Welcome to the conversation!

By August 30th, join in and influence the next iteration of the Enterprise Green Communities Criteria. Read and respond to others’ feedback, and leave your own. Help craft the nation’s only green building program specifically designed for the affordable housing sector. While the 2020 Criteria addresses the same eight categories with which you are familiar, this iteration advances the conversation of how affordable housing practitioners can advance health, resilience, and environmental responsibility through cost effective, meaningful measures.

As the Criteria has not yet been copyedited, please excuse any typos or formatting errors. Points for each optional criterion as well as the introduction, glossary, and appendices will be developed after the public comment period.
General Comments
Category 1: Integrative Design
1. INTEGRATIVE DESIGN

A successful integrative design process facilitates the design and development team’s achievement of their objectives throughout the project life cycle. It considers synergies between the eight categories of the Enterprise Green Communities Criteria and includes the community to leverage multi-benefit strategies. It is the most effective way to maximize holistic quality of life benefits to individuals and families, including improved opportunity for physical and mental health. Green, affordable housing is an upstream investment that provides residents more stability in their lives and can result in co-benefits including reduced costs to health systems, transportation infrastructure and other public resources just to name a few.

A safe, affordable home is a basic need. It is also the foundation for opportunity and participation in society for some of our most vulnerable populations. As the Enterprise Green Communities Criteria is implemented at a large scale across communities, population level health benefits can be realized, along with strengthened community resilience.

Using an early, integrative approach is the most effective way to achieve maximum benefit for no or low additional cost: studies have shown less than 2% incremental cost to implementing the Green Communities Criteria over traditional construction techniques and realizing savings over the lifespan of the project (https://www.enterprisecommunity.org/download?fid=8107&nid=3596). Investments can be targeted to areas of highest opportunity or need to support quality of life for residents.

1.1 Integrative Design – Project Priorities Survey / Mandatory
1.2 Integrative Design – Charrettes + Coordination Meetings / Mandatory
1.3 Integrative Design – Documentation / Mandatory
1.4 Integrative Design – Construction Management / Mandatory
1.5 Resident Health and Well-Being: Health Action Plan / Optional
1.6 Resilient Communities: Multi-Hazard Risk / Vulnerability Assessment / Optional

1.1 Integrative Design – Project Priorities Survey

RATIONALE

A successful integrative design process is more art than science. It also is often the determining factor in ultimately achieving a successful project. At this early phase of predevelopment, it’s critical for project teams to understand many facets of the development, including the residents and their needs, the community at-large, and environmental stressors that affect a person’s health and well-being – this is what an integrative design process can do.

Integrative design is a holistic approach to pre-development that prioritizes information gathering; understanding and prioritizing the resident experience; setting objectives for building performance and resident health and comfort; as well as project coordination and buy-in from all related development stakeholders.

By seeking out readily available information, and engaging in an integrative design process, teams can gain a holistic understanding of the context, place, and population they are serving. This will help teams shape their priorities to drive project decisions. This understanding can also be used to garner project support, demonstrate need, and may support documentation for funding applications.

REQUIREMENTS

Complete the Project Priorities Survey. Once completed, the Project Priorities Survey will serve as a simple guide to understand the context, population, and environmental considerations that your development must address in order to facilitate a well-informed integrative design process.

The Project Priorities Survey can be found in the Appendix. You can also find a version online that you can download, print, complete, and submit as you pursue Certification with Enterprise Green Communities.
RECOMMENDATIONS

- Complete the Project Priorities Survey with as much of your development team as has been identified. Pre-construction coordination and goal setting ensures all development team members are aligned to specific development goals.
- Engage relevant data sets and challenge assumptions of everyone on the development team.
- Qualitative data, especially from current or potential residents, is also a critical source of information, and can be used to confirm or counter quantitative data you may research.

RESOURCES

- Opportunity360 Listen: Community Engagement Toolkit: Listening to the perspectives of the people in a community is critical to the change process. The tools below allow you to engage with residents, stakeholders and community developers to better advance meaningful strategies to address the challenges in your community. [https://www.enterprisecommunity.org/opportunity360/community-engagement-toolkit](https://www.enterprisecommunity.org/opportunity360/community-engagement-toolkit)
- Opportunity360 Measurement Report: Opportunity360 measures five foundational criteria shown to have the greatest impact on how we live. The information provided by each neighborhood-level report can help us all better understand how to ensure communities are inclusive, equitable and thriving. [https://www.enterprisecommunity.org/opportunity360/measurement-report](https://www.enterprisecommunity.org/opportunity360/measurement-report)
- Enterprise Green Communities maintains a comprehensive registry of qualified green affordable housing technical assistance (TA) providers that are available for support on the design, construction, rehabilitation and operations of green affordable housing. To find a Green TA provider near you, search the list found at [https://www.enterprisecommunity.org/solutions-and-innovation/green-communities/tools-and-services/technical-assistance-providers-database](https://www.enterprisecommunity.org/solutions-and-innovation/green-communities/tools-and-services/technical-assistance-providers-database)
- Enterprise Community Partners. Participatory Design Toolkit: This toolkit developed by a designer working in a community development organization offers strategies to engage and involve the community in design projects. It is packed with activities, tips, and techniques to foster dialogue and create informed design goals. [https://www.enterprisecommunity.org/resources/participatory-design-toolkit](https://www.enterprisecommunity.org/resources/participatory-design-toolkit)
- Participate In Design. Outlines different principals of participatory design. [http://participateindesign.org/approach/tools](http://participateindesign.org/approach/tools)

1.2 Integrative Design – Charrettes & Coordination Meetings

Mandatory

RATIONALE

An Integrative Design process is helpful in maximizing project budget and impact through a holistic, comprehensive approach. An integrative project delivery process facilitates the design and development team’s achievement of green objectives, positive health and community outcomes throughout the development life cycle by advancing multi-benefit strategies.

Green design charrettes can be powerful opportunities to educate and align stakeholders with the goals and objectives of a project and to tap into collective wisdom of the group. Smaller multi-disciplinary teams may also be brought together to analyze and develop integrated solutions to complex design challenges that require multiple
perspectives to resolve perceived conflict, between first cost and operational costs. Pre-development is also an important moment to ensure that lessons learned through maintenance of other projects are woven into design decisions of your current project.

The outcomes of an integrative project delivery process may include substantially lower development costs and greater health, economic, environmental, and social benefits for residents, property owners and communities.

**REQUIREMENTS**

Develop an integrative design process that works best for your project team and intentions and document. At minimum, project teams should develop:

- An integrative process that takes the research and learnings of the Project Priorities Survey (Criterion 1.1) and moves them into action. The process should prioritize collaborative meeting formats, such as:
  - Green charrette(s)
  - Preconstruction coordination planning meeting(s)
  - Construction coordination meeting(s)
  - Resident engagement / community meetings

  These collaborative meeting formats should be used, in some combination, to:
  - Productively and regularly engage residents and/or community members;
  - Consider learnings from operating existing projects
  - Identify green objectives for the project;
  - Complete an Enterprise Green Communities Criteria checklist with the entire design and development team;
  - Pre-development research and work are coordinated;
  - Confirm that the documents (plans, specifications, scope(s) of work) reflect the completed Enterprise Green Communities Criteria checklist, as the project transitions from Design Development to Construction Document phase;
  - Confirm green objectives for the project are incorporated into design.

- Throughout your integrative process, as decisions about sustainability strategies are being considered, priority should be placed on multi-benefit strategies that achieve multiple green, health and well-being, environmental resilience, community / social resilience goals concurrently.
- As research and decisions are being made during pre-development, assign responsibility within your design and development team(s) to create accountability. When certain professionals and trades, or better still – individuals, are assigned responsibility for tasks, they have a higher likelihood of being completed.

**RECOMMENDATIONS**

- Consider tracking meeting minutes, attendees, topics discussed, and decisions made in an online database that is searchable. This can be a valuable resource when personnel working on projects can change over the long duration of the design and construction process.
- Prioritize holistic goal setting. The mission statement and research developed through the Project Priorities Survey (Criterion 1.1) should be used to solidify project goals and strategies. Some questions to consider may be:
  - How can the project leverage multi-benefit strategies to holistically address climate & human resilience?
  - Does the project consider the synergies & overlap between the eight categories of the Green Communities Criteria?
  - Are equity and climate change considered throughout the decision-making process?
  - Are both lifecycle and upfront costs being considered when making decisions about systems and materials?
  - Have current, or potential residents, been considered throughout the pre-development process?
  - Have building operations and maintenance staff been consulted on systems and material selection? Building operators of similar projects often have key insights that are helpful when making important decisions at the pre-development phase.
• Use data from your previous projects as baselines to inform your goals for your current project. For example: evaluate your portfolio energy and water consumption (per bedroom); health needs assessment data; and financial data, including pro-forma assumptions broken down more finely regarding operating expense categories.
• Consider creating incentives for your construction team based on the performance of various building components.

RESOURCES
• Enterprise Community Partners. Participatory Design Toolkit: This toolkit developed by a designer working in a community development organization offers strategies to engage and involve the community in design projects. It is packed with activities, tips, and techniques to foster dialogue and create informed design goals. https://www.enterprisecommunity.org/resources/participatory-design-toolkit-13221
• Whole Building Design Guide: This website describes the core elements of “whole building design,” which includes the combination of an integrative design approach and an integrative team process. This site helps users identify design objectives and organize their processes to meet those objectives. http://www.wbdg.org/wbdg_approach.php
• The Integrative Design Guide to Green Building: Redefining the Practice of Sustainability. 7group and Bill Reed (2009). This book provides guidance to building professionals on incorporating integrative design into every phase of a project. https://sevengroup.com/integrative_design_guide/

1.3 Integrative Design – Documentation
   Mandatory

RATIONALE
Projects that intentionally create accountability among project team members to meet the Enterprise Green Communities Criteria through design and construction documentation tend to successfully implement the Criteria on-site during the construction phase. An evaluation of the pre-development process Enterprise Green Communities conducted in 2011 found that development teams that prioritized documentation of Enterprise Green Communities Criteria were 95% more likely to have those materials or methods show up in the final building.

REQUIREMENTS
In the construction / contract documents for the project (including, but not limited to drawing set, scope(s) of work), include all the information needed to properly implement the measures intended to meet Enterprise Green Communities Criteria, and other mission-critical design features. Also, include all necessary Enterprise Green Communities Criteria information in your construction specifications, in Division 1 Section 01 81 13 Sustainable Design Requirements.

As design progresses, the team should be evaluating how the development of the documents is addressing the goals and priorities outlined earlier in the integrative design processes, specifically in the Project Priorities Survey (Criteria 1.1).

RECOMMENDATIONS
• Incorporate all Enterprise Green Communities Criteria mandatory and optional measures that the project intends to meet.
• Plans and specifications should include a performance specification, examples of products that meet the specification, the metrics used to measure compliance and how compliance will be confirmed.
• Architectural drawings should detail the air sealing and compartmentalization approach for the building and units. Drawings should indicate specifically which materials are considered the air barrier, and expectations for the transition of that air barrier between materials on all six sides.

RESOURCES
• Building America’s Climate-Specific Guidance: http://energy.gov/eere/buildings/building-america-climate-specific-guidance and the Building America Solution Center: http://energy.gov/eere/buildings/building-america-solution-center provide residential building professionals with access to expert information on hundreds of high-performance design and construction topics. They include contracting documents and specifications, installation guidance, “right and wrong” photographs of installation practices and training videos.
• Enterprise Green Communities Single-Family Rehabilitation Specifications, Multifamily Rehabilitation Specifications and Universal Design Specifications for both multifamily and single-family residences include customizable specifications for you to copy, adjust and use for your projects. http://www.enterprisecommunity.org/resources
• Enterprise Green Communities maintains a comprehensive registry of qualified green affordable housing technical assistance (TA) providers that are available for support on the design, construction, rehabilitation and operations of green affordable housing. To find a Green TA provider near you, search the list found at https://www.enterprisecommunity.org/solutions-and-innovation/green-communities/tools-and-services/technical-assistance-providers-database

1.4 Integrative Design – Construction Management
Mandatory

RATIONALE
Communication and education of all contractors, subcontractors, and consultants is critical to ensure that the objectives and decisions made throughout the integrative design process are implemented on-site, during construction of the project.

REQUIREMENTS
• Create, implement, and document your contractor/subcontractor education plan to ensure that all persons working on-site fully understand the integrative design process to date, the results of the Project Priorities Survey (Criterion 1.1), the sustainability goals, and final performance expected of the building and site. This should be included in your construction specifications in Division 1 Section 01 81 13 Sustainable Design Requirements.
• Performance testing and verification schedules are included into the overall construction schedule to ensure that advanced notice is given to testing and verification contractors to do appropriate testing at appropriate times during construction. Estimates may be used until the final testing and verification schedules are finalized. This item should be included in your construction specifications in Division 1 Section 01 81 13 Sustainable Design Requirements.
• As the project moves from design into construction, actively consider what information will be useful to operations staff, collect all relevant information (e.g., installation documents; maintenance manuals; troubleshooting guides, etc.). The hand off of the building when it is placed in service is a critical moment to transfer knowledge from contractors and sub-contractors to the operations team.

RECOMMENDATIONS
• Enterprise Green Communities Certification should be a regular, recurring agenda item for weekly construction team meetings, to insure the project is on track.
• Training and education of all the contractors, subcontractors, and consultants the general contractor as they begin working on-site.
• Add self-verification requirements for your construction team for certain project items that demand proper installation (e.g., testing of water fixtures, testing of bath fans, air sealing of air handler closets). Self-verification for product-based measures (submitting cut-sheets for appropriate paints, carpets, etc.) is most likely unnecessary.
• Review notes and deviations [including Request for Information (RFIs) and Architect’s Supplemental Instructions (ASIs)] should be included in construction documentation. Explanations for where and why design/specifications were changed should be clearly identified throughout final documentation. This item should be included in your construction specifications in Division 1 Section 01 81 13 Sustainable Design Requirements.

RESOURCES
• Enterprise Green Communities maintains a comprehensive registry of qualified green affordable housing technical assistance (TA) providers that are available for support on the design, construction, rehabilitation and operations of green affordable housing. To find a Green TA provider near you, search the list found at https://www.enterprisecommunity.org/solutions-and-innovation/green-communities/tools-and-services/technical-assistance-providers-database

1.5 Design for Health and Well-being: Health Action Plan
Optional | X points

RATIONALE
Housing conditions and our socioeconomic environment are significant root causes that account for 50-70% of our health outcomes. Design, construction, and operations decisions impact resident health—whether intentionally made or not. Thoughtful, informed decision making can make a profound difference on the health outcomes of residents. For instance, in affordable housing that has been designed to improve health and address community health priorities, emergency room visits, and medical costs have decreased, and social connection has improved.

The Health Action Plan framework, developed as part of the release of the 2015 Enterprise Green Communities Criteria, provides affordable housing developers a process to consider and integrate health into affordable housing design and development activities. This innovative process pairs affordable housing developers with public health professionals to prioritize the health needs specific to their community through data analysis and community engagement, resulting in cost-effective strategies that amplify project goals and improve resident health outcomes. Drawing from public health methods (including Health Impact Assessments or HIAs), the Health Action Plan framework allows project teams to identify and address important health issues. With the release of the 2020 Enterprise Green Communities Criteria, we have revised the Health Action Plan framework to reflect the experiences and recommendations of practitioners.

REQUIREMENTS
Project teams will follow the Health Action Plan process starting in predevelopment and continuing throughout the project life cycle (design, construction, operations). The process includes:

1) Commit to embedding health into the project life cycle
2) Partner with a public health professional
3) Collect and analyze community health data
4) Engage with community stakeholders to prioritize health data and strategies
5) Identify strategies to address those health issues
6) Create an implementation plan
7) Create a monitoring plan

These steps, in collaboration with a public health professional and community stakeholders, will allow project teams to assess, identify, prioritize, implement and monitor achievable actions to enhance health-promoting features of the project and minimize features that could present risks to health. Compliance with this criterion requires a partnership with a public health professional, a robust review of publicly available health data, and community engagement, which will lead to a more nuanced understanding of resident (or future resident) health needs and a tailored approach to actions that can be taken to address those needs.

Specifically, project teams should comply with the steps and deliverables outlined here:

**Step 1) Commit to embedding health into the project life cycle**
The first step to embarking on the Health Action Plan process is to commit to taking a health-focused approach to development. This commitment undergirds all subsequent actions. As part of this commitment, assess where the project is in its lifecycle to ensure that data collected and strategies selected can be integrated into the design, construction and operations of the development; allocate time and funds to partner with a public health professional and engage community stakeholders; and commit to integrating feasible strategies that can improve health outcomes. This commitment to health should be made early, ideally during schematic design.

**Step 2) Partner with a public health professional**
Formally partner with a public health professional to help support data collection and analysis, community engagement, and the development of evidence-based strategies to address the health needs that emerge from those phases of work. The public health professional must have expertise in:

1) Accessing local public health data with the ability to analyze and disaggregate this data
2) Facilitating resident and community engagement to reveal community health priorities
3) Identifying evidence-based strategies that can be utilized in the design, construction, and operations process to improve health

Public health professionals may be public health consultants, faculty or graduate students of public health programs, staff of public health institutes and/or community-based public health organizations, architects with evidence of a health-promoting practice, and potentially individuals from other types of organizations. The qualifications of the individual are of higher priority than the type of organization within which that individual is based. See Resources for a template Public Health Professional Scope of Work and a list of pre-vetted public health professionals. Consider conducting 2-3 scoping conversation with different public health professionals prior to selecting the right person or organization for your project.

**Deliverable at Prebuild:** Scope of work between project team and the public health professional describing the activities and responsibilities of the public health professional.

**Step 3) Collect and analyze publicly available community health data**
The public health professional, in partnership with the project team, will conduct research on resident health factors by accessing and analyzing existing, publicly available, data sources. Gather evidence about the project’s potential connections to health and the baseline health of the people that live or are most likely to live in or be impacted by the project. If possible, in this quantitative data analysis, disaggregate data by race, ethnicity, income, and/or age and outline the distribution of health issues among impacted communities and describe the context on why different groups may be disproportionately impacted (both positively and negatively) by these health issues, with a focus on the expected community served by the project.

**Deliverable at Prebuild:**
1) Description of key health needs identified through this data analysis phase.
2) List of data sources referenced.
Step 4) Engage with community stakeholders to prioritize health data and strategies

The public health professional and project team will engage community stakeholders to better understand and prioritize the health issues identified during Step 3 and to identify health concerns that the community stakeholders raise that did not surface in the data. Also, solicit feedback on potential types of design, construction, and/or operations solutions that community stakeholders identify to address those health needs.

The intent of this step is to confirm and prioritize aspects of health to focus project interventions, refining what was learned in the data collection phase based on lived experience of the impacted community. When soliciting feedback on potential types of design, construction, and/or operations interventions, ensure that the conversation is framed to identify the type of interventions that would be effective rather than on specific interventions which the project team may not be able to confirm as feasible at this point in the project lifecycle. For instance, rather than asking the community stakeholders to rank their preference for specific interventions (e.g., exercise room, advanced HVAC filtration system, etc) which the project team may not be able to commit to at this stage in development, work towards understanding and agreement with the community stakeholders on the areas of health which are their highest priority (e.g., obesity or indoor air quality or safety) and the type (e.g. more opportunities for physical activity, improved unit-based air quality) of desired intervention associated with it.

Community stakeholders may include community members who live in or may be served directly by the project; individuals who live, work or learn in the neighborhood surrounding the project; and those who provide services or programming in the building or in the neighborhood surrounding the project.

**Deliverable at Prebuild:**

1) Description of key health needs (should include social, environmental and economic factors contributing to health needs) identified and prioritized by stakeholders. See Recommendations for a sample chart that captures this information.

2) List (or asset map) of public health, community stakeholders, and community members involved. For each group, describe how they informed the list of key health needs to be addressed by this project. Submit separately from sample chart seen in Recommendations.

Step 5) Identify strategies to address those health issues

Given the data and feedback collected in Steps 3 and 4, the project team will work closely with the public health professional to characterize how the project may impact — both positively and negatively — health outcomes for residents and, in turn, identify potential actions that could be implemented within the project’s design, construction, or operation to enhance health-supportive features of the project and minimize potential health risks. As listed in Resources, Promoting Equity Through the Practice of Health Impact Assessment can provide guidance.

**Deliverable at Prebuild:** List of the prioritized health needs and potential actions to protect and promote each identified health need. This is meant to be the inclusive list generated, not just those selected for the project. See Recommendations for a sample chart that captures this information.

Step 6) Create an implementation plan

Based on the list of potential interventions generated in Step 5, select strategies to implement. In identifying these actions, prioritize those that are likely to have significant effects on health, are responsive to community concerns, and are feasible to implement given time and budget constraints. Teams should consider the extent to which the actions will address health impacts of higher concern as well as the feasibility of implementation (in terms of cost, resources, technical constraints, etc.). Note that actions may include design changes as well as targeted programming for the property. Document which strategies were selected and determine how these strategies will be implemented throughout the project lifecycle (e.g. who is responsible, when will they occur).

**Deliverable at Prebuild:** List of selected interventions; description of reasons for implementing selected actions and rationale for not selecting the other identified potential interventions for implementation. Additionally, identify the
individual or organization responsible for implementing the selected strategy. See Recommendations for a sample chart that captures this information.

Step 7) Create a monitoring plan

The monitoring plan enables the project team and residents to, over time, understand the impact of the health promoting strategies selected through the Health Action Plan process. Project teams may also use the monitoring plan as a feedback loop to alter interventions over time to increase impact, to generate data for grant funding or innovative partnerships, to inform future project designs, or a variety of other uses that meet the goals of the team. The monitoring plan should be tailored to the needs, capacity, and capabilities of the project team and partners and should be shared with residents and/or community stakeholders.

To develop the monitoring plan: 1) select design, operations, and health performance metrics to track over time, 2) determine a strategy of measurement (e.g. survey, monitoring frequency of use, building check-list) for each metric, 3) determine the frequency of assessment for each metric, and 4) define the staff responsible for data collection, analysis, and dissemination.

Include design and operations metrics for each health promoting strategy selected as part of the Health Action Plan process. Include health metrics either for the health-promoting features of the property in general or for each health promoting strategy.

- Design metrics are used to determine if and how well the selected strategies were incorporated into the project design in a manner that will promote positive health outcomes
- Operations metrics are measured on a routine basis while the building is in operation to determine whether or not the building is performing as intended
- Health metrics indicate resident health factors and, when possible, incidence or prevalence of key health outcomes in the resident and/or community population

Note that a project team, without the assistance of the public health professional, may be able to create the list of design and operations metrics for the property. For health metrics, either connect directly with the public health professional to develop and implement a plan or use the Healthy Housing Outcomes Survey found in the Resources section of this Criterion. Above all else, in evaluating the impact of the strategies implemented as a result of the Health Action Plan process, identify and ask a guiding question with the above metrics. This guiding question should reflect the desired impact for the project owner engaging in this process. For instance: Does the property [improve or reduce] [highest priority health issue for residents]?

Deliverable at Postbuild: Include the performance metrics to be monitored along with how this will occur: indicators and data sources, frequency, and who is responsible for measurement. See Recommendations for a sample chart that captures this information.

RECOMMENDATIONS

Steps 1 – 6: Sample Chart

<table>
<thead>
<tr>
<th>KEY HEALTH ISSUE AND POPULATION GROUP</th>
<th>POTENTIAL DESIGN, CONSTRUCTION, OR PROGRAMMING INTERVENTIONS</th>
<th>EXAMPLES OF STRATEGIES</th>
<th>WAS THIS STRATEGY ELECTED? (YES/NO)</th>
<th>IF SELECTED, INDICATE HOW THIS STRATEGY WILL BE IMPLEMENTED</th>
<th>RATIONALE FOR SELECTING OR REJECTING THE EXAMPLE STRATEGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>High incidence of childhood asthma</td>
<td>Eliminate or reduce use of materials with</td>
<td>Prioritize the specification of hard surface</td>
<td>Yes</td>
<td>Specification of linoleum for kitchens; cork</td>
<td>High-impact strategy in terms of</td>
</tr>
<tr>
<td>KEY HEALTH ISSUE AND POPULATION GROUP</td>
<td>POTENTIAL DESIGN, CONSTRUCTION, OR PROGRAMMING INTERVENTIONS</td>
<td>EXAMPLES OF STRATEGIES</td>
<td>WAS THIS STRATEGY ELECTED? (YES/NO)</td>
<td>IF SELECTED, INDICATE HOW THIS STRATEGY WILL BE IMPLEMENTED</td>
<td>RATIONALE FOR SELECTING OR REJECTING THE EXAMPLE STRATEGY</td>
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<tr>
<td>Above-average prevalence of childhood obesity</td>
<td>Prioritize features that promote physical activity</td>
<td>Street infrastructure improvements to safely accommodate users of all ages, abilities and transportation modes</td>
<td>No</td>
<td>N/A</td>
<td>Our project team does not have the capacity to affect local transportation infrastructure</td>
</tr>
<tr>
<td>Above-average prevalence of childhood obesity</td>
<td>Prioritize features that promote physical activity</td>
<td>Playground</td>
<td>Yes</td>
<td>We will be including a 100-square-foot playground as part of our project</td>
<td>This feature will provide a local, safe space for the families living in our development to play and socialize. Otherwise, closest playspace is 2 miles from project; not easily accessible. Given the disparities in childhood obesity rates by race, ethnicity and income in</td>
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<tr>
<td>KEY HEALTH ISSUE AND POPULATION GROUP</td>
<td>POTENTIAL DESIGN, CONSTRUCTION, OR PROGRAMMING INTERVENTIONS</td>
<td>EXAMPLES OF STRATEGIES</td>
<td>WAS THIS STRATEGY ELECTED? (YES/NO)</td>
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<tr>
<td>Step 7: Monitoring</td>
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<td>our community, this strategy will also help to address health equity.</td>
</tr>
</tbody>
</table>

*Example of product for Health Action Plan Steps 1-7*
<table>
<thead>
<tr>
<th>INFORMATION IDENTIFIED IN STEPS 1-6</th>
<th>NEW COLUMNS ADDED IN STEP 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>POPULATION NEED</td>
<td>SELECTION INTERVENTION(S)</td>
</tr>
<tr>
<td>SELECTED NEED</td>
<td>SELECTED STRATEGY</td>
</tr>
<tr>
<td>SELECTED PERFORMANCE METRICS</td>
<td>RESPONSIBLE INDIVIDUAL(S) AND/OR ORGANIZATION(S)</td>
</tr>
<tr>
<td>FREQUENCY</td>
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<tr>
<td>High incidence of childhood asthma</td>
<td>Eliminate or reduce use of potential asthmagens</td>
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<td>Health Metrics</td>
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<td>Design Metrics</td>
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<tr>
<td>Above average prevalence of childhood obesity</td>
<td>Prioritize physical activity promoting features; add outdoor lighting to play-grounds to allow use for more hours; add bike racks and storage</td>
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<td>---</td>
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<tr>
<td>Design Metrics</td>
<td>Specified lighting for park/playground areas complies with Criterion 5.5 as well as foot candle recommendations</td>
</tr>
<tr>
<td>Operations Metrics</td>
<td>Lighting density</td>
</tr>
<tr>
<td>Health Metrics</td>
<td>Frequency of events and opportunitie s for physical activity (e.g., “community field day” or walking groups) and associated participation rates</td>
</tr>
<tr>
<td>Design Metrics</td>
<td>To be certified on final plan set before construction start</td>
</tr>
<tr>
<td>Health Metrics</td>
<td>Quarterly tracking of events and number of participants</td>
</tr>
</tbody>
</table>
Transparency

- Share your deliverables with the Green Building Information Gateway (http://www.gbig.org) and the Health Impact Project (mailto:healthimpactproject@pewtrusts.org).
- Produce an acknowledgment page or letter(s) of support from public health professionals and community stakeholders regarding their level of support for the Health Action Plan.
- Note where health-related items have been incorporated into project documentation, including plans and specifications.

RESOURCES

Health Action Plan resources
- Healthy Housing Outcomes Survey: Enterprise Community Partners in partnership with Success Measures developed the Healthy Housing Outcomes Survey to enable affordable housing owners to measure changes in resident health outcomes most likely to be influenced by healthy housing development. https://www.enterprisecommunity.org/resources/healthy-housing-outcomes-survey-7999

Connections between the built environment and health outcomes
Project teams can learn more about the connections between the built environment and health outcomes through resources such as these and others:

- The Build Healthy Places Network provides access to research and best-practice models in connecting community development and health efforts. http://www.buildhealthyplaces.org/network_resources/
- The Centers for Disease Control and Prevention, Guide to Community Preventive Services summarizes evidence of community-level programs and policies to improve health and prevent disease based on a scientific systematic review process. https://www.thecommunityguide.org/

HIA, Healthy Planning, and Healthy Design References

- Build Healthy Places Network Jargon Buster and MeasureUp tools may be particularly useful in the context of Health Action Plans. https://buildhealthyplaces.org/
- The Mariposa Healthy Living Toolkit: This toolkit provides a guide for assessing the health conditions of residents and identifying opportunities to improve health during community redevelopment projects. http://mithun.com/special/Mariposa_Healthy_Living_Initiative/
- Health Impact Project’s interactive map of HIAs: This interactive map allows users to sort and analyze data on completed and in-progress HIAs in the U.S. http://www.pewtrusts.org/en/projects/health-impact-project
- The Surgeon General’s National Prevention Strategy: Healthy Communities factsheet: This document outlines actions that different organization types can take to support healthy and safe community environments. https://www.cdc.gov/healthyplaces/national_strategy.htm
- Promoting Equity through the Practice of HIA: This document highlights strategies for and case examples of promoting equity through Health Impact Assessments. https://www.naccho.org/uploads/downloadable-resources/Programs/Community-Health/HIA-Promoting-Equity.pdf
- Human Impact Partners: https://humanimpact.org/products-resources/ Some suggested tools and resources for your use are:
  o Roles for Collaborators: This document provides examples of different partners that might be involved in a Health Impact Assessment and their roles.
o **Rapid HIA Model**: This document provides guidance for conducting a Health Impact Assessment within a short timeline, while maintaining a high level of stakeholder engagement.

o **Data sources table**: This table outlines data sources that may be useful in a Health Impact Assessment.


- National Network of Public Health Institutes — Community Health Improvement: This website provides webinars, case studies and resources regarding community health assessments and community health improvement tools and techniques. https://nnphi.org/focus-areas-service/

### Neighborhood or community-level health data sets

- Some jurisdictions provide readily available health data at the neighborhood level. Here are examples:
  
  o The Baltimore Neighborhood Indicators Alliance: [http://bniafi.org/](http://bniafi.org/)
  
  o San Francisco’s Sustainable Communities Index: [www.sustainablecommunitiesindex.org/profiles.php](http://www.sustainablecommunitiesindex.org/profiles.php)
  
  o San Francisco Open Data Portal: [https://data.sfgov.org/](https://data.sfgov.org/)
  

  o The Boston Indicators Project: [www.bostonindicators.org/indicators/health](http://www.bostonindicators.org/indicators/health)


  o Philadelphia Community Health Database: [www.chdbdata.org/](http://www.chdbdata.org/)


  o Minnesota Compass: [www.mncompass.org](http://www.mncompass.org)

- Enterprise’s Opportunity360 toolkit includes a Measure tool which provides census-tract level data on key community opportunity outcomes. The Listen tool offers resources to generate community feedback and participation. [www.opportunity360.org](http://www.opportunity360.org)

- Project teams can also contact local or state health departments to inquire about the availability of neighborhood-level health data. Additionally, project teams can consult the Centers for Disease Control and Prevention’s guidance on “Creating a Health Profile of Your Neighborhood.” This document outlines the basic steps and provides online resources for creating a neighborhood health profile. [www.cdc.gov/healthyplaces/toolkit/sources_of_health_data.pdf](http://www.cdc.gov/healthyplaces/toolkit/sources_of_health_data.pdf)

- Community Commons: This is an interactive mapping, data and networking tool to support organizations in their efforts to create healthy, sustainable and equitable communities. [www.communitycommons.org](http://www.communitycommons.org)

- County Health Rankings: The County Health Rankings use county-level measures from a variety of state and national data sources to assess and rank the population health of nearly all counties in the U.S. This website allows users to view the rankings and to explore and download data, including statistics on length of life, self-reported general health, and a subset of health influences. [www.countyhealthrankings.org](http://www.countyhealthrankings.org)

- Community Action Partnership: This website provides selected demographic, employment, educational attainment, income, housing, nutrition and health care indicators at the county and state levels and can be summarized using online tables and charts. [https://communityactionpartnership.com/](https://communityactionpartnership.com/)

- Centers for Disease Control, Field Guide for Community Needs Assessment: This document details the steps of conducting a community needs assessment. [www.cdc.gov/globalhealth/fetp/training_modules/15/community-needs_fguidelines_final_09252013.pdf](http://www.cdc.gov/globalhealth/fetp/training_modules/15/community-needs_fguidelines_final_09252013.pdf)

• Robert Wood Johnson Foundation — DataHub: This website allows users to customize state-level data on key health and health care topics and visualize facts and figures. [http://statehealthcompare.shadac.org/](http://statehealthcompare.shadac.org/)
• Health Statistics You Can Visualize, Customize & Share, Centers for Disease Control, State and Local Tracking Portals: This website provides links to health and environmental data from 23 states and one city. [http://ephitracking.cdc.gov/showStateTracking.action](http://ephitracking.cdc.gov/showStateTracking.action)
• Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System: This is an annual, state-by-state phone survey of self-reported health outcomes used to determine national and state disease rates. [www.cdc.gov/brfss/](http://www.cdc.gov/brfss/)

1.6 Resilient Communities: Multi-Hazard Risk / Vulnerability Assessment
Optional | X points

RATIONALE
Creating affordable housing projects that will perform well during natural disasters requires careful planning. The exercise of assessing vulnerabilities and creating a plan to mitigate appropriate risks will result in greater focus on this issue. Engaging in this exercise during the integrative design process will yield input from a variety of stakeholders and help you to incorporate measures that enhance resilience throughout the project design and construction documents.

Per the Resilient Design Institute, resilience is the capacity to adapt to changing conditions and to maintain or regain functionality (“bounce forward”) and vitality in the face of stress or disturbance. It is the capacity to bounce back after a disturbance or interruption of some sort. At various levels — individuals, households, communities and regions — through resilience, we can maintain livable conditions in the event of natural disasters, loss of power or other interruptions in normally available services. Relative to climate change, resilience involves adaptation to the wide range of regional and localized impacts that are expected with a warming planet: more intense storms, greater precipitation, coastal and valley flooding, longer and more severe droughts in some areas, wildfires, melting permafrost, warmer temperatures and power outages.

Resilient design is the intentional design of buildings, landscapes, communities and regions in response to these vulnerabilities to minimize the negative impact on residents and local community members.

REQUIREMENTS
Conduct a four-part assessment (social, physical, functional, strategy) to identify critical risk factors of your property and implement at least two sets of strategies to enable the project to adapt to, and mitigate, climate related risks.

Your Multi-Hazard Risk / Vulnerabilities Assessment should:
• Prioritize a deeper evaluation of applicable hazards (e.g., wildfires, flooding, etc.) identified in the state or county hazard mitigation plan for which your project is located.
• Identify strategies to implement that address at least the top three risk factors identified for your project.
• Ensure that these measures are referenced in Criterion 8.2 Emergency Management Manual.

To comply with Criterion 1.6, project teams must complete a Multi-Hazard Risk / Vulnerabilities Assessment and identify and document which strategies are selected and implemented in the project. At Prebuild submit the draft assessment. At Postbuild submit the final assessment and description of strategies that have been implemented in the project.

Note: Criterion 1.1 required project team to write a non-specific, generic evaluation of Climate and Environmental Resilience issues, in section 6 of the Project Priorities Survey. To earn optional points under Criterion 1.6, project teams must complete the requirements listed above.)

RECOMMENDATIONS
Hold a series of facilitated charrettes and community meetings focused explicitly on identifying how the issues identified in your project's state or county hazard mitigation plan apply to your project and your resident population.

Identify solutions appropriate for your project, evaluate how these strategies overlap with the other criteria selected for your project, and determine best means of implementation. Strategies should be appropriate to the unique residency of your building. For example, senior-only buildings may have different needs from buildings that serve primarily family populations. Also consider and prioritize social and cultural needs your residents may identify.

Creating a safe, comfortable, centralized location where residents and community members can share resources (e.g. water, food, electrical outlets, etc.) and disseminate relevant emergency information from building management is important when considering the immediate moments after an acute disruption.

Enterprise's Multifamily Resilience Manual includes more than a dozen strategies and specific guidance for building property resilience in the event of an emergency. Consider incorporating one or more of these measures into your property.

**RESOURCES**

- FEMA’s hazard mitigation planning resources include a Mitigation Planning Handbook, guidelines for Sustainability in Mitigation Planning, Planning Advisory Service Reports, and examples of Mitigation Activities. [http://www.fema.gov/hazard-mitigation-planning-resources](http://www.fema.gov/hazard-mitigation-planning-resources)
- The National Hazard Mitigation Association (NHMA): Promotes natural hazard risk reduction and climate adaptation through planning, adaptation and mitigation. The NHMA promotes steps to reduce the risk and consequences of natural events with a special emphasis on protecting the most vulnerable populations in our communities. [http://www.nhma.org](http://www.nhma.org)
- The Built Environment Coalition (BEC): Develops analytical approaches, methodologies and tools to help communities and organizations identify opportunities to improve their built environment and make informed decisions on potential investments. [http://www.builtinenvironmentcoalition.org](http://www.builtinenvironmentcoalition.org)
- The Federal Alliance for Safe Homes (FLASH): The country’s leading consumer advocate for strengthening homes and safeguarding families from natural and manmade disasters. [http://www.flash.org](http://www.flash.org)
- Rocky Mountain Land Use Institute: Resource focused on sustainable and adaptive land use and development practices, focused on the western U.S. [http://www.law.du.edu/index.php/rmlui/about](http://www.law.du.edu/index.php/rmlui/about)
- Kaiser Permanente Hazard and Vulnerability Assessment Tool: Naturally Occurring Events is a sample Hazard Vulnerability Analysis Tool: [https://www.ohcanal.org/facility_operations/disaster_planning/Documents/Copy%20of%20Your%20Facility%20Hazard%20Vulnerability.xlsx](https://www.ohcanal.org/facility_operations/disaster_planning/Documents/Copy%20of%20Your%20Facility%20Hazard%20Vulnerability.xlsx)
- California Association of Health Facilities Hazard Vulnerability Worksheet may be used as a template to score and assess your project for potential mitigative actions that can reduce identified vulnerabilities. [https://www.calhospitalprepare.org/hazard-vulnerability-analysis](https://www.calhospitalprepare.org/hazard-vulnerability-analysis)
- Enterprise’s Multifamily Resilience Manual: [http://www-enterprisecommunity.org/resources](http://www-enterprisecommunity.org/resources)
- The Enterprise Green Communities Ready to Respond Toolkit can help project teams complete Criterion 1.6, and provide further guidance on developing comprehensive plans to protect buildings, ensure continuity of housing service, and engage residents on disaster preparedness. [https://www-enterprisecommunity.org/resources/ready-respond-strategies-multifamily-building-resilience-13356](https://www-enterprisecommunity.org/resources/ready-respond-strategies-multifamily-building-resilience-13356)
Category 2: Location & Neighborhood Fabric
2: LOCATION & NEIGHBORHOOD FABRIC
Locating the project within an existing neighborhood with proximity to infrastructure, transportation and services augments affordability, leads to more resource-efficient development of land, saves energy, and increases the vitality of the community.

2.1 Sensitive Site Protection
*Mandatory*

**RATIONALE**
Protecting fragile and scarce environmental resources minimizes negative impacts on valuable ecosystem. Designating sensitive lands into Ecological Resource Protection Zones (ERPZs) and limiting development in these areas decreases the impact development has on climate change and protects the project from the exacerbating effects of flooding due to climate change.

**REQUIREMENTS**
All projects must:

1. Protect floodplain functions (e.g., storage, habitat, water quality) by limiting new development within the 100-year floodplain of all types of watercourses.
2. Conserve and protect aquatic ecosystems, including wetlands and deepwater habitats that provide critical ecosystem functions for fish, other wildlife, and people.
3. Protect ecosystem function by avoiding the development of areas that contain habitat for plant and animal species identified as threatened or endangered.
4. Conserve the most productive agricultural soils by protecting prime farmland, unique farmland, and farmland of statewide or local importance.

If your site contains features any of those conditions (floodplains; aquatic ecosystems including wetlands; habitat for threatened or endangered species; prime farmland), follow the Requirements under that subheading.

1. **Protect floodplain functions** - Protect floodplain functions (e.g., storage, habitat, water quality) by limiting new development within the 100-year floodplain of all types of watercourses.

   All projects must document the location of the 100-year floodplain (Special Flood Hazard Area or SFHA) as identified by FEMA on the Flood Insurance Rate Map (FIRM) as part of an Ecological Resource Protection Zone (ERPZ).

   **NEW CONSTRUCTION** – minimize development in floodplains, by:
   - Minimize the disturbance of land within the ERPZ.
   - Ensure that any permanent encroachment of land within the flood zone ERPZ, will improve existing floodplain conditions (maintain or increase existing floodplain storage, improve water quality, flood-resilient design);
   - Infill projects built on land that is within the Special Flood Hazard Areas (SFHA) as identified by FEMA on the Flood Insurance Rate Map, must be designed to meet the American Society of Civil Engineers ASCE 24 Flood Resistant Design and Construction standard.

   **REHABILITATION** – Maintain or improve existing floodplain conditions, by:
   - Ensure any development or redevelopment activities within the floodplain will mitigate and improve existing floodplain conditions (maintain or increase existing floodplain storage, improve water quality, flood-resilient design);
   - Do not increase flood elevations;
   - Comply with the National Flood Insurance Program (NFIP) requirements for the rehabilitation of buildings within the 100-year floodplain.

2. **Protect aquatic ecosystems**
All projects must document the full geographic extent of any aquatic ecosystems, including isolated wetlands, located within project boundary as part of an Ecological Resource Protection Zone (ERPZ).

Aquatic ecosystems include wetlands, deepwater habitats, and are classified as:

- Marine (Tidal wetlands, shorelines, mudflats, reefs)
- Estuarine (Bays, lagoons, marshes)
- Riverine (Streams, rivers [associated floodplains and their riparian buffer])
- Lacustrine (Lakes, ponds [associated shorelines and their riparian buffer])
- Palustrine (Non-tidal wetlands, seeps, springs, vernal pools, seasonal wetlands)

**NEW CONSTRUCTION** – Do not build within 100 feet of the any of the wetlands or deepwater habitats included in your ERPZ.

**REHABILITATION** – Maintain or improve existing aquatic ecosystems, by:

- Do not extend the building, built structures, roads, or parking areas into the ERPZ.
- Develop restoration plan for wetland and deepwater habitats within the ERPZ.

Identifying and delineating aquatic ecosystems is detailed by the U.S. Army Corps of Engineers. Other boundaries of aquatic ecosystems are defined by ordinary high-water mark (OHWM).

3. **Conserve habitat for any species on federal or state threatened or endangered lists**

   As part of predevelopment design process, identify whether the site is in the range of habitats for any plant or animal species on U.S. federal or state threatened or endangered lists. If the site hosts any threatened or endangered plant or animal species, conduct a habitat assessment for each identified species.

   **ALL PROJECTS** – Sites that feature habitat for any species on federal or state threatened or endangered lists, must:

   - Designate the full extent of habitats for threatened and endangered plant and animal species on the site as an Ecological Resource Protection Zone (ERPZ).
   - Minimize disturbances within the ERPZ. If construction activities permanently disrupt the habitat of threatened or endangered animal habitats, follow the guidance of responsible state (or local) agencies on how to best address.

4. **Limit development on farmland** (only for New Construction projects located on/in rural / tribal / small towns)

   If farmland soils are present on site, consider relocating project to an alternative site. If developing on an alternative site is not possible, locate project development to conserve prime farmland soils and minimize disturbance due to construction activity.

   **New Construction projects on/in rural/tribal/small towns — Sites with farmland soils**

   - Designate the full extent of prime farmland soils on the site as an Ecological Resource Protection Zone (ERPZ). Minimize the amount of developed prime farmland located in the ERPZ.
   - If more than 20% of the prime farmland noted in the ERPZ is developed, the project must purchase a permanent agricultural conservation easement on land with comparable, productive farmland soils for every acre of prime farmland developed, 1:1.

Prime farmland is defined by the U.S. Department of Agriculture (USDA) in the United States Code of Federal Regulations, Title 7, Volume 6, Parts 400 – 699, Section 657.5 or by the USDA’s Natural Resources Conservation Service (NRCS) soil survey.

**RECOMMENDATIONS**

- An Ecological Resource Protection Zone (ERPZ) are boundaries that are identified and mapped on site plan(s) during predevelopment phase. Area marked in the EPRZ must be treated sensitively, as described throughout
the Enterprise Green Communities Criteria, to ensure there is no disturbance, disruption or damage of 1. floodplains, 2. aquatic ecosystems, 3. wildlife habitats, and 4. prime farmland. Every development will not have an ERPZ. Some developments may have an ERPZ that only reflects some of the four categories listed.

- Operations and Maintenance plans (Criterion 8.1) should include section(s) describing on-going management activities required to protect the integrity of the floodplain functions.
- Many states have specific protocols for evaluating sites for endangered animals and plants. Be sure to consult with your state (or local codes) or other requirements when evaluating the wildlife habitats on your site.
- When endangered animal species are present on site, make efforts to commence construction and maintenance activities during seasons when the animal species is not present.

RESOURCES

- U.S. Departments of Homeland Security: FEMA Flood Map Service Center: https://msc.fema.gov/portal/home

2.2 Connections to Existing Development and Infrastructure

Mandatory for New Construction, except for projects defined as rural / tribal / small town

RATIONALE

Locating a project within an existing neighborhood and in proximity to existing infrastructure encourages more resource-efficient development of land, conserves energy, adds to the vitality of the overall community, and safeguards a community during significant weather events. Ensuring that pedestrian and cycling infrastructure is included encourages safe, active transportation, which can improve health by increasing daily physical activity.

REQUIREMENTS

Demonstrate, on your site plan and context map, that the following have been incorporated into your development:

- Locate the project on a site that is within or contiguous to existing development (at least 25% of the site perimeter borders currently developed land) and that has access to existing road, water, and sewers infrastructure.
- Connect the project to the existing pedestrian network by creating new roads with sidewalks, providing sidewalks on existing streets, or providing all-weather pathways to link the project to transit stops, public or civic spaces, open spaces, and adjacent development.
- For sites over 5 acres, provide connections to the adjacent street network at least every 800 feet.
- Tie all planned bike paths/lanes on your site to existing bike paths or lanes that intersect your site in ways that are safe, accessible, and clearly identified.

RECOMMENDATIONS

- Provide enhanced pedestrian crossings at intersections using elements such as curb extensions, medians, crosswalk countdown clocks, daylighting, street treatments (e.g., different color or texture pavement in crosswalks) or sidewalk expansion. On streets with large blocks, consider mid-block pedestrian crossings.
- Dedicated pedestrian and bicycle paths are important even on dead-end streets.
If bicycle lanes or paths run through or adjacent to your site, consider adding bicycle storage for residents and visitors.

Design engaging and safe sidewalk experiences appropriate for expected pedestrian flows and uses.

**RESOURCES**

- Center for Active Design: The Center for Active Design maintains an urban design checklist that includes best practices for sidewalk design to encourage their vibrant use, including features like trees, lighting and wayfinding. [http://centerforactivedesign.org/](http://centerforactivedesign.org/)
- Center for Active Design: Sidewalks. [https://centerforactivedesign.org/sidewalks](https://centerforactivedesign.org/sidewalks)
- Smart Growth America: Complete Streets. [http://www.smartgrowthamerica.org/complete-streets](http://www.smartgrowthamerica.org/complete-streets)
- Resilient City Urban Design Principles: A resilient post-carbon community, which reorients city-life to the pedestrian scale (a 500-mile radius), must focus its efforts to creating several local destinations, which attract a critical-mass of users and activities. [https://www.resilientcity.org/index.cfm?id=11928](https://www.resilientcity.org/index.cfm?id=11928)

### 2.3 Compact Development

*Mandatory for New Construction*

**RATIONALE**

Compact development encourages more resource-efficient development of land, conserves energy and supports demand for transit, neighborhood retail and community cohesion. Compact development also correlates with walking behavior and physical activity through active transportation. For communities that want to promote active transportation and a healthy lifestyle, compact development is critical to success.

**REQUIREMENTS**

At a minimum, build to the residential density (dwelling units /acre) of the census block group where the project is located. Find the density of your census block group by typing your project address into the Center for Neighborhood Technology “Residential Density of a Location” calculator found at [http://apps.cnt.org/residential-density](http://apps.cnt.org/residential-density).

**Notes:**

- *Net density calculations do not include land that is set aside for future building phases or development. For multi-phased projects, the project net density should include only the portion of the parcel that is being used for that particular phase.*
- *Any acreage maintained as permanently protected open space per Criteria 2.6 and 2.7 may be deducted from total project acreage to determine project density.*

In rural / tribal / small town locations that do not have zoning requirements, use the following: Build to a minimum net density of 5 units per acre for single-family houses; 10 units per acre for multifamily buildings, single and two-story; and 15 units per acre for multifamily buildings greater than two-stories.

**RECOMMENDATIONS**

- To determine if your project qualifies as rural / tribal / small town, reference the definitions included in the Introduction.

**RESOURCES**

- Congress for the New Urbanism: This nonprofit organization provides tools and resources for promoting walkable, neighborhood-based development as an alternative to sprawl. [http://www.cnu.org](http://www.cnu.org)
- Smart Growth America: This website outlines smart growth principles, provides a guide through smart growth terms and technical concepts, and hosts a searchable catalog of reports, websites, tools and case studies. [https://smartgrowthamerica.org/](https://smartgrowthamerica.org/)

- Resilient City Urban Design Principles: A resilient post-carbon community, which reorients city-life to the pedestrian scale (a 500-mile radius), must focus its efforts to creating several local destinations, which attract a critical-mass of users and activities. [https://www.resilientcity.org/index.cfm?id=11928](https://www.resilientcity.org/index.cfm?id=11928)

- Urban Land Institute: This nonprofit organization promotes the responsible use of land to enhance the total environment. ULI’s online bookstore includes numerous publications regarding compact and higher-density development. [http://www.uli.org](http://www.uli.org)

2.4 Compact Development

*Optional | X or X points*

**RATIONALE**

Compact development encourages more resource-efficient development of land, conserves energy and supports demand for transit, neighborhood retail and community cohesion. See Rationale for Criterion 2.3.

**REQUIREMENTS**

Exceed the residential density (dwelling units /acre) of the census block group in which your project is located. Find the density of your census block group by typing your project address into the Center for Neighborhood Technology “Residential Density of a Location” calculator found at [http://apps.cnt.org/residential-density/](http://apps.cnt.org/residential-density/).

<table>
<thead>
<tr>
<th>EXCEED THE CNT RESIDENTIAL DENSITY</th>
<th>OPTIONAL POINTS</th>
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<tbody>
<tr>
<td>2x</td>
<td>X points</td>
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<tr>
<td>3x</td>
<td>X points</td>
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</tbody>
</table>

In rural / tribal / small towns that do not have zoning requirements, build to a minimum net density of 7.5 units per acre for single-family houses; 12 units per acre for multifamily buildings, single and two-story; and 20 units per acre for multifamily buildings greater than two-stories. [X points]

**RECOMMENDATIONS**

See Recommendations for Criterion 2.3.

**RESOURCES**

See Resources for Criterion 2.3.

2.5 Proximity to Services & Community Resources

*Mandatory for New Construction*

**RATIONALE**

Locating housing in proximity to neighborhood services, including grocery stores, community centers, health services and some retail shops reduces the need to travel, thus reducing monthly living costs and improving health by encouraging walking or biking. Additionally, proximity and access to active recreation facilities such as parks, playgrounds and other exercise amenities are associated with increased physical activity and contribute to a healthy lifestyle.

Residents with services within a close, safe, accessible physical proximity will fare better during natural disasters in the event of a loss of automobile access or other major events when gasoline and public transportation may be limited.

**REQUIREMENTS**
• Create a Context Map that is centered on the center of your project site and demonstrates that your project is within a 0.5-mile walk distance of at least four, or a 1-mile walk distance of at least seven, amenities identified below.

For projects that qualify as rural / tribal / small town, locate your project within 5-miles of at least four services.

• Walk distances should be shown on your Context Map along clearly identifiable, safe, pedestrian-friendly walking routes that can accommodate people of various ages and levels of mobility.

• Each “service” type may not be counted more than twice. For example, if there are five banks within the required distance, only two may be counted.

SERVICES AND COMMUNITY RESOURCES

<table>
<thead>
<tr>
<th>Food Access</th>
<th>Health &amp; Wellness</th>
<th>Education &amp; Culture</th>
<th>Mobility</th>
<th>Civic &amp; Community Facilities</th>
<th>Retail</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers market</td>
<td>Pharmacy</td>
<td>Public library</td>
<td>Public transportation (e.g. bus stop, subway stop, etc.)</td>
<td>Community or recreation center, potentially including performance space</td>
<td>Clothing store or department store selling clothes</td>
<td>Bank (with teller hours)</td>
</tr>
<tr>
<td>Full-service grocery store</td>
<td>Gym, health club, exercise studio</td>
<td>Place of worship</td>
<td>Bike share / scooter docking station</td>
<td>Police or fire station</td>
<td>Hardware store</td>
<td>Hair care</td>
</tr>
<tr>
<td>Other food store with produce</td>
<td>Medical clinic or office that treats patients</td>
<td>Educational facility (including K–12 school, university, adult education center, vocational school, community college)</td>
<td>Public transportation (e.g. bus stop, subway stop, etc.)</td>
<td>Post office</td>
<td>Adult or senior care (licensed)</td>
<td>Laundry, dry cleaner</td>
</tr>
<tr>
<td>Restaurant, café, diner</td>
<td>Public park</td>
<td>Cultural arts facility (e.g. museum, performing arts space, concert venue)</td>
<td>Public transportation (e.g. bus stop, subway stop, etc.)</td>
<td>Senior center</td>
<td>Child care (licensed)</td>
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</tbody>
</table>

RECOMMENDATIONS

• To determine if your project qualifies as rural / tribal / small town, reference the definitions in the Introduction.

• In conversations with existing (or potential) residents, and using other assessment tools like the Enterprise Opportunity Report (Opportunity360), identify the most needed services and community resources in your area. If your building has

• Make the pedestrian experience safe and comfortable. Consider using some of the following techniques to make pedestrian paths more enjoyable and accessible: tactile curb warning ramps, additional lighting, clearly marked crosswalks, corner bulb outs, and pedestrian crossing signals.

• City, municipal and county governments (e.g., local planning department, health department) can serve as valuable resources to better understand community amenities.

RESOURCES


• Google Maps offers a function to demonstrate walk distance. On Google Maps, go to “Directions” and select “Walk Directions” to obtain this information. [http://www.google.com/maps](http://www.google.com/maps)

• Safe Routes to School National Partnership: This network of more than 300 nonprofit organizations, government agencies, schools and professionals works to advance the Safe Routes to School (SRTS) movement in the United States. SRTS can provide a variety of important benefits to children and their communities, including increasing physical activity, reducing traffic congestion, improving air quality and enhancing neighborhood safety. [http://www.saferoutespartnership.org/home](http://www.saferoutespartnership.org/home)
• Resilient City Urban Design Principles: A resilient post-carbon community, which reorients city-life to the pedestrian scale (a 500-mile radius), must focus its efforts to creating several local destinations, which attract a critical-mass of users and activities. https://www.resilientcity.org/index.cfm?id=11928

• The National Association of Area Agencies of Aging (n4a): This resource can be used to find aging-in-place service providers in your area. http://www.n4a.org/

• U.S. Department of Health and Human Services, U.S. Administration on Aging, Eldercare Locator: This resource can be used to find home- and community-based service providers in your area. https://www.eldercare.gov/

• Consider using a technology like TransitScreen in your building’s common space(s) to provide real-time transportation information to building residents and staff. http://transitscreen.com

• Professor Anne Vernez-Moudon’s papers on walkability, College of Built Environments, Department of Architecture, University of Washington. http://arch.be.uw.edu/people/anne-vernez-moudon/

2.6 Preservation of and Access to Open Space for Rural / Tribal / Small Towns

Mandatory for New Construction Rural / Tribal / Small Towns

RATIONALE
Open space is more than just a land asset for development; it is an amenity that attracts and welcomes the broader community. Access to safe open space and other natural resources improves quality of life, enhances opportunities for physical activity and social interaction/connection, and provides the opportunity to better understand the importance of the natural ecosystem.

REQUIREMENTS

Option 1
Locate the project within a 0.25-mile walk distance of dedicated non-paved public open space that is a minimum of 0.75 acres.

To demonstrate compliance with Option 1: on your context map, show the walk distance from the center of your project site to the public non-paved open space on a Context Map.

OR

Option 2
Set aside a minimum of 10% (minimum of 0.25 acre) of the total project acreage as a permanent non-paved open space for use by all residents.

To demonstrate compliance with Option 2:
• Create a site plan with total site acres and the number of acres of the proposed non-paved open space.
• When calculating non-paved open space, be sure to deduct buildings, private outdoor areas, streets and roads from your total site area.

Notes (for all options):
• Green Roofs can be used in open space calculations if the roof area is accessible to all residents.
• Land that is set aside for future development cannot be included as open space in these calculations.

RECOMMENDATIONS
• To determine if your project qualifies as Rural/Tribal/Small Town, reference the definitions in the Introduction section.
• Be sure to consider security and maintenance of all open spaces included on site.
• Design building massings to enhance nearby parks, plazas and open spaces.
• Open spaces should be safe and designed to promote active use by residents. Features such as active bike and walking trails/paths, lighting, seating options, native plantings and recreation facilities make open spaces a community amenity.
• Open spaces should complement the cultural preferences of the local population and accommodate people of all ages.
RESOURCES

- The Trust for Public Land: Creates parks and protects land for people, ensuring healthy, livable communities for generations to come. http://www.tpl.org/
- The Trust for Public Land, ParkScore Index: A rating system developed to measure how well U.S. cities are creating parks. http://parkscore.tpl.org/

2.7 Preservation of and Access to Open Space
Optional | X points maximum

RATIONALE
See Rationale for Criterion 2.6.

REQUIREMENTS

Option 1
Locate the project within a 0.25-mile walk distance of dedicated public non-paved open space that is a minimum of 0.75 acres.

To demonstrate compliance with Option 1: on your context map, show the walk distance from the center of your project site to the public non-paved open space on a Context Map.

OR

Option 2
Set aside a percentage of non-paved open space for use by all residents.

<table>
<thead>
<tr>
<th>PERCENTAGE OF OPEN SPACE SET ASIDE</th>
<th>NUMBER OF OPTIONAL POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td>X points</td>
</tr>
<tr>
<td>35%</td>
<td>X points</td>
</tr>
<tr>
<td>45% + submitted written statement of preservation / conservation policy for set-aside land (for 15 years)</td>
<td>X points</td>
</tr>
</tbody>
</table>

To demonstrate compliance with Option 2:
- Create a site plan with total acres and the number of acres of the proposed non-paved open space.
- When calculating non-paved open space, be sure to deduct buildings, private outdoor areas, streets and roadways from your total site area.

Notes (for all options):
- Green Roofs can be used in open space calculations if the roof area is accessible to all residents. If the roof(s) are not vegetated or if they are not accessible to all residents, they should not be considered part of the calculations listed above.
- Land that is set aside for future development cannot be included as open space in these calculations.

RECOMMENDATIONS
See Recommendations for Criterion 2.6.

RESOURCES
See Resources for Criterion 2.6.
2.8 Access to Transit

*Rationale*
Projects located near transit reduce a resident’s need to own or rely upon a car, thereby eliminating or lowering the costs of auto ownership. Transit use and biking reduces consumption of fossil fuel and related emissions of air pollutants and carbon dioxide. In addition, locating near high-frequency transit typically allows project residents to access major employment centers, and can provide opportunities for increased physical activity through active transportation, improving health. Bicycle facilities can significantly increase the area served by public transit, as distances too long to walk are often easily accessible by bicycle.

**Requirements**

- **Mandatory** New Construction projects, in urban / suburban locations:
  Locate projects within a 0.5-mile walk distance of public transit services (bus, rail and/or ferry) that combined constitute at least 60 or more transit rides per weekday and include some type of weekend service.

- **Optional** New Construction projects, in urban / suburban locations:
  Locate the project along dedicated bike trails or lanes (Class I, II, or IV) that lead to high-quality transit services (100 or more trips per day) within 3 miles. (x points)

- **Optional** Rehabilitation projects, in urban / suburban locations:
  Locate projects within a 0.5-mile walk distance of public transit services (bus, rail and/or ferry) that combined constitute at least 60 or more transit rides per weekday and include some type of weekend service. (x points)

  For an additional x points: Locate the project along dedicated bike trails or lanes (Class I, II, or IV) that lead to high-quality transit services (100 or more trips per day) within 3 miles. (x points)

- **Optional** New Construction and Rehabilitation projects, in rural / tribal / small town locations:
  Locate the project within a 5-mile distance of the following transit options: 1) vehicle share program; 2) dial-a-ride program; 3) employer vanpool; 4) park-and-ride; or 5) public–private regional transportation; or 6) install at least two charging stations for electric vehicles (x points)

  For an additional x points: Locate projects within a 0.5-mile walk distance of public transit services (bus, rail and/or ferry) that combined constitute at least 60 or more transit rides per weekday and include some type of weekend service. (x points)

On the context map, demonstrate that the center of the site is within the distance required of the transit amenities selected.

**Recommendations**

- A “ride” is an opportunity to take a transportation line or route from a stop. For example, if your site has one bus stop that services two bus routes that each run service every 30 minutes from 6 am to 9 pm, your project would have:

  \[
  \text{Route 1: 15 hours x 2 stops per hour = 30 “rides”} \\
  + \text{Route 2: 15 hours x 2 stops per hour = 30 “rides”} \\
  \text{TOTAL: 60 rides / workday}
  \]

- Many cities and counties provide bicycle trail and route maps for free download through their websites.

**Resources**

- To determine if your project qualifies as Rural/Tribal/Small Town, reference the definitions in the Introduction.
• Google Maps offers a function to demonstrate walk distances and to identify bicycle trail and route maps. On Google Maps, go to “Get Directions” and select “Walking” or “Bicycling,” as applicable, to obtain this information. [http://www.google.com/maps](http://www.google.com/maps)

• Consider using a technology like TransitScreen in your building’s common space(s) to provide real-time transportation information to building residents and staff. [http://transitscreen.com/](http://transitscreen.com/)

• Victoria Transportation Policy Institute: This independent research organization provides consulting and publicly available research about solutions to emerging transportation issues, such as transportation demand management. [http://www.vtpi.org](http://www.vtpi.org)


• The City of Oakland California. Engineering and Construction – Bikeway Types: [http://www2.oaklandnet.com/government/o/PWA/o/EC/s/BicycleandPedestrianProgram/OAK024595](http://www2.oaklandnet.com/government/o/PWA/o/EC/s/BicycleandPedestrianProgram/OAK024595). This resource is helpful to better understand the differences between Class I, Class II and Class IV bike lanes.

• National Association of City Transportation Officials, “Bike Lanes,” [http://nacto.org/cities-for-cycling/design-guide/bike-lanes/](http://nacto.org/cities-for-cycling/design-guide/bike-lanes/)

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ACCESS TO PUBLIC TRANSPORTATION

Route 129 — 40 stops/weekday, 20 stops/weekend day: < 0.1 mile from site
Route 200 — 60 stops/weekday, 25 stops/weekend day: 0.3 mile from site

2.9 Improving Connectivity to the Community

Optional □ X-X points

RATIONALE
Connections to adjacent development and public, open spaces promote recreational walking, biking and alternative means of commuting as well as other healthy lifestyle choices. Safe and accessible connections to amenities and open space can reduce isolation and increase equity by making it easier for residents to access community amenities, including transit. Research shows that low-income communities and communities of color often do not have access to these benefits, and this has led to lower levels of physical activity and high rates of chronic diseases, as well limited access to quality jobs. Increasing access to safe, complete sidewalks, bike paths, open spaces, and community amenities is a step toward reducing inequities created by our built environment.

REQUIREMENTS
Improve access to community amenities through at least one of the measures below. To earn optional points under this criterion, projects must meet a minimum point threshold of X points.

Incentivize Biking Mobility
• Provide outdoor bicycle racks that are accessible for visitors and residents. [X point]
• Provide secure, lockable, sheltered and accessible bicycle storage. Provide at least one bicycle parking space for every residential unit. Post signage directing residents to bicycle parking areas and programs [X points]

• Provide bicycles and equipment (e.g., helmets, locks, tire pumps, maintenance equipment) for resident use. [X points]

• Promote use of, and access to, one or more bicycle-share / micro-mobility (scooter) programs within 0.25-mile of the building. Bicycles and scooters need to be accessible to occupants at all hours. Maps to the nearest bike station and scooter docking facility should be posted in a visible location within a common area in the building and included in the Resident Manual (Criterion 8.3). [X point]

• Provide residents with discounted bicycle-share memberships for a period of at least 12-months [X points]

• Provide residents with free bicycle-share memberships for a period of at least 12-months. [X points]

Improving Access

• Provide residents with discounted transportation passes for a period of at least 12-months. [X points]

• Provide residents with free transportation passes for a period of at least 12-months. [X points]

• Include car-share services (parking) on property. [X point]

• Provide all eligible residents with discounted car-share memberships for a period of at least 12-months. [X points]

• Provide a minimum of 50% of eligible residents with free car-share memberships for a period of at least 12-months. [X points]

RECOMMENDATIONS

• Safety should be encouraged when considering opportunities for biking, walking, driving and parking. Consider promoting designs that encourage slow-speed, low-volume roadways, thereby enhancing pedestrian and bikers' safety.

• Provide orientation materials and maps to the nearest bus, transit stations, car-share or bike-share facilities (general orientation materials are acceptable for floating car- or bike-share services). Information about these amenities should be posted in a visible location in a common area in the building and included in the Resident Manual (Criterion 8.3).

• Consider offering a credit for residents to try their local car-share or bike-share service (if available). Contact the provider of these services to see if they would like to offer a discount or credit to encourage use.

• Incorporate street furniture such as benches, trash receptacles and bicycle racks to create an active streetscape.

• For ease of use, bicycle storage is ideally incorporated on the ground floor with direct roll-in access that is separate and distinct from automobile access. Push-button doors make roll-in access even more convenient for riders, especially during inclement conditions.

• Provide bicycle storage for staff as well as residents.

• Make bicycle and pedestrian routes to parks and public spaces safe and visible.

• Provide shade for bicycle and pedestrian routes to protect residents from heat island effect and extend usage hours.

• Conduct an assessment to determine most likely routes of pedestrian and bicycle use when laying out paved pathways/sidewalks from the project to the surrounding neighborhood. Build the pathways/sidewalks where there is visible evidence of pedestrian and bicycle use.

• To encourage pedestrian activity, minimize vehicular curb cuts on streets with heavy foot traffic; construct curb extensions along sections of the sidewalk that tend to attract greater pedestrian congestion and that are close to pedestrian crossings.

• Dedicated pedestrian and bicycle paths are important even on dead-end streets.

• Install street features that have been shown to effectively calm traffic, including curb extensions, medians, roundabouts and raised speed reducers.

RESOURCES


• Robert Wood Johnson Foundation, Active Living Research. https://activelivingresearch.org/
2.10 Passive Solar Heating / Cooling

Optional / X points maximum

RATIONALE
The use of passive solar design minimizes need for mechanical heating, lowers cooling loads, and increases access to natural daylight. Passive solar heating, cooling-load-avoidance strategies, and a knowledge of prevailing winds are valuable in protecting the well-being of residents during extended power outages or interruptions in heating fuel.

REQUIREMENTS
Design and build project with passive solar design, orientation and shading that meets the following guidelines. Documentation must include sun angles and a wall section showing compliance with the project’s Climate Zone (see 2018 IECC Climate Zone Map in the Appendix), and a site plan indicating true north. Also include documentation of compliance with all guidelines noted below.

<table>
<thead>
<tr>
<th>PROJECT TYPE</th>
<th>POTENTIAL POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Construction: Stand-alone building</td>
<td>x</td>
<td>Meet all guidelines</td>
</tr>
<tr>
<td>New Construction: Projects with multiple buildings</td>
<td>x</td>
<td>25% of the homes meet all guidelines</td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>50% of the homes meet all guidelines</td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>75% of the homes meet all guidelines</td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>90% of the homes meet all guidelines</td>
</tr>
<tr>
<td>Rehabs: Moderate or Substantial</td>
<td>x</td>
<td>All new windows must comply with the glazing type guidelines, by Climate Zone (Guideline 3)</td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>All south-facing elevations must comply with shading guidelines, by Climate Zone (Guideline 4)</td>
</tr>
</tbody>
</table>

Guidelines
1. **Building orientation**: Orient the building on an east–west axis with a minimum ratio of width to length of 2:1 and orient the east–west axis of the building to be within 15 degrees of true east–west.

2. **Glazing**: Climate Zones 1–3: The glazing area on the north- and south-facing façades should be 50% greater than the sum of the glazing areas on the east- and west-facing walls; Climate Zones 4–7: The glazing area on the south-facing façade should be 30% greater than the sum of the glazing areas on the east-, west- and north-facing façades.

3. **Glazing type**: Provide windows with U-values and solar heat gain coefficients (SHGC) by orientation and Climate Zone that meet the requirements in the following table and map.

4. **Shading**: For south-facing windows, follow the shading requirements in the following table and the map in the Appendix.

Requirements for Shading
To find your Climate Zone, see 2018 IECC Climate Zone Map in the Appendix. As of August 2019, those requirements are as listed:

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>U-FACTOR</th>
<th>MINIMUM SOLAR HEAT GAIN COEFFICIENT</th>
<th>PERCENTAGE OF WINDOW THAT NEEDS TO BE SHADED AT NOON ON JUNE 21</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>0.40</td>
<td>0.25</td>
<td>95%</td>
</tr>
<tr>
<td>3</td>
<td>0.30</td>
<td>0.25</td>
<td>75%</td>
</tr>
<tr>
<td>4 except Marine</td>
<td>0.30</td>
<td>0.40</td>
<td>75%</td>
</tr>
<tr>
<td>4 Marine, 5, 6, 7, 8</td>
<td>0.30</td>
<td>0.35</td>
<td>50%</td>
</tr>
</tbody>
</table>

**RECOMMENDATIONS**
- Interior spaces requiring the most lighting and heating should be along the south face of the building.
- Include a narrow floor plate (less than 40 feet), single-loaded corridors and an open floor plan to optimize daylight and natural ventilation by accommodating the natural ventilation of prevailing winds.
- Thermal Massing, Climate Zones 2–7:
  - Locate a material with high thermal mass on the southern portion of the house where sunlight hits during the heating season.
  - Materials with thermal mass include brick, concrete, stone, water and any other high-density material.
- Passive cooling strategies:
  - Plant deciduous shade trees at the south façades.
  - Maximize cross ventilation by installing operable windows at the leeward and windward sides of the building.
  - Install light-colored roofing or coat existing roofs with light-colored elastomeric coatings.

**RESOURCES**
- 2018 IECC Climate Zones Map: A detailed map that shows Climate Zones zoomed into each state and county as well as the basic 2018 IECC Building Code requirements for each Climate Zone (see the Appendix).

### 2.11 Adaptive Reuse of Buildings

*Optional / X points*

**RATIONAL**
The reuse of existing structures reduces landfill waste, reduces the need for new materials, and reduces pressure to develop undeveloped land. Adaptive reuse techniques extends the useful life of existing structures. Preserving and adapting existing buildings can help reinforce the unique sense of history of your community by retaining known built forms.

**REQUIREMENTS**
Rehabilitate and adapt an existing structure that was not previously used as housing. Design the project to adapt, renovate, or reuse at least 50% of the existing structure and envelope (includes exterior skin and framing and excludes window assemblies and non-structural roofing).
Projects with multiple buildings are eligible for optional points in this criterion so long as one of the buildings is being renovated and adaptively reused for residential purposes.

RESOURCES
- Center for Community Progress: This website provides information, resources, tools and assistance to support vacant property revitalization efforts. http://www.communityprogress.net

2.12 Access to Fresh, Local Foods

Optional | X points

RATIONALE
Access to fresh produce offers healthy food options for residents, and purchase of fresh produce directly from farmers demystifies the cycle of food production. This measure also supports local economic development that increases the economic value and production of farmlands and community gardens. An ability to obtain local food offers important resilience benefits should major U.S. agricultural areas in the Midwest and California be threatened, for instance.

REQUIREMENTS

Option 1: Neighborhood Farms and Gardens [X points]
Provide permanent space for food growing within the project site that is equal or greater in size to 10 square feet per dwelling unit for 50% of the dwelling units. Provide watering systems, secure storage space for tools, safe access for residents to the gardening spaces. Ensure that the gardens are built and maintained in a manner to minimize pests through non-toxic methods such as Integrated Pest Management practices. Ensure that the food growing space is managed by an entity that includes residents in its decision-making, such as a resident council/committee or homeowners’ association.

OR

Option 2: Community-Supported Agriculture [X points]
Offer a specified location within the project boundaries for delivery of community-supported agriculture (CSA) program shares for residents, project staff and surrounding community members, as appropriate. Shares must be delivered to the specified delivery point on a regular schedule at least twice a month for at least four months of the year.

OR

Option 3: Proximity to Farmers Market [X points]
Locate the project’s geographic center within a 0.5-mile walk distance of an existing or planned farmers market that will operate at least once a week for at least five months of the year, or for a length of time proportional to the growing season for the project’s vicinity. A planned farmers market must have firm commitments from farmers and vendors that the market will meet all of the above requirements and be in full operation by the time there is 50% occupancy of the project’s dwelling units.

RECOMMENDATIONS
- For projects pursuing Option 1, consider bringing in an individual or a group (e.g., a master gardener or a garden club) to work with the residents to establish the garden and maintain productivity.
• Grow and/or provide foods that have cultural connection for residents – either familiar or traditional foods – and/or allow residents to decide what to grow.

• Encourage fresh food providers, including those who organize farmers markets and run food cooperatives (co-ops), to accept Electronic Benefit Transfer (EBT) and Supplemental Nutrition Assistance Program (SNAP).

• Incorporating cooking classes for residents into your resident engagement program (see Category 8: Operations, Maintenance + Resident Engagement) is an excellent way to incentivize residents to eat healthy and prepare meals with fresh foods. Cooking classes is a fun and creative way to raise awareness and understanding of cultural diversity in a place, as well as a way to build community / social cohesion within a development.

RESOURCES

• Local Harvest: This website offers a search function to find farmers markets, family farms and other sources of local, sustainably grown food in a given area. http://www.localharvest.org

• U.S. Department of Agriculture, National Agricultural Library, Food and Nutrition Information Center, Community Food Systems: This website links to dozens of publications, programs and other sites. http://fnic.nal.usda.gov/

• U.S. Department of Agriculture, Economic Research Service. The USDA, Treasury Department and HHS have defined a “food desert” as a census tract with a substantial share of residents who live in low-income areas that have low levels of access to a grocery store or healthy, affordable food retail outlet. Use this resource to determine if your project is located in a food desert. https://www.ers.usda.gov/data-products/food-access-research-atlas/go-to-the-atlas.aspx

• Centers for Disease Control and Prevention (CDC), Community Food Assessment: The purpose of a community food assessment (CFA) is to determine the locations and incidence of food deserts — that is, areas with limited access to healthy and fresh food — and inform decision-makers of those areas that need intervention. https://www.cdc.gov/healthyplaces/healthtopics/healthyfood/community_assessment.htm


• Enterprise Community Partners, “Fresh, Local Food Access Toolkit”: This toolkit, which is designed to provide step-by-step instructions and resources to implement a fresh food access model that meets the Enterprise Green Communities Access to Fresh, Local Food Criteria, best addresses the needs of your development, and leverages the assets of your organization and neighborhood. https://www.enterprisecommunity.org/resources/fresh-local-food-access-toolkit-new-york-14222

2.13 Advanced Certification: Site Planning, Design, and Management

Optional | X points

RATIONALE
Project teams that have certified projects to these advanced site standards have taken steps to minimize the environmental impact of land development practices and emphasize themes of responsible land use, smart growth, urbanism and green building.

REQUIREMENTS
Locate building(s) within a community that is certified in one the following programs:

• LEED for Neighborhood Development – At Postbuild, provide the Built Project Review documentation from LEED for Neighborhood Development.

• LEED for Cities and Communities – At Postbuild, provide the initial certification from the LEED for Cities and Communities program.

• Living Community Challenge – At Prebuild, provide the Emerging Living Community Designation. At Postbuild, provide the certification documentation in all areas that are currently certified that pertain to this project.

• SITES – At Prebuild, commit to following and earning SITES certification. At Postbuild, provide the final certification from SITES.
RESOURCES

- U.S. Green Building Council, LEED for Neighborhood Development: This page has links to the LEED-ND rating system, a project checklist and information on certification. http://www.usgbc.org/leed#rating
- LEED for Cities and Communities: This page has a good breakdown of how the program works, how to certify, and a list of cities already registered to become a LEED City or Community. https://new.usgbc.org/leed-for-cities
- Living Community Challenge: This page brings you to key resources of the program. https://livingfuture.org/lcc/resources/#key-resources
- SITES: This page provides SITES certification overview and links to resources. http://www.sustainablesites.org/certification-guide

2.14 Local Economic Development and Community Wealth Creation
Optional / X points maximum

RATIONALE
Housing can offer opportunities to directly enhance the lives of residents when it includes physical space to accommodate various programs for learning, job skill development and other social interactions. Numerous studies have documented the ways in which affordable housing projects have positive economic impacts on their surrounding neighborhoods. In some cases, small-business focused economic development can help mitigate displacement of local-owned businesses, retaining employment opportunities.

REQUIREMENTS

Option 1: Local Hiring Preference [X points]
Demonstrate that a local preference for construction employment and subcontractor hiring was part of your bidding process, and how it functioned during actual construction. Provide your local preference procurement and subcontractor set-aside.

Note: Indian Preference can be solely that, without a miles-to-project requirement.

OR

Option 2: Local Hiring [X points]
Demonstrate that you achieved at least 20% local employment as a result of your local preference procurement/training plan. Provide proof that subcontractors are local and/or that local crews have members within 10 miles of your project site. (Note: “Local hiring” is defined as hiring any individual who resides within 10 miles of the project site.)

To determine the percentage of local employment, calculate:

\[
\text{(% of local employment)} = \left( \frac{\text{Total # of hours worked by local contractors with local employees}}{\text{Total # of hours on the project}} \right) \times 100 
\]

Notes:

- If sweat equity hours were used to complete some of the labor for the project, those hours are eligible and should be included in the above calculation.
- Indian Preference can be solely that, without a miles-to-project requirement.

OR

Option 3: Physical Space for Business, Nonprofits, and/or Skill and Workforce Education [X points]
Provide physical space for business, nonprofits, and/or skills and workforce education. Points can be achieved with documentation of compliance with one of the below:

- Providing space to conduct job skills training for building residents and community. This training could focus on a variety of topics, including but not limited to, computer training, resume building, financial skills training or other similar jobs skills training. If training is to be completed with internal staff, provide a 12-month training
curriculum and outreach plan. If training is to be completed by a third-party provider, provide evidence of at least a two-year contract for these services. OR

- Providing reduced-cost space for educational institutions and/or public education, demonstrated through signed leases. OR
- Providing mixed-use space specifically to local/small businesses or nonprofits to accommodate economic development, demonstrated through signed leases. Local and small business must meet prevailing national definitions (i.e., no national chains, even if they are locally owned franchises or registered B Corporations). OR
- Asset Development: Providing on-site financial services and asset development to residents and community. This could be through annual tax assistance (e.g. EITC, free tax filing), savings programs (IDAs, financial literacy) or affordable lending (payday loan alternatives). A Community Development Financial Institution (CDFI) office or satellite in the facility would qualify for these points.

RECOMMENDATIONS

- If providing physical space for business, nonprofits, and/or skill and workforce education, prioritize leasing to tenants that would bolster the building and become neighborhood assets.

For instance, if your project has access to bike routes or trails, leasing space to a bicycle workshop or cooperative (co-op) would be one way to promote bicycle use and provide a valuable amenity to residents and the community at large. Innovative bike programming may teach people how to ride bicycles, mentor people through using bicycles safely for everyday needs (e.g., winter biking), let people check out bicycles, teach bicycle maintenance and more.

- Commercial and/or educational spaces should have doors or direct access to the street at grade. At a minimum, commercial / educational space should have visual connections to the outdoors.

RESOURCES

- Enterprise Community Partners, New Market Tax Credit: NMTC applications factor in number of jobs created, living-wage jobs during and after construction, and can serve as a valuable resource for understanding the impacts of local hiring. [http://www.enterprisecommunity.org/financing-and-development/new-markets-tax-credits](http://www.enterprisecommunity.org/financing-and-development/new-markets-tax-credits)
- Slow Money “Principles for local investment”: [https://slowmoney.org/principles](https://slowmoney.org/principles)
- 1% for the Planet: Connects businesses, consumers and nonprofits, empowering all of us to drive big, positive change. [http://www.onepercentfortheplanet.org/](http://www.onepercentfortheplanet.org/)

2.15a Access to Broadband: Broadband ready

*Mandatory for New Construction and Substantial Rehabilitation projects in rural / tribal / small town locations*

RATIONALE

Building owners have the opportunity to build pathways for future installation of broadband, significantly reducing barriers to connectivity for residents. Improving internet connectivity in rural locations is critical to ensuring residents have access to opportunities such as access to programs, telemedicine, jobs opportunities and helps to narrow the digital divide between urban and rural communities.

REQUIREMENTS

Design and build or retrofit the property to incorporate broadband infrastructure so that when broadband service comes to a community, the property can be easily connected. Include a network of mini-ducts or conduit throughout the building extending from the expected communications access point to each network termination point in the building. Include:

- Conduit from the property line (expected broadband access point) to the utility room;
• Conduit from the utility room through risers and/or other infrastructure and leads to the expected network termination points in each dwelling unit and common space.

RECOMMENDATIONS
• Broadband conduit would follow the same path as telephone and cable TV conduit
• If broadband is provided elsewhere in your community, consult with local service providers to determine more precise specifications for the type of cable preferred, to more specifically ensure your property is able to connect in future.
• Fiber connections and equipment are typically located in a dedicated electrical or telecom closet, often on a low floor in the building with access to riser spaces.
• Power and HVAC services will be helpful if the service provider plans to install active electronics in the closet.
• In occupied buildings undergoing a rehabilitation, conduit placement can be challenging. However, there are many alternative ways of making pathways for broadband infrastructure, including placing cables above drop ceilings or moldings, mounting small cables on wall surfaces, or running cables up the outsides of buildings into individual units. Fiber optic cables can be very small, and in many cases, the visual impact can be small.

RESOURCES
• Become Broadband Ready: A toolkit of practices and a first-stop resource for any community seeking strategies and solutions to connect its residents. https://nextcenturycities.org/becoming-broadband-ready/
• Broadband Communities: Guidelines to help building owners provide spaces, pathways and cables that service providers can use to deliver fiber optic services. https://www.bbcmag.com/multifamily-broadband/making-a-building-fiber-ready
• Next Century Cities, Webinar: Connecting Residents in Low-Income Housing. https://www.youtube.com/watch?v=r3CZB1PHszU
• City of Kansas City, Missouri, Digital Equity Strategic Plan. https://data.kcmo.org/api/file_data/7a21a1bd-39de-4e0f-a0d1-1cebed868033?filename=Digital%252520Equity%252520Strategic%252520Plan%252520DRAFT%2525203.0.pdf
• National Digital Inclusion Alliance, Digital Inclusion Resources. https://www.digitalinclusion.org/resources/
• EveryoneOn, Low-Cost Internet Service & Affordable Devices. https://www.everyoneon.org/lowcost-offers
• Purdue University, Gauging Household Digital Readiness. https://pcrd.purdue.edu/files/media/gauging-household-digital-readiness.pdf

2.15b Access to Broadband: Connectivity
Optional for rural / tribal / small town | X points

RATIONALE
Improving internet connectivity in rural locations is critical to ensuring residents have access to opportunities such as access to programs, telemedicine, jobs opportunities and helps to narrow the digital divide between urban and rural communities.

REQUIREMENTS
Ensure all units and common spaces in the property have broadband internet access with at least a speed of 25/3 mbs.

RECOMMENDATIONS
• Provide digital skills training for the property’s residents, either directly or through partnerships with local anchor and/or civic institutions.
• Locate within .5 mile of schools and libraries, as these are often the first facilities in a community to receive broadband access through the E-Rate program mentioned below.

RESOURCES
• Public Library Association, Digital Literacy http://www.ala.org/pla/initiatives/digitalliteracy
• E-Rate helps schools and libraries obtain affordable broadband https://www.fcc.gov/general/e-rate-schools-libraries-usf-program
Category 3: Site Improvements
3: SITE IMPROVEMENTS

Low-impact design and development principles minimize the site’s environmental footprint and reduce infrastructure costs associated with stormwater management.

3.1 Environmental Remediation

RATIONALE
An environmental site assessment determines the potential environmental liabilities associated with property acquisition and ownership.

REQUIREMENTS
Determine whether there are any hazardous materials present on-site by conducting either 1) a Phase I Environmental Site Assessment, 2) a Tier II Environmental Review Assessment per HUD funding requirements, 3) an environmental site assessment approved by HUD through the Part 50 or Part 58 process, or 4) an environmental assessment approved by USDA through the 1970 process, and any additional required assessments.

If an environmental site assessment reveals any hazardous materials, mitigate these contaminants before proceeding with development.

RESOURCES
• U.S. Department of Housing and Urban Development. HUD Exchange Orientation to Environmental Reviews: https://www.hudexchange.info/environmental-review/orientation-to-environmental-reviews/#overview. This site hosts information about both Part 50 and Part 58 environmental review.

3.2 Minimization of Disturbance during Staging and Construction

RATIONALE
Erosion- and sedimentation- control during site development keeps valuable topsoil on-site and reduces pollution, limits stormwater runoff (especially during storm events); and limits sedimentation associated with construction activities from contaminating local waterways. Soils compacted from construction activities are less able to absorb water, resist plant root penetration and lack the porosity needed for adequate aeration.

REQUIREMENTS
For sites with an area equal to or less than one acre, complete the following:
• Stockpile and protect disturbed topsoil from erosion, for reuse.
• Control the path and velocity of runoff with silt fencing or comparable measures.
• Protect Ecological Resource Protection Zones (ERPZs), on-site storm sewer inlets, watercourses and water bodies with straw bales, silt fencing, silt sacks, rock filters or comparable measures.
• Provide swales to divert surface water from hillsides.
• Identify and protect significant, high value trees during construction (healthy tree with a diameter at breast height greater than 6”). Install tree protection fencing outside the critical root zone.
• If soil in a sloped area is disturbed during construction, use tiers, erosion blankets (geotextile mats), compost blankets, filter socks and berms, or some comparable approach, to keep soil stabilized.

If your project is governed by local requirements on erosion and sedimentation control during construction, follow whichever requirements are most stringent.

For sites larger than one acre, implement EPA’s National Pollutant Discharge Elimination System (NPDES)’s Stormwater Discharges from Construction Activities guidance, or local requirements, whichever is more stringent.
RECOMMENDATIONS

- Create and implement an erosion, sedimentation, and pollutant control plan, commonly referred to as a stormwater pollution prevention plan (SWPPP) or erosion and sedimentation control plan (ESC) for all construction activities associated with the project. Plan should conform to U.S. EPA’s Construction General Permit or local erosion and sedimentation control standards and codes, whichever is more stringent. The plan should list the best management practices (BMPs) employed and describe how the BMPs accomplish the following objectives:
  - Prevent loss of soil during construction by stormwater runoff or wind erosion, including protecting topsoil by stockpiling or covering for reuse.
  - Prevent and reduce sediment discharges into storm conveyances, receiving waters, or other public infrastructure components or systems.
  - Prevent polluting the air with dust and particulate matter.
  - Prevent runoff and infiltration of other pollutants from construction sites (e.g., thermal pollution, concrete wash, fuels, solvents, hazardous chemical runoff, high or low pH discharges, pavement sealants) and ensure proper disposal of all construction related materials.
  - Protection of existing sounds (prevent compaction; implement mitigation / restoration)
  - Protection of existing trees
  - Protection of existing vegetation

- Critical root zone, or CRZ, is defined as the area of soil where roots required for future tree health and survival are located. This area can also be defined as a circle with a minimum radius of 1’ for every 1” in trunk diameter at 4.5” above ground.

- Support a net-zero waste site and minimize down-cycling of materials by diverting, reusing, or recycling construction and demolition materials to avoid disposal in landfills or combustion in incinerators.

RESOURCES

- U.S. Environmental Protection Agency, “Stormwater Discharge from Construction Activities.”
  [https://www.epa.gov/npdes/stormwater-discharges-construction-activities](https://www.epa.gov/npdes/stormwater-discharges-construction-activities)
- U.S. Environmental Protection Agency, “National Pollutant Discharge Elimination System.”
  [https://www.epa.gov/npdes](https://www.epa.gov/npdes)
- EnviroCert International, Inc.: Use the International Registry of Certified Professionals in Environmental Specialties to find erosion and sedimentation control professionals in your state. [https://envirocertintl.org/](https://envirocertintl.org/)

3.3 Ecosystem Services / Landscape

Mandatory, if providing landscaping

RATIONALE

Ecosystem services are the functions provided by the living landscape. Soil and vegetation absorb and purify stormwater to protect receiving water bodies. Trees create shade, protect from wind, and help to regulate the climate. Plants capture particulate matter and sequester carbon to help moderate climate and reduce air pollution. Native and adaptive plants are more resistant to naturally occurring disease, insects, drought, low levels of nutrients and major storm events, while reducing or eliminating the need for fertilizers, pesticides, herbicides and irrigation. Research suggests that the incorporation of natural elements in the built environment can generate ecosystem services to protect and improve a community’s quality of life and resiliency to climate change.

REQUIREMENTS

If providing plantings, all plantings (trees, shrubs and groundcover, including grasses) should be native or adapted to the region. All new plantings must be appropriate to the site’s soil and microclimate. Do not introduce any invasive plant species. All disturbed areas should be reseeded or xeriscaped.

RECOMMENDATIONS

- Consult a landscape architect or your local arborist during the integrative design process to identify appropriate areas for landscaping and shading.
• Consider developing a soils management plan to: identify, protect and utilize valuable site soils; to identify disturbed soils; and to outline a soil restoration process.
• Provide adequate horticultural soil volume for new tree plantings. Reference the ANSI A300 standards as managed by the Tree Care Industry Association for more details.
• When removing invasive species, be careful that your removal and transferring of invasive plant material limits site disruption and does not affect soil compaction.
• In areas where water shortages are common, consider “xeriscaping,” a landscaping strategy that uses drought-resistant plants to significantly reduce or eliminate the need for irrigation.
• Integrate the landscape plans with the stormwater management plan to provide water and drainage that is complementary with plantings.
• While turf may be appropriate for some landscaping, such as for play areas, it should be minimized wherever possible. Turf grass is resource intensive due to irrigation and mowing requirements. The cumulative effects of regular mowing contribute to air and noise pollution. Applications of chemical fertilizers and herbicides contribute to pollution of waterways and can adversely affect native habitat.
• The project team should strive to use only organic and nontoxic fertilizers, pesticides, herbicides, fungicides and pre-emergents.
• Where possible, create walking pathways and seating to encourage pedestrian activity. Establishing a tree canopy, especially along pathways and gathering areas like seating, is important to creating a welcoming, comfortable public space.
• If possible, existing invasives should also be mitigated/removed. Local cooperative extensions often maintain best practices for mitigation.
• Provide visually appealing environments along paths of travel with visually interesting landscaping (e.g., a variety of colors, textures and flowering times).
• Ensure that the expected heights of plants adjacent to pedestrian walkways or seating areas are appropriate to maintain visibility into and out of the corridor in order to facilitate a safe and secure environment.
• If possible, limit turf or high-water-using species to 20% of the total landscape area, as suggested by the City of Santa Monica (Calif.) Landscape Standards.

RESOURCES
• ReScape California: this California nonprofit educates about and advocates for a regenerative, whole systems approach to landscaping that works in harmony with the natural environment. Find ReScape qualified professionals, tools, and the ReScape Rating System for multifamily landscapes that have an irrigated area of 2,500 or more https://rescapeca.org/rated-landscapes/process/
• Native Plant Information Network: This site, maintained by the Lady Bird Johnson Wildflower Center, includes a database of native wildflowers, plants and landscapes throughout North America. The website also includes a National Suppliers Directory. www.wildflower.org/explore/
• Tree Care Industry Association. ANSI A300 Standards. https://www.tcia.org/TCIA/Build_Your_Business/A300_Standards/A300_Standards.aspx?WebsiteKey=b9a41e1f-978d-4585-9172-c411c78c5c14
• University of Arizona Cooperative Extension, Xeriscape Plant Listing: https://cals.arizona.edu/yavapai/anr/hort/xeriscape/
• USDA National Invasive Species Information Center: As part of the USDA’s National Agricultural Library, NISIC serves as a reference gateway to information, organizations and services about invasive species. http://www.invasivespeciesinfo.gov/plants/main.shtml
• USDA Agricultural Cooperative Extension System: Lists of local drought-tolerant plants may be available from local USDA Agricultural Cooperative Extension System offices, as well as through numerous online resources. https://nifa.usda.gov/cooperative-extension-system
• U.S. Forest Service, “Celebrating Wildflowers”: This site has extensive information on native gardening, selecting appropriate native plants and invasive plant species, and has basic instructions for restoration and native landscaping projects. http://www.fs.fed.us/wildflowers/Native_Plant_Materials/Native_Gardening/index.shtml
• City of Santa Monica (Calif.) Office of Sustainability and the Environment, Landscape Standards Overview: https://www.smgov.net/departments/ose/
• USDA Forest Service, Northern Research Station. Nowak, David J. Tree Planting to Improve Air Quality (2002): https://www.nrs.fs.fed.us/units/urban/local-resources/downloads/Tree_Air_Qual.pdf
3.4a Surface Stormwater Management

**Mandatory**

**RATIONALE**
Reducing or eliminating stormwater runoff through design and management techniques increases on-site filtration, reduces total suspended solids (TSS) and other pollutants from entering waterways, and reduces soil erosion. From a resiliency standpoint, minimizing stormwater runoff and storm sewer flows also helps reduce downstream flooding — an important concern with more intense storms predicted in the future. Water storage and nutrient collection processes reduce the need for irrigation and contribute to forming a healthier ecological community within the landscape.

**REQUIREMENTS**
Retain, on site, the precipitation volume from the 60th percentile precipitation event as defined by the U.S. Environmental Protection Agency in the *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act.*

On sites in which retaining the 60th percentile precipitation event is not feasible due to geotechnical issues, soil conditions or the size of the site, the project must retain the maximum possible up to the 60th percentile precipitation event.

**RECOMMENDATIONS**
- Improve the water-retention capacity of the soil by increasing the organic matter content of the soil through the addition of compost or other organic soils.
- Projects may retain precipitation volume through any combination of the following techniques: on-site infiltration, evapotranspiration, water reuse, and cisterns.
- Implement runoff-reduction strategies (e.g., biofiltration through plantings, soils). These strategies also improve water quality.
- Evaluate the discharge volumes and rates to ensure that they do not increase the natural rate of erosion in receiving waterways or negatively affect a receiving waterway’s ecological flows or natural groundwater replenishment rates and volumes.
- Implement strategies to reduce precipitation runoff volumes, peak flows, and pollutant discharges.
- Use rainwater-harvesting systems to reduce precipitation runoff volumes and rates. Design rainwater harvesting and use systems to maintain the ecological flows of receiving waters and historical groundwater recharge rates.
- Make use of innovative, low-impact techniques such as disconnected downspouts, permeable paving, swales, retention basins, rain gardens, green roof, rain barrels to convey, capture, infiltrate and/or reuse stormwater.
- Minimize impervious areas (surfaces that do not allow stormwater infiltration), including roofs, driveways, sidewalks and streets, or use porous materials for such areas. Water-permeable materials include pervious interlocking concrete paving blocks, concrete grid pavers, perforated brick pavers and compacted gravel.
- Provide a visual reminder that storm sewer inlets connect to area waterways and groundwater storages, use a plaque, tile, painted or pre-cast message such as “No Dumping. Drains to [name of water source].” If project is unable to label storm inlets due to jurisdictional constraints, the project team must provide documentation.

**RESOURCES**
- U.S. Environmental Protection Agency, “National Pollutant Discharge Elimination System.” [https://www.epa.gov/npdes](https://www.epa.gov/npdes)
- U.S. Environmental Protection Agency, Storm Drain Marking. [http://water.epa.gov/polwaste/npdes/swbmp/Storm-Drain-Marking.cfm](http://water.epa.gov/polwaste/npdes/swbmp/Storm-Drain-Marking.cfm)
• U.S. Environmental Protection Agency, Low-Impact Development. [http://water.epa.gov/polwaste/green](http://water.epa.gov/polwaste/green)
• University of Arizona Cooperative Extension, Xeriscape Plant Listing. [http://ag.arizona.edu/yavapai/anr/hort/xeriscape/](http://ag.arizona.edu/yavapai/anr/hort/xeriscape/)

### 3.4b Surface Stormwater Management

*Optional | X points*

**RATIONALE**
See RATIONALE for Criterion 3.4a.

**REQUIREMENTS**
Through on-site infiltration, evapotranspiration, and rainwater harvesting, or retain the maximum precipitation volume possible beyond the requirements of Criterion 3.4a precipitation on site.

Retain precipitation volume for the following percentile precipitation events:

<table>
<thead>
<tr>
<th>Percentile Event</th>
<th>X points</th>
</tr>
</thead>
<tbody>
<tr>
<td>70th percentile precipitation event</td>
<td>X points</td>
</tr>
<tr>
<td>80th percentile precipitation event</td>
<td>X points</td>
</tr>
<tr>
<td>90th percentile precipitation event</td>
<td>X points</td>
</tr>
</tbody>
</table>

70th, 80th and 90th percentile precipitation events are defined by the U.S. Environmental Protection Agency in the *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act.*

**RECOMMENDATIONS**
See RECOMMENDATIONS for Criterion 3.4a

**RESOURCES**
See RESOURCES for Criterion 3.4a.

### 3.5a Efficient Irrigation and Water Reuse

*Mandatory (if irrigation is utilized)*

**RATIONALE**
Using irrigation zones that respond to site conditions and plant material helps to maximize efficient water use. Accurate delivery of water reduces evaporation and eliminates overspray and overwatering. Proper scheduling eliminates fluctuations between wet and dry states that stress plants. These strategies will help to maintain plantings during drought and when outdoor watering restrictions may be in place and will reduce water waste and overwatering during wet weather conditions.

**REQUIREMENTS**
If irrigation is utilized, install an efficient irrigation system. These irrigation requirements are mandatory only for permanent landscaping that requires regular irrigation.

An efficient irrigation system must include the following:

- Comply with all local watering restrictions;
• Design irrigation zones to respond to weather considerations (temperatures, precipitation, wind), solar exposure, reflected light/heat from adjacent building or hardscape, soil type, topography/slope, plant material;
• Establish irrigation volume and frequency per zone to be appropriate for the climate, soil type and plants;
• Select emission devices (eg. spray sprinklers), valves, pipes, controllers, and sensors suitable to the landscape requirements that will facilitate long-term reliability and serviceability;
• Design irrigation system to target each planting area with no overspray of impervious surfaces or adjacent planting areas. Prevent runoff of water from the site;
• Install timer/controller that activates the valves for each watering zone at the best time of day to minimize evaporative losses while maintaining healthy plants and obeying local regulations and water-use guidance;
• Install soil moisture sensor controller per vegetation zone (based on irrigation demand) or rain delay controller.

RECOMMENDATIONS
• Follow the Best Management Practices from the Irrigation Association, which include:
  o Consider future needs such as expansion of the system to accommodate further development.
    ▪ Consider using non-potable water sources
    ▪ Captured rainwater
    ▪ Reclaimed water
    ▪ Recycled wastewater
    ▪ Recycled graywater
    ▪ Air-conditioner condensate
    ▪ Blowdown water from boilers and cooling towers
    ▪ Water treated and conveyed by a public agency specifically for non-potable uses
  o Do not exceed manufacturer’s sprinkler spacing recommendations.
  o Design system so sprinklers operate within manufacturer-recommended operating pressure.
  o Use matched precipitation rate sprinklers (+/- 5 percent) within a zone.
  o Size the zone control valve so that flow through the valve is within the manufacturer’s stated flow range and so that pressure loss does not exceed 10 percent of static pressure.
  o Install valves either above grade or below grade in a valve box large enough to service or access.
  o Valve box location should consider safety and aesthetics of the site, along with long-term durability of the valve box.
• Develop a proactive maintenance plan to ensure the integrity of the irrigation system.
• As the plants mature, the irrigation system may require adjustments.

RESOURCES
• City of Santa Monica (Calif.) Office of Sustainability and the Environment, Landscape Standards Overview. https://www.smgov.net/Departments/OSE/Categories/Landscape/Landscape_Requirements.aspx
• American Society of Landscape Architects (ASLA): ASLA is the national professional association representing landscape architects. Their site provides information about members, products, services, publications and events. https://www.asla.org/
• U.S. Environmental Protection Agency, WaterSense: This site provides information on the EPA WaterSense labeling program for water-efficient landscape irrigation products, plus tips and recommendations for water-efficient irrigation. Follow the link to Weather- or Sensor-Based Irrigation Control Technologies for related information on high-efficiency irrigation controllers. http://www.epa.gov/watersense/
• U.S. Environmental Protection Agency, Water-Smart Landscapes: This manual provides information about reducing water consumption through creative landscaping techniques. https://www.epa.gov/watersense/water-smart-landscape-design
• University of Arizona Cooperative Extension, Xeriscape Plant Listing. http://ag.arizona.edu/yavapai/anr/hort/xeriscape/
• Irrigation Association.
3.5b Efficient Irrigation and Water Reuse

*Optional | X or X points*

*If irrigation is utilized*

**RATIONALE**
See Rationale for Criterion 3.5a.

**REQUIREMENTS**
Projects must meet the mandatory requirement of Criterion 3.5a Efficient Irrigation and Water Reuse, and:

**Option 1 [X points]**
Design and install an efficient irrigation system equipped with a WaterSense-labeled weather-based irrigation controller (WBIC).

OR

**Option 2 [X points]**
A minimum of 50% of the site’s irrigation should reuse water from one, or multiple, of the following sources:
- treated greywater
- captured rainwater, collected from the roof or site
- water from a municipal recycled water system specifically treated for non-potable uses
- air-conditioning condensate
- blowdown water from boilers and cooling towers

For all projects, watering tubes for trees are allowed for a period of two years.

**RECOMMENDATIONS**
See Recommendations for Criterion 3.5a.

**RESOURCES**
See Resources for Criterion 3.4a.

3.6 Natural Environments

*Optional | X points*

**RATIONALE**
Exposure to the natural environment has been demonstrated to help mitigate stressors and positively impact cognitive and emotional health. Incorporating natural elements into common spaces in the building and onsite can strengthen community and encourage social connections.

**REQUIREMENTS**
Develop and submit a narrative plan that identifies how the project will provide access to nature in the building and/or on site, through each of the three areas listed:

1. Direct connection to nature: (minimum: two)
   a. Plants
   b. Water
   c. Light
   d. Nature Views
2. Indirect connection to nature (e.g., natural materials, patterns, colors, images, natural sounds, etc.)
3. Space layout and configuration, that places natural elements along shared circulation pathways, shared common areas (e.g., lobby, mailroom, multi-purpose space, computer room, etc.) to enhance the resident experience.

RECOMMENDATIONS

- Work with design team to orient the buildings to optimize views of natural elements and minimize the ambient noise of the neighborhood.
- Provide a variety of seating options throughout common spaces, on site and within the building. Consider providing comfortable, moveable seating that allow residents to configure the furniture.
- During the design development phase, identify areas in the building and site plans that will be quiet and could be leveraged towards providing mental health benefits for residents and visitors.
- Design the outdoor mental restoration spaces away from distractions, such as noise from mechanical systems, building and facility operations, and traffic. To minimize noise, incorporate multiple solutions such as quieter pavement or road surfacing, dense foliage, earth berms, and barriers or screens. Schedule maintenance activities when site users are not present.
- Provide amenities or vegetation that enhance a multi-sensory aesthetic experience, such as a grove of trees, water features, scents from flowers or foliage, tactile variation, or art.
- Provide unobstructed views of vegetation from 50 percent of common spaces (e.g., office spaces, classrooms, waiting rooms, living areas, dining rooms).
- Provide outdoor physical activity features such as physically challenging playgrounds, connected walk/bike paths, fitness courses.
- Physical activity programs (e.g., yoga classes, tai chi, regular sports programs) to be established within six months of project completion.
- Improve site user safety by providing clearly defined gathering spaces with a variety of access points, clear site lines, and adequate lighting levels at entrances and walkways.

RESOURCES

Category 4: Water
4. Water

4.1 Water-Conserving Fixtures

*Mandatory*

**RATIONALE**
Water conservation translates into direct utility savings for residents and building owners and lowers infrastructure costs associated with stormwater management and water treatment facilities. Reduced water pressure saves water, conserves energy and helps ensure proper operation of fixtures and appliances.

**REQUIREMENTS**
Reduce total indoor water consumption by at least 20% compared to the baseline indoor water consumption chart below. Any new toilet, showerhead, and/or lav faucet that is installed in the project must be WaterSense certified, in addition to the project’s total indoor water consumption meeting the minimum 20% improvement threshold.

Use the Enterprise Green Communities Water Calculator to calculate and compare your project per-person per-day indoor water consumption to the baseline water consumption chart below [adapted from: LEED v4.1 Residential RD+C Multifamily Homes Multifamily Water Reduction Calculator]. When making your comparison, assume that the baseline project has the same type of fixtures as your project in question. For instance, if your project does not include dishwashers, do not include dishwasher water consumption in your baseline project calculation for comparison.

<table>
<thead>
<tr>
<th>FIXTURE</th>
<th>BASELINE FLUSH OR FLOW RATE</th>
<th>ESTIMATED FIXTURE USAGE</th>
<th>ESTIMATED WATER USAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shower (per compartment)</td>
<td>2.5 gpm</td>
<td>6.15 minutes</td>
<td>15.4 gallons</td>
</tr>
<tr>
<td>Lav, Kitchen faucet</td>
<td>2.2 gpm</td>
<td>5.0 minutes</td>
<td>11 gallons</td>
</tr>
<tr>
<td>Toilet</td>
<td>1.6 gpf</td>
<td>5.05 flushes</td>
<td>8 gallons</td>
</tr>
<tr>
<td>Clothes washer</td>
<td>8.4 WF* top loading and 4.7 WF front loading</td>
<td>0.37 cycles @ 3.5 ft³</td>
<td>13.2 gallons top loading/7.4 gallons front loading</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>5.0 gpc standard and 3.5 gpc small</td>
<td>0.1 cycles</td>
<td>0.5 gallons standard and 0.4 gallons small</td>
</tr>
</tbody>
</table>

**AND**

For all single-family homes and all dwelling units in buildings three stories or fewer, supply pressure may not exceed 60 PSI and should be controlled by pressure regulator if necessary. Piping for fire sprinkler systems is excluded from this requirement and should comply with state and local codes and regulations as well as manufacturer specifications.

**RECOMMENDATIONS**
- Certain existing fixtures, such as bathroom faucets, can be retrofitted with aerators rather than be replaced to reduce water flow to the requisite level. Note that WaterSense-labeled aerators are available and recommended.
- Dual-flush toilets have an average flow rate calculated and provided by the manufacturer. However, if you are not able to locate this information on the packaging, use a 2:1 ratio for low-volume flush to high-volume flush to determine the average flow rate.
For example, with a dual-flush toilet that has a 0.8 low-volume flush and a 1.6 high-volume flush, the calculation to determine the average would be:

\[
\frac{(0.8 \text{ gpf} \times 2) + (1.6 \text{ gpf} \times 1)}{3} = 1.067 \text{ gpf}
\]

- For senior projects, consider using single-flush toilets that meet the criterion flow rates rather than dual-flush toilets. Feedback from past Enterprise Green Communities projects suggests that senior populations may be unsure of the dual-flush technology, which may lead difficulty in operating the toilets in an effective and appropriate way.

**RESOURCES**

- Products and services that have earned the WaterSense label have been certified to be at least 20% more efficient than the baseline, without sacrificing performance. For instance, not all toilets — even high-efficiency toilets — operate equally well. Poor performance can lead to the need for multiple flushes, creating higher than anticipated water consumption. To correct for this, the EPA’s WaterSense program certifies toilets that achieve water efficiency and operational effectiveness. Information on WaterSense products and services is available at [http://www.epa.gov/watersense](http://www.epa.gov/watersense).

- Maximum Performance (MaP™) Testing, The MaP™ testing project was initiated in 2003 to test toilet models’ performance. This testing protocol simulates real-world use to help consumers identify high-efficiency toilets that not only save water but also work well. The current MaP testing report provides performance information on 470 toilet models. This site provides access to the complete listings of the tested toilets. [http://www.map-testing.com](http://www.map-testing.com)

- WaterSense-labeled homes are designed to reduce residential water use indoors and out. Find the EPA WaterSense Resource Manual for Building WaterSense® Labeled Homes here as well as the WaterSense Water Budget Tool which may be used to predict project water consumption: [https://www.epa.gov/watersense/homes](https://www.epa.gov/watersense/homes)

- HERSe2 and Water Efficiency Rating Score (WERS) [http://www.wers.us/](http://www.wers.us/) are two performance based home modeling tools which result in a 0-100 score.

### 4.2 Advanced Water Conservation

*Optional | X points maximum*

**RATIONALE**

Water conservation translates into direct utility savings for residents and building owners and lowers infrastructure costs associated with stormwater management and water treatment facilities.

**REQUIREMENTS**

Reduce total indoor water consumption by at least 30% compared to the baseline indoor water consumption chart below. Any new toilet, showerhead, and/or lav faucet that is installed in the project must be WaterSense certified, in addition to the project’s total indoor water consumption meeting the minimum 30% improvement threshold.

Use the Enterprise Green Communities Water Calculator to calculate and compare your project per-person per-day indoor water consumption to the baseline water consumption chart below [adapted from: LEED v4.1 Residential RD+C Multifamily Homes Multifamily Water Reduction Calculator]. When making your comparison, assume that the baseline project has the same type of fixtures as your project in question. For instance, if your project does not include dishwashers, do not include dishwasher water consumption in your baseline project calculation for comparison.

<table>
<thead>
<tr>
<th>PERCENTAGE OF REDUCTION IN TOTAL INDOOR WATER CONSUMPTION</th>
<th>NUMBER OF OPTIONAL POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>X points</td>
</tr>
<tr>
<td>50%</td>
<td>X points</td>
</tr>
</tbody>
</table>
BASELINE INDOOR WATER CONSUMPTION (PER PERSON PER DAY)

<table>
<thead>
<tr>
<th>FIXTURE</th>
<th>BASELINE FLUSH OR FLOW RATE</th>
<th>ESTIMATED FIXTURE USAGE</th>
<th>ESTIMATED WATER USAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shower (per compartment)</td>
<td>2.5 gpm</td>
<td>6.15 minutes</td>
<td>15.4 gallons</td>
</tr>
<tr>
<td>Lav, Kitchen faucet</td>
<td>2.2 gpm</td>
<td>5.0 minutes</td>
<td>11 gallons</td>
</tr>
<tr>
<td>Toilet</td>
<td>1.6 gpf</td>
<td>5.05 flushes</td>
<td>8 gallons</td>
</tr>
<tr>
<td>Clothes washer</td>
<td>8.4 WF* top loading and 4.7 WF front loading</td>
<td>0.37 cycles @ 3.5 ft³</td>
<td>13.2 gallons top loading/7.4 gallons front loading</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>5.0 gpc standard and 3.5 gpc small</td>
<td>0.1 cycles</td>
<td>0.5 gallons standard and 0.4 gallons small</td>
</tr>
</tbody>
</table>

WF = Water Factor

RECOMMENDATIONS
See Recommendations for Criterion 4.1: Water-Conserving Fixtures.

RESOURCES
See Resources for Criterion 4.1: Water-Conserving Fixtures.

4.3 Water Quality

Optional X-X points

RATIONALE
Quality of drinking water in the United States is regulated tightly and, according to the American Association for the Advancement of Science, remarkably safe. However, there are homes with people at high risk, vulnerable populations with frequent exposure to sources of lead. For instance, “lead free” plumbing fixtures were permitted to contain up to 8% lead-by-weight until 2014. Today the allowable threshold for that label is 0.25%. Lead pipes were banned in new systems in 1986, and yet, according to a study by the American Water Works Association, nearly a third of US water systems still contained lead service lines in 2016. Properties that are served by private wells are particularly likely to have lead in drinking water. No level of lead exposure is safe, and exposure can lead to long-term learning and behavioral problems.

Legionnaires’ disease is less common, and most healthy people who are exposed to Legionella do not get sick. However, adults 50 years or older, current or former smokers, and people with a weakened immune system or chronic disease are at increased risk, if exposed.

Also consider the interplay between water conservation and quality – low flow fixtures may inadvertently exacerbate water quality degradation, if water is allowed to age in a system and pipes are not “right-sized” to prevent excessive stagnation.

REQUIREMENTS
- In all buildings, install water heaters and fixtures which are certified as lead free.
In rehabs of buildings built before 1986, replace lead service lines:
In rehabs of buildings built before 1986, replace lead service lines: Determine whether a lead service line (LSL) connects the drinking water main under the street with the building. If an LSL is present, replace it before or while replacing the water heater. Follow American National Standards Institute (ANSI)/America Water Works Association (AWWA) C810-17 Standard when replacing the LSL. To determine if the service line is lead, contact the utility company for guidance and inspect the line where it enters the property. See https://www.lsl-collaborative.org/intro-to-lsl-replacement.html for additional guidance.

In rehabs of buildings built before 2014, and in all buildings served by private wells, test water from dwelling unit faucets for the presence of lead—contact an EPA approved lab for collection bottles and instructions. If results are elevated, install NSF filters in all units and replace these per manufacturer's instructions. If lead results are above 10 ppb, replace all fixtures with NSF61 fixtures.

RECOMMENDATIONS

Some water utilities and municipalities offer financial incentives for replacing lead service lines; check with your local agencies.

For all properties—new construction as well as rehab—ensure that water is flushed regularly, rather than risking long periods of time between when water enters the system and when it is used. When water stagnates, quality may degrade considerably. As water ages in a system, disinfectant residual will decay, reducing chlorine residuals. This may lead to increased corrosion in copper and lead pipes and increase microbial regrowth, including legionella. The less that water is allowed to age in a system, whether through thoughtful plumbing system design and/or flushes with municipal water, the less likely these issues are to occur. Note that each tap in the property will have a different stagnation rate, depending on use, and a different risk profile, depending on pipe and fixture materials. Consider design and testing carefully for each use of water in the property.

All community water systems prepare a Consumer Confidence Report (CCR) for their customers each year. Contact your water utility to receive a copy of their latest report. https://www.epa.gov/ccr

Install and regularly replace individual filtration systems.

13% of the US population receives drinking water from private wells and are not required by federal or state government to remediate quality issues if found, if those wells serve fewer than 100 people. For any property on a private well, test and remediate for lead. See the National Center for Water Quality Research for guidelines https://ncwar.org/water-testing/well-water-testing/

RESOURCES

EPA's National Primary Drinking Water Regulations https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations

Find products certified as lead free: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100LVYK.txt


Purdue University’s Center for Plumbing Safety: Website designed to provide information to persons who drink water in buildings, as well as building construction, plumbing, water utility, education, and public health sectors https://engineering.purdue.edu/PlumbingSafety

Virginia Tech’s recent research on preventing potential unintended negative water quality impacts through water conservation:
**4.4 Monitoring Water Consumption and Leaks**

*Optional | X points*

**RATIONALE**

In some cases, leaks may be the largest driver of project water consumption. Properly installed water-using fixtures, equipment and appliances should not leak. However, over time, leaks may occur and should be resolved.

Monitoring water consumption by fixture, dwelling unit, or riser allows more nuanced understanding and management of water consumption than the typical whole-building meter.

**REQUIREMENTS**

Conduct pressure-loss tests and visual inspections to determine if there are any leaks; fix any leaks found. Visual inspections shall include checking for leaks at all accessible, visible water supply connections and valves for water-using fixtures, appliances and equipment.

AND
Install an advanced water monitoring and leak detection system capable of identifying and shutting water off during anomalous water use events. Or, install a device to separately monitor water consumption in each of the following areas of the project:

- Each cold branch off the apartment line riser for each dwelling unit OR each cold water riser and the domestic hot water cold water feed for each building OR each toilet in the project with a technology that allows remote monitor readings
- Common project laundry facilities, if such facilities exist
- Boiler makeup water, if such boiler(s) exists,
- Outdoor water consumption
- Water consumption in any non-residential spaces of the project

**RECOMMENDATIONS**

- For single-family homes with only one water supply to the home, the inspector will attach a pressure gauge to an outside faucet, take a reading and then shut off the municipal water supply to the house. After several minutes, the inspector will determine if the pressure has dropped. A loss of pressure indicates an unseen leak. For homes with more than one water supply or without an outside faucet, inspectors will attach a pressure gauge to the cold water faucet for the washing machine hookup or other cold water faucet and take the pressure reading. Conducting a pressure-loss test on dwelling units in multifamily buildings will vary based on the plumbing system design. Dwelling units that are supplied through a single line with a shut-off can be tested at any point of use.

- As a first step, when designing the plumbing system for a multifamily building, consider supplying each unit with a single pipe source and stubbing out for a meter to facilitate individual unit submetering. This will reduce costs associated with having to install multiple meters/monitors for several points of use attached to a single riser pipe.

- Second, choose equipment that is best suited for accurately measuring water use in each unit. Because water use within individual units will fluctuate between low and peak flows depending on the unit's occupancy and the time of day, positive displacement meters are often the best option. Also, work with the meter/monitor manufacturer to select an appropriately sized device. It is critical to understand both the building's and the individual units’ size, function, fixture types, usage occupancy and peak population in order to select an appropriately sized meter/monitor. These statistics determine the minimum and maximum flow rates and will assist in the selection of a properly sized water meter/monitor for each unit.

- Follow manufacturers' instructions closely so that proper installation can occur. Improper installation can lead to metering/monitoring inaccuracies. In general, meters and/or monitors should be installed in an accessible location to allow for reading and repair and in a location protected from potential damage. To ensure uniform flow entering and exiting the meter or monitor, locate it where there is sufficient length of straight pipe before and after the device. Consider installing a strainer to prevent debris and sediment from entering the meter/monitor and causing reading inaccuracies.

- **Equipment**: In-line meters or monitors should meet AWWA standards and include a pulse output (1 pulse per gallon is desirable). More critical is meter/monitor sizing; oversizing is common. A 2-inch riser, for example, does not require a 2-inch meter/monitor. Not only would a 2-inch meter/monitor be much more expensive, but it would miss the very low flows it is supposed to detect. Most risers up to 2 inches in diameter in 6-story or shorter buildings can be handled by a ¾-inch meter/monitor. Some vendors package water monitors with a remote data monitoring system. Other vendors offer only monitors or only remote data monitoring systems; these may be paired. And remote data monitoring systems come in a variety of forms: some are wireless and others require that they be hard-wired. With either type, typically the water consumption data is sent from each meter/monitor to a datalogger inside the building, which passes it on to a website where it can be reviewed and downloaded. In cases where staff do not have time to review data for dozens of submeters/monitors, the website can be programmed to send out a text or email alarm when a leak is suspected. Because it is easy to set up alarms, it is not necessary to dedicate an employee or outside firm to monitor the water data, but it is desirable and should be considered.
• Installation: At all times, follow manufacturer installation instructions. In-line meters/monitors should be installed by a licensed plumber. When possible, use a press-fit pipe joining system instead of sweated joints for these installations. Such a system saves labor costs and permits otherwise impossible installations. Remote data-gathering systems are often installed by a controls or telecom contractor or, more expensively, by a licensed electrician. The most crucial factor is to install every meter/monitor so it can be easily accessed for repairs or for manual reading (should that become necessary) – meters/monitors in cramped or inaccessible locations frequently end up ignored or forgotten. Experience shows that domestic water systems frequently include long pipe runs without any shutoff capability, which makes future repairs more difficult and/or disruptive. A few extra well-placed isolation valves will pay large dividends over time. Similarly, in new construction in particular, designers should be encouraged to make the pipes more accessible than they usually are, either by exposing them or placing them behind an easily-removable access door or chase. Pipes in an easily-removable chase would be easier to repair and inspect and might even be isolatable enough to eliminate water damage from a pipe burst or joint leak. Experience also shows that basements frequently lack electrical outlets. With the increase in telecom, internet and cable TV installations and a likely rise in data-gathering systems like the one described here, strategically-located additional outlets would be quite valuable.

RESOURCES
• U.S. EPA conducted a study of multifamily housing that showed submetering reduced water use by 16.4%: http://www.allianceforwaterefficiency.org/assets/0/28/142/2534/77adbb1c-89d1-4590-be67-587e9af15b80.pdf
• American Water Works Association Offers information and articles on submetering: http://www.awwa.org
• California Apartment Association has articles on submetering: http://www.caanet.org
• California Water Efficiency Partnership has articles on submetering: https://calwep.org/
• WaterSense-labeled New Homes: http://www.epa.gov/watersense/new_homes/

4.5 Efficient Plumbing Layout and Design
Optional | X points

RATIONALE
Efficiently designed hot water delivery systems reduce the amount of time it takes hot water to reach a fixture, saving both water and energy. Approximately 10–15% of the energy use associated with the hot water delivery system is wasted in distribution losses, waiting for hot water to arrive at the point of use.

REQUIREMENTS
To minimize water loss from delivering hot water, the hot water delivery system shall store no more than 0.5 gallons of water in any piping/manifold between the water heating source and fixture. To account for the additional water that must be removed from the system before hot water can be delivered, no more than 0.6 gallons of water shall be collected from the fixture before a 10 degree F rise in temperature is observed. Recirculation systems must be demand-initiated. Systems that are activated based solely on a time and/or temperature sensor do not meet this requirement. Ensure that your project is still meeting all relative local codes and requirements. Codes such as recent versions of the Universal Plumbing Code and WE-Stand employ 'right-sized' plumbing techniques that supersede and automatically comply with this requirement.
RECOMMENDATIONS

• Effective and efficient distribution of hot water requires a whole-system approach and can be challenging to many builders. Considering the hot water delivery system early in the design phase and carefully following a plumbing design can deliver superior homes and reduced installation costs.

• A hot water distribution system with less stored water in its piping will waste less water and energy. The length of piping between the water heater and each fixture, the pipe diameter and piping material can have a great cumulative impact on the efficiency of hot water delivery.

• Insulation of hot water pipes can improve the efficiency of a hot water distribution system. Insulation of hot water pipes reduces the rate of heat loss and can deliver water that is 2°F to 4°F hotter than uninsulated pipes can. Pipe sleeves made with polyethylene or neoprene foam with thicknesses of either ½ or ¾ inch are the most commonly used insulation. The pipe sleeve inside diameter should match the diameter of the pipe for a close fit. Securing insulation every one or two feet using tape, wire or cable tie will also help to fit insulation close to the pipe. Insulation should be used along the entire length of hot water pipes, including elbows and joints, but should be kept 6 inches away from the flue of gas water heaters. Insulation performs better with an R-value of R-3.0 or greater.

• Consider central core plumbing, and/or multiple stacked central core plumbing layout, locating the water heater very close to hot water fixtures.

RESOURCES

• EPA Hot Water Volume Tool: This editable tool allows project teams to design their plumbing system with a variety of materials to minimize waste in delivery. https://www.epa.gov/sites/production/files/2017-02/ws-homes-hot-water-volume-tool.xlsm

• EPA WaterSense-labeled New Homes — Hot Water Delivery Systems. https://www.epa.gov/watersense/watersense-labeled-homes-hot-water


4.6 Non-potable Water Reuse

Optional | X points maximum

RATIONALE

Rainwater and greywater reuse strategies reduce the need for municipal water supplies and sewage treatment. This is also an important resilience strategy, as it offers some level of protection and stability against drought or interruptions in water supply.

REQUIREMENTS

Harvest, treat and reuse rainwater and/or greywater to meet a portion of the project’s non-potable water needs.

To achieve optional points, provide the defined percentage of the project’s non-potable water needs which will not be met with a potable water source—in instead, through rainwater and/or greywater.

<table>
<thead>
<tr>
<th>TOTAL NON-POTABLE WATER NEEDS SUPPLIED BY NONPOTABLE SOURCES (RAINWATER AND/OR GREYWATER)</th>
<th>NUMBER OF OPTIONAL POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>X points</td>
</tr>
<tr>
<td>20%</td>
<td>X points</td>
</tr>
<tr>
<td>30%</td>
<td>X points</td>
</tr>
</tbody>
</table>
RECOMMENDATIONS

- Rainwater and greywater systems are subject to state and local regulations and special requirements. In some jurisdictions, rainwater or greywater systems may not be allowed. Check with your local building code officials for requirements.

- Non-potable water recommended for residential application can be provided by harvested rainwater using rain barrels or cisterns or by obtaining reclaimed water from the municipality. Rainwater and reclaimed water do not meet potable water standards, and therefore have limited use applications. These water sources can supply water for non-spray irrigation and other outdoor water needs during periods of drought but are never suitable for human consumption. Proper signage should be displayed on the structure to caution users that the water source is non-potable.

- Rainwater can be harvested from impervious surfaces such as roofs and carried via gutters and downspouts to a storage tank or cistern where it can be treated or filtered for potable uses. Untreated rainwater may be used for non-potable uses.

- Greywater may be stored and treated for non-potable uses such as toilet flushing and irrigation.

- Consider striving for rainwater and greywater utilization of at least 20%. In some cases, employing rainwater and greywater harvesting, treatment and reuse can provide for all of a project’s water needs.

RESOURCES


4.7 Access to Potable Water During Emergencies

Optional | X points

RATIONALE

During power outages, access to water for drinking and sanitation needs is often one of the greatest challenges. During a power failure, residential buildings using electric pumps lose their supply of potable water.

REQUIREMENTS

Provide residents with ready access to potable water in the event of an emergency that disrupts normal access to potable water, including disruptions related to power outages that prevent pumping water to upper floors of multifamily buildings or pumping of water from on-site wells. Choose one of the following options:

Option 1

In buildings where on-site electrical pumps are used to transport water to upper floors, provide residents with access to potable water at a location where containers can be filled and brought to apartments. Ensure that this access point is located above flood level and that it may be accessed safely and relatively easily in times of power loss (e.g., a public restroom on a lower floor).

OR

Option 2
Provide stored potable water that can be used during times of emergency totaling 10 gallons per resident per day for a minimum of four days. Note potability as well as storage size and weight considerations.

OR

Option 3
Provide a drilled well with a means for pumping water when the electric grid is down (e.g., hand pump, portable generator serving pump, gravity-flow spring).

RECOMMENDATIONS

- In many cities, pressure typically brings water up to the fifth or sixth floor of taller buildings, with pumps used to deliver water to higher floors. If the power grid fails and backup generators are not connected to water pumps or if they fail, residents should have access to a place in a common room to fill containers with potable water. This could be a centrally accessible corridor or utility closet. Specifics will vary by project.

- In more rural areas that rely on on-site water rather than municipal water, advanced, modern hand pumps can provide a resilient water supply.

- Harvested rainwater or pumped water can be stored on top of buildings, in utility space in buildings or in separate water tanks.

- For properties that use roof-top tanks to maintain pressure, it may be possible to utilize these tanks a source during emergencies with proper controls and access.

RESOURCES


- Enterprise’s Ready to Respond toolkit includes more than a dozen strategies and specific guidance for building property resilience in the event of an emergency, including access to potable water.  
  [http://www.enterprisecommunity.org/resources](http://www.enterprisecommunity.org/resources)
Category 5: Operating Energy
5. Operating Energy

5.1a Building Performance Standard

Mandatory, New Construction

RATIONALE
ENERGY STAR homes must meet strict program requirements for energy efficiency. They are at least 10% more efficient than homes built to code and achieve a 20% improvement on average. ENERGY STAR homes are independently verified to be energy-efficient and durable. These high-performance homes achieve energy savings in heating, cooling, hot water, lighting, and appliance efficiencies, which improve resident comfort, reduce operating costs and decrease greenhouse gas emissions. Reducing building emissions through energy efficiency strategies that are verified by a third-party is the first step on the “path to zero.” Reporting projected operating energy and building emissions intensity frames the building’s performance in quantifiable, comparable, terms.

REQUIREMENTS
Certify all buildings with residential units in the project through the ENERGY STAR Residential New Construction Program using ENERGY STAR Multifamily New Construction (MFNC), ENERGY STAR Manufactured Homes, and/or ENERGY STAR Certified Homes as relevant. The ERI, prescriptive, and ASHRAE paths included in these programs are all acceptable. Use the appropriate specification version of ENERGY STAR given the project construction typology, permit date, and location.

AND
Provide projected operating energy use intensity (EUI) for the project in kBtu/ft²/yr and kBtu/bedroom/yr as well as projected operating building emissions intensity for the project in tCO₂e/ft²/yr and tCO₂e/bedroom/yr. Include results for these figures with and without the project’s production of on-site energy generation. Include the source of these figures for your project (ERI model, ASHRAE model, other). If a more precise figure is not available, use the national database average source energy conversion factors from ASHRAE standard 105 for converting energy use intensity to emissions intensity. If following the ERI pathway, provide the average, best, and worst per dwelling unit statistics for the project.

RECOMMENDATIONS
• Because project teams must engage a qualified individual—a Rater—throughout construction to complete third-party inspections and certify to ENERGY STAR, it’s often useful to clearly identify their role in the project in relation to other project team members. Review the program guidance on partnership, training, qualifications, credentialing, and certification process online for your project’s appropriate version of ENERGY STAR Residential New Construction. Builders, Developers, Raters, ASHRAE Path Modelers, and Functional Testing Agents (FT Agents) have eligibility requirements. We recommend that project teams engage these partners as early in their project design stage as possible. Find a Rater here: http://www.energystar.gov/partnerlocator. For additional information: http://www.resnet.us/choose-the-right-contractor
• During the design phase, work with the Rater and/or ASHRAE Path Modeler to set energy-efficiency goals that comply with the appropriate ENERGY STAR Residential New Construction Program. After the project team has decided on a compliant energy package, build these measures into the project plans and specs, and work with the Rater and/or FT Agent to create and implement a verification plan throughout construction.
• The ENERGY STAR Residential New Construction Programs allow Raters to use a Verification Oversight Organization (VOO) - approved sampling protocol to assess a group of dwelling units to meet ENERGY STAR guidelines based on pre-analysis of building plans and subsequent testing and inspections of a sample set of the dwelling units. Where a sampling protocol does not sufficiently describe methodology for multifamily projects, use

RESOURCES


- At the time of this Criteria publishing, examples of modeling software that are approved for the ERI pathway are Ekotrope, EnergyGauge, and REM/Rate. Find the up to date list here: https://www.resnet.us/providers/accredited-providers/hers-software-tools/

- Examples of modeling software that meet ASHRAE 90.1 Appendix G, Section G2.2 requirements are not limited to, but include: DOE-2, eQUEST, TRACE, HAP, and EnergyGauge.

- To identify a Rater in your area: http://www.energystar.gov/partnerlocator


5.1b Building Performance Standard

Mandatory, Moderate and Substantial Rehab

RATIONALE

Dwelling units rehabilitated to a whole-building energy efficiency standard achieve energy savings in heating, cooling, hot water, lighting, and appliance efficiencies, which improve resident comfort, lower operating costs, and decrease greenhouse gas emissions. With a reference home design aligned with the 2006 IECC, dwelling units that achieve an ERI score of 80 or less are projected to be 20% more efficient than that baseline. Certain existing buildings undergoing rehabilitation are unable to achieve that level of performance without making drastic changes to the building envelope; these buildings will be permitted to achieve a HERS Index score of 100 (approximately 2006 IECC energy performance levels). ASHRAE 90.1-2013 is approximately 7.5% more efficient than ASHRAE 90.1-2010. Reducing building emissions through energy efficiency strategies that are verified by a third-party is the first step on the “path to zero.” Reporting projected operating energy and building emissions intensity frames the building’s performance in quantifiable, comparable, terms.

REQUIREMENTS

Projects may choose to follow the ERI or ASHRAE option. Projects may not include on-site power generation to meet the target.

Also provide projected operating energy use intensity (EUI) for the project in kBtu/ft²/yr and kBtu/bedroom/yr as well as projected operating building emissions intensity for the project in tCO₂ₑ/ft²/yr and tCO₂ₑ/bedroom/yr. Include results for these figures with and without the project’s production of on-site energy generation. Include the source of these figures for your project (ERI model, ASHRAE model, other). If a more precise figure is not available, use the national database average source energy conversion factors from ASHRAE standard 105 for converting energy use intensity to building emissions intensity. If following the ERI pathway, provide the average, best, and worst per dwelling unit statistics for the project.

ERI Option

The ERI reference design shall be configured such that it meets the minimum requirements of the 2006 IECC prescriptive requirements. Note that RESNET’s HERS Index, based on ANSI RESNET Standard 301-2014 is a
compliant ERI method for inspecting and calculating a home’s energy performance. Energy modeling software used during the design stage to determine an appropriate package of energy efficiency measures and to generate the ERI score must be approved by an EPA-approved Verification Oversight Organization (VOO) (e.g., RESNET) or, for projects in California, the California Energy Commission.

For each dwelling unit in the project, achieve an ERI score of 80 or less. Any method or strategy, except for on-site power generation, may be implemented to satisfy the targeted minimum energy performance.

Exception:
Each dwelling unit of the following is eligible to achieve an ERI score of 100 or less rather than 80 or less:
- Substantial rehabs of buildings built before 1980 with walls made only of brick/masonry
- Moderate rehabs of buildings built before 1980

ASHRAE Option
Demonstrate that the energy performance of the completed building will be equivalent to, or better than, ASHRAE 90.1-2013 using an energy model created by a qualified energy services provider according to Appendix G 90.1-2016.

This performance requirement shall only be met through building performance improvements, rather than through the addition of on-site power generation. Also, in order to ensure long-term optimal building performance and to better situate a building for withstanding power outages, prioritize envelope improvements over mechanicals and lighting.

Projects in California must use the version of Title 24 under which the project is permitted to calculate the targeted minimum energy performance.

RECOMMENDATIONS
To succeed with the ERI or ASHRAE Option, engage a Rater and/or ASHRAE Modeler and/or FT Agent as early in the project design stage as possible. Their responsibilities will include:
- creating an energy model during the design stage of the project to configure the preferred set of efficiency measures for the project to meet target, with plans and specifications showing the building’s projected energy performance
- conducting a mid-construction pre-drywall thermal enclosure
- verifying the final performance of the building with post-construction performance testing, including a blower door and duct blaster test of the home and/or units

RESOURCES
- To identify a Rater in your area: http://www.energystar.gov/partnerlocator For additional information: http://www.resnet.us/choose-the-right-contractor
- List of software approved by EPA-approved-VOO, RESNET, to generate an ERI compliant HERS Index score: http://www.resnet.us/professional/programs/energy_rating_software
- Examples of modeling software that meet ASHRAE 90.1 Appendix G, Section G2.2 requirements are not limited to, but include: DOE-2, eQUEST, TRACE, HAP, and EnergyGauge.
- Residential Energy Services Network (RESNET): A resource where residents can learn about the energy audit and rating process. http://www.resnet.us
- Enterprise Green Communities Single-Family and Multifamily Rehabilitation Specifications: A set of green specifications—one for single family and one for multifamily—written in MasterSpec that include insulation, air sealing and other details that can be customized to your project. https://www.enterprisecommunity.org/solutions-and-innovation/green-communities/tools-and-services/construction-specifications
• U.S. Department of Energy, Air Sealing, Technology Fact Sheet: This fact sheet describes the importance of sealing air leaks and providing controlled ventilation. https://www1.eere.energy.gov/buildings/publications/pdfs/building_america/26446.pdf

• 2009 IECC Climate Zones Map: A detailed map that shows Climate Zones zoomed into each state and county as well as the basic 2009 IECC Building Code requirements for each Climate Zone. https://basc.pnnl.gov/images/iecc-climate-zone-map

• For more information on ASHRAE 90.1-2013: http://www.ashrae.org

• California Building Energy Efficiency Standards (Title 24) and compliance manuals: https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2019-building-energy-efficiency


5.2a Moving to Zero Energy: Additional Reductions in Energy Use

Optional | X–X points

RATIONALE
Improvements in building energy performance result in utility cost savings from more efficient heating, cooling, hot water, lights and appliances, which improve residents’ comfort, lower operating costs and decrease greenhouse gas emissions. From a resilience standpoint, a highly energy-conserving building envelope will help to ensure that habitable temperatures will be maintained in the event of extended loss of power or interruptions in heating fuel (passive survivability).

Reducing building emissions through energy efficiency strategies that are verified by a third-party and go beyond the level of energy efficiency that is required of the property places a property farther along the “path to zero.”

REQUIREMENTS
Design and construct a building that is projected to be more efficient than what is required of the project by Criterion 5.1. Projects acquiring points from Criterion 5.2b Moving to Zero Energy: Near Zero Certification or Criterion 5.4 Achieving Zero Energy are not eligible for points from this criterion.

Projects following this criterion must also comply with Criterion 7.8 Dehumidification.

• 5 optional points for ERI score 5 lower than required by 5.1 if following ERI path for 5.1 compliance or for 5% greater efficiency than required if following ASHRAE path for 5.1 compliance.

• Additional 1 optional point for each additional 1 point decrease in ERI score if following ERI path for 5.1 compliance or for 1% greater efficiency if following ASHRAE path for 5.1 compliance, up to maximum of 12 total optional points.

These additional reductions in energy use must be captured by energy conservation measures associated with improved building component systems and not through the addition of on-site power generation. Projects following a prescriptive path of Criteria 5.1a are not eligible for points from this criterion.

RECOMMENDATIONS
Using the baseline energy model created in Criteria 5.1a – 5.1b, analyze, identify and adopt energy improvements to achieve additional energy reductions beyond the mandatory levels.

RESOURCES
DOE’s Building America Solution Center provides access to expert information on hundreds of high performance construction topics, including research publications, tools, specs, details, webinars and newsletters on cost-effective, energy-efficient building strategies. https://basc.pnnl.gov/
5.2b Moving to Zero Energy: Near Zero Certification
Optional / Mandatory for Stretch Certification

RATIONALE
These complementary whole building certification programs emphasize strategies that aggressively reduce whole building energy loads, reducing the need to heat and cool, reducing utility bills, reducing associated greenhouse gas emissions, and increasing project capacity to sustain habitability during loss of power.

Reducing building emissions through energy efficiency strategies that are nearly as aggressive as possible and verified by a third-party come close to eliminating building emissions associated with the amount of energy a building requires to operate, moving farther along the “path to zero.”

REQUIREMENTS
Certify the project in a program that requires advanced levels of building envelope performance such as DOE Zero Energy Ready Home and/or PHIUS+.

- DOE Zero Energy Ready Home certification – 10 points
- PHIUS+ certification – 15 points

Projects acquiring points through this criterion are not eligible for points from Criterion 5.2a Moving to Zero Energy: Additional Reductions in Energy Use nor from Criterion 5.4 Achieving Zero Energy.

If a project supplies the supplemental documents required of Criterion 5.2b as part of their Prebuild application and those are approved, additional documentation for Criterion 5.1 is not necessary apart from reporting projected operating CO₂e and EUI as described in that criterion.

Likewise, at the time of Postbuild submission, proof of certification for the program selected through Criterion 5.2b will suffice for compliance with both Criterion 5.1 and Criterion 5.2b. If the project is unable to demonstrate compliance with Criterion 5.2b at Postbuild, the project will not be eligible for those optional points and the project must demonstrate compliance with Criterion 5.1 in order to be eligible for Enterprise Green Communities certification.

RECOMMENDATIONS
Each of these programs requires a significant commitment to ensure significant levels of project performance. Begin strategizing how to achieve your project goals through dual certification with these programs as early in the integrative design process as possible.

RESOURCES
- Passive House Institute US (PHIUS): PHIUS is committed to making high-performance passive building the mainstream market standard. A Passive House is a set of design principles and a quantifiable performance standard applied to any building project, producing radically less energy needs, unparalleled comfort and supreme air quality. [https://www.phius.org/home-page](https://www.phius.org/home-page) and [http://www.phaus.org](http://www.phaus.org)

5.3a Moving to Zero Energy: Photovoltaic/Solar Hot Water Ready
Optional / X points

RATIONALE
Designing for the future installation of photovoltaics or solar hot water systems allows a building owner the flexibility to transition to increased energy generation through renewable energy sources as resources become cost-
competitive. Installation of renewable energy systems is a hedge against rising costs for purchased energy and for cleaner energy sources.

Rather than focusing on reducing building emissions associated with how much energy the building requires to operate, this criterion is a preparatory step for reducing emissions associated with the source of energy for the property, a key consideration along the “path to zero.”

REQUIREMENTS
Projects acquiring points through this criterion are not eligible for points from Criterion 5.3b Moving to Zero Energy: Renewable Energy nor from Criterion 5.4 Achieving Zero Energy.

Orient, design, engineer, wire and/or plumb the development through one or both of the following pathways to accommodate installation of photovoltaic (PV) or solar hot water system in the future.

**Pathway 1: Photovoltaic Ready**
Submit a complete Renewable Energy Ready Home (RERH) Solar Photovoltaic Checklist

**Pathway 2: Solar Hot Water Ready**
Submit a complete Renewable Energy Ready Home (RERH) Solar Water Heating Checklist

RECOMMENDATIONS
• Determine if the placement of the solar equipment impacts the roof warranty.

RESOURCES
• EPA Renewable Energy Ready Homes (RERH): The RERH Specifications were developed by the U.S. Environmental Protection Agency (EPA) to educate builders on how to assess and equip new homes with a set of features that make it easier and less expensive for homeowners to install solar energy systems after the home is constructed. [http://www.energystar.gov/index.cfm?c=rerh.rerh_index](http://www.energystar.gov/index.cfm?c=rerh.rerh_index)


**5.3b Moving to Zero Energy: Renewable Energy**

*Optional* | *X points maximum*

RATIONALE
Renewable energy reduces environmental impacts such as greenhouse gas emissions that are associated with energy sourced and produced from fossil fuels. Use of renewable energy technologies can also result in energy cost savings.

Rather than focusing on reducing building emissions associated with how much energy the building requires to operate, this criterion reduces building emissions associated with the source of energy for the property, a key strategy along the “path to zero.”

REQUIREMENTS
Install photovoltaic (PV) panels or other electric-generating renewable energy source to provide a specified percentage of the project’s estimated source energy demand. The renewable energy may be owned and produced on-site or off-site if the associated renewable energy certificates (RECs) are retained or retired by the building owner. Or, the renewable energy may be procured through a contract of at least 20 years from community solar, virtual power purchase agreements, or Green-E certified renewable energy certificates.

When calculating points for Criterion 5.3b, evaluate the percentage of your project’s total energy demand that is satisfied by a renewable energy source. Demonstrate the energy demand with the energy model your project team


created in compliance with Criterion 5.1. Projects using a prescriptive path for Criterion 5.1 compliance will not be able to obtain points under Criterion 5.3b.

Projects acquiring points through this criterion are not eligible for points from Criterion 5.3a Moving to Zero Energy: Photovoltaic/Solar Hot Water Ready nor from Criterion 5.4 Achieving Zero Energy.

Refer to the table below for the point structure.

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<thead>
<tr>
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<th>10%</th>
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<th>40%</th>
<th>55%</th>
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<tbody>
<tr>
<td>Single-story/Single-family</td>
<td>—</td>
<td>—</td>
<td>6 points</td>
<td>8 points</td>
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<tr>
<td>2–3 stories</td>
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<td>6 points</td>
<td>8 points</td>
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<tr>
<td>4 stories or more</td>
<td>6 points</td>
<td>8 points</td>
<td>10 points</td>
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**RECOMMENDATIONS**

- To provide a higher percentage of the project’s estimated annual energy consumption with electric-generating renewable energy sources, focus on reducing the building’s overall energy consumption in Criteria 5.1 and 5.2 with energy-efficiency measures, which are generally more cost-effective and longer lasting than renewables.
- Consider installing solar water heating systems for stand-alone laundry facilities in multifamily projects.
- Evaluate and review your maintenance contract to ensure that it includes all renewable systems and appropriate reviews and protocols for their maintenance, as well as the associated implications of roof-mounted systems.
- Refer to DOE’s A Common Definition for Zero Energy Buildings for guidance on accounting for energy produced and consumed, but, note the allowances in this criterion’s requirement for certain additional permissible means of procurement.

**RESOURCES**

- American Solar Energy Society (ASES): A nonprofit organization committed to a sustainable energy economy, ASES accelerates the development and use of solar and other renewable energy resources through advocacy, education, research and collaboration among professionals, policymakers and the public. [http://www.ases.org](http://www.ases.org)
- Florida Solar Energy Center (FSEC): This is a resource for basic information on types of photovoltaic solar electric systems, sizing, installation and system ratings. FSEC also has an industry resources page that includes its Photovoltaic System Design Course Manual, available at [http://www.fsec.ucf.edu/en/education/cont_ed/manuals/index.htm](http://www.fsec.ucf.edu/en/education/cont_ed/manuals/index.htm)
- National Renewable Energy Laboratory (NREL): Photovoltaic research at NREL provides a clearinghouse on all aspects of photovoltaic solar cell systems. [https://www.nrel.gov/](https://www.nrel.gov/)
- DSIRE is the most comprehensive source of information on incentives and policies that support renewables and energy efficiency in the United States. Operated by the North Carolina Clean Energy Technology Center at North Carolina State University, with support from the Interstate Renewable Energy Council, Inc, DSIRE is funded by the U.S. Department of Energy. [http://www.dsireusa.org](http://www.dsireusa.org)

5.4 Achieving Zero Energy  
Optional / Automatic qualification for Stretch Certification
RATIONALE
There are three essential strategies on the “path to zero,” the path towards reducing emissions associated with a building: reducing a building’s operating energy through energy efficiency practices, reducing a building’s emissions through the type of energy source that fuels that operating energy, and reducing a building’s emissions embodied in the materials that are used to construct the property. Criteria 5.1 and 5.2 address reducing operating energy needs and Criteria 5.3 and 5.5 address reducing emissions through the property’s power sources. This criterion, 5.4, combines the two concepts, directing projects towards Zero Energy of operations.

Aggressive levels of energy efficiency coupled with renewable energy production, and/or purchase of renewable energy certificates, at levels equal to or greater than a project’s annual energy needs results in a Zero Energy Building or Renewable Energy Certificate Zero Energy Building [see “A Common Definition for Zero Energy Buildings,” in Resources]. This strategy reduces nonrenewable energy usage, utility bills, and greenhouse gas emissions.

REQUIREMENTS
Achieve Zero Energy performance for the project through one of the following options.

Projects acquiring points from this criterion are not eligible for points from Criterion 5.2a, 5.2b, 5.3a, nor 5.3b.

If a project supplies the supplemental documents required of Criterion 5.4 as part of their Prebuild application and those are approved, additional documentation for Criterion 5.1 is not necessary apart from reporting projected operating CO2e and EUI as required by Criterion 5.1.

Likewise, at the time of Postbuild submission, proof of certification for the program selected through Criterion 5.4 will suffice for compliance with both Criterion 5.1 and the building certification component of Criterion 5.4. If the project is unable to demonstrate compliance with Criterion 5.4 at Postbuild, the project will not be eligible for those optional points and the project must demonstrate compliance with Criterion 5.1 in order to be eligible for Enterprise Green Communities certification.

Option 1
Certify each building in the project to ZERH (refer to Criterion 5.2b).

AND

Either install renewables and/or procure renewable energy, which in sum will produce as much, or more, energy in a given year than the project consumes. The renewable energy may be owned and produced on-site or off-site if the associated renewable energy certificates (RECs) are retained or retired by the building owner. Or, the renewable energy may be procured through a contract of at least 20 years from community solar, virtual power purchase agreements, or Green-E certified renewable energy certificates.

Option 2
Certify each building in the project in a program that requires zero energy performance such as PHIUS+ Source Zero, ILFI’s Zero Energy Petal, Zero Carbon Petal, or Living Building Certification.

RECOMMENDATIONS
- Consider coupling this criterion with Criterion 5.5a or 5.5b, Moving to Zero Carbon, to move towards not only offsetting, but removing, combustion fuels from the property and further reducing associated emissions with the building’s operations.

- Consider coupling this criterion with Criterion 6.5 Environmentally Responsible Material Selection and fully consider the implications of a zero emissions building from both the operations and materials perspective—fully embracing the “path to zero.”
• Each of this criterion’s options requires a significant commitment to ensure significant levels of project performance. Begin strategizing how to achieve your project goals through dual certification with these programs as early in the integrative design process as possible.

• Refer to DOE’s A Common Definition for Zero Energy Buildings for guidance on accounting for energy produced and consumed, but, note the allowances in this criterion’s requirement for certain additional permissible means of procurement.

• Multifamily buildings, and/or properties in urban locations, may not have enough space for installation of enough on-site renewables to offset the property’s energy consumption. In that scenario, consider purchasing renewable energy certificates to achieve Renewable Energy Certificate Zero Energy designation.

RESOURCES

• Passive House Institute US (PHIUS): PHIUS is committed to making high-performance passive building the mainstream market standard. The PHIUS+ standard has been cost-optimized by climate. PHIUS+ combines a thorough passive house design protocol with a stringent Quality Assurance and Quality Control program. https://www.phius.org/home-page and http://www.phaus.org

• DOE Zero Energy Ready Home: The DOE Zero Energy Ready Home is a program that builds upon ENERGY STAR for Homes, along with proven Building America innovations and best practices. These homes are third-party verified. http://energy.gov/eere/buildings/guidelines-participating-doe-zero-energy-ready-home

• Living Building Challenge Net Zero Energy Building Certification: Net Zero Energy Building Certification is a program operated by the International Living Future Institute using the structure of the Living Building Challenge. Net Zero Energy Building Certification verifies that the building is truly operating as claimed, provides a platform for the building to inform other efforts throughout the world and accelerate the implementation of restorative principles, and celebrates a significant accomplishment and differentiates those responsible for the building’s success in this quickly evolving market. http://living-future.org/netzero

5.5a Moving to Zero Carbon: All-Electric Ready

Optional

RATIONALE
A crucial part of reducing a property’s carbon emissions is considering the emissions associated with the fuels that are used to power a home. Building an all-electric-ready property is a first step. Even if installing renewables is not feasible, the electric grid for a given property is not yet clean, and/or the price of operating an all-electric building in a given region is not yet cost-competitive, building an all-electric-ready property is a cost-effective means of preparing for future electrification.

REQUIREMENTS
A project is eligible for points when, although it is using combustion fuel source, the building has adequate electric service and has been designed and wired to allow for a seamless switch to electricity as a fuel source for the following uses throughout the project:

• space heating
• space cooling
• water heating (DHW)
• clothes dryers
• equipment for cooking (including but not limited to ranges, cooktops, stoves, ovens)
Projects acquiring points through this criterion are not eligible for points from Criterion 5.5b Moving to Zero Carbon: All Electric.

RECOMMENDATIONS

- Utilize electricity for as many of the components listed above as possible; make the others electric-ready. From an emissions perspective, prioritize electrifying components which otherwise would use propane or heating oil. From a cost perspective, evaluate rates for various fuel sources and uses in your property.

- Factor in the cost of potentially needing to upgrade electric service to the property against the cost of gas piping. Connect with your electric utility service provider to evaluate whether or not additional feeder lines and/or electrical panels are necessary.

- Consider installing heat pumps, of which effective cold climate models are available, to provide air conditioning as well as space heating. Heat pump water heaters and dryers are available; consider what electric technologies are appropriate for your property.

RESOURCES

- The Economics of Electrifying Buildings, RMI, this analysis explores which building typologies can benefit financially from electrification https://rmi.org/insight/the-economics-of-electrifying-buildings/


- U.S. households/ heating equipment choices are diverse and vary by climate region, EIA, https://www.eia.gov/todayinenergy/detail.php?id=30672&src=%E2%80%93%E2%80%93%E2%80%93%E2%80%93%E2%80%93%E2%80%93%

- “Pollutant Exposures from Natural Gas Cooking Burners: A Simulation-Based Assessment for Southern California.” Jennifer M. Logue, Neil E. Klepeis, Agnes B. Lobscheid, Brett Singer: Residential natural gas cooking burners (NGCBs) can emit substantial quantities of pollutants, and they are typically used without venting range hoods. http://ehp.niehs.nih.gov/1306673/


5.5b  Moving to Zero Carbon: All Electric

Optional

RATIONALE

An all-electric property’s source operating emissions will be no worse than the emissions associated with the electric grid that provides power to the property. As grid sources of energy become cleaner, so will the emissions profile of the property. Removing combustion fuels from the property itself eliminates emissions associated with nonrenewable energy sources even if generating renewable power is not feasible on site. And all-electric buildings allow for future grid flexibility, enabling a property to potentially take advantage of favorable rate structures.

Also consider the health implications. The process of combustion releases byproducts to which residents and staff may be exposed, and natural gas cooking burners have been shown to emit substantial quantities of pollutants. Eliminating combustion equipment from a building project eliminates the possibility of negative resident and staff health impacts due to exposure to combustion byproducts.

REQUIREMENTS

No combustion equipment used as part of the building project; the project is all-electric.

Projects acquiring points through this criterion are not eligible for points from Criterion 5.5a Moving to Zero Carbon: All-Electric Ready.
RECOMMENDATIONS

- Factor in the cost of potentially needing to upgrade electric service to the property against the potential savings from avoiding gas piping. Connect with your electric utility service provider to evaluate whether or not additional feeder lines and/or electrical panels are necessary.

- Consider installing heat pumps, of which effective cold climate models are available, to provide air conditioning as well as space heating. Heat pump water heaters and dryers are available; consider what electric technologies are appropriate for your property.

RESOURCES

- The Economics of Electrifying Buildings, RMI, this analysis explores which building typologies can benefit financially from electrification [https://rmi.org/insight/the-economics-of-electrifying-buildings/](https://rmi.org/insight/the-economics-of-electrifying-buildings/)


- “Pollutant Exposures from Natural Gas Cooking Burners: A Simulation-Based Assessment for Southern California.” Jennifer M. Logue, Neil E. Klepeis, Agnes B. Lobscheid, Brett Singer: Residential natural gas cooking burners (NGCBs) can emit substantial quantities of pollutants, and they are typically used without venting range hoods. [http://ehp.niehs.nih.gov/1306673/](http://ehp.niehs.nih.gov/1306673/)

- “Take Care in the Kitchen: Avoiding Cooking-Related Pollutants.” Nate Seltenrich: [http://ehp.niehs.nih.gov/122-a154/or Environmental Health Perspectives 122:A154–A159: http://dx.doi.org/10.1289/ehp.122-a154](http://dx.doi.org/10.1289/ehp.122-a154)

5.6 Sizing of Heating and Cooling Equipment

*Mandatory for New Construction and rehabs that include replacement of heating and cooling equipment.*

RATIONALE

Appropriately sized equipment can save money, contribute to dehumidification and prevent short-cycling that can lead to premature motor default.

REQUIREMENTS

Size and select heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manuals J and S or in accordance with the ASHRAE 2009 Handbook of Fundamentals.

Note that projects in compliance with the ENERGY STAR Certified Homes pathway of Criterion 5.1a automatically meet this Criterion 5.5 by virtue of that certification's requirements.

RECOMMENDATIONS

- As buildings become more energy efficient and loads decrease, proper sizing and thoughtful approaches to year-round moisture control become more critical in all climate zones. Given projected changes in annual extreme heat days, properties in all climate zones have more reason to install air conditioning to ensure that residents are safe.

- There are two types of loads to manage in a building: sensible and latent. Sensible capacity is the capacity to lower temperature and latent capacity is the capacity to remove moisture from the air. Total capacity is sensible + latent. When sizing heating and cooling systems, we recommend sizing to the sensible load. If, in that scenario, the design shows that latent load will not be met by the equipment, install a dehumidifier to handle the latent load rather than sizing the air conditioner up. Sizing the air conditioner for the latent load will result in an oversized system which will have little latent control. Refer to Criterion 7.8 Dehumidification for further guidance.

- The HVAC designer generates a Manual J load calculation to determine the heating and cooling loads of a particular project. A room-by-room Manual J is recommended, in order to properly determine room-by-room airflows best suited for the space's associated heating and cooling loads. A Manual S is used to determine which space heating and cooling equipment best match the load of the project calculated per
Manual J. The Manual J accounts for factors such as the dwelling unit's solar orientation, window design and insulation R-value, installation quality, building air leakage, and internal loads. Consult [http://www.acca.org/standards/software](http://www.acca.org/standards/software) for a list of software programs reviewed by ACCA to perform Manual J calculations.

- Manual D describes how to design a residential duct system. Given the amount of air that Manual J dictates is needed for a particular space, the HVAC designer uses Manual D to determine how to design the duct system to achieve that flow rate.

- Manual LLH (Low Load Homes) is one of the newest ACCA manuals. LLH uses Manuals J, S, D, T, and others as a baseline and identifies equipment options and approaches to address low cooling and/or heating loads.

- Consider locating heating and cooling equipment and the distribution system within the building envelope in order to reduce thermal distribution losses—this is essential to achieving higher levels of property energy efficiency. Do not locate air handler or ductwork within the garage space (see Criterion 7.3 Garage Isolation for more information).

**RESOURCES**


- Air Conditioning Contractors of America, “HVAC Quality Installation Specification: Residential and Commercial Heating, Ventilating, and Air Conditioning Applications”: The site also includes links to various articles and other ANSI and ACCA standards. [https://www.acca.org/standards/quality](https://www.acca.org/standards/quality)

- California Energy Commission, Procedures for HVAC System Design and Installation: This site provides an overview of good practices for designing and installing the HVAC system, as well as detailed strategies and measures for the “house as a system” approach to construction. [https://ww2.energy.ca.gov/title24/orc/hvac/2016_hvac.html](https://ww2.energy.ca.gov/title24/orc/hvac/2016_hvac.html)

- For additional information on duct sealing details: [http://www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_ducts](http://www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_ducts)

**5.7 ENERGY STAR Appliances**

*Mandatory*

If providing appliances

**RATIONALE**

ENERGY STAR products meet strict energy-efficiency criteria set by EPA. These products reduce utility costs and greenhouse gas emissions.

**REQUIREMENTS**

If providing appliances, install ENERGY STAR clothes washers, dishwashers and refrigerators. If appliances will not be installed or replaced at this time, specify that, at the time of installation or replacement, ENERGY STAR models must be used via Criterion B.1 Building Operations & Maintenance (O&M) Manual and Plan and Criterion 8.4 Resident and Property Staff Orientation.

**RECOMMENDATIONS**

The specifications of the installed appliances should be reflected in the energy modeling building input data report.

**RESOURCES**

- When preparing project specifications, find ENERGY STAR product information, including model numbers and savings calculators: [http://www.energystar.gov/products/certified-products](http://www.energystar.gov/products/certified-products)
5.8 **Lighting**  
*Mandatory*

**RATIONALE**
Energy reductions through efficient lighting products contribute to lower utility costs and lower greenhouse gas emissions. Dedicated and screw-based CFLs and linear fluorescent lighting as well as LED lights are an energy-efficient alternative to standard incandescent and T-12 fluorescent lighting. ENERGY STAR LED lamps have now been available for a decade, and exist for most intended use cases. Automatic lighting controls can significantly reduce lighting energy use. Battery backup in emergency lighting features allows for ease of egress during power blackouts.

**REQUIREMENTS**
For all permanently installed lighting fixtures, indoors and outdoors, install high-efficiency lighting that is capable of meeting recommended light levels (weighted average footcandle) in the Illuminating Engineering Society Lighting Handbook, 10th edition.

Also, comply with all of the below:

- Recessed light fixtures shall be Insulation Contact Air-Tight (ICAT).
- Lighting inside the building, but not in a dwelling unit, shall be controlled by occupancy sensors or automatic bi-level lighting controls.
- Lighting power density in dwelling units, measured in watts/square foot, is 1.1 or less.
- All exterior lighting shall meet the following specifications and have motion sensor controls, integrative photovoltaic cells, photosensors or astronomic time-clock operation. Note, Dark Sky-approved “Friendly Fixture” certification automatically meets the following specifications.
  - Luminaires shall be fully shielded emitting no light above 90 degrees (with the exclusion of incidental light reflecting from fixture housing, mounts, and pole). The luminaire’s mounting hardware shall not permit mounting in any configuration other than those maintaining full shielding. Non-residential luminaires shall be rated U0.
  - Fixture shall have no sag or drop lenses, side light panels, up-light panels.
  - Fixture shall employ warm-toned (3000K and lower) white light sources or may employ amber light sources or filtered LED light sources.

*Note: Exterior emergency lighting and lighting required by code for health and safety purposes are exempt.*

**RECOMMENDATIONS**
- Consider incorporating daylighting practices throughout your project. Include controlled admission of natural light as well as a daylight-responsive lighting control system.
- Review ENERGY STAR product and design information regarding fixture and bulb selection and design.
- Incorporate stairwell skylights as a multi-purpose design feature, providing light, egress and ventilation.
- Install occupancy sensors in closets and rooms that will be occupied only intermittently. If installed in restrooms, position occupancy sensors to recognize the presence of someone in a toilet stall.
- Ensure that stairway lighting is consistent with or better than building corridor lighting to encourage use.
- Design outdoor lighting to eliminate light trespass from the project site and to minimize impact on nocturnal environments.
- Design outdoor lighting to meet IES guidelines (Lighting for Exterior Environments, IESNA publication, RP-33-1999).

**RESOURCES**
- For more information on lighting design and buying guidance:  
• The Lighting Research Center: This university-based, independent lighting research and education group provides objective and timely information about lighting technologies and applications, and about human response to light. http://www.lrc.rpi.edu/


• International Dark-Sky Association (IDA) is a recognized authority on light pollution. Information on Dark-Sky-approved fixtures can be found online at: http://www.darksky.org/outdoorlighting

• Lamp Recycle lists locations where fluorescent lamps and ballasts may be taken for recycling: http://www.lamprecycle.org

5.9 Resilient Energy Systems: Floodproofing

Optional | X points

RATIONALE
When raising services, equipment and building portions above design flood level is not possible, dry floodproof (“bunkerize”) such services and spaces in order to better ensure building service in the case of a major flood event. The first and lower floors of buildings are often at risk because they are below flood level. Any essential building equipment should be located elsewhere, if flooding is a risk. Submersion of electrical utility services to the first point of switch disconnect is a safety concern and can lead to excessive or irreparable damage to both utility and building systems and increase the recovery time for such systems.

REQUIREMENTS
Conduct floodproofing, including perimeter floodproofing (barriers/shields), of lower floors.

Design and install building systems in such a way that, in the case of an emergency, the operation of these systems will not be grossly affected:

• Locate any and all central space and water heater equipment above design flood elevations.

• Locate the service disconnect at a readily accessible location above the design flood elevation.

• Locate at least one exit door above the design flood elevation.

• On plan sets, identify water entry points at basements and foundation walls and demarcate all penetrations, wall assemblies and doors/openings to ensure that future renovations do not compromise the integrity of floodproof construction.

RECOMMENDATIONS
• Project teams should, in accordance with Category 1, identify whether or not floods are of concern for the project in question. If not, it may be wise to choose different optional criteria instead of this one.

• Project teams will need to identify suitable space, with accessible entry, for locating this equipment above design flood elevation.

• See ASCE 24-05 Flood Resistant Design and Construction for further guidance regarding design and placement of building services.

RESOURCES


• Enterprise’s Multifamily Resilience Manual includes more than a dozen strategies and specific guidance for building property resilience in the event of an emergency, including floodproofing strategies.  
http://www.enterprisecommunity.org/resources

5.10 Resilient Energy Systems: Critical Loads  
Optional | X points

RATIONALE
With more intense storms, flooding, wildfires and heat waves forecast with climate change, the frequency and duration of power outages may increase. So-called “islandable” electrical systems offer a significant level of resilience in such situations for supplying power to critical building systems.

REQUIREMENTS
Provide adequate emergency power to serve certain systems in the project through an islandable photovoltaic (PV) system with battery storage and a system to switch to battery backup when the electric grid goes down OR through an efficient generator that will offer reliable electricity for critical circuits during power outages. Size either system type to satisfy at least three of the most critical energy loads of the project.

Critical energy load options include:

- Operation of electrical components of fuel-fired heating systems
- Operation of a fan sufficient to provide emergency cooling if mechanical air conditioning equipment cannot operate
- Operation of water pumps if needed to make potable water available to occupants
- Lighting level a minimum of 3 footcandles in all building spaces to define a path of egress to all required exits and to a distance of 10 feet on the exterior
- One location for every 500 square feet that provides a minimum of 30 footcandles measured 30" above the floor
- At least one functioning electrical receptacle per 250 square feet of occupied space
- Sufficient power for operation of critical medical equipment for residents
- Operation of cable modem and wireless router or other means of providing online access within the building, if applicable
- Operation of one elevator in building, if applicable

RECOMMENDATIONS
• Prioritize which electrical equipment will run on backup power so buildings can remain habitable during extended blackouts. Because cogeneration and solar power systems are always in use, they can be more reliable than generators that are turned on only during emergencies. In substantial rehab projects where the installation of a PV system is not feasible, a generator may be used as a backup power source.
• Prioritize emergency systems such as egress lighting, extended life safety systems (fire alarms), water, parking egress, improved habitability for mobility-impaired occupants (elevator car operation), small critical heating and cooling loads, and convenience power for building occupants (charging stations).
• A bi-modal solar system that can both feed power into the electric grid (net-metering) and shunt power to and from a battery bank offers great flexibility and resilience (including power at night during power outages).
• Where a permanent connection is being made for a portable generator, a disconnecting means and overcurrent protection should be provided at the point of connection. For a temporary generator hookup, the project should provide easy access to an electrical connection point. Connections shall be administered by qualified people who maintain and supervise the installation.

RESOURCES
• Enterprise Community Partners, Multifamily Resilience Manual includes more than a dozen strategies and specific guidance for building property resilience in the event of an emergency, including backup power strategies. http://www.enterprisecommunity.org/resources

• Database of State Incentives for Renewables & Efficiency (DSIRE): DOE and the North Carolina Clean Energy Technology Center developed this database to collect information on state financial and regulatory incentives (e.g., tax credits, grants and special utility rates) designed to promote the application of renewable energy technologies. DSIRE also offers additional features, such as preparing and printing reports that detail the incentives on a state-by-state basis. http://www.dsireusa.org

Category 6: Materials
6. Materials

6.1 Ingredient transparency for material health: products with content publicly characterized and screened to 1,000 ppm or better

Optional, 8 points max.

RATIONALE
As occupants of buildings, we all are exposed to the chemicals that make up the built environment. People who build, and residents of communities where building products are manufactured, can be exposed at higher rates. We all are better served by knowing what chemicals we are exposed to and what health hazards may be associated with those chemicals. In particular, people responsible for the design, construction, and operation of buildings are in a position to act upon this information and avoid known and potential hazards. Public ingredient disclosure for building materials allows project teams to make more informed choices.

Full disclosure of content and known hazards for products is the first step towards optimizing buildings, enabling us to avoid construction of homes with hazardous chemicals. Once full content information is publicly disclosed, staff can work to assess the chemicals and work towards supplying, manufacturing, and specifying products where all chemicals are assessed to be of relatively low hazard. Until then, regrettable substitutions—replacing a well-studied hazardous chemical with a less studied chemical whose hazards are not yet known, if that chemical is later found to be equally or more hazardous than the targeted chemical—are likely. Full disclosure enables high priority chemical avoidance and moves the needle toward project optimization.

REQUIREMENTS
Specify and install products that have inventories that have been publicly disclosed where content is characterized and screened using health hazard lists or restricted substances lists to 1,000 ppm or better. Note that "better than" 1,000 ppm is a number lower than 1,000 ppm (e.g. screening to 100 ppm is better than to 1,000 ppm).

There are several ways of accruing points within this criterion. Any combination of the below point pathways may be used for a project. However, a product may only be counted for points once within this criterion.

- 1 point per 5 installed Declare or HPD products in at least three product categories
- 1 point per 2 installed Declare or HPD products in any of these high priority product categories: adhesives, sealants, windows
- 1 point per each product with third-party verified disclosure (ex: LPC, third party verified HPD, third party verified Declare Label)
- 2 points per each product with third-party verified disclosure (ex: third party verified HPD, third party verified Declare Label) in any of these high priority product categories: adhesives, sealants, windows

RECOMMENDATIONS
- The number and variety of products with public ingredient disclosure is growing. Ask your suppliers to commit to transparency throughout their supply chain.

RESOURCES
- The Health Product Declaration (HPD) is a standardized format for manufacturer disclosure of product content, emissions and health hazards associated with the content. Manufacturers voluntarily use the format and may distribute it as they do MSDS’s or Technical Data Sheets. The Health Product Declaration Collaborative maintains the HPD Standard and a list of tool providers who offer databases of HPDs. [Find publicly available HPDs in the HPD Repository](https://hprepository.hpd-collaborative.org/Pages/Results.aspx)
- Declare is a transparency platform and product database for the materials marketplace. [Find Declare Labels in the Declare Database](https://living-future.org/declare/)
• The mission of Healthy Building Network (HBN) is to advance human and environmental health by improving hazardous chemical transparency and inspiring product innovation. HomeFree is HBN’s national initiative supporting affordable housing leaders who are improving human health by using less toxic building materials. The HomeFree website provides healthy building material recommendations and resources for understanding and requesting public ingredient disclosure. https://homefree.healthybuilding.net/transparency

6.2 Recycled content and ingredient transparency: products including post-consumer recycled content

Optional, 2 points max.

RATIONALE
Use of building materials with recycled content reduces the negative environmental impact resulting from extraction and processing of virgin materials. However, reuse of materials should be done with care to minimize negative health implications.

The need for content disclosure applies not just to virgin materials, but also to recycled content, which can contain legacy contaminants. This hazardous content can be unintentionally incorporated into new products, further exposing people through both the recycling process and during the product’s use. Removing hazardous materials from products also increases their future value as recycled content, improving the potential for circular manufacturing. Sometimes a complete understanding of the chemical make-up of recycled content is difficult to achieve. The first step toward ensuring safe recycled content is an understanding of the source of the recycled content. This allows for consideration of what hazardous chemicals are likely to be present and prioritized screening to avoid those hazardous chemicals.

REQUIREMENTS
Use building materials that feature recycled content and disclosure about that recycled content.

The building material must make up 75% (by weight or cost) of a project component and must be composed of at least 25% post-consumer recycled content to be eligible for this criterion.

For each building material, provide a public disclosure of the origin of the post-consumer recycled content (e.g., PVC wire and cable scrap; cathode ray tubes; vehicle tires) and if/how the recycled content has been screened for or avoids sources of heavy metals. For this criterion, heavy metals are defined as compounds containing arsenic, cadmium, hexavalent chromium, lead, or mercury.

The following table provides a sample of project components and example building materials that a team can incorporate for optional points. Each building material that meets the requirements of this criterion is worth 1 point.

<table>
<thead>
<tr>
<th>PROJECT COMPONENT</th>
<th>BUILDING MATERIAL (EXAMPLES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framing</td>
<td>Wood, concrete, steel, aluminum</td>
</tr>
<tr>
<td>Siding or masonry</td>
<td>Wood, metal, masonry</td>
</tr>
<tr>
<td>Flooring (non-structural)</td>
<td>Linoleum, cork, bamboo, reclaimed wood, sealed concrete, carpet</td>
</tr>
<tr>
<td>Paving</td>
<td>Cement slab (Urbanite)</td>
</tr>
<tr>
<td>Roofing</td>
<td>Wood shingles, asphalt shingles, tile, metal, roofing membranes</td>
</tr>
<tr>
<td>Insulation</td>
<td>Fiberglass batt, cellulose, rigid panel</td>
</tr>
<tr>
<td>Sheathing</td>
<td>Plywood, OSB</td>
</tr>
</tbody>
</table>

Note: The list above is a partial list and does not include all possible building materials; mechanical, electrical and plumbing components cannot be included in this calculation.
RECOMMENDATIONS
Consider the incorporation of recycled-content building materials from the early stages of project design.

RESOURCES
- SCS Global Services Recycled Content Certification evaluates products made from pre-consumer or post-consumer material diverted from the waste stream. Certification measures the percentage of recycled content for the purpose of making an accurate claim in the marketplace. [https://www.scsglobalservices.com/services/recycled-content-certification](https://www.scsglobalservices.com/services/recycled-content-certification)
- The mission of Healthy Building Network (HBN) is to advance human and environmental health by improving hazardous chemical transparency and inspiring product innovation. HBN provides in-depth research reports on various common recycled feedstocks used in building materials and potential hazardous content therein. [https://healthybuilding.net/reports/category/1-optimized-recycling](https://healthybuilding.net/reports/category/1-optimized-recycling)

6.3 Chemical hazard optimization: products with third-party verification of optimization to 100 ppm
Optional, 8 points max.

RATIONALE
While public ingredient disclosure, incentivized through Criterion 6.1, allows project teams to make more informed choices, Criterion 6.2 rewards project teams for choosing products that minimize human and environmental health hazards.

REQUIREMENTS
Install products that have third-party verification of optimization to 100 ppm or better.

There are several ways of accruing points within this criterion. Any combination of the below point pathways may be used for a project. However, a product may only be counted once within this criterion. Projects are permitted to acquire points for a given product in both Criterion 6.1 or Criterion 6.2 and in Criterion 6.3. There are multiple levels on the path toward full assessment and optimization. Each successive level below provides progress toward a fully optimized product. Not all of the certifications/declarations/labels within a given optimization level below are equivalent, but within a level they provide a relatively similar degree of rigor and assurance about the health hazards associated with the product contents.

- 1 point per 3 installed products with screening level optimization for 100% of content to 100 ppm, verified by a third party
  - Third party verified Declare Red List Free
  - Third party verified Declare Living Building Challenge (LBC) Compliant (if the only exemption is the proprietary ingredient exemption)
  - C2C Basic or Bronze; C2C Material Health Certificate Basic or Bronze
  - GreenScreen Certified Bronze-100
  - Third party verified HPD with no LT-1s or publicly available BM-1
- 1 point per 2 installed products with assessment level optimization for 95% of content to 100ppm, verified by a third party
  - GreenScreen Certified Silver or Gold-95
  - C2C Silver
  - Living Product Challenge with Transparent Materials Health, to 95%
- 1 point per 1 installed product with assessment level optimization for 100% of content to 100ppm, verified by a third party
  - Living Product Challenge with Transparent Material Health, to 100%
  - C2C Gold or Platinum C2C Material Health Certificate Gold or Platinum or C2C Material Health Certificate Silver showing 100% assessed
  - GreenScreen Certified Silver-100 or Gold
Third party verified HPD where each chemical in the product is assessed and the product is free of GreenScreen BM-1 chemicals

RECOMMENDATIONS

- All products, and product labels, are not equal. Be aware that when selecting products in order to avoid a given characteristic, there is a chance of selecting an alternate product with an equally poor chemical inventory that has not yet been characterized or has not been fully assessed—leading to a regrettable substitution. To minimize the likelihood of this, consider choosing products that have been fully characterized and assessed for human health hazards.

- Refer to dynamic lists of products whenever possible. The sector does not yet use standard naming conventions, and product specifiers, manufacturers, and suppliers are all simultaneously revealing more information about product content and impact.

RESOURCES

- Declare is a transparency platform and product database for the materials marketplace. Through Declare, project teams can search for Declare Red List Free and Declare Living Building Challenge Compliant products [https://living-future.org/declare/](https://living-future.org/declare/) Living Product Certified products can be found in the LPC database [https://living-future.org/lpc/case-studies/](https://living-future.org/lpc/case-studies/)

- Cradle to Cradle (C2C) Certified Products and Material Health Certificate products [https://www.c2ccertified.org/](https://www.c2ccertified.org/)

- GreenScreen is a universally recognized tool that identified hazardous chemicals and safer alternatives [https://www.greenscreenchemicals.org/](https://www.greenscreenchemicals.org/)

- The Health Product Declaration (HPD) is a standardized format for manufacturer disclosure of product content, emissions and health hazards associated with the content. Manufacturers voluntarily use the format and may distribute it as they do MSDS’s or Technical Data Sheets. The Health Product Declaration Collaborative maintains the HPD Standard and a list of tool providers who offer databases of HPDs. [http://hpdcollaborative.org/](http://hpdcollaborative.org/)

6.4 Healthier material selection

*Mandatory & Optional, 6 points max*

RATIONALE

On the path from disclosure to fully optimized products, an intermediate step is avoiding key chemicals of concern. These can come in the form of volatile organic compounds (VOCs) and also less volatile chemicals that escape from products over longer periods of time. Paints, coatings, primers, adhesives, and sealants may release VOCs, particularly when newly applied or when wet. Similarly, new carpets, padding and flooring adhesives also release VOCs that may pose health hazards to residents and installers. Exposure to individual VOCs and mixtures of VOCs can cause or aggravate health conditions including allergies, asthma and irritation of the eyes, nose and airways. Some VOCs, like formaldehyde, are associated with health impacts like cancer. However, no health-based standards for indoor non-occupational exposure have been set. The SCAQMD thresholds below ensure that products have limited VOC content, and the California Department of Public Health (CPDH) emission standard (formerly called California 01350) ensures that products are verified to have limited VOC emissions, for the specific VOCs tested. Use of products meeting these SCAQMD and CPDH requirements in interior applications is a critical step to reduce VOC exposure and health harm.

Beyond VOCs, building products may contain other chemicals of concern which can be avoided. For instance:

- Alkylphenol Ethoxylates (APEs) are chemicals of concern for their endocrine-disrupting properties. APEs are common in paints, although a phase-out is underway in the US and many products without APEs are available.

- Isocyanates are asthmagens used in SPF, fluid applied floors and polyurethane high performance coatings.
Phthalates are used to make PVC/vinyl flexible. They have largely been phased out in vinyl flooring in the US and safer alternatives are widely available. They are also found in some sealants, where the transition to safer alternatives is still underway.

Many hazardous chemicals, including bisphenol A, go into making epoxy materials such as fluid applied floors and epoxy high-performance paints and other epoxy coatings applied on-site.

Formaldehyde, a carcinogen, is used in binders for some high-density fiberglass insulation, most mineral wool insulation, and in plywood, particleboard and other composite woods.

**REQUIREMENTS**

Use products that comply with the specifications below.
### Product Type
- **Mandatory**
  - VOC content less than or equal to the thresholds provided by the most recent version of SCAQMD 1113 available at time of product specification for all interior paints, coatings, and primers.
  - VOC emissions verified as compliant with CDPH Standard Method for all wall finish paints.
  - All wallpaper, phthalate free.

- **Optional**
  - Use of sealants that do not contain orthophthalate plasticizers. Use of adhesives that are CDPH compliant.
  - All project flooring assemblies (adhesive, sealant, flooring product, pigment) are Red List free.

- **Recommendations**
  - Orthophthalate plasticizers are common in polyurethane and modified polymer sealants. While not common, they may also be found in some acrylic latex or siliconized acrylic sealants. Verify that specified sealants are phthalate-free.
  - Minimize the need for adhesives when possible. For instance, finger-joints and mechanical fasteners do not contain chemicals of concern.
  - Common flooring product labels that meet or exceed the mandatory requirement include FloorScore, GreenGuard Gold, SCS Indoor Advantage Gold, and Berkeley Analytical Clear Chem, and Carpet Rug Institute Green Label Plus (CRI+).
  - In place of vinyl or other PVC-based resilient flooring, consider salvaged hardwoods, natural linoleum, rubber, cork, other PVC-free resilient flooring, ceramic or stone tile, sealed concrete, or pre-finished solid wood flooring. Pre-finished products, compared to those finished on site keep potential exposures lower through a more controlled environment during finishing.

### All interior paints, coatings, primers, and wallpaper
- VOC content less than or equal to the thresholds provided by the most recent version of SCAQMD 1113 available at time of product specification for all interior paints, coatings, and primers.

- VOC emissions verified as compliant with CDPH Standard Method for all wall finish paints.

- All wallpaper, phthalate free.

### All interior adhesives and sealants
- VOC content less than or equal to the thresholds provided by the most recent version of SCAQMD 1168 available at time of product specification for all interior adhesives and sealants.

### Flooring
- All flooring products (whether carpet or hard surface) must comply with CDPH emission requirements.

- No flexible PVC with phthalates may be installed, whether the phthalates were intentionally added or added via recycled content.

- No carpet in the project may be installed in building entryways, laundry rooms, bathrooms, kitchens/kitchenettes, or utility rooms.

- Fluid applied finish floors may only be installed in non-occupied spaces, such as mechanical rooms.

- The project complies with one of the following options:
  - Absence of vinyl-flooring throughout the project
  - Absence of carpet throughout the project
  - All project flooring assemblies (adhesive, sealant, flooring product, pigment) are Red List free

- If using carpet, specify those that do not use a fluorinated (PFAS) stain repellant.

### Use of sealants that do not contain orthophthalate plasticizers. Use of adhesives that are CDPH compliant.

- All project flooring assemblies (adhesive, sealant, flooring product, pigment) are Red List free.

### The project complies with one of the following options:
  - Absence of vinyl-flooring throughout the project
  - Absence of carpet throughout the project
  - All project flooring assemblies (adhesive, sealant, flooring product, pigment) are Red List free

- If using carpet, specify those that do not use a fluorinated (PFAS) stain repellant.

- 3 points.

- Use of sealants that do not contain orthophthalate plasticizers. Use of adhesives that are CDPH compliant.

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  - Absence of vinyl-flooring throughout the project
  - Absence of carpet throughout the project
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  - All project flooring assemblies (adhesive, sealant, flooring product, pigment) are Red List free

- Use of sealants that do not contain orthophthalate plasticizers. Use of adhesives that are CDPH compliant.

### The project complies with one of the following options:
  - Absence of vinyl-flooring throughout the project
  - Absence of carpet throughout the project
  - All project flooring assemblies (adhesive, sealant, flooring product, pigment) are Red List free

- Use of sealants that do not contain orthophthalate plasticizers. Use of adhesives that are CDPH compliant.
• All products, and product labels, are not equal. Be aware that when selecting products in order to avoid a given characteristic, there is a chance of selecting an alternate product with an equally poor chemical inventory that has

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**Insulation**

- If fiberglass or mineral wool batts are used, these must be formaldehyde-free

The project does not include any spray polyurethane foam.

3 points.

Alternative insulation products include recycled cotton, cellulose, wool and blown fiberglass. All major US manufacturers of residential fiberglass batt insulation have transitioned to formaldehyde-free products. Some formaldehyde-free mineral wool batts are also available.

**Composite wood**

- Formaldehyde emissions less than or equal to the thresholds provided by CARB Phase 2 and/or TSCA Title IV for plywood, particleboard, MDF, and these materials within other products like cabinets and doors. For any other composite wood products not covered by CARB/TSCA requirements, but used in interior spaces, these must at minimum be NAUF (have no added urea formaldehyde).

Use of composite woods that are certified ultra-low emitting formaldehyde (ULEF). 1 point per product.

2 points max.

- While finish products (including plywood, MDF, particleboard, and cabinet and door components) comply by law with this mandatory requirement, ensure that all products installed in the project that are exposed to the conditioned space meet these standards or at a minimum do not include added urea formaldehyde.

- No-added formaldehyde (NAF) products qualify as ULEF and will be eligible for optional points. However, be aware that the alternative binders utilized in these products may include regrettable substitutions. For instance, the most common alternative binder for composite wood is PMDI, which is made with isocyanates. PMDI is expected to be a lower hazard during use than formaldehyde, but more information is needed. Preferable alternatives would be more than half bio-based (e.g., binders that are at least 50% soy) with full content disclosure, so they can be vetted for health hazards.
not yet been characterized or assessed—leading to a regrettable substitution. To minimize the likelihood of this, consider avoiding products that contain certain classes of chemicals rather than specific (studied) chemicals. Definitions of chemicals that fall into the chemical classes outlined above can be found in Pharos. See below to links for specific chemical classes.

Alkylphenol ethoxylates (APEs): https://www.pharosproject.net/material/show/2089943
Phthalates: https://www.pharosproject.net/material/show/2072101
Per- and polyfluoroalkyl substances (PFAS): https://www.pharosproject.net/material/show/2072164
Halogenated flame retardants (HFRs): https://www.pharosproject.net/material/show/2072163

• For all material installation, be sure to closely follow the manufacturer’s instructions. Many products require increased ventilation during installation and curing and should be applied/installed only when wearing appropriate safety gear, including, but not limited to, eye protection, respirators, gloves and skin protection. If residents are in place while potentially hazardous materials are being used, take extra precautions. Residents should be moved out of the building during the product application and for the duration of the curing period noted by the manufacturer.

RESOURCES
Product Selection Resources
• GreenWise Gold products have been tested and certified to pass the indoor air quality requirements of the California 01350 Small Chamber Emissions Test, and to contain less than 5 grams VOC per liter, even after tinting with specified colorants. Green Wise Gold certified products meet the same performance and durability standards as the original Green Wise certified products. https://www.greenwisepaint.com/green-wise-gold
• The Red List & Watch List contain the worst in class materials prevalent in the building industry https://livingfuture.org/declare/declare-about/red-list/
• The SCS FloorScore program website includes information about the program, as well as a list of certified products that is updated regularly. http://www.scscertified.com/faq/floorscore.html and http://www.rfci.com.
• GreenGuard Gold certification https://spot.ul.com/main-app/products/catalog/
• HomeFree, is Healthy Building Network’s national initiative supporting affordable housing leaders who are improving human health by using less toxic building materials. The HomeFree website provides healthy building material recommendations and education. https://homefree.healthybuilding.net/
• Product Guides. BuildingGreen’s independent team of editors has compiled guides to more than 100 product categories to help you learn what to look for when selecting green products that avoid negative health impacts. https://www.buildinggreen.com/product-guidance
• Green Seal: Provides information on environmentally preferable products and services. www.greenseal.org/Home.aspx

Guidance Resources

• Pharos provides open access to a wealth of information to support chemical hazard assessment, alternatives assessment, and informed substitution. This includes hazard data for over 140,000 chemicals, data on chemical function, use, and exposure, as well as a forum for discussions about critical hazard assessment issues. It also contains profiles of common content and associated hazards for many types of building products, through Common Product profiles. Pharos is developed and managed by Healthy Building Network. http://www.pharosproject.net

• SixClasses, a project of the Green Science Policy Institute which frames a six classes approach to reducing chemical harm. www.sixclasses.org


• The California EPA Air Resources Board, FAQ on Composite Wood Products. http://www.arb.ca.gov/toxics/compwood/consumer_faq.pdf

• The U.S. Environmental Protection Agency identified phthalates, a chemical used to make sheet vinyl pliable, as a “chemical of concern” on December 30, 2009. https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/phthalates

• “Full Disclosure Required: A Strategy to Prevent Asthma through Building Product Selection” is a report by the Healthy Building Network identifying asthmagens that are included as contents in building materials and making recommendations for product improvement. https://healthybuilding.net/reports/14-full-disclosure-required-a-strategy-to-prevent-asthma-through-building-product-selection

6.5 Environmentally responsible material selection

Mandatory & Optional, 5 points max

RATIONALE
Product selection has environmental implications, both in production as well as throughout operations. Just as with toxicity of building material content, transparency regarding embodied greenhouse gas emissions of materials is a critical first step in identifying optimum product selection. The embodied carbon associated with the products that are specified for a building determine that building’s climate impact before anyone turns on a light. While the overall climate impact of a property will be determined by the sum of its embodied emissions and operations emissions, a high performance building (with low emissions due to operations) built from materials with high embodied energy will release more total emissions than a code-compliant building (from an operating energy perspective) built with materials with moderate embodied emissions. A first step in determining the embodied emissions of building materials is to evaluate the Global Warming Potential of each product through an Environmental Product Disclosure (EPD). Note that many building materials with low embodied emissions also have lower human health hazards.

In addition to evaluating embodied emissions of a project’s materials, the characteristics of timber and the reduction of urban heat islands can be impacted through material specification:
Less than 10% of the old growth forest remains in the United States. The use of salvaged wood and engineered wood products throughout your building for major structural components reduces the need to use old-growth lumber. Forest Stewardship Council (FSC) certified wood encourages forestry practices that are environmentally responsible including protecting plant and animal species, the rights of indigenous people, forest worker safety, and preserving valuable and free ecosystem services such as recreation and filtering water and air. Intact and sustainably managed forests and soils also store the excess greenhouse gases that cause climate change.

Urban heat islands increase local air temperatures due to the absorption of solar energy by the built environment. Reducing the heat-island effect through thoughtful roofing and paving product selection decreases energy consumption by decreasing loads on cooling systems, and it enhances resilience by reducing overheating of buildings in the event of power outages when air conditioning cannot operate.

**REQUIREMENTS**

Use products that comply with the below.

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Mandatory</th>
<th>Optional</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete, steel, insulation</td>
<td>N/A</td>
<td>Submit a publicly disclosed EPD for 90% by volume for all [material] used in the project. Clearly indicate the total Global Warming Potential.</td>
<td>· Compare the GWP of your specified concrete product to the industry average for your region (see NRMCA resource below).</td>
</tr>
<tr>
<td>Roofing</td>
<td>N/A</td>
<td>Install a combination of the following to cover at least 90% of the roofing area:</td>
<td>· EPDs from different sources should not be used comparatively, as there are likely different assumptions underlying their creation.</td>
</tr>
<tr>
<td>· A “green” (vegetated) roof</td>
<td></td>
<td></td>
<td>· Consider prioritizing products with low Global Warming Potential for those materials that make up the larger volumes of the building.</td>
</tr>
<tr>
<td>· For roofs with slopes less than or equal to 2:12, roofing materials that have an SRI of at least 0.65 (initial) or at least 0.50 (3-year aged).</td>
<td></td>
<td>· EPA will sunset its labeling of ENERGY STAR roof products by June 1, 2022, as many states and municipalities have adopted codes which include standards for roof products on commercial buildings that are stricter than the ENERGY STAR Roof Products Version 3 specification in the climate zones where reflective roofs are most beneficial (Zones 1-3). Properties are instead encouraged to implement guidance from EPA’s Heat Island Reduction Program.</td>
<td></td>
</tr>
<tr>
<td>· For roofs with slopes greater than 2:12, install roofing materials that have an SRI of at least 0.25 (initial) or at least 0.15 (3-year aged).</td>
<td></td>
<td>· PVC roofing membranes include phthalates. Consider</td>
<td></td>
</tr>
<tr>
<td>3 points.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Example Action</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
| Paving                  | Use light-colored, high-albedo materials with an initial minimum solar reflectance of 0.33 and/or an open-grid pavement system over at least 50% of the site’s hardscaped area. | - If a roof space is designed and installed in such a way that intends regular resident access and use, that space would be considered a hardscaped area and subject to the paving requirement.  
- Consider using paving materials that both reduce urban heat-island effect and that are water permeable. |
| Wood, non-composite     | Use Forest Stewardship Council (FSC) certified wood or salvaged wood for at least 70% by cost for all structural, framing, sheathing, deckling, subfloor, and finish applications. | 3 points.                                                                                                                         |

**RESOURCES**

- **EPD:** An Environmental Product Declaration is an independently verified and registered document that communicates transparent and comparable information about the lifecycle environmental impact of products. As a voluntary declaration of the lifecycle environmental impact, having an EPD for a product does not imply that the declared product is environmentally superior to alternatives. [https://www.environdec.com/What-is-an-EPD/](https://www.environdec.com/What-is-an-EPD/)


- **The Embodied Carbon Network TM** is a collective group of individuals within focus groups committed to designing embodied and operational carbon out of new and renovated buildings to achieve a carbon-neutral built environment by 2050. [http://embodiedcarbonnetwork.org/](http://embodiedcarbonnetwork.org/)

- **LCA Practice Guide** provides guidance on how to conduct an LCA of a building and provides key resources. [http://www.carbonleadershipforum.org/lca-practice-guide/](http://www.carbonleadershipforum.org/lca-practice-guide/)

- **Carbon Smart Materials Palette:** A project of Architecture 2030, this Palette is an attribute-based design and material specification guide. [https://materialspalette.org/about/](https://materialspalette.org/about/)

- **National Ready Mixed Concrete Association (NRMCA) sustainability resources,** which include industry benchmarks for Global Warming Potential of products with varying strengths for different applications and exposure conditions. Use these regional benchmarks to compare the GWP of your specified concrete product to the industry average for your region. [https://www.nrmca.org/sustainability/EPDProgram/Index.asp#IndustryBaselines](https://www.nrmca.org/sustainability/EPDProgram/Index.asp#IndustryBaselines)

- **Athena Institute:** A nonprofit, Athena’s development of its LCA design tools, the Impact Estimator for Buildings and Pavement LCA, may be used for free by design teams to evaluate the relative climate impacts of material selections in their properties. [http://www.athenasmi.org/our-software-data/overview/](http://www.athenasmi.org/our-software-data/overview/)
• Tally: A Revit® software plug-in which calculates environmental impact of building materials for whole building analysis as well as comparative analysis of design options. [https://choosetally.com/](https://choosetally.com/)

• U.S. Environmental Protection Agency, Heat Island Effect: This site contains information about heat-island effect, its social and environmental costs, and strategies to minimize its prevalence, including shading, cool roofs, green roofs, and coloration of hardscapes. [http://www.epa.gov/heatislands](http://www.epa.gov/heatislands)

• Cool Roof Rating Council (CRRC), Directory of Rated Products: CRRC maintains a third-party rating system of radiative properties of roof surfacing materials. [http://coolroofs.org/products/results](http://coolroofs.org/products/results)

• Lawrence Berkeley National Laboratory, Heat Island Group: The Lawrence Berkeley National Laboratory conducts research to find, analyze and implement solutions to minimizing heat-island effects; its current efforts focus on the study and development of more reflective surfaces for roadways and buildings. [http://heatisland.lol.gov/](http://heatisland.lol.gov/)

• Building Materials Reuse Association: [https://bmra.org/](https://bmra.org/)

### 6.6 Bath, kitchen, laundry surfaces

**Rationale**
The use of durable, cleanable, moisture-resistant materials in wet areas reduces the potential for damage due to moisture and the potential for indoor mold growth that may yield odors and pose health hazards to residents and staff. These materials and proper moisture detailing reduce long-term maintenance costs as well.

**Requirements**
Use materials that have durable, cleanable surfaces throughout bathrooms, kitchens and laundry rooms. Materials installed in these rooms should not be prone to deterioration due to moisture intrusion or encourage the growth of mold.

Use moisture-resistant backing materials such as cement board, fiber cement board or equivalent per ASTM #D 6329 behind tub/shower enclosures. Projects using a one-piece fiberglass tub/shower enclosure are exempt from this requirement.

**Recommendations**
When possible, avoid using materials such as unsealed grout, which traps and holds moisture and can facilitate mold growth.

**Resources**
- Product Guides: BuildingGreen’s independent team of editors has compiled guides to more than 100 product categories to help you learn what to look for when selecting green products that avoid negative health impacts. [https://www.buildinggreen.com/product-guidance](https://www.buildinggreen.com/product-guidance)


### 6.7 Regional Materials

**Rationale**
Building materials that are extracted, processed and manufactured locally to the project site minimize the energy embedded in their transportation and contribute to the local economy. Use of local materials can also reflect local identity, history, or context, increasing sense of connection to place.
REQUIREMENTS
Use products that were extracted, processed and manufactured within 500 miles of the project for a minimum of 90%, based on weight, of the building material.

Building material types that can qualify for these points include the following (every two compliant materials can qualify for 1 point):

- Framing materials
- Exterior materials (e.g., siding, masonry, roofing)
- Flooring materials
- Concrete/cement and aggregate material
- Drywall/interior sheathing materials

*Note: Mechanical, electrical and plumbing components cannot be included in this calculation.*

RECOMMENDATIONS
Natural building materials that are approved by HUD or USDA can qualify for points under this measure.

RESOURCES
- Product Guides. BuildingGreen’s independent team of editors has compiled guides to more than 100 product categories to help you learn what to look for when selecting green products that avoid negative health impacts. https://www.buildinggreen.com/product-guidance

6.8 Managing Moisture: Foundations
*Mandatory*

For all New Construction projects and for all Rehab projects with crawl space foundations

RATIONALE
Moisture can move through building structures in four ways: as bulk water, through capillary action, through air transport, and through vapor diffusion. The dominant type of moisture movement control sought in a given scenario will dictate the type of materials that should be installed, and how those materials should be installed, to either allow or suppress that moisture movement.

Ideally, a property will be designed and constructed with four continuous control layers, listed here in priority in order: 1) continuous water control layer via a weather resistant barrier that includes flashing and sealed penetrations that manages bulk and capillary moisture movement away from the structure, 2) continuous air control layer enclosing the conditioned space, 3) continuous vapor control layer, 4) continuous thermal control layer (insulation)

Specifying these four continuous control layers is simple upon first glance, but, depending on the property’s climate zone, assembly type, and site, complex hygrothermal configuration issues arise very quickly that require careful detailing and material specification. And as we construct buildings that perform well in terms of energy efficiency, our burden to carefully detail moisture control strategies increases.

Consider your property’s foundation. Moisture can migrate through concrete and most other masonry materials. Proper installation of foundation drainage, vapor retarders, and waterproofing materials can greatly reduce the migration of moisture that can occur even in non-saturated soils. While installation of the four continuous control layers in accordance with the unique hygrothermal needs of a property should always be front of mind, the basic prescriptive strategies below will solve for egregious moisture movement across the foundation assembly.

REQUIREMENTS
* Beneath Concrete Slabs (including those in basements and crawl spaces) *(Rehab projects are exempt)*
• Install a capillary break as follows: 4-inch layer of ½-inch diameter or greater clean aggregate OR install a 4-inch uniform layer of sand, overlain with a layer or strips of geotextile drainage matting installed according to the manufacturer’s instructions

• Immediately above the capillary break, install at least 6-mil polyethylene sheeting overlapped at least 6 inches at the seams to serve as a vapor retarder in direct contact with the slab above.

**Beneath Crawl Spaces** *(projects on raised pier foundations with no foundation walls are exempt)*

• Install at least 8-mil cross-laminated polyethylene on the crawl floor, extended up at least 12 inches on piers and foundation walls, and with joints overlapping at least 12 inches. The 8-mil and the cross-lamination ensure longevity of the poly.

• Line the likely “high-traffic” areas of the crawl space with foam board, so the polyethylene beneath will not be disturbed.

**RECOMMENDATIONS**

• Where a high water table is anticipated or observed or has been documented in the soil boring report, or where specifically recommended by the geotechnical engineer, provide subsurface drain tile or other drainage system in strict accordance with the geotechnical engineer’s or other qualified professional’s recommendations to divert underground water away from the structure.

• Ensure that subsequent trades’ work does not puncture the vapor retarder.

**RESOURCES**

• Indoor airPLUS construction specifications [https://www.epa.gov/indoorairplus/indoor-airplus-program-documents](https://www.epa.gov/indoorairplus/indoor-airplus-program-documents)


• Building Science Corporation: Features articles on conditioned crawl spaces. [http://www.buildingscience.com/resources/cond-crawlspaces](http://www.buildingscience.com/resources/cond-crawlspaces)


• The Partnership for Advanced Technology in Housing: This site has an extensive, searchable resource section with pertinent information about construction solutions. [https://www.huduser.gov/portal/consumer/home.html](https://www.huduser.gov/portal/consumer/home.html)

**6.9 Managing Moisture: Roofing and Wall Systems**

*Mandatory*

For all New Construction projects and those Rehab projects that include replacing particular assemblies called out below

**RATIONALE**

Moisture can move through building structures in four ways: as bulk water, through capillary action, through air transport, and through vapor diffusion. The dominant type of moisture movement control sought in a given scenario will dictate the type of materials that should be installed, and how those materials should be installed, to either allow or suppress that moisture movement.

Ideally, a property will be designed and constructed with four continuous control layers, listed here in priority in order: 1) continuous water control layer via a weather resistant barrier that includes flashing and sealed penetrations that manages bulk and capillary moisture movement away from the structure, 2) continuous air control layer enclosing the conditioned space, 3) continuous vapor control layer, 4) continuous thermal control layer (insulation)
Specifying these four continuous control layers is simple upon first glance, but, depending on the property’s climate zone, assembly type, and site, complex hygrothermal configuration issues arise very quickly that require careful detailing and material specification. And as we construct buildings that perform well in terms of energy efficiency, our burden to carefully detail moisture control strategies increases.

Consider your property’s wall systems. Diverting water from the project prevents bulk water entry into wall systems, which can contribute to moisture-related problems such as mold and the deterioration of wood and other building materials. Properly installed weather barriers, including flashing and drainage planes, help direct water away from wall cavities. While installation of the four continuous control layers in accordance with the unique hygrothermal needs of a property should always be front of mind, the basic prescriptive strategies below will solve for egregious moisture movement across the foundation assembly.

**REQUIREMENTS**

Provide water drainage away from walls, windows and roofs by implementing the following techniques:

**Water Management: Wall Systems**
- Provide a continuous housewrap/weather-resistive barrier with sheets lapped shingle-style to prevent bulk water that penetrates the finished exterior cladding system from entering the wall assembly or being introduced through window or door openings or through other penetrations. Alternatively, install a fluid applied weather-resistive barrier in accordance with manufacturer’s instructions.
- Flashings at roof/wall intersections and wall penetrations (i.e., plumbing, electrical, vents, HVAC refrigerant lines and the like in addition to windows and doors) must be integrated with the weather-resistive barrier and drainage plane to prevent bulk water from entering the exterior wall assembly.
- Provide a pathway for bulk water that may be behind the exterior cladding system to safely exit the exterior wall assembly. For example, a drainage plane and weep holes for brick-clad structures.

**Water Management: Roof Systems**
- Install drip edge at entire perimeter of roof.
- At wall/roof intersections, maintain ≥2” clearance between wall cladding and roofing materials, install flashing along the intersection, and use kick-out flashing.

**RECOMMENDATIONS**
- Many of the strategies required through this criterion are also required by code. The importance of proper installation of these materials is critical and will impact the building throughout its time in service.
- Ensure that a vapor retarder with an appropriate permeability rating is installed on the correct side of the wall assembly, based on climate considerations and drying potential.

**RESOURCES**
- U.S. Environmental Protection Agency, Indoor airPLUS Construction Specifications: Includes detailed construction specifications, several of which are focused on moisture management. [https://www.epa.gov/indoorairplus/indoor-airplus-program-documents](https://www.epa.gov/indoorairplus/indoor-airplus-program-documents)
6.10 Construction Waste Management

*Mandatory and Optional | 6 points maximum*

**RATIONALE**
Diverting construction debris, and recycling and reusing materials whenever possible, reduces waste and disposal costs. In addition, construction waste management reduces the project’s impact on landfills.

**REQUIREMENTS**
Develop and implement a waste management plan that reduces non-hazardous construction and demolition waste through recycling, salvaging or diversion strategies; maintain documentation on diversion rate for each selected strategy.

*Mandatory:* All projects must select either one pathway in Option 1 (a or b), two pathways in Option 2 (c – j), or one pathway in Option 3 (k or l). No points are accrued for compliance with this mandatory requirement.

*Optional:* Projects may select additional pathways to accrue optional points. These pathways may be from within a different Option from what the project chose to comply with as mandatory. Not to exceed 6 optional points.

**Option 1: Measured by Percentage (Mandatory: select one)**

a. Provide a waste plan that diverts 75% of the construction waste from the landfill. [1 point]

b. Provide a waste plan that diverts 95% of the construction waste from the landfill. [2 points]

**Option 2: Material Specific (Mandatory: select two)**

c. Avoid disposal of all cardboard. [1 point]

d. Avoid disposal of all wood. [1 point]

e. Avoid disposal of all drywall. [1 point]

f. Avoid disposal of all metals. [1 point]

g. Avoid disposal of all concrete, brick and asphalt. [1 point]

h. Avoid disposal of all insulation, foam, and plastics [1 point]

i. Avoid disposal of all carpet. [1 point]

j. Develop and implement a comprehensive efficient framing plan that minimizes all waste by design. [1 point]

**Option 3: Minimizing Construction Waste — New Construction only (Mandatory: select one)**

k. Total construction waste to landfill or incinerator <2.5 lbs /SF of building [2 points]

l. Total construction waste to landfill or incinerator <1.5 lbs /SF of building [3 points]

**RECOMMENDATIONS**

- Consider creating a feedback loop on waste generation from the site to the person responsible for material purchasing and/or paying disposal costs. The feedback loop could be as simple as a photo record of the dumpster after each major stage of construction, shared back with the materials purchaser and/or whom tracks waste disposal costs. Use this information to hone purchasing and minimize materials waste.

- Avoid disposal of materials by instead donating them to nonprofit organizations.

- Investigate and document local options for recycling or reusing all anticipated major constituents of the project waste stream, including cardboard packaging and “household” recyclables (e.g., beverage containers).

- Create detailed framing plans or scopes of work and accompanying architectural details for use on the job site to proactively reduce waste. Create a detailed cut list and lumber order prior to construction.

- For projects with limited access to recycling centers, consider waste diversion strategies such as using panelized walls and roof trusses to minimize total materials.

- Consider recycling carpet for rehab projects when carpeting is being removed. The specification language below may be customized and included to determine whether carpet recycling is feasible and cost-effective in your locale.
- Vendor shall supply a price quote to recycle carpet and carpet components at 100%, 50% and 30% of product tonnage.
- Property manager shall identify the carpet product and polymer, nylon, polypropylene (which is documented on carpet specification). This will enable the carpet vendor to ascertain the recyclability of the product.
- Some manufacturers of drywall and certain types of ceiling tiles will accept the return of old materials for reprocessing.

**RESOURCES**

  [https://p2infohouse.org/ref/45/44120.pdf](https://p2infohouse.org/ref/45/44120.pdf)
- NAHB Research Center, Best Practices for Construction Waste Management: This site includes frequently asked questions, case studies, reports and various links. It includes A Builder’s Field Guide, which includes guidance for creating a step-by-step construction waste management and recovery plan.
  [https://www.wbdg.org/resources/construction-waste-management](https://www.wbdg.org/resources/construction-waste-management)
- U.S. Environmental Protection Agency, WasteWise Program: This site has information about the WasteWise Building Challenge program, including articles, publications, and various links and resources for more information.
  [https://www.epa.gov/smm/wastewise](https://www.epa.gov/smm/wastewise)
- U.S. Environmental Protection Agency, Construction and Demolition Debris: This site includes basic information on construction and demolition debris disposal practices, regional and state programs, publications, and links.
- Construction & Demolition Recycling Association (CDRA): This site includes links to websites on recycling concrete, asphalt roof shingles and drywall, as well as a state-by-state listing of construction waste reusers and recyclers.
  [http://www.cdrecycling.org](http://www.cdrecycling.org)

6.11 Recycling storage

*Optional*

**RATIONALE**

Recycling prevents usable materials from entering the waste stream. Providing bins within the living space for the separation of recyclables from trash encourages higher rates of recycling.

**REQUIREMENTS**

For projects in locations with municipal recycling infrastructure and/or recycling haulers, provide separate bins for the collection of trash and recycling for each dwelling unit and all shared community rooms.

For projects in locations without municipal recycling infrastructure or recycling haulers, advocate to the local waste hauler or municipality for regular collection of recyclables. Commit to providing recycling bins if service becomes available.

**RECOMMENDATIONS**

- Ensure that the recycling program has management support and include your procedures in the project maintenance manual (Criterion 8.1) and Resident Manual (Criterion 8.3).
- Ensure that signage and bin colors are consistent across the project, and with local community norms where applicable. Consider the opportunity for functional artwork through creative/artistic recycling containers:
  [http://www.thesteelyard.org/publicprojects/aboutpp](http://www.thesteelyard.org/publicprojects/aboutpp)
- Designate an area for recyclable collection and storage that is appropriately sized and located in a convenient area.
- Identify local waste handlers and buyers for glass, plastic, metals, office paper, newspaper, cardboard and organic wastes. This may include artists or public art organizations seeking to divert solid waste by creating art using recycled materials.
• In multifamily buildings, instruct occupants on recycling procedures through clear and visible signs that include pictures and that are translated into a variety of languages spoken by residents.

RESOURCES
• Enterprise Community Partners Resource Center: Enterprise Green Communities hosts a variety of resident engagement tools and trainings, including a module on waste reduction and recycling. Search for “Resident Engagement” at this link: http://www.enterprisecommunity.com/resources
• New York City Department of Sanitation, What to Recycle with Sanitation: New York City’s Department of Sanitation maintains a host of good background information on recycling basics. Contact your city/county about local recycling policies and procedures. https://www1.nyc.gov/assets/dsny/site/services/recycling/what-to-recycle
• The City of Saint Paul’s Mears Park combines recycling and public art to increase quality of life and expand recycling opportunities https://www.stpaul.gov/news/recycling-and-art-meet-mears-park
Category 7: Healthy Living Environment
7. Healthy Living Environment

I. REDUCING EXPOSURE TO TOXINS

7.1 Radon Mitigation

Mandatory
New Construction and Substantial Rehab

RATIONALE
Radon is a radioactive gas generated by the natural decay of uranium in the soil and rock below and around buildings. It can enter homes through holes and cracks. Breathing radon gas increases the risk of lung cancer. Radon is the leading environmental cause of cancer mortality in the United States. Exposure to radon is the second leading cause of lung cancer in the U.S., after smoking. A smoker who is also exposed to radon has a much higher risk of lung cancer. The only way to know if homes have elevated radon levels is to test. Testing is easy and inexpensive, and elevated radon levels can be reliably mitigated, if necessary, with simple, durable and commonly available materials and techniques.

REQUIREMENTS
New Construction
In EPA Zone 1 areas, install passive radon-resistant features below the slab. Also install a vertical vent pipe with junction box within 10 feet of an electrical outlet in case an active system should prove necessary in the future.

Exception: Buildings with garages attached to a foundation system do not require soil gas vent systems if compliant with ANSI/AHRMA MAMF-2017 for multifamily buildings or ANSI/AHRMA MAH-2014 for single family homes. In time-sensitive situations, consistent with HUD's radon policy, a radon professional may sample a minimum of 25% of randomly selected ground-level dwelling units.

Substantial Rehab
Test Substantial Rehab projects located in EPA Zone 1 areas under the supervision of a radon professional for the presence of radon in accordance with ANSI-AARST RMS-MF-2018 for multifamily buildings or ANSI-AARST SGM-2017 for single family homes. In time-sensitive situations, consistent with HUD’s radon policy, a radon professional may sample a minimum of 25% of randomly selected ground-level dwelling units.

If the radon level is above the EPA action level of 4 pCi/L (pico curies per liter), install radon-reduction measures per ANSI-AARSTR RMS-MF 2018 for multifamily buildings or SGM-SF-2017 for homes.

After all rehab work is complete, test again. If radon levels after renovation are ≥ 4 pCi/L AND higher than the radon levels before upgrades, install mitigation in accordance with ANSI-AARST RMS-MF 2018 for multifamily or, for homes, either ANSI-AARST SGM-SF-2017 or ASTM 2121. For post-test levels between 4 and 10 pCi/L, consider a long-term test (minimum 90 days) to confirm an increase before undertaking the mitigation process.

A radon professional shall have:

- Certification from either the American Association of Radon Scientists and Technologists’ (AARST) National Radon Proficiency Program (NRPP) or the National Radon Safety Board (NRSB), and
- Certification/license from the state in which the testing or mitigation work is being conducted, if the state has this requirement.
RECOMMENDATIONS


• Short-term tests offer an affordable screening method for many homes. Longer-term testing may provide a more accurate representation of the annual exposure to radon and the need for mitigation. If short-term results are between 2 and 10 picocuries per liter (pCi/L), consider conducting a long-term radon test (minimum 90 days).

• Elevated levels of radon have been found in homes built in all three zones on EPA’s Map of Radon Zones. Consult your state radon program for current information about radon in your area.

• A radon vent fan should be installed when the test result is 4 pCi/L or more. EPA recommends that all homes built with radon-resistant features in EPA Radon Zone 1 pre-emptively include a radon vent fan. EPA also recommends radon-resistant features for homes built in EPA Radon Zones 2 and 3, along with testing for radon prior to occupancy.

• Guidance for underground garages:
  – International Mechanical Code (IMC), which requires 0.75 cfm/sf for garages serving multifamily projects, and ASHRAE Standard 62.1-2010 section 5.15, which encourages maintaining attached garage air pressure at or below adjacent occupiable spaces.
  – If the pressure management strategy is not designed to continually maintain negative pressure in the underground garage space relative to the occupied spaces (i.e., if a timer is used for exhaust fan control), then radon control is not assured. In such situations, use either the radon-resistant New Construction techniques summarized in IAP spec 2.1 (http://www.epa.gov/indoorairplus/pdfs/construction_specifications.pdf) and detailed further in EPA guidance and/or test the occupied space for radon.
  – If the underground garage does not cover the entire foundation (i.e., some living space is directly above a slab or crawlspace), then those portions of the project should be handled per Indoor airPLUS specs.
  – Any mechanical or service closets in the garage area that are connected to the conditioned enclosure should be aggressively sealed between the garage and the conditioned space.

• For projects located on brownfields or proximate to industrial operations that are not in EPA Zone 1, consider testing for radon to determine if elevated levels exist on-site. If the radon level is elevated above 4 pCi/L (picocuries per liter), install radon-reduction measures.

• Preemptive radon-reduction measures include installing airtight drain fittings (e.g., trap or flange system) in the floor drains of the foundation; sealing and caulking penetrations, openings or cracks in below-grade walls and floors that contact the ground with a sealant that meets the requirements of ASTM C920; covering exposed earthen floors in basements and crawlspaces according to Section 1.2 of EPA’s Indoor airPLUS Construction Specifications; air-sealing sumps by installing an airtight sump cover in such a way that water can drain from above (e.g., with a ball valve) and below the sump cover.

RESOURCES

• U.S. Environmental Protection Agency. http://www.epa.gov/radon/zonemap.html Or contact your state radon coordinator through the state health office to determine if your project is located in a Zone 1 radon area. http://www.epa.gov/radon/whereyoulive.html

• American Lung Association, Radon Fact Sheet: This is a general overview of the health risks associated with radon exposure. http://www.lungusa.org/healthy-air/home/resources/radon.html


• National Center for Healthy Housing, “Radon-Resistant Construction: Low-Rise Multi-Family Housing.” https://nchh.org/resource-library/Factsheet_Radon--no%20HDF.pdf
7.2 Reduce Lead Hazards in Pre-1978 Buildings

Mandatory
Substantial rehab on buildings constructed before 1978

RATIONALE
In 1978 the federal government banned consumer uses of lead-containing paint. In homes built before that year, risk of exposure exists; lead from paint is one of the most common causes of lead poisoning. Exposure to lead dust, lead in soil and deteriorated lead-based paint poses significant risks to young children (<6 years) and pregnant women, affecting long-term neurological development, IQ and learning issues. In rare cases, extreme lead exposure can result in death. Opportunities exist to control lead hazards in pre-1978 buildings as part of renovation projects.

REQUIREMENTS
Conduct lead risk assessment or inspection to identify lead hazards. Control identified lead hazards using lead abatement or interim controls, using lead-safe work practices that minimize and contain dust. Follow EPA or state and/or local laws and requirements, where applicable. Alternatively, follow standard lead treatments defined by HUD as a series of hazard reduction measures designed to reduce all lead-based paint hazards in a dwelling unit without the benefit of a risk assessment or other evaluation (25 CFR 34.110).

RECOMMENDATIONS
- Replace windows that have deteriorated lead-based paint with energy-efficient windows.
- With the exception of paint that is tested and found not to contain lead-based paint in accordance with 40 CFR 745.82(a), follow renovation requirements of 40 CFR 745 Subpart E and correct the underlying cause of deterioration.
- Perform dust lead clearance testing at the conclusion of renovation work; compare against EPA dust lead clearance standards.
- Remove or cover lead-contaminated soil so that it is inaccessible to children. For gardening, use raised beds with lead-free soil.

RESOURCES
- Find information from the EPA about lead abatement, inspection and risk assessment, as well as find accredited firms, here: https://www.epa.gov/lead/lead-abatement-inspection-and-risk-assessment
- Find information from HUD about lead-safe work practices here: https://www.hud.gov/program_offices/healthy_homes

7.3 Combustion Equipment

Mandatory
RATIONALE
Direct-vent appliances bring outdoor air through a sealed pipe and help exhaust combustion products directly outdoors through another hard-piped vent. No indoor air is used, so there is very little risk of spillage or back-drafting. Power-vented appliances rely on indoor air, but use a fan to push exhaust products through the flue to the outside. These are much less susceptible to spillage and back-drafting than conventional units.

REQUIREMENTS
For new construction and rehab projects, specify power-vented or direct-vent equipment when installing any new combustion appliance for space or water heating that will be located within the conditioned space.

If there are any combustion appliances in the conditioned space, install one hard-wired carbon monoxide (CO) alarm with battery backup function for each sleeping zone, placed per National Fire Protection Association (NFPA) 720.

In Substantial and Moderate Rehabs, if there is any combustion equipment located within the conditioned space for space or water heating that is not power-vented or direct-vent and that is not scheduled for replacement, conduct combustion safety testing prior to and after the retrofit. Conduct the combustion safety testing for central systems and for 10% of these individual dwelling unit systems per RESNET Guidelines for Combustion Safety and Developing Work Orders or BPI Combustion Safety Test Procedures for Vented Appliances. Report any deficiencies immediately to the owner or owner’s representative in any failed tested system.

This criterion does not apply to projects without any combustion equipment (i.e., space and water heating equipment, cook tops, dryers or any other combustion equipment) nor to projects with combustion equipment located only in detached utility buildings or open-air facilities.

RECOMMENDATIONS
CO and smoke detectors may be hard wired to the heating and DHW system, thus activating if that equipment malfunctions.

RESOURCES
- U.S. Environmental Protection Agency, Combustion Products and Carbon Monoxide: These two extensive EPA sites describe the sources of carbon monoxide and other combustion gases, their health effects, steps to reduce exposure, and related standards and guidelines, and provide additional resources and links. 
- NFPA 720 contains requirements for the performance, installation, operation, inspection, testing and maintenance of CO detection and warning equipment. These requirements address installations of commercial systems and components as well as installations of single- and multiple-station CO alarms and household CO detection systems. http://www.nfpa.org/codes-and-standards/document-information-pages?mode=code&code=720
- Underwriters Laboratories, Product Safety Tips: CO Alarms: This site provides a basic overview of the problems associated with carbon monoxide, as well as tips about purchasing and installing carbon monoxide alarms. https://code-authorities.ul.com/about/blog/carbon-monoxide-alarm-considerations-for-code-authorities/
7.4 Garage Isolation

**Mandatory**

**RATIONALE**
Carbon monoxide inhalation can be dangerous to human health. The air barrier and air sealing will help prevent carbon monoxide migration from the garage to the living space, and the CO alarm will help ensure that residents are alerted in the case of accidental accumulation of the gas.

**REQUIREMENTS**
- Provide a continuous air barrier between the conditioned space and any garage space to prevent the migration of contaminants into the living space. Visually inspect common walls and ceilings between attached garages and living spaces to ensure that they are air-sealed before insulation is installed.
- Do not install ductwork or air handling equipment in a garage.
- Fix all connecting doors between conditioned space and garage with gaskets, or otherwise make substantially airtight with weather stripping.
- Install one hard-wired carbon monoxide (CO) alarm with battery backup function for each sleeping zone of the project, placed per National Fire Protection Association (NFPA) 720, unless the garage is mechanically ventilated or an open parking structure as defined by code.

**RECOMMENDATIONS**
Refer to ASHRAE 62.1 for garage contaminant isolation measures.

**RESOURCES**

7.5 Integrated Pest Management

**Mandatory**

**RATIONALE**
Integrated pest management (IPM) is an approach to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment. While pest damage can be, and is often, controlled through application of pesticides, IPM is a more wholistic approach with applications in building design, construction, and operations. Incorporating pest prevention in the design of new buildings and in retrofits increases the durability of the building and, in the end, saves time and money by proactively taking steps to prevent conditions that attract pests. Sealing of cracks and penetrations will minimize entry points for pests such as rodents and cockroaches. Exposure to allergens from pests is linked with asthma and respiratory issues. Rodents may also carry diseases. Avoiding unnecessary pesticides, improving resident housekeeping, and promptly responding to pest problems and conditions that contribute to pests will reduce the chemicals needed to treat pests and will keep homes pest-free longer than solely relying on a routine chemical treatment program.
**REQUIREMENTS**

Design for easy inspection of all pest-prone areas (interior and exterior), and engineer slabs and foundations to minimize pest entry.

Seal all wall, floor and joint penetrations with low-VOC caulking or other appropriate nontoxic sealing methods (window screens, door sweeps, escutcheon plates, elastomeric sealants) to prevent pest entry. Use rodent- and corrosion-proof screens (e.g., copper or stainless steel mesh or rigid metal cloth) for openings greater than ¼-inch. Also pay close attention to sealing off entry points under kitchen and bathroom sinks.

During all future repair work by building staff, utilities and contractors, reseal these areas once repair or installation work is completed.

**RECOMMENDATIONS**

- Refer to Maintenance and Resident Manuals (Criteria 8.1 and 8.3) for complementary practices.
- Plan exterior surfaces, lighting, drainage and landscaping to minimize the attractiveness of the site to pests.
- Preventative pest management work should be completed in conjunction with air sealing. Project teams should work with an air sealing contractor and a pest management professional to ensure that IPM strategies are part of the scope.
- Rehabilitation of an existing building provides the opportunity to address physical barriers that make handling garbage difficult. Engage with residents and building maintenance staff to identify and correct problems with the collection and storage of waste (e.g., inadequate space in trash rooms, narrow stairs, improper signage, unsafe access to exterior trash receptacles, etc.).

**RESOURCES**

- The National Center for Healthy Housing, Integrated Pest Management Interventions for Healthier Homes Case Study Series. [https://nchh.org/who-we-are/nchh-publications/case-studies/ipm-interventions-for-hh-case-studies/](https://nchh.org/who-we-are/nchh-publications/case-studies/ipm-interventions-for-hh-case-studies/)

### 7.6 Smoke-Free Building

*Mandatory. Exception: Permanent Supportive Housing*

**RATIONALE**

Secondhand smoke is the third leading cause of preventable death in this country. Air filtration and ventilation systems do not eliminate the health hazards caused by secondhand smoke. Smoke from one unit may seep through the cracks, be circulated by a shared ventilation system or otherwise enter the living space of another. In addition to the negative health effects, smoking significantly increases fire hazards and increases cleaning and maintenance costs.

**REQUIREMENTS**

Implement and enforce a no-smoking policy in all common and individual living areas, and within a 25-foot perimeter around the exterior of all residential projects. Lease language must prohibit smoking in these locations and specify that it is a violation of the lease to smoke. The no-smoking restriction applies to all owners, tenants, guests and service people. The use of e-cigarettes is prohibited wherever smoking is prohibited.
RECOMMENDATIONS

• If implementing a no-smoking policy in an occupied building, plan on a 6–8 month resident engagement effort. Excellent resources exist — see below.

• If working with a new or an unoccupied building, all building marketing materials should clearly state the smoke-free policy. Project owners and managers should inform residents that they are prohibited from smoking in or around the property. This information should be incorporated into the Resident Manual as well as manuals for building management and maintenance staff (see Criteria 8.1 and 8.3).

• A designated outdoor smoking area should be provided as an alternative arrangement for those who smoke or vape. Design this area to be as attractive as possible, provide shelter from the elements, and be accessible for users with various forms of mobility in order to encourage smokers to smoke in this location rather than inside the building or within the 25-foot–perimeter no-smoking buffer area.

• Effectively communicate the rationale for implementing the no-smoking policy to residents, with particular attention to and education around the harms of 2nd and 3rd hand smoking.

• Provide resources and education around smoking cessation and connect to local resources and partners for assistance. See Resources for more information.

• Provide suitable receptacles in the designated outdoor smoking area for the disposal of cigarette butt litter. Ensure that the receptacles are inside the project line and do not encroach into public space.

RESOURCES

  https://www.hud.gov/sites/documents/PDFOWNERS.PDF

• American Lung Association, Air Quality in the Home: This site includes an entire section devoted to indoor air quality in the home. Choose “Air Quality” at the bottom of the screen and then click “Indoor Air Quality” and “Air Quality in the Home” to find numerous articles and educational pieces about maintaining a healthy indoor environment. http://www.lungusa.org

• Southeastern PA Tobacco Control Project, Smoke Free Multi-Unit Housing Enforcement Guide
  http://www.sepatobaccofree.org/sites/default/files/muhenforcementguide_10_3_18.pdf

• Smoke Free Housing NY, Templates:

• New York Landlord Smoke-Free Housing Toolkit

• U.S. Department of Housing and Urban Development, “Implementing HUD’s Smoke-Free Policy in Public Housing: HUD Guidebook”
  https://www.hud.gov/sites/documents/SMOKEFREE_GUIDEBK.PDF

• U.S. Environmental Protection Agency, Indoor Air Quality Division: This site has numerous resources related to indoor air quality in homes, including reports and web links. https://www.epa.gov/indoor-air-quality-iaq

• HUD Smoke-Free Housing Tool Kit: https://www.hud.gov/sites/documents/PDFOWNERS.PDF

• Capital District Tobacco-Free Coalition: http://www.smokefreecapital.org

• New York City Department of Health’s Smoke-Free Housing Resources:
  https://www1.nyc.gov/site/doh/health/health-topics/smoking-smoke-free-housing.page

• Michigan Smoke-Free Apartments: http://www.mismokefreeapartment.org/listing.html

• Smoke-Free Housing Coalition of Maine: https://breatheeasymaine.org/

• Minnesota Smoke-Free Housing: http://www.mnsmokefreehousing.org

• Smoke-Free Environments Law Project: http://www.tcsq.org/sfelp/home.htm

• Tobacco Technical Assistance Consortium: http://www.ttac.org
• Online record of LISC webinar: “Going Smoke Free: Best Practices of Multifamily Housing Owners & Managers”:

• Smoking Cessation Leadership Center: https://smokingcessationleadership.ucsf.edu/campaigns/smoke-free-public-housing-helping-smokers-quit

• Live Smoke Free: http://www.mnsmokefreehousing.org/

II. MANAGING THE INDOOR ENVIRONMENT

7.7 Ventilation

Mandatory: New Construction and Substantial Rehab
Optional: Moderate Rehab  |  X points maximum

RATIONALE
Optimal ventilation improves indoor air quality, contributing to a healthier living environment.

Properly sized and controlled exhaust fans in bathrooms and kitchens remove moisture-laden air, lowering the potential for indoor mold growth that may yield odors, pose health hazards to residents and create durability concerns. Kitchen fans also help remove carbon dioxide and carbon monoxide over fuel-burning appliances and other air contaminants that may be byproducts of cooking. And ENERGY STAR–qualified bathroom fans use 65% less energy on average than standard models and move more air per unit of energy used with less noise. Timers and humidistat sensors help to ensure that fans regularly remove moisture and provide adequate ventilation.

REQUIREMENTS
For each dwelling unit, in full accordance with ASHRAE 62.2-2010, install:

• A local mechanical exhaust system in each bathroom [X points if Moderate Rehab]
• A local mechanical exhaust system in each kitchen [X points if Moderate Rehab]
• A whole-house mechanical ventilation system [X points if Moderate Rehab]

Verify and ensure that these dwelling unit ventilation system flow rates are either within +/- 15 CFM or +/- 15% of design value.

Note:

1. Local exhaust airflow may be credited toward the whole-house ventilation airflow requirement when local exhaust fans are used to provide whole-house mechanical ventilation.

2. For Substantial and Moderate Rehab projects, particularly those of a historic or landmark nature, consult Appendix A of ASHRAE 62.2-2010 for compliance options for ventilation in existing buildings.

3. Projects that achieve certification with Passive House Institute United States (PHIUS+) are permitted to follow the Passive House ventilation requirements as an alternative to meeting the Criterion 7.6 ventilation requirements as they relate to kitchens, so long as there are no combustion fueled appliances within the dwelling unit and at minimum there is a continuous kitchen exhaust rate of 25 CFM per 2009 IRC Table M1507.3.

Also, for each multifamily building of four stories or more, in full accordance with ASHRAE 62.1-2010, install:
• A mechanical ventilation system for all hallways and common spaces \([X \text{ points if Moderate Rehab}]\)

For all project types, in addition to the above requirements:

• All systems and associated ductwork must be installed per manufacturer's recommendations.

• All individual bathroom fans must be ENERGY STAR-labeled. If not running continuously, these must either be wired to turn on with the light switch or equipped with a humidistat sensor, timer or other control (e.g., occupancy sensor, delay off switch, ventilation controller) to ensure adequate run-time.

• If using central ventilation systems with rooftop fans, each rooftop fan must be direct-drive and variable-speed with speed controller mounted near the fan. Fans with design CFM 300-2000 must also have an ECM motor.

RECOMMENDATIONS

• For climate-specific strategies, consult ASHRAE 62.2-2010 and the Resources below.

• Avoid exceeding ventilation requirements, particularly when using local exhaust. Excessive exhaust may depressurize dwelling units, potentially back-drafting combustion appliances.

• Proper installation of each ventilation system is as critical as its design to its performance. Consult the Resources below for best-practice installation techniques. Also consider testing exhaust fan performance at rough-in: Hold two squares of toilet paper to the exhaust fan. If, when on, the fan can hold these squares, as a rule of thumb you may assume that the fan is pulling 50 CFM. If the fan is not able to hold the squares of toilet paper, examine the fan's installation.

• Placing a single multi-port, in-line fan in each dwelling unit to exhaust air from the kitchen and bathroom(s) is an acceptable ventilation strategy. If utilizing this strategy, in addition to meeting local code requirements for the minimum distance of thru-wall exhaust vents from windows, ensure that the placement of the exhaust grill meets code requirements for kitchen ventilation.

• With continuous, demand-controlled or other centralized ventilation systems, the project team (specifically, the designer, installer and maintenance staff) should ensure that the systems are balanced from unit to unit to meet the requirements of ASHRAE 62.2-2010. Also, consider installing fans with ECM motors for fans designed to exhaust more than 250 CFM.

• Consider the following mechanical controls for introducing outside air:
  – Flow control/butterfly damper to regulate the amount of air introduced through an outside air intake.
  – Shut-off damper (electronic or barometric) to close an outside air intake when the HVAC system is not calling for air.
  – Fan timer /cycler on the HVAC system to regulate the length of time an outside air intake remains open.

RESOURCES

• ASHRAE Standard 62.2-2010: This site provides a viewable version of ASHRAE Standard 62.2-2010. http://www.ashrae.org/technology/page/548

• “Ventilate Right: Ventilation Guide for New and Existing California Homes”: This site provides a thorough, user-friendly guide to installing ventilation systems in accordance with ASHRAE 62.2 as well as best practices in ventilation system design and installation. Equally applicable to projects outside the state of California. https://homes.lbl.gov/ventilate-right

• Building America Solution Center: This searchable database includes pictorial guides for best practices in ventilation system design and installation. https://basc.pnnl.gov/resource-guides


• ENERGY STAR: This website describes the advantages of ENERGY STAR–labeled ventilation fans and provides product and manufacturer lists. [http://www.energystar.gov/index.cfm?c=vent_fans.pr_vent_fans](http://www.energystar.gov/index.cfm?c=vent_fans.pr_vent_fans)

• Home Ventilating Institute (HVI), Ventilation Systems and Controls: The HVI provides consumers an assurance of product performance. It also works to increase public awareness of the need for good ventilation and provides resources for selecting the proper ventilation products. [https://www.hvi.org/](https://www.hvi.org/)

• University of Minnesota, Common Questions about Heat and Energy Recovery Ventilators: This site provides a brief, easy-to-understand overview of heat- and energy-recovery ventilators. [http://www.mnshi.umn.edu/kb/scale/hrverv.html](http://www.mnshi.umn.edu/kb/scale/hrverv.html)

### 7.8 Dehumidification

**Mandatory for properties following Criterion 5.2a**

**Optional for properties following Criterion 5.1a or b**

**N/A for properties following Criterion 5.2b and 5.4**

**RATIONALE**

Interior relative humidity levels above 55% are often uncomfortable and can create the conditions for growth of mold, mildew, bacteria, and other biological allergens. The more energy efficient a building, the greater the need to manage its moisture flow. Often, the heating & cooling system cannot sufficiently manage a building’s temperature and moisture levels throughout the year—traditional systems are designed to manage temperature only, and they run less frequently in energy efficient homes. Supplemental dehumidification is often needed to manage the property’s moisture loads, particularly in cooling-dominated climates.

**REQUIREMENTS**

For projects located in Climate Zones 1-3 and 4A, complete one of the following:

Design, select, and install equipment to keep relative humidity < 60%. This will often require ancillary dehumidification systems.

**OR**

Equip all dwelling units with dedicated space, drain, and electrical hook-ups for permanent dehumidification systems to be installed if needed. Install interior RH monitoring equipment (e.g. smart thermostats with hygrometers) with alerts. For multifamily properties, provide remote access for building operations and maintenance staff to monitor relative humidity and override system controls as necessary.

**RECOMMENDATIONS**

• As buildings become more energy efficient and loads decrease, proper sizing and thoughtful approaches to year-round moisture control become more critical in all climate zones.

• For projects located in humid climates, supplemental dehumidification may be necessary to maintain comfort during times of high ambient relative humidity. Design a system with the capacity to meet ASHRAE requirements, and then provide additional accommodations to adjust the outside air introduced as needed.

• Use ACCA Manual LLH sizing calculations to size your systems to maintain interior RH below 60% ; refer to Appendix 3 Ancillary Dehumidification for explicit latent load guidance

• Carefully consider interior loads in your HVAC and dehumidification sizing exercises; dense properties may require more dehumidification than initially expected

• Consider the unintended consequences of installing ancillary dehumidifiers—the heat generated may require adjustments to sensible HVAC sizing
• Consider the project's ventilation system. While balanced systems and ERVs will not necessarily eliminate the need for stand-alone dehumidification, ventilation strategies that do not exacerbate interior moisture loads are preferred.

RESOURCES
• Ductwork for ERVs, Dehumidifiers, and Forced-Air Heating Systems, David Treleven, Building Green https://www.greenbuildingadvisor.com/article/ductwork-erds-dehumidifiers-forced-air-heating-systems
• Whole House Dehumidification, Building America Solution Center https://basc.pnl.gov/resource-guides/whole-house-dehumidification

7.9 Construction Pollution Management
Optional

RATIONALE
Left unchecked, particulate matter and air pollution produced by typical construction practices can negatively impact the health and well-being of people working with or living near the construction site.

REQUIREMENTS

Earn the EPA Indoor airPlus label

OR

In all dwelling units, seal all return and supply floor ducts and returns throughout construction to prevent construction debris from entering

OR

Flush all dwelling units after completion of construction and prior to occupancy either for at least 48 hours (may be nonconsecutive) with all windows and interior doors open and all HVAC fans running or with at least 14,000 ft3 per ft2 of floor area

RECOMMENDATIONS
• Consider testing dwelling unit air quality to ensure desired performance levels are achieved

7.10 Noise Reduction
Optional

RATIONALE
Exposure to traffic noise over time poses a risk to adults and is linked to complications with cardiovascular system, diabetes, hypertension, stroke, depression, and high blood pressure. In children, chronic aircraft noise exposure has been shown to impair reading comprehension, mental arithmetic, and proofreading. Continuous noise levels from internally generated noise sources (e.g., HVAC, amenities, appliances, plumbing) have the potential to increase
stress, reduce focus, warrant complaints, and decrease occupant’s satisfaction with living conditions.

Impact noise and airborne sound transmission between dwelling units has been a leading complaint in multifamily real estate since its inception. With an influx of buildings designed with light-weight construction, impact noise and airborne sound transmission has become common and often results in reduced focus and increased sleep disturbance, annoyance, agitation, and stress. When considered at the onset of project design, multifamily units that apply elements of noise control are more likely to yield comfortable environments for their residents.

**REQUIREMENTS**

Manage internally generated noise and exterior noise intrusion within dwelling units as follows:

- Design noise levels to meet requirements by WHO, EPA, or state and/or local laws and requirements, where applicable, **OR**
- Follow standard noise abatement, planning, and assessment as defined by HUD for site planning and general noise mitigation on the project site (24 CFR 51B), **OR**
- Ensure all exterior wall and party wall penetrations are sealed with acoustical sealant, all party walls and floor/ceiling assemblies have an STC rating of at least 55, and exterior windows and doors in projects near a significant exterior noise source have an STC rating of at least 35.

**RECOMMENDATIONS**

- Avoid locating bedrooms in areas of the building which face sources of continuous or excessive noise or near mechanical equipment rooms, rooftop mechanical units, generators, plumbing, elevator shafts, amenities, or other source of periodic or continuous operational noise.
- Avoid the use of PTAC units in bedrooms, especially when the project site is located within an area of ‘unacceptable’ noise levels in accordance to HUD (24 CFR 51B).
- Design and install floor-ceiling assemblies as full-span assemblies connected to the walls/partitions and sealed at all flanking paths around all penetrations as ASTM C919 and sealant manufacturer’s recommendations.
- Install or retrofit resilient underlayment, concrete slabs, and/or composite floor-ceiling constructions to meet the minimum code requirements for impact noise insolation, as applicable.
- Consider installing sound reducing barriers.
- Control noise from sources such as HVAC, elevators, amenities, trash chutes, plumbing, electrical components, etc. within dwelling units in accordance with ASHRAE Fundamentals Chapter 48 or ASHRAE 189.1 guidelines.
- For proposed projects located in high noise areas, noise attenuation can be provided as part of HUD (24 CFR 51B). See Chapter 4 – Noise Attenuation in HUD resource below for additional information.
- Test building façade elements in accordance with ASTM E90 to meet the minimum level of attenuation needed to provide at least a marginally acceptable level of noise attenuation when provided at the building envelope.
- Include building lease language with description of quiet hours or allowable usage of excessive noise sources (i.e., landscaping, music, events, etc.)
- Where building amenities offer high-impact activities like weightlifting, treadmills, running, or similar, provide impact isolation as necessary such that sound from impacts is reduced within dwelling units. (Note: sound from heavy impact noise can travel in all directions throughout the structure of a building, not just from the floor above. It is highly recommended that a professional in acoustics provide recommendations when fitness amenities include high-impact, heavy weightlifting elements)
RESOURCES

- U.S. Environmental Protection Agency, Clean Air Act Title IV – Noise: This site includes sections related to abatement, health effects, regulated noise sources, and other useful education related to noise as a pollutant. www.epa.gov/clean-air-act-overview/clean-air-act-title-iv-noise-pollution


- IBC 2015 Chapter 12: Interior Environment: Section 1207 details the code minimum requirement for sound transmission and includes a link to view ICC-ES (evaluation service) providers that can provide additional support when installing resilient flooring: codes.iccsafe.org/content/IBC2015/chapter-12-interior-environment?site_type=public
III. PROMOTING HEALTH THROUGH DESIGN

All projects must comply with either Criterion 7.11, 7.12, or 7.13.

No points will be accrued for this mandatory requirement, but, project teams are encouraged to pursue more than one criterion within this section and will be eligible to receive optional points for compliance for these criteria beyond the first.

Specific design and/or construction strategies can only be counted towards one criterion, meaning the same strategy cannot be used in multiple criteria to accrue optional points.

7.11 Active Design: Promoting Physical Activity

Optional | X points

RATIONALE
Physical inactivity increases the risk of many chronic diseases and conditions including obesity, hypertension, heart disease, stroke, some cancers and Type 2 diabetes. Two minutes of stair climbing daily burns enough calories to prevent annual average weight gain. Common stairs also encourage social interactions and improve mental health. Climbing 20–34 floors of stairs per week (~3–5 floors per day) is associated with a reduced stroke risk of 29%, and climbing 100–150 floors of stairs per week is associated with a 10–20% decrease in all-cause mortality.

For those residents for whom stairway travel may be dangerous due to their limited functional mobility, other key design considerations may positively influence their level of physical activity. In these instances, building or site design measures that increase either frequency or duration of physical activity are encouraged.

Child play and adult exercise reduce the risks of obesity, improve mental health and encourage social interactions. Improving access to places for physical activity can result in a 25% increase in the number of people who exercise at least 3 times per week.

REQUIREMENTS

Option 1: Choosing Everyday Stairs

Buildings that include stairs as the only means to travel from one floor to another—whether in a two-story single-family home or a multifamily walk-up building are not eligible for this option.

Provide a staircase that is accessible and visible from the main lobby as well as visible within a 25-foot walking distance from any edge of the lobby. Ensure that no turns or obstacles prevent visibility of or accessibility to the qualifying staircase from the lobby, and that the staircase is encountered before or at the same time as the elevators. Ensure that stairway lighting and finishes are consistent with, or better than, those in the building corridor to encourage use. Place point-of-decision signage at building entrance and corridor intersections to promote stair use (rather than elevator use) for health and other benefits. From the corridor, accessible staircases should be made visible by at least one of the below:

- Providing transparent glazing of at least 10 square feet (1 square meter) at all stair doors or at a side light
- Providing magnetic door holds on all doors leading to the stairs
- Removing door enclosures/vestibules

OR

Option 2: Choosing Everyday Walking Pathways

Incorporate at least one strategy inside or outside of the building, apart from stairs and/or activity spaces, designed to increase frequency and duration of physical activity as part of normal routines for a majority of property residents. Elements such as grab bars in hallways or informational displays about walking paths within the building paired with incremental distance markers on walking paths outside the building can improve the duration and frequency of
physical activity. Include a narrative describing your selection process and how your selected strategy will increase frequency and duration of physical activity.

OR

Option 3: Activity Spaces
Provide an on-site dedicated recreation space with exercise or play opportunities for adults and/or children that is open and accessible to all residents. The space must be at least 400 square feet, include adult exercise and/or children’s play equipment for a minimum of 5% of building occupants, and ensure minimum operational hours for use of 10 hours/day at least 3 days/week. Complementary resident engagement strategies may promote outdoor play, exercise, gardening or other physical activity.

RECOMMENDATIONS
Promoting Everyday Stairs

- Stairwell finish, as well as clear and appealing visuals such as windows or artwork provide a pleasant experience and encourage stair use for those who are able.
- In high-rise buildings, provide an integrated vertical circulation system that incorporates stair use for travel between adjacent floors, so that elevators are used primarily for vertical travel of four floors or more.
- Consider programming elevators so they do not return to the ground floor and do not rest in the open position when not in use.
- While maintaining at least one (or more if required by code) ADA-accessible elevator to all floors, consider installing skip-stop elevators, where appropriate for the building.
- Provide daylighting at each floor/roof level of the stair(s) using windows and/or skylights of at least 8 square feet (1 square meter) in size.
- Incorporate permanent artwork, murals and/or music into the stair environment.
- Incorporate natural ventilation into the stair environment.

Activity Spaces

- Design a courtyard, garden, terrace or roof that can serve as outdoor space for children’s play and/or adult activities.
- Design recreation spaces for versatile use by people of a variety of ages and abilities, including landscape features when possible, as opposed to traditional playground equipment. Playspaces can be works of art and landscape architecture that provide a visual appeal and a pleasant environment for all users.
- In the design of parks and playgrounds, create a variety of climate environments to facilitate activity in different seasons and weather conditions. Provide shaded areas as well as areas that are open to sunlight.
- Locate physical activity spaces in a centrally visible location in the building to help increase awareness and use of these spaces, as well as a sense of safety and security.
- Provide lights on sidewalks and active play areas to extend opportunities for physical activity into the evening.
- Provide views to the outdoors from physical activity/play rooms.

RESOURCES

- Affordable Designs for Affordable Housing
- Center for Active Design: Building Design Checklist and Urban Design Checklist https://centerforactivedesign.org/
- CDC Guide to Strategies to Increase Physical Activity in the Community
• StairWELL  


• Centers for Disease Control and Prevention, Healthier Worksite Initiative: Motivational Signs.  
  http://www.cdc.gov/nccdphp/dnpao/hwi/toolkits/stairwell/motivational_signs.htm


• OCAD University, Georgia Institute of Technology, NYC Department of Health and Mental Hygiene. Active Design Supplement: Affordable Designs for Affordable Housing, 2013.  
  https://centerforactivedesign.org/affordablehousingcosts

• Stair use for cardiovascular disease prevention.  

• Johns Hopkins Center for Injury Research and Policy, NYC Department of Health and Mental Hygiene, Society for Public Health Education, Active Design Supplement: Promoting Safety, Version 2, 2013: This document offers design guidelines on increasing safety while also promoting health and physical activity within the built environment.  
  https://centerforactivedesign.org/promotingsafety

  http://nrckids.org

7.12 Beyond ADA: Universal Design

Optional | X points

RATIONALE

Universal Design has been defined as “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design [The Center for Universal Design (1997)].” As applied to residential projects, the principles of Universal Design anticipate and plan for a greater diversity of residents’ abilities and needs, both today and in the future, thereby supporting and facilitating both safety, independence, and connectedness for all residents, including older adults, children and individuals with mobility, visual, cognitive or other impairments.

Social isolation is at epidemic levels, exacerbating mental and physical health issues, relationships, and work. Lower income populations are more likely to report feelings of loneliness. Social isolation can be a result of or exacerbated by the built environment, when it is not reflective of a person’s or specific group’s needs. Our physical environment can help build social cohesion, trust, participation, and stewardship by bringing intentionality to design and developing spaces that are welcoming, accessible, inclusive, and connected. Spaces such as these, that incorporate Universal Design, combat spatial inequities and help to build cultural resilience and improve physical, and mental health outcomes.

As a framework for design, Universal Design is distinct from the goals of accessible or “barrier-free” design. More important, it is also distinct from legally mandated accessibility requirements. Local and federal accessibility laws and regulations provide a base for Universal Design but define only a minimum level of performance to serve people with disabilities. Furthermore, these laws focus overwhelmingly on requirements for wheelchair users, largely overlooking the broader spectrum of mental, physical, sensory and cognitive needs represented in the United States today.
REQUIREMENTS
Consider your resident population and the questions answered through the Integrative Design Criterion in Category 1. Using this information, select and implement at least three strategies below. Submit a narrative detailing which pathways and strategies were selected and the reasoning for selection. For any strategy impacting dwelling units, include in at least 75% of the project’s units.

**Pathway 1: Create welcoming and accessible spaces that encourage equitable use and social connections**
- Ensure high levels of even, natural and artificial lighting within circulation and common areas (vision impaired, dementia)
- Include universal, gender neutral restrooms available for use in common areas. **RECOMMENDATION:** These restrooms should be easily accessible. Single-occupant accessible unisex restrooms offer more flexibility, turning space and privacy than a traditional men’s and women’s restroom with stalls.
- In properties with more than 12 units, create sub-clusters of units with no more than 12 units sharing semi-private space or entry sequence to promote connections with neighbors.
- For shared interior or exterior spaces include permanent essential amenities including seating, toilets, and drinking water to promote comfort and use.
- Create paths with auditory crossing signals, adequate crossing times, clear signage, visible access ramps, median refuge islands, and connections to walking, cycling and public transit routes.
- Make streets and paths throughout the project site universally accessible, smooth and sufficiently wide, and provide curb cuts at street crossings and entry points, and turning radii adequate for a wheelchair or walker.

**Pathway 2: Create spaces that are easy and intuitive to use and navigate.**
- Create approachable building entries that are welcoming, easy to identify, promote feelings of safety, and are accessible without the use of stairs. Include a covered entryway with seating, greenery, and lighting. Include exterior signage that is prominent, visible from access road or parking lot.
- Create logical circulation patterns and navigability throughout the project, with particular focus from the dwelling units to transit or frequently used areas. This may include continuous pathways, signage, art, lighting, and multi-sensory features to promote navigability. (Dementia, vision impaired, age-in-place)
- Provide clear signage throughout the building that avoids jargon, uses clear language, incorporates a positive frame, and is multi-lingual where appropriate. Incorporate illustrations to encourage universal understanding. Signage for way-finding and other purposes should be available in the interior and exterior spaces.
- Avoid strong patterns on floor finishes and instead provide plain, matte finishes which will help reduce glare/shine in brightly lit conditions. Carpets and flooring with subtle neutral patterns (vision impaired, dementia)
- Install light switches and power outlets that contrast in color and value with wall surfaces and have an indicator light when turned off. Mount light switches at 52 inches and power outlets at 20 inches above the finish floor. (vision impaired, age-in-place)

**Pathway 3: Promote safety and create spaces that allow for human error**
- Install slip-resistant flooring in the common spaces, frequently used pathways, units, and entry ways (wheelchair & walker, dementia, age-in-place)
- Install grab bars to provide extra support in bathroom including shower, bedroom, and other areas where it would provide assistance. Mount horizontally or vertically, not on a diagonal (wheelchair & walker, vision impaired, age-in-place, dementia)
- Install all towel bars to support the same loads as grab bars are required to by code, as they may be used accidentally as grab bars by their placement in or near tubs and showers and adjacent water closets
- Install thermostatic or anti-scald control faucets (hearing impaired, dementia, vision impaired)

**Pathway 4: Create spaces that can be accessed and used with minimal physical effort**
Design all interior and exterior doors to be accessible without the use of steps or raised thresholds and all sloped surfaces to have proper support on both sides (wheelchair & walker, dementia, age-in-place, vision impaired)
Install lever handles on all doors (wheelchair & walker, dementia, vision impaired, age-in-place)
Install accessible bathtub or roll-in shower with hand-held adjustable shower head (wheelchair & walker, age-in-place)

Pathway 5: Create spaces with the appropriate size and space to allow for use, whatever the user's form of mobility, size, or posture.

- All hallways with 42-inch clearance (wheelchair & walker)
- Thirty-two (32) inches clear and/or 36 inches rough opening for all doors designed to allow passage through the unit including entry doors, doors to habitable rooms or hallways, doors in walk-in closets, patio doors, and doors in utility/storage rooms larger than 48”x48” in size. (wheelchair & walker)
- 5’x5’ diameter turning circle in kitchen and bathroom (wheelchair & walker)

RECOMMENDATIONS
- During the integrative design process, determine which Universal Design features to incorporate based on the expected resident population.
- Implement the selected Universal Design features in as many units as possible, if not 100%.

RESOURCES

7.13 Healing-Centered Design
Optional / X points
RATIONALE
Physical environments affect people's sense of worth and dignity. They can lift people up and contribute to healing from various historic, community, or life traumas. Trauma is a set of normal human responses to stressful and threatening experiences. Most people are exposed to some trauma (e.g. witnessing or experiencing violence, natural disaster, serious accident, chronic stress) in their lives and may react differently to the same event or exposure. It is important to consider the potential trauma that residents, staff, and family members may carry with them into the building and how the built environment can support healing. Spaces within and surrounding affordable housing can play a significant role to 1) ensure residents are not re-exposed or reminded of current or past trauma and 2) are able to move towards healing through welcoming, safe, and accommodating spaces that promote social and cultural connection.

REQUIREMENTS
Consider your resident population and the questions answered through the Integrative Design Criterion in Category 1. Using this information, select and implement at least one strategy in at least three of the pathways detailed below. Submit a narrative detailing which pathways and strategies were selected, the reasoning for selection, and an explanation of how they will be implemented. For any strategy impacting dwelling units, include in at least 75% of the project's units.

Pathway 1: Provide an environment that promotes feelings of real and perceived safety.
- Incorporate strategies that allow residents to be in control of their physical distance from other people while also promoting opportunities for relationship and community building (ability to be in a public space without having to interact, ability to have control over your physical space, visual awareness of surroundings, and mix of social and more private spaces). These features may include wide hallways, alternative pathways, open design allowing occupants to have an understanding of what is happening the building, improved lines of site, or the creation of smaller more intimate spaces near large communal spaces.
- Incorporate strategies that allow residents to feel safe in their units and when navigating the building. This may include the reduction of blind spots, removing door undercuts, installation of visible and secure locks, visual connections between units and the street or exterior spaces, or no spaces without windows.
- Incorporate strategies that allow a sense of reliability and consistency throughout the building. These features may include the presence or reliability of resources of programming that may have been a stressor in the past (e.g. drinking fountains, food resource), consistent and clear signage throughout the building, and uniform lighting at building entries and interior paths of travel.
- Engage residents to develop strategies used in this pathway.

Pathway 2: Create flexible spaces that allow for personalization and/or manipulation to meet individual and community needs. This pathway includes strategies that allow residents to manipulate their environment to meet their specific needs and enable the configuration of the property to adapt and change in accordance with the needs of new or long-term residents.
- Incorporate strategies that allow residents control over lighting and climate systems. This may include features such as variable lighting, climate systems, and shading devices.
- Incorporate strategies that allow resident or community personalization and agency over space and service or program offerings. This may include naming, signage, art (flexible art exhibit space), and programming (gardening, murals, etc.).
- Incorporate strategies that encourage variability in the space. These features may include moveable partitions to allow spaces to be used for multiple purposes or moveable furniture allowing individual choice over how much space they have from others.
- Engage residents to develop strategies used in this pathway.

Pathway 3: Connect residents and staff to a living landscape and nature.
- Incorporate strategies that connect the common spaces to nature. This may include highlighting views of outdoor scenery - including avoiding visual barriers between 3’ and 6’ feet from the ground, incorporating a water feature, or incorporating natural or artificial greenery.
- Incorporate strategies that connect the residential units to nature. This may include through views and sightlines to outdoor scenery or other design strategies. At least 75% of the units incorporate strategies to connect residents to the landscape or nature.
• Create accessible (in multiple weather condition) exterior spaces that promote a connection to nature through features such as a mix of greenscape and hardscape, easy transit between outdoor and indoor space, and provision of permanent seating, water, and other use-promoting resources in the outdoor spaces.
• Incorporate strategies that promote and maximize resident exposure to natural light or indoor lighting that emulates daylight (e.g. timed lighting adjusting to natural light cycles or circadian rhythms).
• Engage residents to develop strategies used in this pathway.

Pathway 4: Utilize art and culture in design and programming and promote social connectedness.
• Use art as a way for residents to reframe their narrative and incorporate this art and art generated by and reflective of the community throughout the project.
• Use design strategies that are reflective of nature and the local environment through art, color, pattern, and other design elements. Design that is reflective of nature can create soothing spaces and reduce anxiety and agitation. These strategies should be incorporated in the common spaces and units.
• Create a story for the space that incorporates resident identity and culture into design elements, allows for residents to be engaged and their voice to be incorporated, and where residents can see themselves reflected in the space.
• Engage residents to develop strategies used in this pathway.

RECOMMENDATIONS
• As the project team designs healing-centered strategies, the following considerations should serve as guiding principles:
  1. Do not inadvertently retraumatize – project teams should first ensure their design, operations, and programming do no harm in terms of creating new trauma or retraumatizing residents.
  2. Consider and be sensitive towards the trauma residents may hold, this requires resident engagement and understanding. It is critical to meet residents where they are and develop strategies around that.
  3. Incorporate strategies that will move residents towards healing.
• During this process, consider these best practices:
  • Engage the full project team; including, architect & interior designer around the trauma-informed and healing-centered approach. Consider including a mental health professional or other professional with experience in designing for trauma and healing. The professional can help project teams as they consider:
  a. Biases as a developer (architect, designer, etc.)
  b. Acknowledgement of barriers
  c. Reflections on these biases and barriers
  d. How to design from a place of cultural context and empathy
  • Engage community members or residents and build power by incorporating their voices and ensuring residents feel represented in the space.
  • Incorporate design and programming strategies based on first two steps.
  • Ensure there is flexibility in the space - the space should be able to grow and change with the needs of the population.
  • Use empowering language towards your community throughout this process and the project lifecycle.
  • Evaluate this process and the strategies incorporated. This evaluation should be used as an opportunity for continual feedback and incorporation of new needs (e.g. questions - do you see yourself in this space? Does the space make you feel better?).

RESOURCES
• Social Equity Impact Protocol for Affordable Housing Redevelopment
• The Future of Healing: Shifting from Trauma Informed Care to Healing Centered Engagement
  https://medium.com/@ginwright/the-future-of-healing-shifting-from-trauma-informed-care-to-healing-centered-engagement-634f557ce69c
• Trauma Informed Community Building, a model for strengthening community in trauma affected neighborhoods, by BRIDGE Housing Corporation and The Health Equity Institute
• Finn, Matthew. Posttraumatic Understanding: The connections between posttraumatic stress and environmental design. Perkins + Will. [https://static1.squarespace.com/static/586cf7b2be659472709cd98a/t/59f8cc9310952631f619f90f/1509477523905/PosttraumaticUnderstanding_2014.pdf]

• SAHF Literature Review

• Trauma-Informed Community Building and Engagement, April 2018, a guide for of approaches to supporting residents, including background on trauma and community healing; strategies and practices for trauma-informed resident engagement, and two case studies. [https://urban.org/sites/default/files/publication/98296/trauma-informed_community_building_and_engagement.pdf]

• VA Healing Environment Design Guidelines describe ways to plan and design the key public elements of a healthcare facility to deliver safe, effective, and efficient healthcare to Veterans. Whole Building Design Guide, a program of the National Institute of Building Sciences, [https://www.wbdg.org/ffc/va/design-manuals-pg-18-10/healing-envir]

• Crime Prevention through Environmental Design (CPTED) is a multi disciplinary approach for reducing crime through urban and environmental design and the management and use of built environments. CPTED strategies aim to reduce victimization, deter offender decisions that precede criminal acts, and build a sense of community among inhabitants. [http://www.cpted.net/]

• Institute for Human Centered Design, dedicated to enhancing the experiences of people of all ages, abilities, and cultures through excellence in design [https://www.humancentereddesign.org]

• Trauma Informed Care resources from The National Child Traumatic Stress Network highlight training and overview materials that affordable housing development teams may access to learn about trauma informed work. [https://www.nctsn.org/trauma-informed-care]

• Assembly: Civic Design Guidelines, The Center for Active Design, is a playbook for creating well-designed and well-maintained public spaces as a force for building trust and healing divisions in local communities [https://centerforactivedesign.org/assembly]

• Public Life Tools, Gehl Institute. Most useful in planning exterior spaces, these tools help measure and plan for the relationship between spaces and the public life that takes place there. Includes the Twelve Quality Criteria, which is used to evaluate whether different features of a public space are protective, comfortable, and enjoyable for people spending time there. [https://gehlinstitute.org/tools/]

• SITES Rating System v2 Section 6: Site Design – Human Health + Well-Being [http://www.sustainablesites.org/certification-guide]
Category 8: Operations, Maintenance, and Resident Engagement
8. Operations, Maintenance, and Resident Engagement

8.1 Building Operations & Maintenance (O&M) Manual and Plan

*Mandatory for all multifamily projects*

**RATIONALE**

Regular building Operations & Maintenance (O&M) practices using green methods minimizes building maintenance needs and utility consumption, and provides a healthy, safe and durable living environment for residents. Developing a building O&M manual and complementary plan throughout the project design, development and construction stages allows the project team to properly customize these documents with the input of project installers.

**REQUIREMENTS**

Develop a manual with thorough building operations & maintenance guidance and a complementary accountability plan. The manual and plan should be developed over the course of the project design, development and construction stages to transfer knowledge from this stage of the project lifecycle to the operations and asset management stage. At minimum, the manual and plan shall address the following topics:

- Operations & maintenance guidance for all mechanical and electrical equipment and appliances (building level and dwelling unit level)
- HVAC specifications, and operations & maintenance schedules
- Refrigerant management
- Operations, maintenance and replacement guidance for any other specialized systems (e.g., solar photovoltaics, solar water heating, ground source heating, cogen) within the project along with evidence of training completed for these systems
- Location of mechanical, electrical, gas and water-system turnoffs
- Lighting equipment specifications and replacement guidance
- Landscaping and hardscaping specifications and maintenance plan, including any specific instructions for community gardens or growing spaces
- Green cleaning product specifications and cleaning schedules
- Integrated pest management protocol
- Maintenance of active recreation and play spaces (e.g., playgrounds, ground markings, exercise equipment)
- Protocol for reviewing and responding to utility data consumption information
- An occupancy turnover plan that describes the dwelling unit turnover protocol, including all materials that are frequently replaced at turnover

**RECOMMENDATIONS**

Begin creating a thorough and well-developed O&M manual and plan well before construction completion. Work with designers, systems installers and operations staff to assemble critical information and schedules for best-practice operations and maintenance strategies.

**Prior to, and while the project is under construction:**

During the design process, keep a running list of how maintenance and landscaping teams and residents may need to be involved with the building in order to ensure that it will perform as intended. Once the project team has completed the integrative design process (see Category 1), amend templates of O&M documents with project-specific information for maintenance staff and residents. By working in this manner, the building O&M manual and plan will be informed by the development process and completed by the time the project is ready for occupancy.

- Identify the senior management position(s) with oversight responsibility for O&M and the job roles responsible for producing, managing and/or implementing the manual and plan.
- Ensure that the building performance goals/requirements that were established for the project during integrative design will be included in the O&M manual and plan.
• Create a knowledge-transfer plan to ensure that accurate as-built information is captured during construction, start-up and commissioning, and integrated into the O&M manual and plan (e.g., if possible, create a video of the commissioning agent or system installer showing key maintenance checks to use when training staff).
• Discuss your building O&M training plan to ensure that responsible staff will be up to speed on the operation of the building prior to turnover and occupancy.
• Develop a succession plan to ensure that important information is retained from departing staff and transferred to new staff. This could include an exit interview checklist, maintenance log review, etc.

As construction nears completion and into operations:
Finalize your building O&M manual and plan. Clearly identify key operations and maintenance activities, assign those activities to a person/job role and establish a schedule to verify that maintenance is performed.

To enhance your O&M manual and plan, include:
• Account information on your energy and water performance tracking software. Identify who will monitor this account and at what interval, and what procedures will take place if irregularities are discovered.
• HVAC maintenance plans. Develop a maintenance schedule for HVAC systems, and include assignments of key tasks to specific job roles. Create a system to track when/what maintenance tasks were completed.
• Information on lighting equipment, including specs for replacement bulbs and a maintenance strategy for when to replace inaccessible fixtures (e.g., what percentage of bulbs/diodes can fail in any one lamp pylon before you install replacements).
• Location of mechanical, electrical, gas and water-system turnoffs.
• Irrigation system maintenance plans. Develop a periodic visual inspection of functions (since irrigation systems are often scheduled to operate when O&M staff are off duty).
• Landscaping and hardscapes (paved surfaces) review protocols. Develop an inspection schedule of landscaping and paving and assign key tasks to specific job roles.
• Green cleaning products and cleaning schedules. Specify products, vendors, schedule and assignments of key tasks to specific job roles. Create a system to track when actions are completed.
• A written Integrated Pest Management policy (see Category 7) aimed at preventing pests and addressing conditions conducive to pests. Repair and maintain structures and grounds to minimize pest-related conditions. Develop resident guidelines related to pesticide use, housekeeping and prompt reporting of pest problems, such as cockroaches, rodents and bed bugs. Ensure that anyone applying pesticides is licensed and working under a scope that includes IPM provisions.
• If the project is utilizing recycled water (greywater), design and institute a policy that requires biodegradable soaps, cleaners and other products if they are going to be flushed down the drains.
• Video-record installers of mechanical systems explaining best practices for regular maintenance and strategies to address common system problems. Use this video as part of your maintenance staff training.
• Provide maintenance staff with local information for handling hazardous waste, including where to recycle fluorescent and compact fluorescent lighting (CFLs).

RESOURCES
• For language on residential IPM policy, the University of Minnesota offers the following resource: https://www.mnipm.umn.edu/
• Stewards of Affordable Housing for the Future (SAHF), Multifamily Energy and Water Management Toolkit: This toolkit (including checklists, worksheets and resources) helps improve energy and water management, reduce costs and spending, and minimize environmental impacts over the long-term, while helping to preserve affordable properties. https://www.sahfnet.org/resources/downloads/multifamily-energy-and-water-toolkit
8.2 Emergency Management Manual
Mandatory for all multifamily projects

RATIONALE
In the event of an emergency, time is of the essence. Creating and socializing a plan for building managers and residents before an emergency occurs increases the likelihood that disturbances due to the emergency (whether it be flooding, earthquake, power outages or another disturbance) can be appropriately mitigated.

REQUIREMENTS
Provide a manual on emergency operations targeted toward operations and maintenance staff and other building-level personnel. The manual should address responses to various types of emergencies, leading with those that have the greatest probability of negatively affecting the project. The manual should provide guidance as to how to sustain the delivery of adequate housing throughout an emergency and cover a range of topics including but not limited to:

- communication plans for staff and residents to use in the event of an emergency
- useful contact information for public utility and other service providers
- infrastructure and building “shutdown” procedures

Emergency Management Manuals should be responsive to information generated from successful completion of Category 1

This information should be readily available to all building residents, staff and visitors.

RECOMMENDATIONS

- Emergency Maintenance Manuals should be updated annually (at a minimum) in both digital and hard-copy formats, and located in a well-marked location.
- Reviewing and updating all Emergency Maintenance Manuals should be built into the job description and performance requirements of staff members.
- Consider having staff trained in first aid, cardiopulmonary resuscitation (CPR) and the use of automated external defibrillators (AEDs), and include information about these resources within the Emergency Management Manual.

RESOURCES

- Enterprise Disaster Response Staffing Plan: http://www.enterprisecommunity.org/resources
- “Ready” is a public service campaign designed to education and empower Americans to prepare for and respond to emergencies, including natural and man-made disasters. The goal of the campaign is to get the
public involved and ultimately to increase the level of basic preparedness across the nation.

http://www.ready.gov

- American Red Cross: http://www.redcross.org
- Seattle Office of Emergency Management provides many valuable resources, including a Resident Disaster Recovery Booklet translated into several languages. They can be accessed online at: http://www.seattle.gov/emergency/publications

8.3 Resident Manual

Mandatory

RATIONALE
Materials that share information on the features of the building will better enable residents to fully realize the environmental, health and economic investments that have been made to the property.

REQUIREMENTS
Provide a guide for homeowners and renters that explains the intent, benefits, use and maintenance of their home’s green features and practices. The Resident Manual should encourage green and healthy activities.

A range of topics should be discussed. Those topics shall include, but are not limited to:

- a description of the Green Communities criteria included in the project
- a routine maintenance plan, outlining responsibilities of residents and maintenance staff, as applicable
- HVAC operation
- green cleaning guidelines
- location of electrical, mechanical, gas and water-system turnoffs
- recycling and waste management
- integrated pest management protocols
- interior Active Design features
- information on community connectivity amenities, including transportation, car-share, bike-share and other accessibility features
- community garden and other fresh food resources
- energy and water consumption information
- if applicable, procedures to contact building management in the case of a building-related problem
- any other systems that are part of the home

RECOMMENDATIONS

- When developing your Resident Manual and engagement information, include graphics, images, videos and social media information to make your material more engaging, and in turn more useful.
- During the design process, keep a running list of how maintenance and landscaping teams and residents may need to be involved with the building in order to ensure that it will perform as intended. Once the project team has completed the integrative design process (see Category 1), amend templates of the O&M documents and Resident Manual with project-specific information. By working in this manner, these documents will be informed by the development process and completed by the time the project is ready for occupancy.
- Develop an Integrated Pest Management policy and, as part of that, develop resident guidance related to pesticide use, housekeeping and prompt reporting of pest problems with cockroaches, rodents and bed bugs. Ensure that anyone applying pesticides is licensed and working under a scope that includes IPM provisions.
- Provide residents with information about local transportation options by including maps, public transit schedules, car and bike-share programs, and the building’s bicycle amenities.
- Provide residents with maps of neighborhood locations for physical activity and healthy food amenities, including farmers markets, community gardens, walking trails, parks, playgrounds and exercise facilities.
• Amplify the impact of residents having access to fresh food (through gardening spaces or other means) by hosting cooking classes so that they can learn how to use their produce to make healthy meals.
• Consider labeling trash, recycling and composting receptacles throughout the building: Trash can becomes “landfill” can and is made visually distinct from recycling containers through the use of consistent colors.
• Provide residents with two radon test kits designed for 48-hour exposure or radon meters, and include instructions for use and follow-up action per EPA’s Indoor airPLUS program.
• Provide residents with local information for handling household hazardous waste, including compact fluorescent bulbs (CFLs).
• Provide residents with the building’s smoking policy during orientation.
• If the project is utilizing greywater, design and institute a policy that requires biodegradable soaps, cleaners and any other product types that are going to be flushed down the drains.


RESOURCES

• Enterprise Community Partners Resource Center: Enterprise Green Communities hosts a variety of resident engagement tools, trainings and sample manuals. Search for “Resident Engagement” here: [http://www.enterprisecommunity.com/resources](http://www.enterprisecommunity.com/resources)
• Home Energy Resource MN: This site provides information for homeowners on maintaining their home. It includes seasonal checklists and step-by-step instructions for general maintenance, as well as special instructions for new home buyers on maintaining their home during its first year. [http://www.homeenergyresourcemn.org/](http://www.homeenergyresourcemn.org/)

8.4 Walk-throughs and Orientations to Property Operation

Mandatory

RATIONALE

An orientation to the building and community helps educate residents, property manager(s) and building operations staff about the green features that were designed to deliver health, economic and environmental benefits, as well as their role in realizing those benefits in their own lives and the lives of future residents. Without an orientation to the information included in the guides created through Criteria 8.1 – 8.3, that valuable information may not be put to use, and the project’s long-term goals may not be met.

REQUIREMENTS

Provide a comprehensive walk-through and orientation for all residents and for all property manager(s) and buildings operations staff. Orient new residents to the property’s green features before move-in, or within 90 days of move-in. Orient all property managers and building operations staff within 90 days of initial occupancy on building maintenance and unit turnover procedures. For staff joining after the initial orientation, provide walk-through and orientation to green features within their first 90 days. For all orientations and walk-throughs, share the list of Green Communities criteria which were implemented in the project and use the appropriate manuals (see Criteria 8.1-8.3) as the base of the curriculum. Review the project’s green features, operations and maintenance procedures, and emergency protocols.
For home-ownership properties, walk-throughs and orientations should take place at sale.

**RECOMMENDATIONS**

- During Property Management and Resident Services staff trainings, focus on how the features of the building function and are maintained, and how those features help the residents: providing comfort, protecting health, saving money, conserving resources, and also better stewardship of the environment. It is important for all staff to understand how the building and systems were designed to operate so that issues can be identified and addressed promptly.

- Resident orientations should focus on engaging occupants in the process of both creating and maintaining a green and healthy environment as well as increasing resident awareness of on-site and nearby physical activity and healthy food amenities. Engagement orientations should be tailored to residents and their needs (e.g., families, seniors) and educate residents on how to operate key features and building resources (e.g., recycling, thermostats, fans, lighting) and explain why certain building elements/features/materials were selected (e.g., less carpet in favor of smooth flooring improves indoor air quality). This thorough resident orientation will lead to collective improved outcomes, such as how resident behavior affects energy, water and materials use as well as health outcomes. The orientation should also stress the important role that tenants play in reporting building-related problems so that issues can be addressed in a timely fashion.

- Consider providing residents with a green, healthy living packet, including green cleaning materials, healthy recipes, recycling information and important contacts in case of any problems.

- Engage residents at regular intervals (e.g., move-in, 3 months, 1 year, then annually) that coincide with existing tenant engagement to check in on behaviors and the potential need for assistance.

- Provide residents with local information for handling household hazardous waste, including compact fluorescent bulbs (CFLs).

- Educate residents and staff on building protocols for what to do in the case of an evacuation. Consider providing key staff and key residents with additional training and “go-bags” so that they can help residents during an emergency.

### 8.5 Energy and Water Data Collection and Monitoring

**Mandatory**

**RATIONALE**

A utility data-collection and monitoring system allows project owners, on-site staff and residents to understand project performance and accurately determine cost-benefit of energy efficiency improvements. This information may be used to influence future retrofit and repair work, as well as to identify day-to-day performance issues as they arise. If an issue is identified, appropriate actions can be taken to maximize project durability, cost savings and health benefits associated with the goals of the project.

**REQUIREMENTS**

Collect and report project energy and water performance data.

For rental properties, report all consumption and cost data for all energy and water utilities for the residential components of the project. In alignment with HUD’s Multifamily Benchmarking Toolkit, one of four methods may be used for compliance:

- **Method A: Properties with Only Owner-Paid Utility Bills**
  The property owner pays for 100% of the property's utility bills and uses these bills as the source for tracking whole-property utility data.

- **Method B: Aggregated, Whole-Property Utility Data**
  Regardless of the split of owner-paid and tenant-paid utility bills across the property, the property owner requests aggregated whole-property utility data from the utility provider(s).

- **Method C: Collection of 100% of Tenant-Paid Utility Data**
  The property owner collects 100% of the individual tenant-paid utility data form the utility provider(s) or tenants and tracks these along with owner-paid accounts.
• Method D: Collection of a Sample of Tenant-Paid Utility Data
The property owner collects a sample of individual tenant-paid utility data from the utility provider(s) or tenants, which is then used to produce an estimate of whole-property utility data along with the owner-paid accounts. Project teams may either use the Better Buildings Challenge sampling protocol, found in Appendix C of the Better Buildings Challenge Data Manual, or HUD’s Assisted Housing Utility Allowance Calculations sampling protocol, found in Part VI of HUD Notice H-2015-04 to extrapolate the whole building data from the sample set. Note, when sampled tenant-paid utility data is used to estimate whole-property data, the “Estimation” box must be checked when submitting the data in ENERGY STAR Portfolio Manager.

Regardless of the method chosen above, this data must be uploaded and tracked in an online utility benchmarking platform annually for at least 5 years from time of construction completion and view access shall be granted to Enterprise for that time period.

For owner-occupied units, residents shall collect and monitor their energy and water performance data in a manner that allows for easy access and review, and that provides the ability to influence home operations for at least 5 years from time of first occupancy. Also allow Enterprise access to this data.

RECOMMENDATIONS
• Make resident utility access release(s) an opt-out, rather than an opt-in, component of lease-up to provide property management with access to utility data for benchmarking/tracking. This data will allow maintenance staff to proactively identify poorly performing systems and identify other comfort issues that often go unreported, leading to major systems failure.
• Ensure that the training for residents and building maintenance staff includes information on how to effectively use the data-collection, monitoring and reporting system.
• Carefully consider metering and/or utility monitoring configuration of your building to not just meet your needs for utility billing, but also for diagnostics of future potential energy issues. Providing information to residents on the cost and usage associated with the electricity consumption in their unit may reduce energy use. Owners being cognizant of the disaggregated dominant sources of energy consumption can use a proactive operations and maintenance approach, addressing outlier conditions in real-time. The metering and monitoring systems should be specified in the Integrative Design stage, tracked through O&M procedures, and shared with residents and staff.

RESOURCES
• Enterprise’s Utility Benchmarking FAQ provides instructions as to how to share view access for common utility benchmarking platforms.
• ACEEE’s article Benchmarking Initiatives in the Multifamily Market includes best practices for this sector https://aceee.org/sector/local-policy/toolkit/benefits-benchmarking
• Portfolio Manager Quick Reference Guide for Multifamily Housing: Portfolio Manager is a free, online, interactive energy management tool that allows you to measure and track your building’s energy and water consumption, identify investment priorities, and verify improvements over time. Multifamily housing communities can use Portfolio Manager to track weather-normalized energy use intensity (EUI), energy costs, greenhouse gas emissions and water consumption. https://www.energystar.gov/buildings/tools-and-resources/portfolio-manager-quick-start-guide
• Private, fee-based, benchmarking and utility tracking tools are available. Among others, these include: WegoWise: http://www.wegowise.com; Energy Score Cards: http://www.energyscorecards.com; eGauge: http://www.egauge.net
- Portfolio Manager also is designed to create a WaterScore, which can be comparing actual consumption to the model https://www.epa.gov/watersense/water-score-multifamily-housing
Appendix A: Definitions
2020 Enterprise Green Communities Criteria Public Comment Draft

Definitions

Substantial and Moderate Rehab

A Substantial Rehab is defined as a project where the work area exceeds 50% of the aggregate area of the building: an ICC level 3 alteration scope of work, according to the most recent version of the IEBC published at the time of project Prebuild application.

- Aggregate area of the building includes anything within the surrounding exterior walls, including covered exterior spaces, e.g. balconies that have a roof or floor above (does not include roof, outdoor space, etc)
- Work area is defined as the area on the plans that will be considered reconfigured, addition or removal of a window or door, or reconfiguration or extension of any system, or installation of a new system.

A Moderate Rehab is defined as a project where the work area does not exceed 50% of the aggregate area of the building (the work scope is less than an ICC level 3 alteration), yet is still able to comply with the energy performance requirements of Criterion 5.1.

Rural / Tribal / Small Towns

Projects that meet one or more of the four criteria below qualify for the Rural / Tribal / Small Towns pathway.

1. A statistical geographic entity delineated by the Census Bureau that does not meet the definition of an urbanized area contained in the Office of Management and Budget’s 2010 Standards for Delineating Metropolitan and Micropolitan Statistical Areas, 75 FR 37252 (June 28, 2010). That is, a rural area is an area that is NOT a statistical geographic entity delineated by the Census Bureau, which would consist of densely settled census tracts and blocks and adjacent densely settled territory that together contain at least 50,000 people.

   To determine if the area where the project is located qualifies as rural, enter the zip code or city [here](http://arco.is) to confirm eligibility. Areas shaded pink are not eligible geographies.

2. Projects located on Native American Reservations and land owned by Native Alaskans.

3. Projects located in colonias communities as defined by HUD and certified by one of the four border states: Texas, New Mexico, Arizona and California

4. Projects eligible for funding under USDA Rural Housing Services (RHS) programs.
Appendix B: Project Priorities Survey
Project Priorities Survey / 2020 Enterprise Green Communities Criteria
Mandatory

OBJECTIVE:
Complete this survey prior to beginning your integrative design process.

Understanding the context of your affordable housing development is critical to ensuring it successfully meets the needs of your residents and aligns with your intended project goals. This survey, once completed, will serve as a key component of the integrative design process that will follow in your predevelopment process,

1. Identify population served (check all applicable)
Many affordable housing developments serve unique populations, that may have unique needs or concerns that can be addressed through the design of your development. Please identify any unique populations that your development will be targeted towards. If your project is accommodating any eligible persons seeking housing, please select “no specific population identified.”

☐ Families
☐ Veterans
☐ LGBTQ
☐ Seniors - Independent Living
☐ Seniors – Assisted Living
☐ People experiencing homeless or formerly homeless populations
☐ Supportive Housing
☐ Formerly incarcerated
☐ Mixed Income
☐ No specific population identified
☐ Other population: describe:
________________________________________________________________________
________________________________________________________________________

2. Resident-Expert Experience
In conversation with your residents, potential residents, local stakeholders, and/or other community-based groups, reply to the following questions to ensure that residents and their lived experiences are carefully considered for your project.

Before answering the questions below, you must, at minimum:
• Have one conversation with one or more residents, potential-residents, or community members
• Have one conversation with a current building management or resident service staff member that has regular interactions with building residents in one of your existing buildings.

These conversations should include the context of the project you’re working on, why you want to hear their input and what you will do with it. In these conversations, we recommend seeking to understand more about the place and community context – what they value most, their concerns, what works, and what doesn’t work in their current residence.

I. Community Reflection & Understanding

Your answers in this section should be informed by, at a minimum: individual vulnerability factors like age, health, physical ability, language, geographic isolation, and employment as well as sources of stress such as extreme weather, poor physical infrastructure, and limited proximity to jobs, services or transit.

A. Who does this development serve? Who does it not serve? Among those resident populations it is intended to serve, who is most vulnerable? Based on what factors are they vulnerable?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

B. Identify some challenges and opportunities people you serve (particularly the most vulnerable) are facing? What are the root-causes for those challenges?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

C. What are the assets, cultural norms or community resources people leverage to overcome challenges?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

D. What are the opportunities for ongoing resident leadership in the design and development of this project?
II. Ground Truth

E. What forms of feedback have you used or will you use for input from residents or target users to inform your priorities for this project? Please check all that apply.*

We recommend talking to target groups about how they feel comfortable giving feedback to ensure methods are appropriate to the people you want to hear from. Select a combination of methods that complement each other and align with preferred ways to provide feedback. This is easiest when integrated in project and staff expectations from the outset.

☐ Surveys
☐ Interviews
☐ Focus groups
☐ Suggestion box / “Dropbox” for confidential feedback
☐ Community designed feedback systems (communities decide what issues they would like to provide feedback about and how they would like to provide feedback). ______

Please specify: ____________________________________________________________

☐ Other

Please specify: ____________________________________________________________

*For strengths and limitations of specific feedback methods, see p. 10-14 of this practice document: http://feedbackmechanisms.org/public/files/PRACTICE_NOTES_July2016.pdf

III. Comprehensive Community Design

F. How does your approach to and results from community reflection (I) and ground truth (II) inform the design process and design features of your development?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

3. Identify Resident Opportunity Factors

Housing is a foundation for health and quality of life. Project design, development, management, and operations, as well as programs, play a significant role in influencing the health and cultural resilience outcomes for residents.
1. Download and review your customized Enterprise Opportunity Report, generated from the Opportunity360 website following these steps. Go to the Opportunity360 website (www.enterprisecommunity.org/opportunity360).

2. Review the Opportunity360 webpage, then navigate to the “Measure” page by selecting it.

3. Review the webpage, then click the map that is shown on the screen. You will be asked to input your contact information in a pop-up window.

4. On the map provided, input your project address.

5. When the text bubble appears, select “Get Enterprise Opportunity Report.”

6. Download and “Save” the PDF for future use.

Note: It’s helpful to save the PDF of the report, once downloaded, for future reference.

Review the five opportunity outcomes in the customized Enterprise Opportunity Report that has been generated for your address, then answer the following questions:

Q1: What did you learn about your community that you did not know prior to reviewing the information in the Opportunity Report?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Q2: Was there information in the Opportunity Report that confirmed assumptions that you had? What were those assumptions?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Q3: How do you plan to leverage the community assets identified through the Opportunity Report with your project?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
Q4: What did you learn about the health of residents in your community, that you should consider when designing and developing this project?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

NOTE: To earn Enterprise Green Communities Certification to the 2020 Criteria, each project must achieve at least one of the three Promoting Health Through Design criteria listed in Category 7. Healthy Living Environments. Those criteria are:

7.11 Active Design: Promoting Physical Activity
7.12 Beyond ADA: Universal Design
7.13 Healing-Centered Design

Be sure to reference the community health information you’ve learned throughout completing this Project Priorities Survey when you elect which of these criteria you will pursue.

4. Understanding Building Emissions
Central to the 2020 Enterprise Green Communities Criteria is recognizing the role buildings play in impacting our climate. The overall climate impact of a property will be determined by the sum of the building’s embodied emissions (associated with building material choices) and operating emissions (associated with how much energy the property uses and the emissions profile of the source of the energy). Reducing building emissions is important to consider for the field of affordable housing development because the acute impacts of climate change will be borne disproportionately by people with limited economic needs.

Each project team must make individual decisions about sustainability priorities for your project. If reducing building emissions associated with your development were your top priority, you may want to consider the following guidelines:

A. Reduce the amount of energy your property requires and utilize a low-emissions energy source when possible.
   1. Review Category 5. Operating Energy and consider the greatest level of building performance that your project can meet cost-effectively.

   2. Indicate Category 5 criterion that promote energy efficiency that your team might consider, beyond what is required in Criterion 5.1 Building Performance Standards. See if
there are requirements or financial incentives for these levels of building performance in your jurisdiction.

- 5.2a Moving to Zero Energy: Additional Reductions in Energy Use
- 5.2b Moving to Zero Energy: Near Zero Certification (ZERH and PHIUS+)

3. These Category 5 criteria have the potential to reduce emissions associated with the source of energy in your property. Indicate which of these your team may consider:
   - 5.3a: Moving to Zero Energy: Photovoltaic/Solar Hot Water Ready
   - 5.3b: Moving to Zero Energy: Renewable Energy
   - 5.4: Achieving Zero Energy (this also includes aggressive energy efficiency)
   - 5.5a: Moving to Zero Carbon: All-Electric Ready
   - 5.5b: Moving to Zero Carbon: All Electric

B. The specific materials that are used in the building also impact climate. The decisions you make in specifying materials may have a larger impact on building emissions even than reducing your project’s operating emissions.

   Review Criterion 6.5: Environmentally Responsible Material Selection. Consider how to minimize your project’s embodied emissions, given different design schemes and material selections in your project.

C. Understand, at a regional scale, how much carbon dioxide (CO₂) is associated with supplying energy to your building.

1. Visit the U.S. Environmental Protection Agency’s Power Profiler website to understand the emissions associated with electricity in your area: https://www.epa.gov/energy/power-profiler#
2. Enter the 5-digit zip code of your project, and press “Go.”
3. The website will then display emissions rates for your region, and compares those rates to the national average. Write the emissions rate for carbon dioxide (CO₂), based on your region:

   CO₂ emissions: _________ (lbs/MWh)

<table>
<thead>
<tr>
<th>CO₂ emissions (by lbs/MWh)</th>
<th>0-600</th>
<th>601-1000</th>
<th>1000+</th>
</tr>
</thead>
<tbody>
<tr>
<td>lower CO₂ emissions</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>greater CO₂ emissions</td>
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</tbody>
</table>
Projects served by electric grids with lower CO\textsubscript{2} emissions may have a greater impact at reducing their overall building emissions by focusing on reducing embodied emissions associated with building materials.

Projects served by electric grids with greater CO\textsubscript{2} emissions should also reduce overall building emissions by reducing embodied emissions associated with building materials. Also, consider non-grid power sources with low emissions rates, like installing on-site renewables or procuring community solar or verified renewable energy certificates (RECs).

5. Climate and Environmental Resilience

Per the Resilient Design Institute, resilience is the capacity to adapt to changing conditions and to maintain or regain functionality (“bounce forward”) and vitality in the face of stress or disturbance.

The best way to maintain or regain functionality when there is a stress or disturbance to standard is to plan for it. Review the steps that follow, and complete the table.

a. Identify the direct hazards that may impact your proposed project. Mark hazards that are relevant, or may be relevant to your project with a X.

To determine the direct hazards that may impact your project, review your local (city, county, state) hazard mitigation plan(s) – which are readily available online. If those are not available, you can use one of the following resources:


Note: Scroll down the page to find a menu of 244 US Cities; listed by state, then city.

If you have a professional who is able to help you determine the appropriate and relevant hazards (e.g. civil engineer, environmental engineer, structural engineer, etc.), you should consult with them about relevant hazards. They likely have additional local knowledge and professional training relevant to your location.

For rehabilitation projects, please consider not only future conditions at the site, but confirm which hazards have been an issue at the site to date with the operations team at the building.

b. Identify the source that helped your project team identify the applicable hazard (column three). List the hazard mitigation plan, website, professionals or other resources that helped you identify relevant hazards.
c. Next, identify potential risks of all potential hazards (column four). Risks should be considered for residents, for the building itself, for business continuity, and for the community at-large.

An example of what some of those risks may be is shown below.

<table>
<thead>
<tr>
<th>Risks to Residents</th>
<th>Risks to Buildings</th>
<th>Risks to Business Continuity</th>
<th>Risks to the Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>» Injury or loss of life.</td>
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<tr>
<td>» Psychological trauma.</td>
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<tr>
<td>» Loss of property.</td>
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<tr>
<td>» Economic hardship and loss of jobs.</td>
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<tr>
<td>» Exposure to pathogens and toxins.</td>
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<tr>
<td>» Security risk.</td>
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<tr>
<td>» Housing displacement.</td>
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<tr>
<td>» Loss of community services.</td>
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<tr>
<td>Damage to:</td>
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<tr>
<td>» Envelope.</td>
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<tr>
<td>» Building systems.</td>
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<tr>
<td>» Communications infrastructure.</td>
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<tr>
<td>» Roof.</td>
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<tr>
<td>» Foundation.</td>
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<tr>
<td>» Loss of housing units.</td>
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<tr>
<td>» Loss of commercial and institutional tenants.</td>
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<tr>
<td>» Cost of repairs.</td>
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<tr>
<td>» Displacement of tenants and loss of rental income.</td>
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<tr>
<td>» Rising insurance rates.</td>
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<tr>
<td>» Reduction in property value.</td>
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<tr>
<td>» Regulatory fines.</td>
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<tr>
<td>» Destruction of public infrastructure.</td>
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<tr>
<td>» Downsizing in community business and economy.</td>
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<tr>
<td>» Evacuation and Migration.</td>
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<tr>
<td>» Disruption in transportation.</td>
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<td>» Loss of faith in public institutions.</td>
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<tr>
<td>» Water supply contamination.</td>
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</tbody>
</table>


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d. Working with your entire development team, contractor, and consultants, identify the priority for building mitigation for all applicable hazards (column five).

For additional assistance, see the 2020 Enterprise Green Communities Criteria which includes references and resources for identifying hazards and evaluating project risk and vulnerability.
6. Write your project mission

Your project mission should be a high-level statement of what the project will achieve for the community when the building is placed in service. Your project mission should be short (no more than 2 sentences) and direct, using clear language free of industry jargon.

It is important that all project team members have a clear and common understanding of what the goals of the proposed development are.

*Note: Your project mission should be different and distinct from your organizational mission; but should reflect the values of your organization.*