclosure

A drainage plane between exterior cladding and air/vapor membrane is maintained in all conventional rainscreen construction techniques.

## Masonry

Masonry rainscreen walls must be designed and constructed in conformance with conventional construction techniques including among other items: 9 gauge corrosion resistant wire ties spaced a minimum of 24" on center vertically and horizontally securely attached to a backup wall (typically wood or metal stud). All penetrations and joints into the air/vapor barriers must be sealed with a membrane or coating. A 2" air space is recommended (1" min.) to be kept clear of mortar droppings. Flashing must be placed at all locations where the air space is interrupted and must be waterproof, durable and protected against corrosion or degradation.

## Siding

All exterior siding materials are to be back primed as required. All cladding materials are to be installed according to manufacturer's specifications. 5/4" trim must be used with cementitious siding and panels. The use of vinyl siding is forbidden.

## Vents

Vent locations on exterior walls must be limited and eliminated from street-facing elevations where possible. Where vents do occur, their layouts must be organized and coordinated with the exterior design of the building.

## Fenestration and Doors

Windows are to have architecturally appropriate exterior detailing based on casings at head and jamb (on 3 sides) and a protruding sill to push water away from the window opening. Windows must be set into the wall assembly to provide depth in the facade.

Aluminum windows, wood windows, wood windows clad in aluminum or vinyl, fiberglass windows, and uPVC windows with a low u value (and excellent thermal performance) may be used, based on context and building type.

## Steel Doors

Provide 18 gauge interior door frame minimum and 16 gauge exterior door frame when set in exterior and interior masonry door sets. Do not use applied decorative molding to exterior doors.

## Storm/Screen Combination Exterior Doors

The use of combination storm and screen doors at any exterior entries, front and rear, is required for rental units (Boston Sanitary code), including rental units in one-to-three-family owner-occupied houses. Frames are to be caulked (color to match) according to manufacturer instructions.

## Garage Doors

Garage doors must be provided at any garage entrances; open entrances are not permitted.

## Rough Carpentry and Roofs

Wood product sheathing is to be installed in strict accordance with manufacturers' exposure, spacing, and span ratings and is to be stamped by a recognized agency to show those ratings.

## Pitched Roofs

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.

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. The use of exposed anodized aluminum flashing anywhere other than step flashing at dormer and cheek walls is strongly discouraged. Provide continuous roll flashing at shed roofs. Flashing should be factory painted – no mill finish.

Gutters are to be sized per code requirements and made of seamless 0.032 Ga., factory-painted aluminum (not vinyl) securely fastened with straps of the same material and color as the gutters and sealed per manufacturer's recommendations. Do not discharge water from a gutter directly to the ground nor into another gutter nor onto a lower roof below. Size downspouts based on the required roof surface area. Downspouts are to be .027 Ga. minimum aluminum. 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. Downspouts must divert water away from the building by connecting to the stormwater drainage system. Splash blocks, dry wells and other methods to divert water away from entryways or sidewalks may be required by MOH where appropriate.

At minimum, fiberglass/asphalt roof shingles or equivalent, with a minimum 25 year warranty, are to be used.

### 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. Roof parapet cap flashing should be .050 Ga. factory-painted aluminum min.

### Sealing Materials

All plumbing, electrical and other penetrations of walls and floors should be sealed with polyurethane caulk. All sealants should consist of low or no VOC's.

### Open Space

Open space areas for active and passive outdoor activities such as play space, sitting areas, and areas dedicated for gardening are to be designed into the site planning. These spaces are to be accessible, attractive and inviting to residents, particularly for families and children. Patios, front yards, porches, or balconies are smaller open spaces that assist in creating the community interaction of larger open spaces.

### Fencing and Buffers

Fencing, walls, hedges, lines of trees, or other landscaping can assist with defining the street edge and perimeter of the site. Fencing and buffering material and height should complement similar elements in the neighborhoods.

If any fencing is used at the street edge and other areas visible from the street, multifamily projects are to use decorative metal fencing and gates at these locations. Heavy-duty vinyl-covered chain link fencing or wood stockade fencing should be restricted to property edges that do not face a public street. Fencing should be at least 48" high. Chain link fencing 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 according to manufacturer's requirements. Gates are required at accessways and walkways.

### 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.

### Trees and Landscaping

A landscaping plan must be provided. Fencing, planting beds, trees and shrubs (with species and sizes noted) to be retained and removed, play areas, lighting, seating, and all features adding to the aesthetic quality of the site are to be shown. Development teams are to survey the condition of existing trees on (or adjacent to) the site and make every effort to design around existing mature trees. The city places great value on maintaining Boston's tree canopy. Therefore, existing street trees are to be protected and missing trees replaced according to Parks Department and Complete Streets requirements. Typically this is one tree per 25 lineal feet of street frontage and the caliper width is 3" in diameter or greater. Existing mature trees are to be maintained. New

trees are to be provided for every tree removed from the site. These new trees are to provide shaded areas and be spaced appropriately based on the species.

Graded areas must consist of a 6" minimum deep planting bed of clean loam/topsoil. Loam and topsoil is to be clean, screened and raked free of 1" or larger stones, building debris and other non-organic materials. All lawns (including the 6" plant cover) must be maintained by the general contractor to establish planting. Terracing and retaining walls are required where there is evidence of washout and erosion.

### Stormwater Management

Areas around the building must be graded away from foundations and compacted to ensure proper surface drainage. Swales and drains may be designed to carry water away from the foundation and abutting properties. Landscape strategies designed to reduce the heat island effect, assist in stormwater management, reduce the overall irrigation water demand such as rain gardens, bioswales, and permeable paving are encouraged.

Subsurface drainage systems must comply with BWSC requirements. Perimeter drainage is to 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 seals.

### Curb Ramps

Any existing curb ramps adjacent to the project site must be inspected for accessibility compliance and updated if not compliant. Missing curb ramps must also be constructed. Use the city's ADA Curb Ramp Inspection Manual to inspect the existing curb ramps and check for missing curb ramps. Notify the city of the inspection results through the Third Party Ramp Submission form after construction is complete. (see Appendix).

# 06

## Interior Building & Unit Layouts

This section sets forth principles for the interior common spaces and layout of units in new construction. They are also applicable, to the extent possible within the existing constraints, to major renovation projects where the common areas or unit layouts are being modified (refer to the Rehabilitation and Preservation section). We have provided interior layout diagrams demonstrating the application of the dimensional and use requirements toward the goal of creating livable, cost effective, quality housing. Furniture plans are required to ensure rooms can be reasonably furnished with clear space to maneuver.

### Universal Design

Universal design and accessibility requirements have been incorporated in cooperation with Age + Strong and the Disabilities Commission. These requirements are expressly intended to normalize Universal Design principles in all projects funded by MOH over time in order to plan for the long term livability of dwelling units and common areas over the lifetime of residents. (Refer to the Enterprise Aging in Place guidelines in the Appendix.)

### Accessibility

Accessible units provide essential housing to people with a range of disabilities, not solely those who use wheeled mobility. In order to increase the number of accessible dwelling units in the City of Boston, MOH requires a minimum of 10% of units, rounded up, to be fully accessible. This requirement is applicable to new construction rental projects and home ownership projects consisting of 4 or more units. MOH requirements are more stringent than MAAB 521 CMR. These project dwelling units similarly must comply with 521 CMR 9.4 Group 2 Dwelling Units. In buildings without elevators, all units (not just ground floor units) are required to provide blocking required by Group 1 Bathrooms MAAB for future installation of grab bars and shower seats. Accessible units sometimes lack storage when compared with non-accessible units due to efforts to meet the accessibility requirements, so it is important to increase storage in other locations within accessible units. Consider including additional features that will increase the functionality of accessible units, such as lazy susans, cabinets, faucet motion sensors, and technology interventions that allow control of unit appliances, window treatments, and switches from a central device.

To facilitate aging-in-place and accommodate life events that may present physical and mental challenges to residents of MOH-funded projects, MOH encourages all projects to exceed the minimum accessibility requirements outlined in this document. MOH encourages adding features of Group 2 Dwelling Units into all units in consultation with MOH design staff.

The percentage of dwelling units required by 521 CMR 9.7 Sleeping Accommodations for Persons who are Deaf or Hard of Hearing remains unchanged at 2% of the project dwelling units. These “sensory” units should be distinct from the “mobility” units in order to best match residents with units; it is less common to find a resident who needs both types of modifications. However, all units must be capable of being adapted (through future modification of the unit) for those with hearing and visual impairments.

In addition to the accessibility of the dwelling units, accessibility should be incorporated into the entirety of the project design. (Refer to the Article 80 Accessibility Checklist for specific guidance.)

### Townhouses in Multifamily dwellings

MAAB 521 CMR has clarified that townhouses are defined for 1 and 2 family residential uses. Townhouses in multifamily dwellings may need to provide an accessible route to all levels of the townhouse within the unit. Development teams should look to clarify the required accessibility for a townhouse in a multiple dwelling during the conceptual design of the project.

## Broadband Access

All buildings are required to provide broadband (high-speed data network) access in addition to appropriate technology for telephone, data, and other communications within individual units to residents. Residents should be provided choice in terms of the broadband service provider. In response to the challenges experienced with COVID, MOH sees that providing whole-building broadband/wifi access for seniors, individuals who have lost jobs, and families & students who may need additional bandwidth to work from home or attend school from home is critical building infrastructure. Where the number of units (typically 4-10) require the project to utilize an intercom and closed circuit security camera system to allow unit occupants to observe who is seeking entrance to the building (780 CMR 1010.1.9.12) the project should consider systems that also provide overall building broadband/wifi access to residents within common areas. Projects may also consider providing hotspots within the building. These “hotspots” must be indicated on the floor plans or the specification narrative must describe the system/method being used to satisfy the broadband access requirement.

## Artist Live Work Considerations

Artist Live-Work housing addresses the core functions of contemporary artistic practices, providing artists the opportunity to work, live, convene, and present. These core functions are interrelated and often integrated. They are present in buildings dedicated entirely to artists, and also in buildings where only a portion of the development is dedicated to artist work-live units.

Projects must follow unit layout standards described elsewhere in this document in addition to the specific Artist Live-Work principles outlined here.

## Artist Live Work Housing Preference - Tenant Selection and Home Buying Eligibility

In order to prioritize one population over another for tenant selection or eligibility, there needs to be something that serves that particular population. In this way, housing with a preference or requirement for artists is similar to accessible units delivered for residents with mobility disabilities - there has to be a demonstration of a specific design or operational provision to allow for a population to be prioritized in the allocation of units.

MOH Artist Live-Work units must provide appropriate, useful live work and presenting space for artists on-site in-unit and/or elsewhere within the same development. This includes specific design, fit out and operational considerations as set out in the Mayor's Office of Arts and Culture's (MOAC) Artist Housing Guidelines.

Units without space and specific provisions unique to artists on-site in-unit and/or elsewhere within the same development artists cannot be a prioritized group for housing allocations. While MOH will not consider these Artist Live Work Projects, these projects can however use targeted marketing and outreach to ensure that artists are better represented in the general pool of applicants.

## Unit Dimensional & Use Requirements

The dimensions and square footage indicated are required as minimums. Other applications of use and unit layout principles indicated within this section are also requirements.

## Amenity Space

Arts amenity spaces must be provided, either through enhanced common spaces or distinct arts amenity spaces. Arts amenity spaces are to enable artists to convene, collaborate, create specialized work, and present their work to one another and to the public. These spaces are also to address shared production needs that cannot be accommodated by individual studios and provide specialized space or tools, equipment, etc. which are cost prohibitive for individuals to acquire.

## In Unit Workspace

Units are to be sized based on the number of bedrooms and the work space needs. At least 150 sq.ft of workspace must be provided in addition to the living and sleeping areas, for the use of the artist. Artist units are to be distinct from other residential units not intended for artist use.

## Unit Layout Best Practices

The considerations below are intended to guide the design of buildings that incorporate artists. They may not be applicable to every building type or artist community but distinct provisions for artists must be included in some combination. Artist Live-Work Housing development teams should reference and follow design and operational guidelines as set out in the Artist Housing Guidelines issued by the Mayor's Office of Arts & Culture. See Appendix for more information .

- A range of bedroom types (and unit sizes) should be provided.
- Studio doorways, and hallways shall be oversized in width to accommodate shipping of large works (at least 8ft wide corridors and 4ft wide entry doors).
- Loading bays shall be located directly adjacent to a direct route to elevators.
- Freight elevators shall be provided to carry oversize/overweight objects; and allow for noise, weekend and late night deliveries.
- Ceiling heights shall allow for the creation of large works and large equipment, including machinery and lighting (at least 9ft).
- Wall and floor construction shall have adequate sound insulation to prevent the transmission of sound from machinery, equipment, or repetitive tasks.
- Floors must be composed of very durable finishes such as concrete floors and/or structured to provide extra weight-bearing capacity.
- Service sinks are to be located close to other wet areas.
- Fire protection systems shall include the ability to address industrial accidents.
- Fire insulation shall be adequate for open flames.
- Special ventilation and air handling techniques shall be tailored to ensure the safety and health of residents, visitors, and neighbors. All workspaces shall be vented to the exterior. Oversized dumpster capacity shall be provided.
- Containers shall be provided for the disposal of toxic/hazardous materials (turpentine, paints, etc.)
- Access to outdoor work areas shall be provided to all tenants.
- Security systems and entry video systems shall reflect the needs of artists who may have on-site sales, employees, and customers.

## MOH Unit Size - Targets

The square footage below represents target sizes. Units significantly larger or smaller than these targets will be questioned in terms of livability or excess cost. The goal of indicating target sizes is to provide guidance without imposing fixed minimum and maximum 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 size guidelines:

Studio	500 square feet
One bedroom	600 square feet
Two bedroom	750 square feet
Three bedroom	1,000 square feet
Four bedroom	1,100 square feet

## Unit Layout Best Practices

- Circulation spaces are to be designed efficiently. Access to bedrooms and bathrooms is only to 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. Development teams must provide furniture plans and demonstrate compliance with general principles for efficient layout of furniture commensurate with the probable number of occupants.

## Unit Dimensional & Use Requirements

The dimensions and square footage indicated are required as minimums. Other applications of use and unit layout principles indicated within this section are also requirements.

### Bedrooms

#### Primary Bedroom

- 12' x 10' clear dimension minimum with no obstructions (120 square feet minimum)
- 2 occupants

#### Secondary Bedrooms

- 10' x 10' clear dimension minimum with no obstructions (100 square feet minimum)
- 2 occupants

#### Bedroom Closets

- 2' x 4' clear dimension minimum (8 square feet minimum)
- Closet shelving shall allow for a full-bearing, white, vinyl coated steel shelf or similar with an integral clothes rod.

### Application of Bedroom requirements

- Bedrooms may not be located at the street facing corners of multifamily units. Locate bedrooms away from noisy conditions such as driveways and parking areas in 1 to 2 Family dwellings.
- The entry door to a bedroom must be oriented to provide privacy and may not open directly into a living area.
- Switched control of one receptacle in a duplex receptacle box must be provided for connection to an occupant-furnished lamp.

## Living Areas

#### Living Room

- 12' dimension minimum along exterior window wall. (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 without blocking windows.

#### Dining Room

- 10' x 10' clear dimension minimum (100 square feet minimum)
- Accommodates an 8 person table in a 3 bedroom, 6 person table in 2 bedroom, 4 person table in 1 bedroom.

#### Entry "coat" Closets

- 2' deep dimension minimum (6 square feet minimum)
- Configured for coats and storage. (see bedroom closets)

### Application of Living Area requirements

- Locate living and dining areas in the street facing corners of multifamily units.
- In studios, 1 and 2 bedroom units, only the dining room may overlap with the living room as long as functional furniture layouts (and circulation) can be maintained and the following conditions are met. The total living and dining square footage must exceed 200 square feet and maintain a 12' clear width. In the Living room specifically, the 12' clear dimension must exist along an exterior wall with access to natural light. Obstructions such as HVAC may protrude into the required living area as long as a functional furniture layout can be maintained.
- Switched control of one receptacle in a duplex receptacle box must be provided for connection to an occupant-furnished lamp.

## Kitchens

Provide 18" (15" minimum cabinet size) to 24" minimum linear counter space on both sides of the range and sink. Avoid dead corner cabinet locations and Lazy susans should be located at corner base cabinets to provide accessible storage. Task lighting accessories should be considered post occupancy to address low light conditions.

A dishwasher is required in three and four bedroom units. Double bowl sinks are required where dishwashers are not provided. A 30" minimum range is required in a 1 to 3+ bedroom unit. Garbage disposals and rangehoods are required. The cabinet for the sink must be 30" minimum (36" recommended), and a 20 gauge stainless steel sink size (roughly 22" x 30" x 6") with a single handle faucet with spray attachment must be maximized within that cabinet size. A 18 to 20 Cu ft frost-free refrigerator with a separate freezer door is the minimum required. Finish flooring shall continue under refrigerators, stoves, dishwashers, and base cabinets in kitchens. 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.

### Application of Kitchen requirements

- The type and configuration of kitchens in a development are to be standardized to the greatest extent possible in order to create efficiencies for purchasing cabinetry, appliances, equipment, and finishes.
- Unit circulation can not pass through the kitchen work area (except as shown in studio unit diagrams). The work area (triangle) within the kitchen may not be obstructed by furniture.

## Closets and Pantries

A dedicated linen closet is no longer required. Linen storage is to be provided as cabinetry or organized within shelving in another closet. Linen storage of towels is acceptable within a full bathroom. Residents may be reluctant to store other linens there due to moisture concerns even if the bathroom is well-ventilated, so primary linen storage should be outside of bathrooms. Walk in Closets are to have lighting.

Pantries are not required. When used, a vertical cabinet instead of a closet is recommended as a more cost effective option.

## Bathrooms

No more and no fewer than one full bathroom can be provided in 0, 1, or 2-bedroom units.

One full-bathroom and one half-bathroom are required in 3-bedroom units. If cost effective, a 3-bedroom unit may provide a shower in the half bathroom.

Two full bathrooms are required in 4-bedroom units.

All half and full bathrooms shall receive a vanity cabinet and sink, two 24" towel bars, one robe hook, a shower curtain rod (in a full bath), a toilet paper holder, and a mirror-front medicine cabinet with lighting over the mirror.

### Application of Bathroom requirements

- A shower stall may be substituted for one bathtub where 2 full bathrooms are provided.
- All bathrooms must be entered from a common hallway. Entry to the bathroom (full or half) may also be accessed from the bedroom (en suite) if an entry from a common hallway is also provided.
- All bathrooms must comply with Group 1 MAAB.
- Townhouse style units in multifamily buildings and 1 & 2 Family dwellings are subject to and must apply these requirements. In a 2 bedroom townhouse a half bath is to be placed on the ground floor and a full bathroom placed on the upper floor.

## Laundry

Laundry facilities or services should be provided in all buildings. In-unit Washers and Dryers are permitted in Homeownership units and discouraged in rental units. Connections must have stainless steel braided lines to prevent potential overflow and leaking and plumbed drain pans to prevent damage to the unit and other units below. In common laundry rooms, consider providing seating or space for seating to make it easier for residents to use the laundry facilities. Water heating required for laundries should be integrated into the Zero Emissions Strategy for the project.

# Interior Unit Diagrams

## Unit Layout Considerations



Minimum clearances in bedrooms



Minimum clearances in living and dining



Circulation



Access to natural light

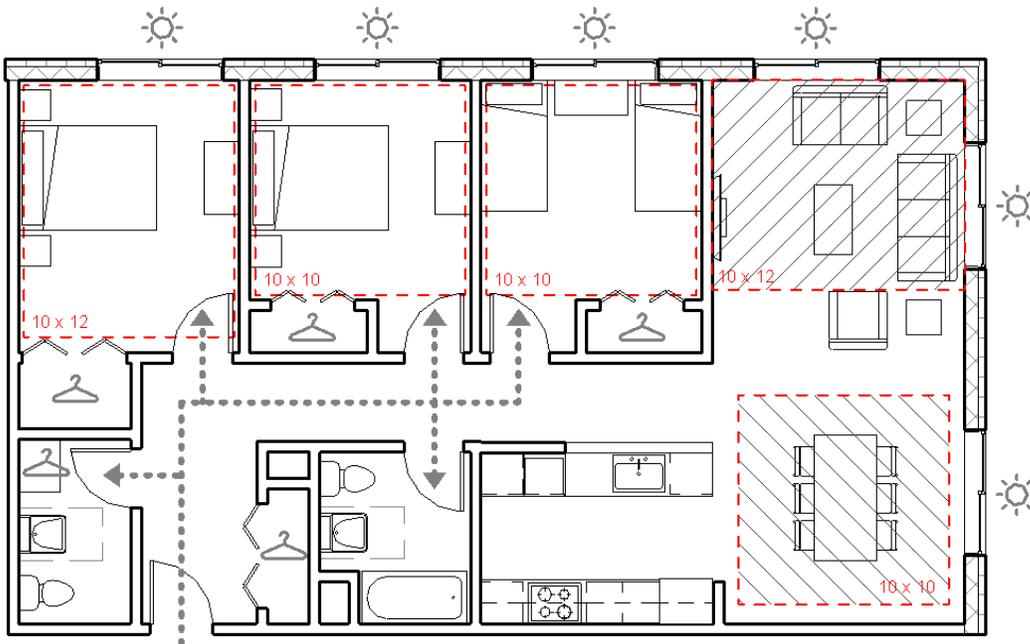


Storage space

## Example Unit (3 Bedroom Corner Unit)

1. **DO** locate bedroom and bathroom doors off of hallways for privacy  
**DO NOT** locate bedroom and bathroom doors off of the living area

2. **DO** provide bedroom closets with minimum dimensions 4' x 2'



3. **DO** provide larger living and dining areas in larger units

4. **DO** orient the 12' min. clearance for the living area parallel to an exterior wall

5. **DO** locate living and dining areas at the corner in corner units

6. **DO** provide furniture plans showing functional spaces and appropriate clearances

7. **DO** provide a distinct dining area, especially in family units  
**DO** provide larger living and dining areas in larger units

8. **DO** provide access to natural light in living rooms, dining areas, and bedrooms

9. **DO** create a defined area for the kitchen  
**DO** provide a line of sight from the kitchen to natural light where possible

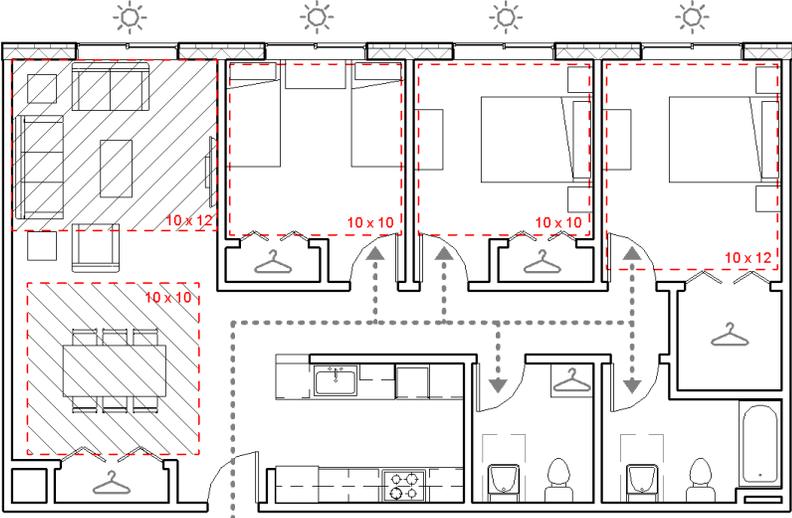
10. **DO** create a defined area for the kitchen  
**DO NOT** require unit circulation to pass through the kitchen work area

11. **DO** provide coat closets near the entry with minimum dimensions 3' x 2'

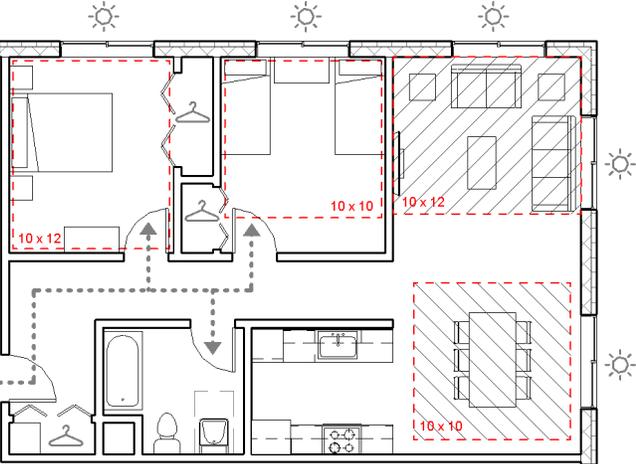
12. **DO** provide linen storage as a utility cabinet or as shelving built into a closet. A separate linen closet is not required.  
**DO NOT** locate linen storage in full bathrooms due to moisture concerns

# Example Unit Layouts

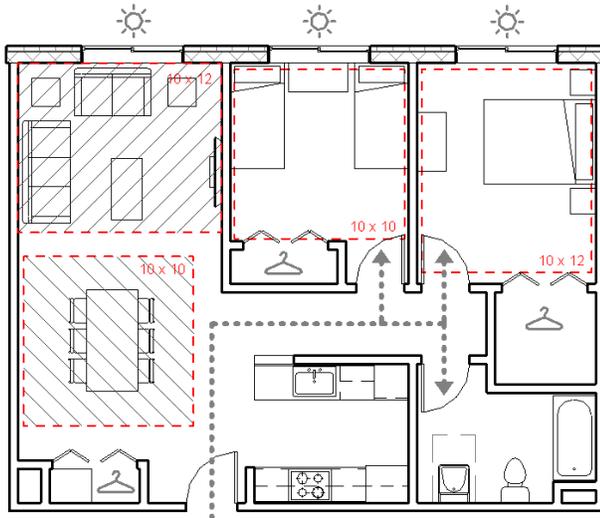
3 Bedroom  
Typical Unit



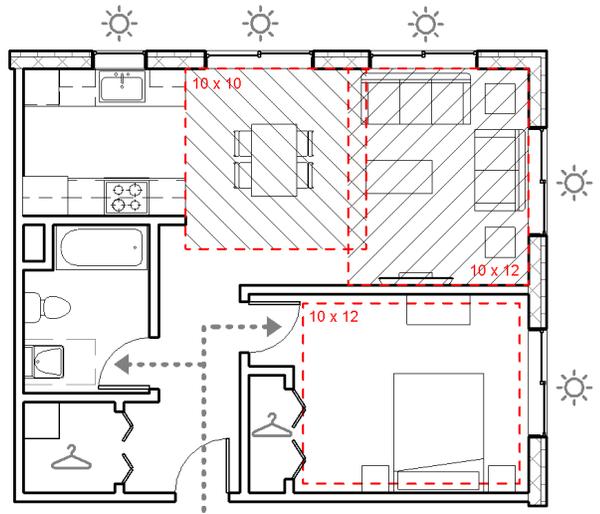
2 Bedroom  
Corner Unit



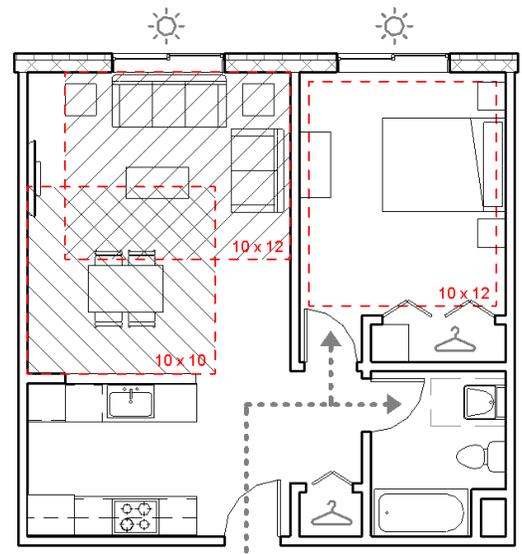
2 Bedroom  
Typical Unit



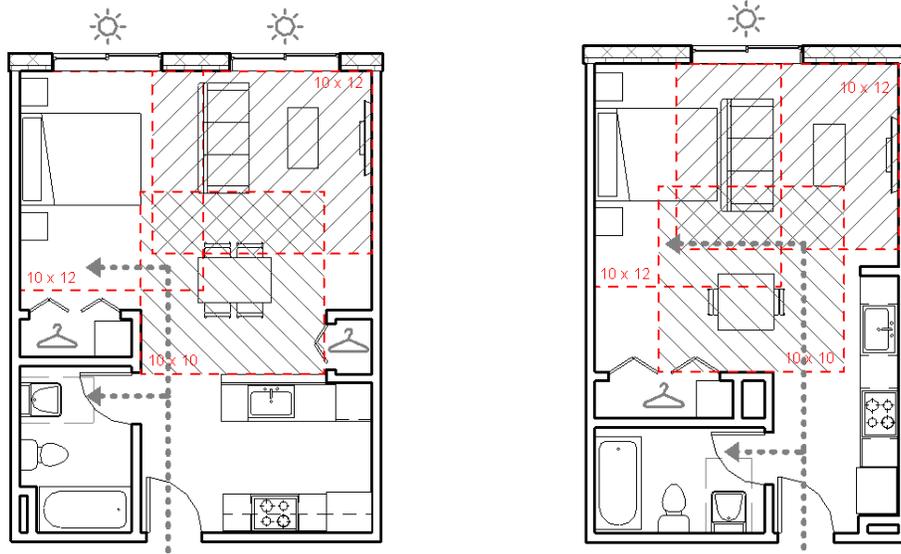
1 Bedroom  
Corner Unit



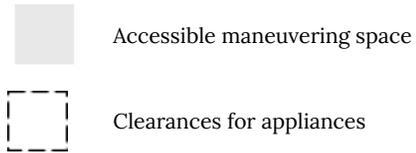
1 Bedroom  
Typical Unit



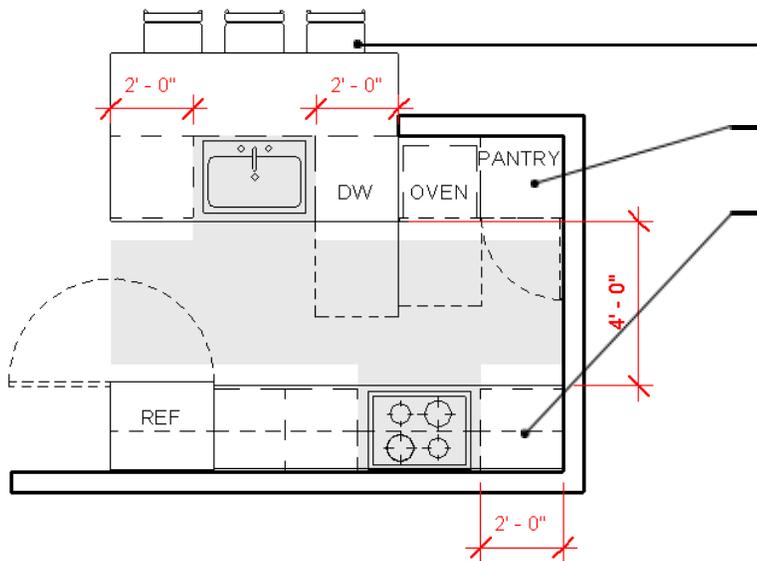
Studio  
Typical Unit



Kitchen Design Considerations



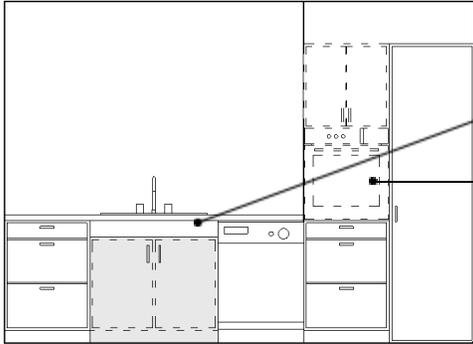
Example Kitchen Layout



**DO** provide counter seating

**DO** provide a tall pantry cabinet

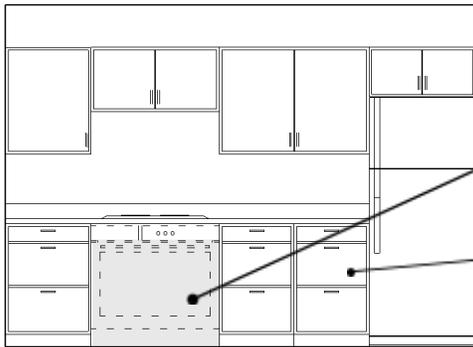
**DO** provide 18" – 24" linear counter space on both sides of the sink and cooktop



### Accessibility

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

A wall oven must be installed. Note: the location of the wall oven on this elevation is for representational purposes only; its actual height should comply with accessibility requirements.

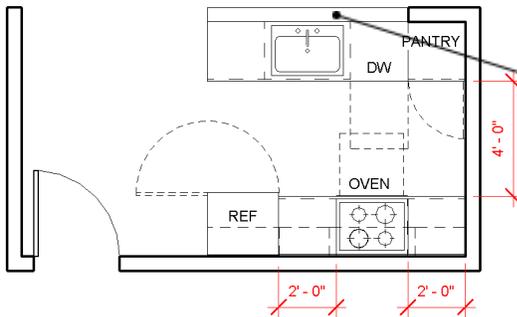


### Universal Design

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

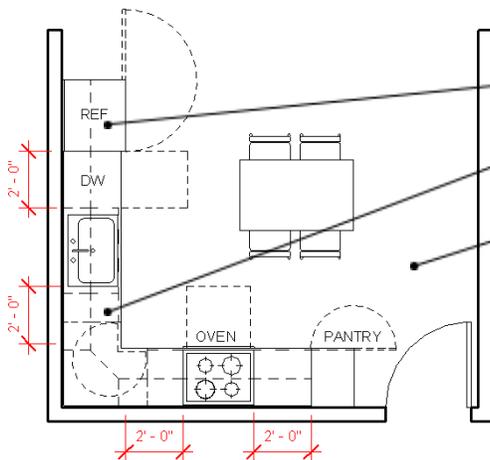
Provide drawers instead of below counter cabinets for more accessible storage.

Note: microwaves, if provided, must be at or below counter height.



### Galley Kitchen

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



### L Shaped Kitchen

DO place the 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 the "L" area, the primary circulation path must not require passing between the dining table and kitchen.



## Single Person Occupancy Types

This section sets forth the minimum Design Requirements for SPO Units. SPO Housing is defined as a residential property that includes single room dwelling units. Each unit is for occupancy by a single eligible individual.

SPO Types 1, 2 and 3 must contain 150 sf of basic living/sleeping area and are to be furnished with a single bed space, dresser, mirror, nightstand, writing desk, 2 chairs, small table and a shelf with space for tv/radio.

SPO Type 4 must contain 240 sf of basic living/sleeping area and is to be furnished with a single bed space, dresser, mirror, nightstand, writing desk, 2 chairs, a dining table, 4 chairs and a shelf with space for tv/radio.

The four (4) SPO types are described below:

### SPO Type 1

SPO Type 1 must contain a closet (15sf), small sink, under counter refrigerator, and microwave oven (may be permitted) within the unit.

- Cooking facilities and a private bath are not contained within the unit.
- Congregate cooking, bath (or shared), dining and support facilities such as TV rooms, reading areas, community living rooms, etc. must be located on-site.

### SPO Type 2

SPO Type 2 must contain a private bath with shower (40sf), a closet (15sf), small sink, under counter refrigerator, and microwave oven (may be permitted) within the unit.

- Cooking facilities are not contained within the unit.
- Congregate cooking, dining and support facilities such as TV room, reading areas, community living rooms, etc. must be located on-site.

### SPO Type 3

SPO Type 3 must contain a private bath with shower (40sf), a closet (15sf) and 35 sf of cooking facilities with a sink, 2 linear feet counter, 2 burner stove and an under-counter refrigerator. The square footage of the cooking area includes a 3' clearance in front of the counter.

- Congregate dining and support facilities such as TV rooms, reading areas, community living rooms, etc. are not required to be located on-site. Some support facilities are, however, recommended.

### SPO Type 4

SPO Type 4 must contain a full kitchen and a private bath with shower (40sf) and closet (15sf) within the unit. This SPO type may require on-site and/or off-site special needs services.

- 35 sf of cooking facilities with a sink, 2 linear feet counter, a small 4 burner stove and a 12 cu. ft. upright refrigerator. The square footage of the cooking area includes a 3' clearance in front of the counter.
- Congregate dining and support facilities such as TV rooms, reading areas, community living rooms, etc. are not required to be located on-site. Some support facilities are, however, recommended.

# Interior Unit Specifications

## Rough Carpentry - 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 and MAAB.

## Finish Carpentry and Millwork

### Cabinetry

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 specifications. Thermofoil and particle board cabinets are not allowed. All medium-density fiberboard (MDF) used in cabinetry and countertops shall be formaldehyde free. All cabinet interiors should be treated with a water resistant substance

- 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 preferred. 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-density particle board. Cabinet sides should have a minimum thickness of 1/2". 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 3/4" x 1/2".

### Sealants

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.

### Interior Door & Window Casing

Window aprons and casings should be painted softwood such as pine. Head and jamb trim should have 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 for baseboard trim. 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.

## Doors

### Unit Entry Doors

- Steel or Solid Wood Unit Entry Doors are acceptable if they are rated to code and are durable. A peep hole shall be provided.
- Interior unit doors are to be solid core wooden doors.
- Doors opening onto patios or decks should swing in and have flush thresholds for accessibility. Drainage is to be provided at decks to prevent water and snow build-up. Sliding doors accessing the exterior are discouraged at ground floor conditions where they pose a security concern.

### Door Hardware

- Lever door handles are to be provided throughout for universal design. Peep holes shall be provided.
- Exterior and Interior unit entry doors should be provided with 2-3/4" backset, lever handle hardware locksets, keyed-alike deadbolts; aluminum and hardwood adjustable thresholds and weather-stripping, as appropriate.

- Bathrooms and Primary bedrooms should be provided with privacy sets. 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. Flooring must extend under any cabinets.

### Ceramic Tile

Bathroom floors are to be ceramic tile, non-slip glazed or unglazed, and include a ceramic sanitary base (tile trim piece or cap) at all wall and floor junctures.

Ceramic wall tile is to be installed in a thin-set mortar on a cement backer board of 1/2" thick glass fiber-reinforced cement tile backer substrate installed per manufacturer's recommendations. Tiles should be at least 4 1/4" square. Moisture resistant drywall (MR board or 'green board') is to be used in areas without wall tile. 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.

### Engineered Wood & Hardwood Flooring

Engineered wood/hardwood floors are allowed throughout the dwelling unit except for in bathrooms. It is required in homeownership units and is acceptable in rental units. Materials which place a laminated imitation wood or laminated wood veneer (which is not able to be refinished) over a thin material backup are not allowed.

### Linoleum

Within multifamily buildings, linoleum flooring is allowed in common stairs and hallways, the kitchen area, the bathroom, and entry vestibules within dwelling units.

### Vinyl Plank and Vinyl Composition Tile (VCT)

High quality vinyl composition planks are allowed in rental units. VCT is only approved for high traffic areas or where VCT is being replaced. Vinyl plank and VCT products should be composed primarily of recycled materials that are easily recycled.

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.

### 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", refer to the appendix.

### 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 eggshell 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 eggshell paint.
- Stained Woodwork – 1 coat oil-based interior wood stain and 2 coats satin or semi gloss polyurethane varnish. VOC content less than or equal to 250 g/L. All stains 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. Anti Corrosive and anti rust 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-based 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.

## Safety & Security

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.

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 except as described below. 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 residents and that limit the openings to less than 4" are acceptable in lieu of guards.

## 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 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.
- Bathtub 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 should be of the freeze-proof type and lockable for water conservation

## Electrical and Fire Protection

Meters and Type "T" gang boxes at exterior walls should be mounted on backer boards such as molding-trimmed MDO fastened to the sheathing.

Fire Sprinkler Systems drawings are to 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 pendent type sprinkler heads and trim plates.

# 06

## Appendix

This section contains other relevant codes and standards which may be associated with a project. 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.

### Other MOH Resources & Policies

The following MOH resources, in addition to others, can be found on MOH's Housing Policies webpage (<https://www.boston.gov/departments/housing/policies>):

Bidding

Contract Proviso

Design Review Checklists

Design Review

Section 3

### 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

### State

MA State Building Codes

MA Department of Environmental Protection

MA Department of Public Health/ State Sanitary Code

State HOME, HSF, FCF, and LIHTC Programs

### Local Municipal

Municipal Zoning Ordinances

Inspectional Service Department among other Departments required for permitting.

Zoning Board of Appeals, Article 80 Project Review and Article 37 U.S. Green Building Council's LEED Certification (Equivalency)

Historic and Parks Commission Reviews and Approvals

Mayor's Office of Arts & Culture

Artist Housing Guidelines: <https://www.boston.gov/arts-and-culture/artist-housing-guidelines>

Curb Ramps:

ADA Curb Ramp Inspection Manual

Third Party Ramp Submission Form:

<https://docs.google.com/forms/d/e/1FAIpQLSddCZRdR9D1ebYMxKR2T8iSkHPYJjsqhWI5DcMp9uK2YKHiOw/viewform?vc=0&c=0&w=1&flr=0>

## Existing Buildings/ 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, Local Historical Commissions

## Universal Design Resources

Boston's Disabilities Commission

Boston's Age Strong Commission

Enterprise's Aging in Place Guidelines - refer to the Example Unit Layout Diagrams and reference the Enterprise Aging in Place guidelines 2016 <https://www.enterprisecommunity.org/resources/aging-place-design-guidelines-18245>

Institute for Human Centered Design (Refer to Data on Disability in States, Cities and Sub-Groups in New England from the Institute of Human Centered Design for more information.)

Article 80 | ACCESSIBILITY CHECKLIST

<http://www.bostonplans.org/getattachment/2b173503-a553-4880-974f-a25270e8ff34>

MA Senior Housing Aging in Place Guidelines

<https://www.mass.gov/service-details/design-construction-guidelines-standards>

## Zero Emissions, Building Enclosure & Other References

2020 Guidebook for Zero Emission Buildings

[https://www.boston.gov/sites/default/files/file/2020/03/200306\\_DND%20book\\_FOR%20WEB.pdf](https://www.boston.gov/sites/default/files/file/2020/03/200306_DND%20book_FOR%20WEB.pdf)

PHIUS and PHI feedback forms - refer to the guidebooks. The feedback forms are generated per project as part of the process

[https://www.phius.org/PHIUS+2018/PHIUS+%20Certification%20Guidebook%20v2.0\\_final.pdf](https://www.phius.org/PHIUS+2018/PHIUS+%20Certification%20Guidebook%20v2.0_final.pdf)

[https://passiv.de/downloads/03\\_building\\_certification\\_guide.pdf](https://passiv.de/downloads/03_building_certification_guide.pdf)

PHIUS multifamily calculator

This is intended to make the inputs equal between all models and is also based on Energy Star requirements.

[http://www.phius.org/Tools-Resources/Protocols-Calculators/PHIUS+2015\\_Multi-Family\\_Calculator-04\\_05\\_16.xlsx](http://www.phius.org/Tools-Resources/Protocols-Calculators/PHIUS+2015_Multi-Family_Calculator-04_05_16.xlsx)

PV Watts Calculator report <https://pvwatts.nrel.gov>.

- For Reference: Average PV panel generates 250 watts. 4 hours of sunlight (for example) during a day. 1 panel will generate a 1000 watts or 1kwh of electricity. Over 30 days in a month, 1 panel would generate 30kwh of electricity. A 4 panel system would be a 1 KW system.

Windows Installation

For installation using other construction methods, such as remodeling, replacement, and recessed openings refer to "ASTM E2112-19c, Standard Practice for Installation of Exterior Windows, Doors and Skylights," for installation suggestions. Information for ASTM E2112 can be found on the ASTM website, [www.astm.org](http://www.astm.org).

Air Source Heat Pumps

Refer to NEEP's guidelines for ASHP. <https://neep.org/ashp>

Duct Air Leakage

Refer to Resnet standards or ASTM E1554 for air leakage.

<https://www.masssave.com/-/media/Files/PDFs/Partners/Duct-Envelope-and-Ventilation-Certificate.pdf?la=en&hash=56A54A118D14FAB2EDA09B4E1F7F13E31E282685>

Closed cell spray insulation that uses HFOs as a blowing agent

<https://www.demilec.com/products/closed-cell-insulation>

Please refer to <http://www.buildingscience.com/resources> and resource within the guidebook for residential wall assemblies.

Thermal Bypass Checklist Guide

[https://www.energystar.gov/ia/partners/bldrs\\_lenders\\_raters/downloads/TBC\\_Guide\\_062507.pdf](https://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/TBC_Guide_062507.pdf)

Masonry veneer walls

See the Brick Institute of American Technical Note 28 and 28B.

Carpet

“Green Label Plus Program” and conform with with HUD Bulletin, UM 44-D

([http://portal.hud.gov/hudportal/HUD?src=/program\\_offices/administration/hudclips/bulletins/umbs](http://portal.hud.gov/hudportal/HUD?src=/program_offices/administration/hudclips/bulletins/umbs)):