Cost of Green Analysis for Affordable Housing in Seattle and Portland

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Prepared by

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- Winkler Development

A list of participating projects is provided in Appendix A.

Introduction

The purpose of this report is to examine the cost of incorporating sustainable design features into affordable housing projects in the cities of Seattle and Portland. The report includes both an analysis of the overall construction costs for green-rated and standard affordable housing projects, and a narrative summary of the key findings arising from the interviews with the projects' participants. The report also includes a review of current funding-related building requirements and standard building practices in the cities of Seattle and Portland as they affect affordable housing, to identify green elements that are required or typically incorporated into buildings, regardless of a project's sustainability goals.

The construction cost analysis section of this report compares the cost of green-rated affordable housing projects to similar standard affordable housing projects. By comparing green-rated buildings to standard buildings within a population, it is possible to evaluate whether the green-rated building projects are costing more than their standard counterparts. The narrative summary of interview findings looks at the common specific sustainable strategies pursued by the projects. By looking at the specific strategies, it is possible to evaluate whether those strategies differ from standard building strategies.

The standard projects in the study form the baseline group, and are the projects which intend to meet at least the minimum green building requirements as defined by Portland's Green Affordable Housing guidelines or Seattle's SeaGreen Affordable Housing guidelines. This level of achievement is required of all projects applying for funding through their respective City. It should be noted that even the base case for this study requires that projects meet certain green building standards which are uncommon in the rest of the country for this type of project. The level of 'green' in the baseline group as compared to the green-rated group is analyzed later in the study. In utilizing these two programs, a project submits its intent to meet the Affordable Housing guidelines at the time of funding application in the form of a checklist of design measures to be pursued. This checklist is not revisited for confirmation during the design phase or upon construction completion. A detailed description of Seattle and Portland's Green Affordable Housing guidelines is provided in the Baseline Affordable Housing Guidelines and Practices section of this report.

For the purposes of this analysis, green-rated projects are defined as those which meet, or are expected to meet, the requirements for either the Built Green Residential Green Building Program or certification through the United States Green Building Council's Leadership in Energy and Environmental Design for New Construction (LEED NC) Green Building Rating System. The Built Green and LEED rating systems are comprehensive in scope.

The LEED rating system requires a quantitative analysis of the sustainable elements incorporated into the building. LEED certification is awarded upon completion of construction and is based on the documented incorporation of sustainable design elements into the design and construction of the project. All LEED projects must be third party certified. Projects seeking LEED NC certification are divided between those pursuing the older version 2.1 and the newer version 2.2.

The Built Green rating system is based on a comprehensive checklist with prerequisites and optional items. Built Green certification is also awarded upon completion of construction and is based on a statement from the project team regarding the sustainable elements incorporated into the design and construction of a project. Projects achieving 3-Star certification are self-certified. Projects pursuing 4-Star and 5-Star certification undergo a third party review of the building. All Built Green projects in this study have achieved, or are pursuing, a 3-Star level.

The checklist for Built Green is included in Appendix B; the checklist for LEED NC v2.2 can be found in Appendix C.

The affordable housing projects in the study are all three to five stories of wood frame residential construction. Most have one to two stories of concrete parking and retail shell below; nine of the projects are residential wood frame construction on grade. All but three projects started construction between 2004 and 2008, the remaining are scheduled to start before August 2009. The projects range in size from 21,000 ft.² to 218,000 ft.², with a median area of 57,000 ft.². 75% of the population fell between 40,000 ft.² and 90,000 ft.².

Key Findings

1. There is no statistically significant difference in construction cost between the green-rated and standard populations within this study.
2. The mandatory aspects of current funding-related building requirements and standard building practices for affordable housing within the cities of Seattle and Portland would normally lead to buildings achieving a LEED score in the range of 5-7 points; 10-15 total points could be earned with minimal additional effort and 20-24 total points could be earned with proper planning, documentation, and early setting of goals & thresholds.
3. Projects meeting the mandatory aspects of current funding–related building requirements in Seattle and Portland can achieve somewhere in the range of 45-60 points in the Built Green system, which would potentially earn either a 1-Star or a 2-Star certification level.
4. Among the respondents to the interviews, most indicated a belief that adding sustainable features increases the cost of projects; however, two key priorities for affordable housing projects are longevity and resident comfort, resulting in incorporation of green building features despite a frequent lack of direct focus on environmental sustainability as a program goal.
5. The green-rated projects were typically pursuing strategies related to site, water, and materials issues; and reduction of VOC content for finish materials

Cost Analysis

Methodology

For this study we compared reported construction (hard) costs and project costs for populations of affordable housing projects in the cities of Seattle and Portland. The initial study identified 34 suitable projects for analysis. Of these, interviews were completed and project cost data obtained for 29 of the projects, while construction (hard) cost data was available for only 27 of the projects. Green-rated buildings made up 55% of the population.

All costs were normalized for time and location, and for the purposes of this report are stated as of November 2008 in Seattle. It should be noted that, given the relatively small time span and the similarity of the construction markets in both cities, the overall time and location adjustments were relatively small.

The study compared the project costs and construction costs for the green-rated and standard buildings, on a cost per square foot basis. The costs and areas used in the analysis were obtained from interviews with representatives of the project teams. It was not possible to audit or validate the building data, and all data was used without verification or adjustment, other than normalization for time and location. While it is possible, we do not believe that there is any built in or systematic bias in the reported data, one way or another.

The analysis compares only the costs between green-rated and standard buildings. Due to the relatively small population size, the study was not able to analyze the data by level of certification with any level of significance, or to subdivide the populations by building type or size, with the exclusion of considering the impact of eliminating the nine on-grade buildings.

Findings

Of the 16 green-rated projects responding to the study, six were pursuing or have achieved Built Green 3-Star certification, while the remaining ten projects achieved or are pursuing LEED certification at the level of Certified, Silver, or Gold. All projects met either the Portland or Seattle Green Affordable Housing Guidelines except for one privately funded project not subject to meeting the local guidelines required for City funding.

Projects in both the standard and the green-rated groups pursued and have obtained incentive funding from a variety of sources. A description of some available incentives is provided later in the Interview Findings section. The incentive monies received were not included in the analysis of costs.

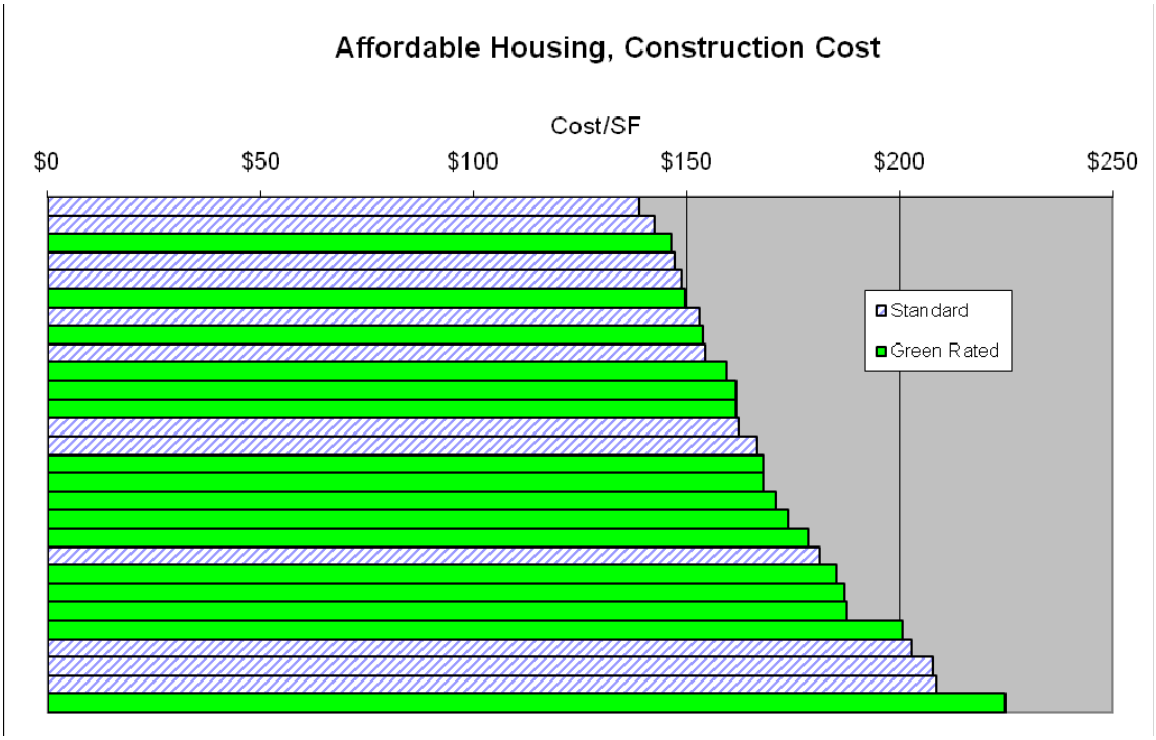
Of the two measures of cost (construction cost and project cost), construction cost is generally the more reliable, having a more universal definition. The reporting of project cost is generally less uniform between projects and building owners. There is no standard definition of what costs should be included within the category of project cost, and our experience tells us that there is a significant variation in the items included under project cost. For this reason construction cost analysis provides a more reliable picture of the data sets. This is evident in the population data, where the standard deviation of the project costs is appreciably greater than the standard deviation of the construction costs.

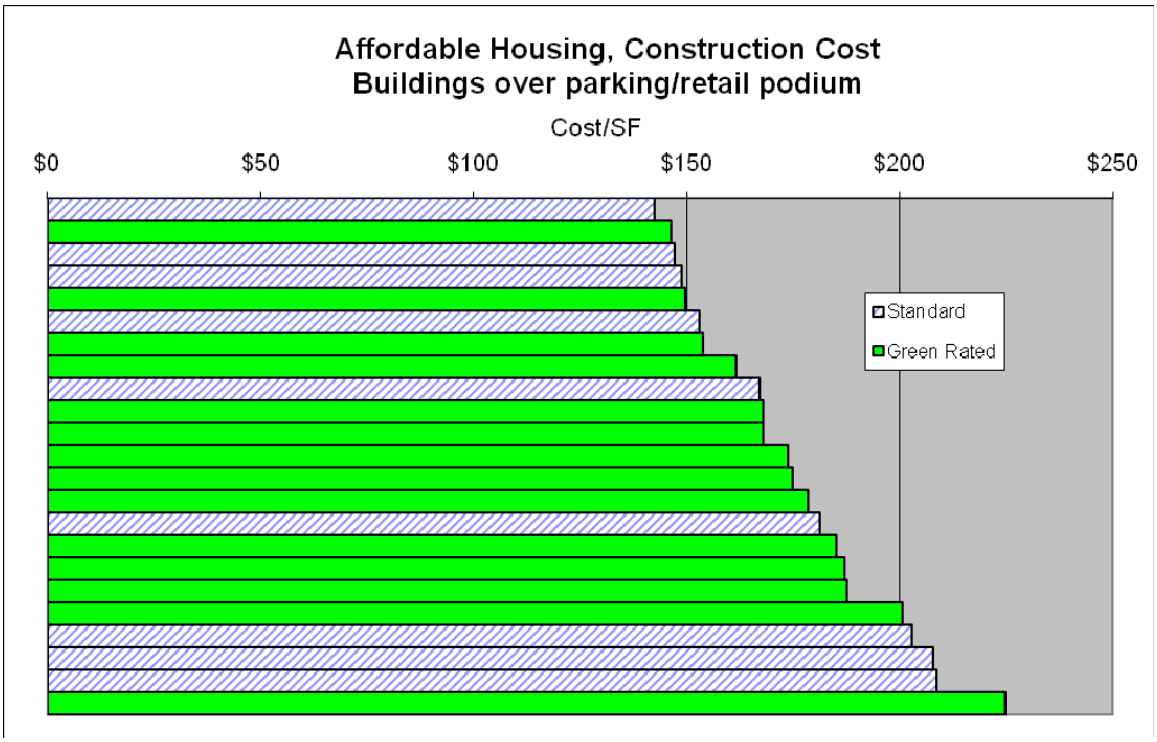
Construction Cost

The construction cost data show a moderate difference (4.6%) in average cost between the green-rated buildings and standard buildings. Statistically this difference is significant, but is due predominantly to the

spread between buildings built on grade and those built over a concrete podium for parking and/or retail. A greater percentage of the standard buildings were on grade, and these are typically lower cost. When the on-grade buildings are eliminated from the sample, the difference in average cost falls to around 1%, a level that is statistically insignificant. It should be noted that the on-grade buildings do form a statistically meaningful subset of the total population, with appreciably lower costs for both standard and green-rated buildings.

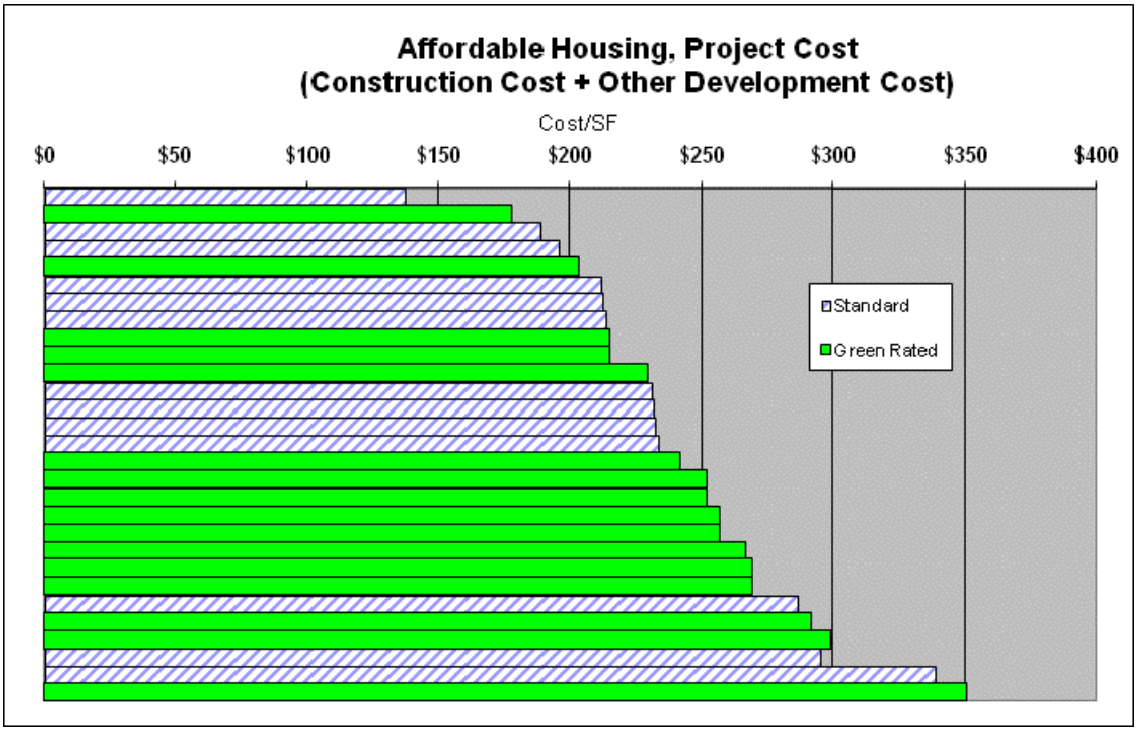
As can be seen from the chart below, the green-rated buildings are reasonably uniformly scattered throughout the population of affordable housing buildings, with both relatively low and high cost green-rated buildings, and relatively low and high cost standard buildings.





Project cost

The project cost data generate broadly similar patterns to those found in the construction cost data. With the elimination of the on-grade buildings, the average green-rated building cost actually falls slightly below the average standard building cost. This, however, is not a statistically meaningful shift.



Interview Findings

Methodology

In project interviews, qualitative data was collected to better understand the affordable housing market's experience with green building. Interviewees were asked to describe the building's energy performance expectations, material palette, and indoor environment. They were also asked to discuss their experience with building green, including perceived cost, and the key opportunities and challenges. Due to the subjective nature of this portion of the research and because not all participants responded to every question, the following data analysis summarizes the most common practices and experiences.

Soft Costs

While not the focus of the study, project teams were asked a few specific questions about soft costs in order to ascertain what, if any, added cost was being incurred explicitly due to the incorporation of green elements or the pursuit of a green rating. Projects in this survey did not provide a total soft cost figure to us due to the variability of such a figure. Areas of soft cost that are typically thought of as added costs associated with green building are: sustainability consulting, commissioning, and energy modeling. Ten projects reported costs associated with sustainability consulting services and/or commissioning services. Of these ten, five projects listed commissioning fees, ranging from $10,000 up to $54,000, or $0.13 to $0.23 per square foot with one project reporting $0.95 per square foot. Three projects reported combined sustainability consulting fees including consulting and commissioning, one at $50,000, one at $100,000, and one at $115,000. Three projects reported separate sustainability consulting fees, at $11,000 (for a 218,000 SF standard building), $28,000 (for a 160,000 SF green-rated building), and $48,000 (for a 58,000 SF green-rated building). Most projects pursuing commissioning indicated that they would have completed commissioning regardless of pursuit of a green rating, either in order to participate in an incentive program, or because they consider it standard best practice to help meet their goals of increasing building longevity and minimizing maintenance. Fees for energy modeling were not reported in this study and only two projects performed energy modeling.

Perceived Cost

One of the questions asked of project participants was if 'going green is an additional cost.' Of the 14 respondents who chose to answer this question, 13 responded yes, and 1 responded no. Two in the 'Yes' category noted that while the answer is yes, the additional cost was very slight, or that the cost was returned due to paybacks over time. The respondent answering 'No' noted specifically that, "no, the project is on budget," and that the team manages to stay on budget, at least in part due to selecting contractors with green building experience. However, the respondent did not note whether or not the original budget was affected by green building strategies.

The question of whether going green adds cost becomes a question of perceived baseline. One of the most common methods of assessing the cost of green is by comparing the cost of the green project with the original project budget, or the original anticipated cost of the project. Clearly this approach has two substantial problems: it assumes that the original budget was adequate in the first place, and it assumes that no other changes or enhancements were made; that the green features were additive, as opposed to simply incorporated into the design along with other more 'standard' features. This approach is also a concern in that projects rarely will report coming in under budget, so a range of reported costs will therefore typically run from 'no added cost' to positive. In addition, while some individual green components may be generally more expensive than their non-green counterparts, most design teams will find a way to offset these costs by reducing output in some other part of the design.

In the case of this analysis, even though the majority of the respondents felt that going green added some cost, the comparison of total costs across buildings in the population demonstrates that this 'added cost' did not automatically mean that the green-rated building was therefore more costly than its standard counterpart. This could be due to the incorporation of green into earlier stages of design or to choices made by the project teams to ensure that the green goals were met within the existing budget. It may also be due to how the projects were initially budgeted, since the cost comparisons showed a wide range of total cost per square foot across all the projects surveyed. The key difference is that, while some strategies may have some added cost when compared to standard strategies, the overall project may not be more expensive due to design choices or trade-offs that the project team makes.

Incentives and Rebates

Several incentive programs are available for projects pursuing sustainable design and construction in both Seattle and Portland. Twenty-two of the twenty-nine projects in the study earned rebates or incentives from one or more of the following sources:

- Business Energy Tax Credits
- Portland Green Investment Fund
- Portland Metro (for transit-oriented development)
- Oregon Housing Weatherization Grant
- Oregon Energy Trust
- Home Depot Foundation
- Enterprise Green Communities
- Seattle City Light's Built Smart
- Seattle City Light's LEED program
- Portland Office of Sustainable Development's Green Innovation Fund

Business Energy Tax Credits (BETC), Oregon Housing Weatherization Grants and Seattle City Light's Built Smart program were the most common sources of funding.

- Six projects received weatherization funding, in amounts ranging from $11,000 up to $500,000 (an outlier). Most projects received between $50,000 and $150,000.
- Six projects received BETC's, ranging from $25,000 to $168,000.
- Seven projects received Built Smart grants, ranging from $11,300 to $41,000.

Seattle City Light's Built Smart program is a commonly utilized program for construction projects in the Seattle area. It is sponsored by Seattle's utility company and provides dollar per square foot incentives for specifying energy efficiency upgrades for specific building elements such as windows, ceilings, and slabs. Built Smart requires certification after construction is complete.

Earth Advantage is a similar program in the Portland area, and while no projects in this study noted pursuing Earth Advantage, it is a program that is worthy of mention. Earth Advantage is an energy efficiency incentive program requiring an overall energy performance of 15% or greater better than the energy performance of conventional residential construction. Earth Advantage requires that projects submit energy models during the design phase to demonstrate energy performance.

Another program of note is Enterprise Green Communities, a national green building incentive program designed for affordable housing. Green Communities has a checklist with mandatory and optional measures. Grants, low-interest loans, and competitive tax credits are awarded based on the number of measures pursued on the checklist. Four of the projects in the study utilized this program.

Most of the respondents, when asked about incentives and rebates, did not comment extensively on any impacts the additional funding sources had on the project regarding the design or sustainability features implemented.

Common Strategies

HVAC

The projects typically used electric heating, with the exception of three using a gas fired central boiler connected to hydronic baseboard heaters. The electric heating strategies include:

- Comfort cove heaters
- Baseboard heaters
- Fan forced wall mounted heaters

Projects also typically used naturally ventilation for cooling except in some common areas. In air conditioned spaces, individual packaged terminal air conditioners were commonly installed. Projects also typically have central gas fired high efficiency domestic hot water heaters.

Energy Efficiency

The most common energy efficiency measures, for both standard and green-rated buildings, are the use of EnergyStar appliances, high efficiency windows, advanced framing techniques, increased insulation, and compact fluorescent lighting. A few respondents noted strategic building orientation and sun shading on west facades but these were not commonly discussed strategies. Strategic building orientation is a required design element of the Seattle and Portland Green Affordable Housing Guidelines, however, so all projects must at least consider orientation.

Eight of the ten LEED projects provided LEED checklists for this study. Seven of these eight projects reported achieving or pursuing Energy & Atmosphere Credit 3 - Enhanced Commissioning. Of these 8 projects, three also reported either earning or expecting to earn 3 points for Energy & Atmosphere Credit 1 – Optimize Energy Performance, three projects with 2 points, and two with 6 points. Two points for EAc1 means the project performed 14% better than ASHRAE 90.1-2004, achieving 3 points demonstrates a 17.5% improvement, and 6 points demonstrates a 28% improvement. Energy modeling was performed on these last two projects pursuing the 28% improvement over ASHRAE.

Four of the six Built Green projects provided checklists for this study. All four projects achieved or pursued the following Energy Efficiency categories:

- 3-3: Third party review and inspection (note: projects typically chose Built Smart because of the incentives)
- 3-4: Building wrapped with exterior air infiltration barrier
- 3-27: Install thermostat for non-ducted electric heat
- 3-34: Light colored interior finishes
- 3-40: Use Compact Fluorescent Bulbs, ballast, or fixtures in hallways
- 3-41: Avoid excessive outdoor light levels

Most Built Green projects noted energy efficient appliances, efficient glazing, and reflective roofing as well. None of the six projects achieving or pursuing Built Green certification noted energy modeling as a strategy for documenting energy performance beyond code.

Standard projects met state energy code through prescriptive measures, and, apart from a few projects that modeled individual building components, they did not conduct whole building energy models. To obtain incentives from Seattle City Light's Built Smart program, a project is required to demonstrate prescriptive thermal envelope efficiency improvements (among other measures).

Water and Landscape

Almost all projects submitting LEED checklists were pursuing Sustainable Sites Credit 6.1 – Storm Water Quantity. The Portland Green Affordable Housing Guidelines require that projects maximize on-site storm water infiltration. A common strategy to meet this requirement was the use of bioswales and stormwater planters. For the most part, these green-rated building projects did not pursue points for controlling the quality of Storm Water leaving the site – i.e. removing pollutants such as suspended solids from the storm water. Many of the storm water measures implemented (such as bioswales) do, however, remove solids and other pollutants.

Most projects in this study made use of high efficiency irrigation technologies. One respondent noted that an efficient irrigation system is probably cheaper than a conventional system. Native/adaptive, drought-tolerant landscaping materials were also commonly used. These measures contributed to water use reduction in the landscape.

Most respondents for standard projects claimed to install low flow fixtures; however, the fixtures installed tended to be code compliant only. Code requirements (1.6 gallons per flush, for example) are standard practice and no longer considered low flow. All green-rated projects submitting LEED checklists achieved (or are pursuing) Water Efficiency Credit 3.1, 20% Reduction, and all but one achieved (or are pursuing) a 30% reduction. This level of achievement is typically possible when low flow showers (<2.5gpm) and lavatories (<2.5gpm) are included. While low flow fixtures were commonly included in these projects, only a few projects reported installing toilets with a flush volume of less than 1.6gpf.

Of the four Built Green Checklists provided, two did not pursue fixtures with efficiencies greater than that required by code, one project pursued bathroom faucets with higher efficiency than code, and one project pursued both bathroom and kitchen faucets with efficiency greater than code.

Indoor Air Quality

Nearly every respondent in both the standard and the green-rated groups specifically mentioned the use of low-VOC paints, adhesives and carpets. Several respondents noted that preventing harmful off-gassing was important, particularly for vulnerable populations; however only three projects noted achieving or pursuing avoiding added urea formaldehyde in composite wood and agrifiber products. Most projects utilize passive ventilation with operable windows for residential spaces, and active conditioning for common rooms and commercial spaces.

All projects submitting LEED checklists achieved Environmental Quality Credits 6.1 Controllability of Systems – Lighting and all but one achieved 6.2 – Controllability of Systems – Thermal Comfort. Most projects achieved Environmental Quality Credits 8.1 Daylighting and Views – Daylight 75% of Spaces and 8.2 – Views for 90% of Spaces; and Environmental Quality Credits 4.1, 4.2, and 4.3: Low Emitting Materials, Adhesives & Sealants, Paints & Coatings, and Carpet Systems.

The most common IAQ measures used by Built Green projects included the following:

- 4-10: Specify Carpet and Rug Institute IAQ label carpets
- 4-11: Install low-pile carpets
- 4-12: Avoid carpets in areas they can get wet

- 4-14: Optimize air quality in family bedrooms
- 4-23: Specify low VOC paints
- 4-38: Make sure air intakes are placed to avoid intake from air pollutant sources

Materials

Most of the projects used vinyl or VCT flooring, and either Hardi or vinyl siding. All projects submitting LEED Checklists either achieved, or are pursuing both points under MRc2 Construction Waste Management which requires that least 75% of construction and demolition debris be diverted from the landfill through reuse or recycling. In addition, all projects pursuing LEED certification either achieved, or are pursuing, a minimum of 10% recycled content material. All LEED projects reported pursuing or achieving 20% of materials manufactured locally, and most are pursuing or achieving at least 10% of materials manufactured *and* extracted locally. Only one project incorporated Forest Stewardship Council-certified wood, although not enough to earn a LEED credit. All Built Green projects pursued the use of materials with recycled content, however exact percentages are not specified, and materials with recycled content vary from project to project.

Key Issues

Initial costs and returns on investment are deciding factors when implementing green strategies. Project teams are often excited about green building, but the returns on investment have to pay off, usually within a 5-7 year period, in order to make it financially feasible. The main concern for many project team respondents was the inability to raise rent in order to cover the costs of additional green features. While a benefit of building green is a decrease in energy usage, leading to a corresponding decrease in energy costs, these savings are more likely to benefit the tenants than the developers of the projects in this study. In addition, several of the respondents noted that in the case of affordable housing, there is usually a long waiting list, so achieving LEED or other green certification has no benefit as a selling point for the tenants. These aspects unique to affordable housing projects present challenges in accurately translating the benefits of going green into any savings either first cost or accrued over time. As a result, a commonly used strategy for keeping green costs low was to start with all the features which require little or no additional design effort or cost (these are fairly similar across all projects), and then continue working up the list of additional features until the green measures no longer make sense from a first cost versus environmental and economic return on investment. Costlier items, such as photovoltaic panels, were rarely considered during early design, and brought into the project only if contingency money was made available further down the development process.

Three of the respondents noted that projects with a design team and contractor experienced with green construction and design have a much higher chance of delivering a green project without costing more. One of these teams went so far as to require that contractors have experience with green building. They indicated that if the contractor raised concerns about building a LEED building on budget, they wouldn't be hired by the owner.

People-oriented design is another key issue that arose during the interviews. Many respondents argued that the goal is primarily to focus on the occupants as opposed to using environmental sustainability as a guiding design principle. Several participants emphasized their priority to spend the money on the project and green measures directly, not on the soft costs of consultant and LEED certification fees. Respondents indicated that main design goals for affordable housing are longevity and livability. Often, these goals result in a greener building, even though (advanced) environmental design isn't the explicit goal. Several respondents, however, noted that people are coming to expect green building and that it's the right thing to do, even though the public is not always willing to pay a premium for it. Despite this concern, when projects are high profile with a lot of public funding, the teams feel obliged to design as green as possible.

One concern expressed was that certain benefits achieved from incorporating green into the projects were highly dependent on user activity. Several respondents reported that enabling the residents to change their behavior is the best strategy for actually achieving the performance levels predicted by energy models and water use calculations. Getting the residents involved in the process, by encouraging participation in the recycling programs and educating the residents in how the building works, is an effective way to maximize the long term sustainability of the project. Alternatively, one project team noted that taking away as much control from the residents as possible was the best way to ensure the highest performance potential. For example, installing a moderate-flow flush toilet is better than a dual flush that may not always be used correctly.

Education seems key to ensuring that the green features are used to their full potential. However, the level and quality of education provided to tenants of the projects in this study varied widely, ranging from providing move-in packets with free cleaning supplies and compact florescent light bulbs, to nothing at all. The tenant reactions to the green building education and green features was mixed as well – some study participants noted that there are always a few tenants who get really excited about everything, while the majority seem indifferent, until they're told that they're saving money on their electric bill. Other participants noted that the tenants love the green features of the building, and attend periodic green building training and movie sessions.

Baseline Affordable Housing Guidelines and Practices

Within the cities of Seattle and Portland, the current requirements for city funding mandate some green features. Each city's affordable housing green building guidelines must be adhered to by all project teams applying for funding from the City. Projects fill out a checklist noting which sustainability measures will be pursued during the design and construction of a project, and submit this checklist when applying for funding. Once a project submits its checklist, there is no follow-up from the City confirming that the elements have been included in the project documents or constructed building, and there is no third-party verification.

In addition, both cities have mature sustainable construction markets, and many owners, developers, designers and contractors integrate sustainable practices into projects whether or not there is a stated sustainability goal. This means that many of the buildings that have been identified as standard will have some appreciable green design elements. The following analysis looks at the sustainable elements that are required in each city's affordable housing guidelines, or may reasonably be expected, in standard affordable housing projects in the cities of Seattle and Portland.

Requirements for City Funding

Due to the way the Seattle and Portland affordable housing guidelines are written, the level of sustainability that is implicitly required for an affordable housing project can vary significantly, depending upon the actual thresholds that a project sets for each guideline.

Portland – The Portland Green Affordable Housing Guidelines

The Portland Green Affordable Housing Guidelines checklist, which is included in this report as Appendix D, is a list of mandatory (Threshold), and Voluntary measures that are divided into the following categories: Enhanced Design & Site, Energy Conservation, Water Conservation, Conserving Materials & Resources, Enhanced Indoor Air Quality, and Operations & Maintenance.

Within the Portland Green Affordable Housing Guidelines checklist, items in the Enhanced Design & Site, Water Conservation, and Operations & Management categories most directly translate into "quantifiable" building and site environmental performance. For example, Enhanced Design & Site 11 – Erosion Control Plan directly translates into a LEED Prerequisite and requires adhering to local code to best manage erosion on site during construction. Enhanced Design & Site 10 – Maximize On-Site Drainage and Enhanced Design & Site 12 – Specify & Install Permeable Surface and Paving Areas addresses stormwater issues that when combined will likely result in significant stormwater runoff reduction, if not elimination.

While Enhanced Design & Site 7 – Building Orientation does not set any thresholds, requiring appropriate building orientation ensures that building systems will not have to work against nature for heating, cooling, and ventilation. Whether quantified by energy modeling or not, this strategy contributes to significant energy savings, which can yield LEED points and prerequisites if quantified, and at the very least, result in reduced energy bills for tenants.

Water Conservation 1 – 2.0 gpm Showerheads & 1.5 gpm Faucets addresses quantifiable domestic water use reduction, likely resulting in at least a 20% reduction in demand per LEED calculation methodologies. Water Conservation 4 – Use Only Native / Hardy Plants and Minimize Turf Area, and Water Conservation 5 – Install High Efficiency Drip Irrigation System will result in significant savings in irrigation demand if applied in concert. The actual irrigation savings will depend on the plants and irrigation systems selected.

The Operations & Maintenance requirements to eliminate pesticide and herbicide use and to eliminate use of solvents, because of their comprehensive nature, preserve local biodiversity and water systems and could contribute to Innovation and Design LEED credits.

The Energy Conservation items in the Portland Green Affordable Housing Guidelines, such as Energy Conservation 1 through 9, 13, and 14, can potentially have a significant impact on the efficiency of building systems depending on the thresholds at which they are specified and implemented. Similarly, while all of the Conserve Materials and Resources items encourage the use of sustainable materials, since thresholds are not set for most of these items, the actual percentage of materials with recycled content, materials that are produced regionally, or construction waste diverted from landfill, will vary from project to project.

Seattle – The SeaGreen Affordable Housing Guidelines

The SeaGreen Affordable Housing checklist, which is included in this report as Appendix E, specifies a number of methods by which affordable housing projects can be built more sustainably in the Seattle area. This guide was developed after, and is based on, the Portland Green Affordable Housing Guidelines. It is structured in a similar fashion as the Portland guidelines. SeaGreen is broken down into six areas, each of which includes a list of Essential items and Recommended items. The categories include Enhanced Design, Site and Water, Energy Efficiency, Health and Indoor Air Quality, Material Efficiency, and Operations and Maintenance.

Some of the areas covered in this guide, including development of an erosion and sedimentation control plan, proximity to public transportation, and availability of secure bicycle storage, translate fairly easily into LEED Sustainable Sites credits. Performing a Level 1 Site Assessment and setting a goal to preserve or create open space can potentially serve as a foundation for earning the LEED Brownfield or Preserving Open Space credits, depending on the level of contamination found and remediated, and the percentage of open space preserved, respectively.

The SeaGreen guidelines specify that projects should install 1.6 gallon per flush toilets, 2 gpm showerheads, and 1 gpm faucets. Even though 1.6 gallon per flush toilets are standard practice, the other low flow fixtures could result in 20% or higher water savings using the LEED baseline assumptions and calculations. Several landscaping measures, such as SeaGreen 2-8, 2-10, 2-11, and 2-14, deal with

landscaping/plant material and irrigation systems and can potentially result in significant reduction of irrigation demand, which could help a project earn WEc1 Water Efficient Landscaping in the LEED Rating System.

There are a number of items laid out in the SeaGreen guidelines regarding energy efficiency. These include flashing and sealing of penetrations, documenting improvements to the building envelope of at least 10% beyond that required by standard building code, and installing efficient water heaters, efficient outdoor lighting, and Energy Star appliances. All of these recommendations contribute to an energy efficient building, although the level of efficiency depends on the degree to which a project implements these measures. The standard project teams interviewed in this study did not do full building energy modeling due to cost; thus the energy performance expected of the standard buildings is not available for the purposes of this study.

SeaGreen lays out suggestions for using recycled materials, and for minimizing waste throughout the building project. Specific levels are not, however, commonly designated within the guide, so the ability of projects using these measures to also qualify for the corresponding LEED credits will be highly dependent on the level of effort and results achieved. Similarly, providing building flush out, make-up air, and specifying low-VOC finishes, as recommended in the SeaGreen guidelines, can significantly increase the indoor air quality of a project, and may also enable the project to earn additional LEED credits, depending on how thorough the flush out is, what VOC limits are established, and so on.

SeaGreen suggests several options for engaging tenants and staff in green building features. If pursued in a comprehensive nature, these educational opportunities can ensure that all green building features are used to their maximum potential, while potentially changing tenant behavior; encouraging tenants to recycle, for example, or use bicycles and public transportation more often.

Comparison of Portland's and Seattle's Green Affordable Housing Guidelines with the LEED Rating System

Seattle's SeaGreen has slightly more stringent requirements than Portland's Green Affordable Housing Guidelines (for example, fixture flow rates and landscape planting material). Portland and Seattle's codes, and other voluntary green standards such as LEED, are similar in that they each encourage sustainable buildings. The LEED Rating System adds a level of rigor, however, by requiring that green design goals not only be set but that the steps taken to reach these goals as well as the achievement level be quantified.

Overall, projects adhering to either Portland's Green Affordable Housing guideline's Threshold items, or Seattle's Sea Green Essential items, i.e. the mandated measures, can achieve between 5-7 LEED points. If 2-3 of the Sea Green's Recommended or Portland's Voluntary items are also pursued in each category, with minimal effort a project can reasonably achieve around 10-15 total LEED points. If moderate performance thresholds are attached to a few of the Voluntary or Recommended items in each category, and proper documentation is prepared, a project can achieve between 20-24 LEED points with some additional effort, but little adjustments in design. 26 points is the minimum level required for certification under the LEED NC Rating System.

By achieving the Essential items in Seattle's SeaGreen Affordable Housing guideline, a range of 45-60 points on the Built Green checklist would be available to projects. A project achieving the Threshold items in the Portland Green Affordable Housing Guidelines would have between 45-55 points available. For both Affordable Housing guidelines, several Built Green points are often *related* to one Essential or Threshold item, but may not always directly translate into an 'earned' credit. If all *related* Built Green items were pursued, a project could achieve up to 70 Built Green points. A Built Green building requires, among other

things, 15 points for a 1-Star building, 60 points for a 2-Star building, and at least 130 points for a 3-Star building (250 points for a 4-Star building and 400 points for a 5-Star building).

Current Common Building Practices

In addition to Portland and Seattle's green building measures that are mandated to get City funding, our evaluation found that there are several sustainable design measures that are typically achieved by the majority of affordable housing projects, regardless of sustainability goals. In some cases these are by virtue of either the location or the character of the development; in others they are due to the standard practices for construction in the region. We have linked these green measures to the LEED credits that would be earned.

Project location is an important factor for those LEED credits which encourage density and building on previously developed land. Most projects in this study, because of their urban location, meet the following Sustainable Sites credits: SSc1 Site Selection, SSc2 Development Density and Community Connectivity, and SSc4.1 Alternative Transportation: Public Transportation Access. SSp1 Erosion and Sedimentation Control is also easily met in this region due to the stringency of the local codes.

Indoor Environmental Quality LEED credits, such as EQc8.2 Daylight & Views: Views for 90% of Spaces, EQc6.1 Controllability of Systems: Lighting, and EQc6.2 Controllability of Systems: Thermal Comfort, are inherently earned because the projects in this study are residential, thus most areas have glazing and tenant-controlled environments. EQp1 Minimum IAQ Performance and EAp1 Minimum Energy Performance are also typically met without difficulty due to the stringency of local codes.

Due to requirements and practices common in the Pacific Northwest, projects will achieve MRc2 Construction Waste Management: Divert 50% (and most likely 75%). In addition, MRp1 Storage and Collection of Recyclables is typically met due to the robustness of local recycling programs.
Many construction professionals in these areas are LEED Accredited Professionals and achieving IDc2 for working with a LEED AP is common.

Appendix A – Survey Participants

Seattle and Portland Affordable Housing
Project Participant List

Project Name	City	Local Code Followed	Rating System Pursued / Achieved	Developer	Architect	Contractor	Construction Completion Date
Tranton North Building	Portland	Portland GAH	LEED Certified	Housing Authority of Portland	Mithun	Walsh Construction	June-06
Shaver Green	Portland	Portland GAH	LEED Gold	Armstrong Stafford, LLC	Deca Architects	Yorke & Curtis, Inc.	April-09
The Jeffrey	Portland	Portland GAH	LEED Gold	E & F Properties, LLC	Ankrom Moison	Howard S Wright Construction	June-08
The Morrison	Portland	Portland GAH	LEED Gold	Housing Authority of Portland	SERA Architects	Hoffman Construction	October-07
Killingsworth Station	Portland	Portland GAH	LEED Gold	Winkler Development	Vallaster & Corl Architects	R & H Construction, Inc	Estimated Summer 2010
The Miracles Club	Portland	Portland GAH	LEED Silver	Gaurdian Management, LLC	Carlton Hart Architects	LMC Construction	Estimated June 2010
Watershed at Hillsdale	Portland	Portland GAH	LEED Silver	Community Partners for Affordable Housing	william wilson architects	Walsh Construction	December-07
Leander Court	Portland	Portland GAH	N/A	Rose Community Development	william wilson architects	Walsh Construction	September-07
New Columbia Trenton Terrace	Portland	N/A	N/A	Northwest Housing Alternatives	Michael Willis Architects	Walsh Construction	January-07
Patton Park	Portland	Portland GAH	N/A	Reach Community Development	SERA Architects	PCR, Inc	January-09
Sitka Apts	Portland	Portland GAH	N/A	Turtle Island Development	Ankrom Moison	Walsh Construction	September & November 2005
Humboldt Gardens	Portland	Portland GAH	N/A	Housing Authority of Portland	Michael Willis Architects	Walsh Construction	August-08
Esperanza Court	Portland	Portland GAH	N/A	Caritas Housing Initiatives, LLC	Lundin Cole Architects & LMS Architects	Seabold Construction & Walsh Construction	September-08
82nd Ave Place	Portland	Portland GAH	N/A	Innovative Housing, Inc	LMS Architects	Walsh Construction	October-08
Genesee Housing	Seattle	SeaGreen	Built Green 3 Star	Housing Resources Group	SMR Architects	Rafn Company	February-06
Cabrini First Hill Apartments	Seattle	SeaGreen	Built Green 3 Star	Low Income Housing Institute	GGLO	Walsh Construction	February-06
Pantages	Seattle	SeaGreen	Built Green 3 Star	Capitol Hill Housing	SMR Architects	Walsh Construction	December-05
The Borealis	Seattle	N/A	Built Green 3 Star	Vulcan	Runberg Architecture Group	W.G. Clark Construction	2008
Denny Park	Seattle	SeaGreen	Built Green 3 Star	Low Income Housing Institute	Runberg Architecture Group	Rafn Company	December-05
MCDermott Place	Seattle	SeaGreen	Built Green 3 Star	Low Income Housing Institute	Runberg Architecture Group	Walsh Construction	Estimated December 2009
West Seattle Community Resource Center	Seattle	SeaGreen	LEED Silver	Delridge Neighborhoods Development Association	Environmental Works	Marpac Construction	March-07
Stone Way Apartments	Seattle	SeaGreen	LEED Silver	Housing Resources Group	GGLO	Walsh Construction	February-07
Broadway Crossing	Seattle	SeaGreen	LEED Silver	Capitol Hill Housing	GGLO	Rafn Company	March-07
Langdon & Anne Simons Senior Apartments	Seattle	SeaGreen	N/A	Plymouth Housing Group	SMR Architects	Marpac Construction	January-08
Fremont Solstice Apartments	Seattle	SeaGreen	N/A	Capitol Hill Housing	SMR Architects	Walsh Construction	August-08
Cascade Senior Housing	Seattle	SeaGreen	N/A	Low Income Housing Institute	Runberg Architecture Group	Synergy Construction	April-09
The Cate Apartments	Seattle	SeaGreen	N/A	Low Income Housing Institute	Runberg Architecture Group	Rafn Company	December-03
Anonymous	Seattle	SeaGreen	N/A				
Anonymous	Seattle	SeaGreen	N/A				

Appendix B – Built Green Checklist

Please note that the following is the checklist only. For a copy of the full document and information about the program, please go to: http://www.builtgreen.net/

Built Green Project Checklist
Multi-Family 2008 Extended Pilot MASTER

Project Address _____

Company Name _____

Action Item Number	Possible Points	CREDITS	Total Points	Comments
TWO-STAR REQUIREMENTS (200 points minimum)				
	required	Program Orientation (one time only)	★	
	required	Section 1: Build to Program Requirements and Green Codes / Regulations	★	
	required	Achieve 30 points from each section	★	
THREE-STAR REQUIREMENTS (300 points minimum)				
	required	Meet 2-Star requirements	★	
	required	Achieve a minimum of 40 points from each section	★	
FOUR-STAR REQUIREMENTS (400 points minimum)				
	required	Meet 3-Star requirements	★	
	required	3rd party verification required	★	
Site & Water	required	Amend disturbed soil with compost to a depth of 8 to 10 inches or better than code to restore soil environmental functions (See Action Item 2-17)	★	
Site & Water	required	Landscape with plants appropriate for site topography and soil types, emphasizing use of plants with low watering requirements [drought tolerant] (See Action Item 2-44)	★	
Site & Water	required	Install ALL bathroom faucets with GPM 1.5 or better (See Action Item 2-51)	★	
Site & Water	required	Install ALL showerheads with GPM less than code (See Action Item 2-53)	★	
Energy	required	Building Modeled to have 15% better performance than energy code	★	
Energy	required	Install photovoltaic system, minimum 1 kW (See Action Item 3-80)	★	
IAQ	required	Use only low-VOC /low-toxic interior paints, primers, and finishes for large surface areas (See Action Item 4-31)	★	
IAQ	required	Provide permanently installed track-off mats and/or shoe grates at common entryways to building (See Action Item 4-79)	★	
IAQ	required	Do not install a wood-burning fireplace inside unit or building (See Action Item 4-82)	★	
Materials	required	Practice waste prevention and recycling and buy recycled products (See Action Item 5-1)	★	
Materials	required	Achieve a minimum of 70 points from each section	★	
FIVE-STAR REQUIREMENTS (600 points minimum)				
	required	Meet 4-Star requirements	★	
Site & Water	required	Preserve existing native vegetation as landscaping (See Action Item 2-8)	★	
Site & Water	required	Use pervious materials for at least one-third of total area for hardscapes (See Action Item 2-24)	★	
Energy	required	Alternate: In lieu of energy requirements demonstrate building energy performance 30% beyond code per (See Action Item 3-2)	★	
Energy	required	Install LED, Energy Star® compliant fixtures, or demonstrated energy equivalent in units and in common areas (See Action Item 3-67)	★	
IAQ	required	Use plywood and composites of exterior grade with no added urea formaldehyde (for interior use) (See Action Item 4-18)	★	
Materials	required	Achieve a minimum recycling rate of 90% of waste by weight (See Action Item 5-31 for reference)	★	
Materials	required	Use a minimum of 10 materials with recycled content per unit (See Action Items in Section 5)	★	
Materials	required	Achieve a minimum of 100 points from each section	★	
SECTION ONE: BUILD TO PROGRAM REQUIREMENTS AND GREEN CODES/REGULATIONS				
1-1	★	Provide owner with an environmentally friendly operations and maintenance kit		
1-2	★	Take extra precautions to not dispose of topsoil in lowlands or wetlands	★	
1-3	★	When construction is complete, leave no part of the disturbed site uncovered or unstabilized	★	
1-4	★	Prepare jobsite recycling plan and post on site	★	
1-5	★	If using can lights, use Energy Star® can lights or can lights approved by Washington Energy Code for all can light applications	★	
1-6	★	2-4 Star: Install CO detector for all units (hardwired preferred) with a combustion device or attached garage	★	
1-7	★	5 Star: Install CO detector for all units (hardwired required) with a combustion device	★	
1-8	★	Prohibit burying demolition and/or construction waste	★	
1-9	★	Dispose of non-recyclable hazardous waste at legally permitted facilities	★	
1-10	★	Meet all applicable state and local codes, regulations, and development standards	★	
		CODES SECTION TOTALS	**ALL**	
SECTION TWO: SITE AND WATER				
SITE PROTECTION				
Overall				
2-1	10	Build on an infill lot to take advantage of existing infrastructure and reduce development of virgin sites		
2-2	10	Build in a planned Built Green® development		
2-3	20	Build on a previously developed site (greyfield or brownfield)		
2-4	30	Create a Low Impact Development		
2-5	5-50	Meet City of Seattle's Green Factor standards		
2-6	5	For each acre of development, set aside an equal amount of land as a conservation easement or transfer the development rights		
		Subtotal	**0**	
Protect Site's Natural Features				
2-7	3	Avoid soil compaction by limiting heavy equipment use to building footprint and construction entrance		
2-8	3	Preserve existing native vegetation as landscaping		
2-9	4	Retain 30% of trees on site or retain arborist to determine tree retention plan for site		
2-10	4	Do not build on or adjacent to sensitive ecological areas: wetlands, shorelines, bluffs, old growth forests, or other critical areas		
2-11	2	If building near sensitive ecological areas, limit development footprint and preserve and protect beyond code		

2-12	5 or 7 or 10	Restore percentage of site outside the footprint for the life of the building -10% - 20% - 35%		
			Subtotal	**0**
Protect Natural Processes On-Site				
2-13	2	Install and maintain temporary erosion control devices that significantly reduce sediment discharge from the site beyond code requirements		
2-14	3	Use compost to stabilize disturbed slopes		
2-15	3	Retain all native topsoil and protect stockpiles from erosion		
2-16	3	Balance cut and fill, while minimizing change to original topography		
2-17	4	Amend disturbed soil with compost to a depth of 8 to 10 inches (or better than code) to restore soil environmental functions		
2-18	2	Replant or donate removed vegetation for immediate reuse		
2-19	2	Use plants salvaged from another site		
2-20	3	Grind land clearing wood and stumps for reuse		
2-21	3	Use a water management system that allows groundwater to recharge		
2-22	10 or 20 or 30	Manage specified percentage of stormwater and building water discharge on site by 60%, 80%, or 100%		
			Subtotal	**0**
Hardscapes				
2-23	5 or 10 or15	Design to achieve 50%, 75%, or 90% effective pervious surface outside of building footprint		
2-24	3	Use pervious materials for at least one-third of total area for hardscapes		
2-25	10 or 15 or 25	Install vegetated roof system (e.g. eco-roof) to reduce impervious surface on 25%, 50%, or 90%+ of total roof surface		
2-26	1	Integrate landscaping with parking area beyond code		
2-27	3	For an urban infill, replace impervious surfaces with permanent pervious surfaces outside building footprint		
			Subtotal	**0**
Reduce Urban Heat Island Effect				
2-28	7	Install a high albedo or light colored roof		
2-29	7	Provide shading for 30% of hardscapes by using landscape, landscape features, or overhangs		
2-30	7	For all exterior hardscape, including surface parking, use only light colored pavement for 90% of project area		
			Subtotal	**0**
Eliminate Water Pollutants				
2-31	1	Wash out concrete trucks in slab or pavement subbase areas		
2-32	1	Establish and post clean up procedures for spills to prevent illegal discharges		
2-33	1	Reduce hazardous waste through good jobsite housekeeping		
2-34	2	Construct tire wash, establish and post clean up protocol for tire wash		
2-35	2	Use slow-release organic fertilizers to establish vegetation		
2-36	2	Use less toxic form releasers		
2-37	4	Provide an infiltration system for rooftop runoff		
2-38	3	Use non-toxic or low-toxic outdoor materials for landscaping (e.g. plastic, least-toxic treated wood)		
2-39	5	No clearing or grading during wet weather periods		
2-40	25 or 50	On-site wastewater treatment for greywater only or for blackwater and greywater		
			Subtotal	**0**
WATER CONSERVATION				
Outdoor Conservation				
2-41	2	Mulch landscape beds with 2 inches organic mulch		
2-42	1	Use grass type requiring less irrigation and minimal maintenance		
2-43	5	Limit use of turf grass to 25% or less of landscaped area		
2-44	10	No turf grass		
2-45	5	Landscape with plants appropriate for site topography and soil types, emphasizing use of plants with low watering requirements (drought tolerant)		
2-46	5	Install intelligent irrigation system		
2-47	2	Install sub-surface or drip systems for irrigation with timers		
2-48	10	Install landscaping that requires no potable water for irrigation whatsoever after initial establishment period (approximately 2 years)		
2-49	1-15	Install rainwater collection system (cistern) that reduces water consumption for irrigation by 50% annually		
2-50	50	Provide 100% of building and landscaping water use with captured precipitation or reused water purified without the use of chemicals		
			Subtotal	**0**
Indoor Conservation				
2-51	3	Install ALL bathroom faucets with GPM 1.5 or better		
2-52	3	Install motion-sensor for bathroom faucets - one per unit and in all common areas		
2-53	3	Install ALL kitchen faucets with GPM less than code		
2-54	5	Install ALL showerheads with GPM less than code		
2-55	5	Stub-in plumbing to use greywater for toilet flushing		
2-56	20	Use greywater or rainwater for toilet flushing		
2-57	3	Provide water sub-metering for each unit		
2-58	8	Install high efficiency toilets in highest use area and at least one per unit in all units		
2-59	2	Install no-cartridge waterless urinals or 1/8 gallon urinals and high efficiency toilets in all common areas		
2-60	4	Install point-source, on-demand (tankless), or recirculation pump hot water systems (where appropriate)		
			Subtotal	**0**
Eliminate Water Pollutants				
2-61	3	Develop and provide a building-wide food waste disposal strategy		
2-62	1	Do not install garbage disposal		
			Subtotal	**0**
DESIGN ALTERNATIVES				
2-63	10	Follow comprehensive integrated design plan for site and structure (as described in the Handbook)		
2-64	5	Hold design charette during various stages including pre-design, schematic design, design development, and construction documents		
2-65	5	Provide community common areas accessible to all buildng occupants		
2-66	2	Take advantage of parking reduction credits that are available in your jurisdiction		
2-67	5 or 10	Provide structured parking within the proposed building footprint at a 50% minimum or 100% with no surface parking		
			Subtotal	**0**
TRANSPORTATION				
2-68	25	Create a transit-oriented development		
2-69	4	Build within ¼ mile of a transit stop or Park and Ride		
2-70	8+	Create a "mixed-use" building		

2-71	2-4	Provide subsidized bus passes		
2-72	2	Provide bicycle lockers or bicycle storage beyond code		
2-73	2	Provide bus shelters		
2-74	5+	Points for B20 biodiesel or better equipment		
2-75	5+	Provide dedicated parking spots for carpool or car-share vehicles		
2-76	1+	Provide a hardwire outlet(s) for electric vehicles		
2-77	2	Provide a link to community trails		
2-78	15	Provide alternative fueling station		
		Subtotal	**0**	
TRAINING AND EDUCATION				
2-79	2	Prepare an environmentally friendly operations and maintenance plan for common area facilities		
2-80	2	Prepare an environmentally friendly landscape operations and maintenance plan		
2-81	3	Conduct training sessions for maintenance staff and/or occupants		
2-82	5	Provide educational materials designed for the public that highlight the green building features and their performance that are included in the project		
		Subtotal	**0**	
EXTRA CREDIT / INNOVATION for Site and Water				
2-83	1-10	Extra credit / innovation for Site and Water		
		Subtotal	**0**	
		SITE & WATER SECTION TOTALS	**0**	
SECTION THREE: ENERGY EFFICIENCY				
3-1	5 or 15	Building systems commissioning beyond code		
		Subtotal	**0**	
ENVELOPE				
Thermal Performance				
3-2	10 or 20 or 30 or 40	Document envelope improvements beyond code (component performance approach) by 10%, 20%, 50%, or 75%		
3-3	2-20	Document envelope improvements beyond code minimum (prescriptive approach)		
3-4	50	Build a zero net energy building that draws zero outside power or fuel on a net annual basis		
3-5	5	Use dense packed cellulose (over 2.5 lbs/inch) or wet blown cellulose or blown in foam		
3-6	3	For concrete walls - use perimeter insulation for exterior slab edges		
3-7	6	Increase roof insulation 20% beyond code		
3-8	8	Participate in a program that provides third-party review and inspection		
		Subtotal	**0**	
Air Sealing				
3-9	3	Airtight drywall approach for framed structures		
3-10	3	Use airtight building method, such as SIP or ICF		
3-11	3	Eliminate or airtight seal all air pathways between floors and units		
3-12	5 or 10	Conduct blower door test for a sampling of units with results better than 0.30 ACH or 0.25 ACH		
		Subtotal	**0**	
Reduce Thermal Bridging				
3-13	1	Use rigid insulation as thermal break in headers		
3-14	1	Fully insulate corners at intersecting exterior walls		
3-15	1	Fully insulate at interior/exterior wall intersection by open cavity framing		
3-16	3	Use energy heels of 6 in. or more on trusses and stick frame roofs to allow added insulation over top plate		
3-17	2	Use insulated exterior sheathing		
3-18	5	Use advanced wall framing - 24-inch OC, with double top plate		
		Subtotal	**0**	
Solar Design Features				
3-19	6	Passive solar design, *basic* features installed		
3-20	12	Passive solar design, *advanced* features installed		
3-21	5	Model solar design features using approved modeling software		
3-22	2	Use landscaping plans that reduce heating/cooling loads naturally		
		Subtotal	**0**	
HEATING/COOLING				
Distribution				
3-23	1	Centrally locate heating / cooling system to reduce the size of the distribution system		
3-24	3	Install ceiling fans in all units - minimum one per unit		
3-25	2	Use advanced sealing of ducts using low-toxic mastic		
3-26	10	Third-party performance air leakage test using prescribed sampling method for each unit type meets certification		
3-27	5	Third-party duct test results less than 6% loss of floor area to outside/total flow		
3-28	2	All ducts are in conditioned space		
3-29	4	Locate heating / cooling equipment inside the conditioned space		
		Subtotal	**0**	
Controls				
3-30	1	Install thermostat with on-switch for furnace fan to circulate air		
3-31	1	Install thermostat with one degree dead-band (electronic or vapor diaphragm) for non-ducted electric heat		
3-32	2	Install 60-minute timers or humidistat for bathroom and laundry room fans		
3-33	2	Install programmable thermostats		
3-34	1	Provide separate switching for bathrooms fan/heat lamp and fan/light combination fixtures		
3-35	3	Provide electricity and/or natural gas direct metering for each unit		
3-36	5	Install heat systems with separate zones for sleeping and living areas (not including electric resistance heating)		
		Subtotal	**0**	
Heat Recovery				
3-37	7	Install a heat recovery ventilator or an energy recovery ventilator		
		Subtotal	**0**	
Equipment				
3-38	3	Select high efficiency heat pumps		
3-39	3	Select Energy Star® heating / cooling equipment or equivalent		
3-40	2	No gas fireplaces, or use direct vent gas or propane hearth product (AFUE rating)		
3-41	7	No air conditioner		
3-42	5	Direct use of natural gas, i.e., centralized boiler with hydronic heating system units <u>or</u> units with fan coil system that can do both heating and cooling		

3-43	10 or15	Install whole building hydronic heating for heating in all units, point range based on boiler efficiency - 85% or 92%		
3-44	10	Install geothermal heat pumps		
		Subtotal	**0**	
WATER HEATING				
Overall				
3-45	5	Install drainwater heat recovery system (DHR)		
3-46	2	Install whole building recirculation pump		
3-47	2	Passive or on-demand hot water delivery system installed at farthest location from water heater		
3-48	2	Install on-demand (tankless) hot water heater		
3-49	3	Upgrade electric water efficiency above code		
3-50	2 or 4	Upgrade gas or propane water heater efficiency to 0.61 or 0.81		
3-51	2	Install the water heater inside the heated space (electric, direct vent, or sealed venting only)		
3-52	4	Upgrade electric water heater to an exhaust air heat pump water heater or de-superheater: EF 1.9		
3-53	3	Install a timer to regulate standby hot water loss in hot water heater		
3-54	3	Ultra high efficiency central water heating		
3-55	5	Solar water heating system for common facilities		
3-56	5	Install Solar Hot Water Heating		
		Subtotal	**0**	
Distribution				
3-57	2	Locate water heater within 20 pipe feet of highest use		
3-58	1	Insulate all hot water pipes and install cold inlet heat traps on hot water heater		
		Subtotal	**0**	
LIGHTING				
Natural Light				
3-59	1	Light-colored interior finishes		
3-60	2	Use clerestory for natural lighting		
3-61	**5**	Maximize daylighting for all units		
		Subtotal	**0**	
Efficient Lighting				
3-62	2	Install low-mercury T-8 lamps		
3-63	1	Halogen lighting substitited for incandescent downlights		
3-64	3	Install lighting dimmer, photo cells, timers, and/or motion detectors (interior) for high efficiency fixtures		
3-65	2	Install photo cells, timers, motion detectors (exterior) for 90% of fixtures		
3-66	3-5	Install LED or Energy Star® compliant CFL bulbs or demonstrated energy equivalent in all units and common areas.		
3-67	1-10	Install LED, Energy Star® compliant fixtures, or demonstrated energy equivalent in all units and common areas		
3-68	5	Avoid excessive outdoor light levels while maintaining adequate light for security and safe access, meet IESNA Levels		
		Subtotal	**0**	
APPLIANCES				
3-69	4	Install gas clothes dryer in common laundry or in all units		
3-70	2	Install a water-saving, energy-efficient washing machine in all units		
3-71	5	Install common laundry facilities instead of in each unit with water-saving, energy-efficient washers		
3-72	1	Install a water-saving, energy-efficient dishwasher in all units		
3-73	2	Install Energy Star® refrigerator in all units		
3-74	2	Install gas stove/cooktop in all units		
3-75	2	Install biofuel appliances		
3-76	2	Install Energy Star® exhaust fans in all units		
		Subtotal	**0**	
ALTERNATIVE ENERGY BONUS POINTS				
3-77	2-5	Participate in the local utility's electricity program for renewable electricity sources		
3-78	1	Solar-powered or low-voltage walkway or outdoor area lighting		
3-79	10	More than 2% of building powered by photovoltaic		
3-80	5-25	Install photovoltaic system, minimum 1 kW		
3-81	5 or 10 or 25	Install innovative non-solar renewable power systems that produce a minimum of 15%, 30%, or 50% of the common area's total annual energy		
		Subtotal	**0**	
EXTRA CREDIT / INNOVATION for Energy Efficiency				
3-82	1--10	Extra credit / innovation for Energy Efficiency		
		Subtotal	**0**	
		ENERGY EFFICIENCY SECTION TOTALS	**0**	
SECTION 4: HEALTH AND INDOOR AIR QUALITY				
OVERALL				
4-1	5	Builder or architect certified to have taken American Lung Association (ALA) of Washington "Healthy House Professional Training" course, or equivalent approved by Director		
4-2	15	Certify building under an IAQ program approved by Director		
4-3	5	Building is designated non-smoking		
4-4	2	Provide tenants or homeowners with maintenance checklists		
		Subtotal	**0**	
JOBSITE OPERATIONS				
4-5	1	Use less-toxic cleaners		
4-6	1	Require workers to use VOC-safe masks when applying VOC containing wet products and N-95 dust masks when generating dust		
4-7	3 or 5	Take measures during construction operations to avoid moisture problems later (see Handbook for Basic or Expanded levels)		
4-8	2	Take measures to avoid problems due to construction dust by performing all items listed in the handbook		
4-9	3	Ventilate during all new wet finish applications		
4-10	2	No use of unvented heaters during construction		
4-11	3	Clean duct and furnace thoroughly before occupany		
4-12	2	Train subs in implementing a healthy building jobsite plan for the project		
4-13	2	Cover all duct openings during construction		
		Subtotal	**0**	
LAYOUT AND MATERIAL SELECTION				
4-14		Inside the building envelope use only low-VOC, low-toxic, water-based, solvent-free sealers, grouts, mortars, drywall mud, caulks, and adhesives for:		

4-14a	2	Tiling		
4-14b	2	Framing		
4-14c	4	Flooring		
4-14d	2	Plumbing		
4-14e	2	HVAC		
4-14f	2	Insulating		
4-14g	2	Drywalling		
4-15	5	Use an alternatiave to fiberglass insulation		
4-16	3	Use urea formaldehyde-free insulation or Greenguard certified product		
4-17	1	Do not install insulation or carpet padding that contains brominated flame retardant		
4-18	3	Use plywood and composites of exterior grade with no added urea formaldehyde (for interior use)		
4-19	5	Use only shelving, window trim, door trim, base molding, etc., with no added urea formaldehyde		
4-20	5	Install cabinets made with board with no added urea formaldehyde and low-toxic finish		
4-21	1	Use pre-finished flooring		
4-22	3	Use ceramic tile flooring		
4-23	18	Bonus Points: No carpet in units		
4-24	3	Limit use of carpet to one-third of unit's square footage		
4-25	2	If installing carpet system (carpet, pad, and adhesive), specify CRI Green Label Plus or Greenguard		
4-26	3	If using carpet, install by dry method		
4-27	2	Install low pile or less allergen-attracting carpet and pad		
4-28	2	Install natural fiber carpet		
4-29	2	Avoid carpet in environments where it can get wet		
4-30	2 or 6	Optimize air quality in family bedrooms to basic or advanced level by completing items listed in handbook		
4-31	5	Use only low-VOC / low-toxic interior paints, primers, and finishes for large surface areas		
4-32	7	Use only low-VOC / low toxic interior paints and finishes for all surface areas (including doors, windows, trim)		
4-33	30	Select materials such that the building is free from the following materials/chemicals: added formaldehyde, halogenated flame retardants, PVC, mercury, CFCs, HCFCs, neoprene (chloroprene), cadmium, chlorinated polyethelene, xylene, tolulene		
		Subtotal	**0**	
MOISTURE CONTROL				
Overall				
4-34	4	Use Building Envelope Consultant during design		
4-35	1	Grade to drain away from buildings		
4-36	4	Envelope inspection at various stages of envelope installation by a qualified professional		
Roof				
4-37	6	Provide 50% minimum 2 inch 12 pitch sloped roof surface		
4-38	10	Provide 100% minimum 2 inch 12 pitch sloped roof surface		
Walls - Above Grade				
4-39	3	Provide continuous weather resistive barrier and continuous air seal barrier with manufacturer's recommended termination (seal or tape)		
4-40	3	Use self-adhering membrane flashing and counter-flashing at all inside and outside corners and at exterior siding materials transitions		
4-41	6	Install an enhanced drainage plane with an air space to allow ventilation between the weather barrier and cladding and include weep control system		
4-42	3 or 7	Use moisture test to ensure that wood framing contains less than 15% moisture content prior to installation of any interior finish		
4-43	3	In wood-framed structures, use low-toxic mold-inhibitor product		
Below Grade				
4-44	3	For slab on grade, use 10 mil polyethylene vapor barrier or equivalent performance, under slab		
4-45	2	Perform moisture test for any slab on grade prior to installing any finish to manufacturer's specifications		
4-46	2	Install working mechanical vent system to eliminate potential moisture, methane, and radon problems in crawl space or under slabs on grade		
4-47	1	Install a rigid perforated footing drain at foundation perimeter, not connected to roof drain system		
4-48	3	Install moisture management system for below grade walls beyond code, i.e., drainage mat		
Openings				
4-49	3	Provide appropriately sized overhangs at 25% of openings		
4-50	6	Provide appropriately sized overhangs on 100% south and/or west side openings		
4-51	1	Properly seal building openings and penetrations against moisture and air leaks as specified in handbook		
4-52		Install additonal moisture control measures:		
4-52a	1	sill pans with back dams at windows		
4-52b	7	door pans with back dams at doors		
4-52c	3	sill protection at windows		
4-52d	3	threshold protection at doors		
4-52e	1	metal head flashing at windows		
4-52f	1	metal head flashing at doors		
4-53	3	Provide hose testing or negative pressurization testing to pre-installed sample of each window type to test assembly for moisture control protection		
		Subtotal	**0**	
AIR DISTRIBUTION AND FILTRATION				
4-54	1	Provide ideal relative humidity and air circulation to prevent IAQ problems		
4-55	1	Ensure ceiling plenums contain no hazardous/unhealthy materials		
4-56	2	No stud or joist cavities used as plenums		
4-57	2	Do not install electronic, metal mesh, horse hair, or non-pleated fiberglass filters		
4-58	1	Make sure air intakes are placed to avoid intake from air pollutant sources that go beyond code		
4-59	1	No parking within 40 feet of building air intakes		
4-60		Use effective air filter:		
4-60a	1	Use medium efficiency pleated filter, MERV 10		
4-60b	5	Use high efficiency pleated filter, MERV 12 or better, or HEPA		
4-61	2	Install operable windows in all occupied spaces to allow for cross ventilation and daylighting		
4-62		Install CO detector (hardwired) for all units with a combustion device		
4-63	3	Separately ventilate all janitorial spaces, copy rooms, and chemical storage areas		
4-64	2	Install CO_2 detectors in community rooms		
		Subtotal	**0**	
HVAC EQUIPMENT				
4-65	1	Design to ensure accessibility of all system components		

4-66	1	Design to prevent standing water in HVAC system		
4-67	1	Flow test all spot ventilation fans in units		
4-68	1	Use heating system controls that are free of mercury		
4-69	1	Limit kitchen exhaust fan to 300 cfm maximum		
4-70	1	Install a 60-minute timer or humidistat for bath exhaust fans		
4-71	2	Install quiet (≤0.8 sone) bath fan with smooth ducting, minimum 4 inch		
4-72	1	Reduced or zero use of ozone-depleting compounds in refrigeration and fire suppression systems		
4-73	1	No sound insulation or other fibrous materials installed inside ducting		
4-74	3	Install sealed combustion heating and hot water equipment		
		Subtotal	**0**	
HEALTH AND INDOOR AIR QUALITY				
4-75	1	Build a lockable storage closet for hazardous cleaning and maintenance products, separate from occupied space		
4-76	1	Install biodegradable carbon filter at sink		
4-77	3	Install showerhead filter in all units, include information in the tenent handbook		
4-78	3	Provide permanently installed track-off mats and/or shoe grates at common entryways to building		
4-79	2	Provide track-off mats at exterior unit main entrances to each unit and a shoe storage area		
4-80	3	Design a shoe removal vestibule at major entrances to units		
4-81	3	Do not install a wood-burning fireplace inside unit or building		
4-82	1	Do not install gas-burning appliances inside unit or building		
4-83	1	Install floor drain or catch basin with drain under washing machine		
		Subtotal	**0**	
EXTRA CREDIT / INNOVATION for Health and Indoor Air Quality				
4-84	1-10	Extra credit / innovation for Health and Indoor Air Quality		
		Subtotal	**0**	
		HEALTH AND INDOOR AIR QUALITY SECTION TOTALS	**0**	
SECTION FIVE: MATERIALS EFFICIENCY				
OVERALL				
5-1	10	Practice waste prevention and recycling and buy recycled products		
5-2	5 or 7 or 9	Design and build for deconstruction concept - 50%, 75%, or 90%		
5-3	1-5	Eliminate materials and systems that require finishes or finish materials on a minimum of 100 square feet in common areas- 1 pt per 100 sf - 5 pts max		
		Subtotal	**0**	
JOBSITE OPERATIONS				
5-4	3	Provide weather protection for stored materials		
5-5	1	Substitute products that require solvent-based cleaning methods with solvent-free or water-based methods		
5-6	5	Purchase a one-time carbon offset to account for construction carbon footprint		
		Subtotal	**0**	
Reduce				
5-7	2	Create detailed take-off and provide as cut list to framer		
5-8	2	Use central cutting area or cut packs		
5-9	3	Require subcontractors and contractor's employees to participate in waste reduction efforts		
		Subtotal	**0**	
Reuse				
5-10	2 or 10 or 20	Use deconstruction to dismantle and reuse existing building(s) on site		
5-11	1	Sell or give away wood scraps, lumber and land clearing debris		
5-12	1	Donate, give away, or sell reusable finish items		
5-13		Re-use materials:		
5-13a	1	doors		
5-13b	1	flooring		
5-13c	1	windows		
5-13d	1	appliances		
5-13e	1	fixtures		
5-13f	1	hardware		
5-13g	1	cabinets		
5-13h	1	siding		
5-13i	1	decking		
5-13j	1	trim		
5-13k	2	framing lumber		
5-14	1-10	Bonus points for reuse of salvaged materials		
		Subtotal	**0**	
Recycle				
Source Separation Recycling				
5-15	1	Recycle cardboard by source separation, 90% minimum recycling rate		
5-16	2	Recycle metal scraps by source separation, 90% minimum recycling rate		
5-17	5	Recycle clean scrap wood and broken pallets by source separation, 90% minimum recycling rate		
5-18	2	Recycle package wrap and pallet wrap by source separation, 90% minimum recycling rate		
5-19	3	Recycle drywall by source separation, 90% minimum recycling rate		
5-20	2	Recycle concrete/asphalt rubble, masonry materials, or porcelain by source separation, 90% minimum recycling rate		
5-21	1	Recycle paint by source separation, 90% minimum recycling rate		
5-22	4	Recycle asphalt roofing by source separation, 90% minimum recycling rate		
5-23	2	Recycle carpet padding by source separation, 90% minimum recycling rate		
5-24	2	Recycle carpet by source separation, 90% minimum recycling rate		
5-25	1	Recycle glass by source separation, 90% minimum recycling rate		
5-26	3	Recycle land clearing and yard waste, soil and sod by source separation, 90% minimum recycling rate		
5-27	1	Recycle batteries		
5-28	4	Commingle recycle at least 50% of remaining jobsite debris, and take to a facility with a minimum recycling rate of 50%		
		Subtotal	**0**	
Commingle Recycling				
5-29	5 or 10	Send less than 1lb per square foot of gross construction waste to land fill, or less than ½ lb per square foot to land fill (does not include deconstruction)		
5-30	10	Send at least 85% of jobsite waste (by weight excluding concrete) to a commingled recycling facility with 50% recycling rate		

5-31	18	Send at least 85% of jobsite waste (by weight excluding concrete) to a commingled recycling facility with 75% recycling rate		
5-32	24	Send at least 85% of jobsite waste (by weight excluding concrete) to a commingled recycling facility with 90% recycling rate		
			Subtotal	**0**
DESIGN AND MATERIAL SELECTION				
Overall				
5-33	1	Use standard dimensions in design of structure		
5-34	10	Design and install recycling stations on each floor, including a maintenance service plan		
5-35	1	Install materials with longer life cycles		
5-36	1	Install locally/regionally produced materials		
5-37	10	Install locally/regionally produced materials, minimum 5 materials used in all units		
5-38	5	Use salvaged lumber, minimum of 1,000 board feet		
5-39	1	Use any amount of rapidly renewable building materials and products made from plants harvested within a ten-year cycle or shorter		
5-40	3	In three applications, use rapidly renewable building materials and products made from plants harvested within a ten-year cycle or shorter		
5-41	3	Use no endangered wood species		
5-42	2	Use environmentally preferable products with third-party certifications		
5-43	3	Use no PVC or CPVC piping for plumbing or sprinkler within the building envelope		
			Subtotal	**0**
Framing				
5-44	10	Use dimensional lumber that is third-party certified sustainably harvested wood that meets the Tier 1 requirements outlined in the Handbook, 50% minimum		
5-45	6	Use dimensional lumber that is third-party certified sustainably harvested wood that meets the Tier 2 requirements outlined in the Handbook, 50% minimum		
5-46	7	Use sheathing that is third-party certified sustainably harvested wood that meets the Tier 1 requirements outlined in the Handbook, 50% minimum		
5-47	4	Use sheathing that is third-party certified sustainably harvested wood that meets the Tier 2 requirements outlined in the Handbook, 50% minimum		
5-48	5	Use beams that are third-party certified sustainably harvested wood that meets the Tier 1 requirements outlined in the Handbook, 50% minimum		
5-49	3	Use beams that are third-party certified sustainably harvested wood that meets the Tier 2 requirements outlined in the Handbook, 50% minimum		
5-50	3	Use factory framed wall panels (panelized wall construction)		
5-51	3	Use engineered structural products and use no 2xs larger than 2x8, and no 4xs larger than 4x8		
5-52	1	For interior walls, use steel studs with minimum 50% recycled content		
5-53	4	Use structural insulated panels (SIPs)		
5-54	2	Use insulated concrete forms (ICFs)		
5-55	1	Use finger-jointed framing material (e.g. studs)		
5-56	5	Use advanced system framing with double top plate		
			Subtotal	**0**
Foundation				
5-57	1 or 3	Use at least 90% regionally or locally produced block		
5-58	3 or 6	Use regionally produced flyash or blast furnace slag for 25% by weight of cementitious materials for all concrete (20% for flat work), if available		
5-59	2	Use recycled concrete, asphalt, or glass cullet for base or fill		
			Subtotal	**0**
Sub-Floor				
5-60	1	Use recycled content sub-floor		
			Subtotal	**0**
Doors				
5-61	2	Use domestically-grown wood interior doors		
			Subtotal	**0**
Finish Floor				
5-62	1	If using vinyl flooring, use product with recycled content		
5-63	4	No vinyl flooring		
5-64	1	Use any amount of rapidly renewable flooring products made from plants harvested within a ten-year cycle or shorter (excluding carpet)		
5-65	3	On more than 250 square feet per unit, use rapidly renewable flooring products made from plants harvested within a ten-year cycle or shorter (excluding carpet)		
5-66	1	Use recycled content carpet pad		
5-67	1	Use recycled content or renewed carpet		
5-68	2 or 4	Use replaceable carpet tile for 50% of carpeted area or 100% of carpeted area		
5-69	5	If using tile, use 75% of tile that is 40% recycled content		
5-70	5	Use natural linoleum		
5-71	1 or 3 or 5	If using wood flooring, use locally salvaged wood flooring on 25%, 50% or 90%+ of total flooring		
5-72	5	Use flooring that is third-party certified sustainably harvested wood that meets the Tier 1 requirements outlined in the Handbook, 50% minimum		
5-73	3	Use flooring that is third-party certified sustainably harvested wood that meets the Tier 2 requirements outlined in the Handbook, 50% minimum		
5-74	1	Use spot repairable floor finish		
			Subtotal	**0**
Interior Walls				
5-75	4	Use drywall with a minimum of 90% recycled content gypsum or flue gas substitute for recycled gypsum		
5-76	2 or 3	Use recycled or “reworked” paint and finishes on main surfaces or all surfaces		
5-77	1	Use recycled newspaper or cork expansion joint filler		
5-78	2	Use natural wall finishes, like lime paint and clay		
5-79	2	Reduce interior walls through open plan for kitchen, dining and living areas		
5-80	2	Install toilet/shower partitions with recycled content		
			Subtotal	**0**
Ceilings				
5-81	1	If installing acoustical ceiling, select a recycled content product		
			Subtotal	**0**
Exterior Walls				
5-82	2	Use recycled content sheathing (OSB does not apply)		
5-83	3	Use exterior cladding with reclaimed or recycled material on at least 20% of solid wall surface		

5-84	4	No vinyl siding or exterior trim		
5-85	3	Use salvaged masonry brick or block, 50% minimum		
5-86	2	Use regionally produced stone or brick		
5-87	2	Use 50-year siding product		
5-88	5	Use wood siding that is third-party certified sustainably harvested wood that meets the Tier 1 requirements outlined in the Handbook on at least 20% of solid wall surface		
5-89	3	Use wood siding that is third-party certified sustainably harvested wood that meets the Tier 2 requirements outlined in the Handbook on at least 20% of solid wall surface		
		Subtotal	**0**	
Windows				
5-90	3	Use wood, composite, or fiberglass windows		
5-91	4	No vinyl windows		
5-92	1	Use finger-jointed wood windows		
5-93	2	Use regionally produced windows		
		Subtotal	**0**	
Trim				
		If using wood trim:		
5-94a	1	Use regional products, 50% minimum		
5-94b	3	Use domestic hardwood trim that is third-party certified sustainably harvested wood that meets the Tier 1 requirements outlined in the Handbook, 50% minimum		
5-94c	2	Use domestic hardwood trim that is third-party certified sustainably harvested wood that meets the Tier 2 requirements outlined in the Handbook, 50% minimum		
5-94d	3	Use third-party certified sustainably harvested wood that meets the Tier 1 requirements outlined in the Handbook, 50% minimum		
5-94e	2	Use third-party certified sustainably harvested wood that meets the Tier 2 requirements outlined in the Handbook, 50% minimum		
5-95	3	Use finger-jointed or MDF trim with no added urea formaldehyde, 90% minimum		
5-96	1	Use wood veneers that are third-party certified sustainably harvested woods that meets the Tier 1 requirements outlined in the Handbook, 50% minimum		
5-97	1	Use wood veneers that are third-party certified sustainably harvested woods that meets the Tier 2 requirements outlined in the Handbook, 75% minimum		
		Subtotal	**0**	
Cabinetry				
5-98		For cabinets:		
5-98a	2	Use regional products, 90% minimum		
5-98b	2	Use domestic hardwood that is third-party certified sustainably harvested wood that meets the Tier 1 requirements outlined in the Handbook, 50% minimum		
5-98c	1	Use domestic hardwood that is third-party certified sustainably harvested wood that meets the Tier 2 requirements outlined in the Handbook, 50% minimum		
5-98d	2	Use third-party certified sustainably harvested wood that meets the Tier 1 requirements outlined in the Handbook, 50% minimum		
5-98e	1	Use third-party certified sustainably harvested wood that meets the Tier 2 requirements outlined in the Handbook, 50% minimum		
5-98f	2 or 3	Use cabinet casework and shelving constructed of agricultural fiber (“strawboard” or “wheatboard”) with no added urea formaldehyde for 50% or 90% of all casework		
5-99	1	Use resource efficient countertop material in lobby/reception areas		
5-100	4	Use countertops that are salvaged, recycled, or third-party certified sustainably harvested wood with a chain of custody in all units		
		Subtotal	**0**	
Roof				
5-101	2	Use recycled content roofing material		
5-102	3	Upgrade material quality and durability (metal is better than torch down)		
5-103	2	Use 30-year warranted roofing material		
5-104	4	Use 40-year warranted roofing material		
5-105	6	Use 50-year warranted roofing material		
5-106	7	Use solar shingles		
5-107	3	Install a metal roof		
		Subtotal	**0**	
Insulation				
5-108	2	All insulation to have a minimum of 40% recycled content		
5-109	3	Use environmentally friendly foam building products (formaldehyde-free, CFC-free, HCFC-free)		
5-110	3	Use backer rod around windows for infiltration sealing		
		Subtotal	**0**	
Other Exterior				
5-111	2	Use reclaimed or salvaged material for landscaping walls		
5-112	3	Use 100% recycled content HDPE, salvaged lumber, or lumber that is third-party certified sustainably harvested wood that meets the Tier 1 requirements outlined in the Handbook for decking and porches		
5-113	2	Use 100% recycled content HDPE, salvaged lumber, or lumber that is third-party certified sustainably harvested wood that meets the Tier 2 requirements outlined in the Handbook for decking and porches		
5-114	2	Use recycled content lumber for decking (e.g., Trex)		
5-115	4	If lumber is used, use no pressure treated lumber		
5-116	1	If using pressure-treated lumber, use CAB		
		Subtotal	**0**	
EXTRA CREDIT / INNOVATION for Materials Efficiency				
5-117	1-10	Extra credit / innovation for Materials Efficiency		
		Subtotal	**0**	
		MATERIALS EFFICIENCY SECTION TOTALS	**0**	
		PROJECT SCORING TOTAL	**0**	

	PROJECT SUMMARIES	
One	PROGRAM REQUIREMENTS AND CODES / REGULATIONS	X
Two	SITE & WATER SECTION TOTALS	0
Three	ENERGY EFFICIENCY SECTION TOTALS	0
Four	HEALTH & INDOOR AIR QUALITY SECTION TOTALS	0
Five	MATERIAL EFFICIENCY SECTION TOTALS	0

_____**Total Points for Project**

Program Level Obtained

☐ 2-Star ★★ ☐ 3-Star ★★★

☐ 4-Star ★★★★ ☐ 5-Star ★★★★★

By my signature, I certify that I have performed all Action Items checked above.

X_____

(Home Builder Signature and Date)

Appendix C – LEED NCv2.2 Checklist

Please note that the following is the checklist only. For a copy of the full document and information about the program, please go to: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220

LEED for New Construction v 2.2
Registered Project Checklist

Project Name: _____

Project Address: _____

Yes	?	No		
			Project Totals (Pre-Certification Estimates)	69 Points
			Certified: 26-32 points **Silver**: 33-38 points **Gold**: 39-51 points **Platinum**: 52-69 points	

Yes	?	No			
			Sustainable Sites		14 Points
Yes			Prereq 1	**Construction Activity Pollution Prevention**	Required
			Credit 1	**Site Selection**	1
			Credit 2	**Development Density & Community Connectivity**	1
			Credit 3	**Brownfield Redevelopment**	1
			Credit 4.1	**Alternative Transportation**, Public Transportation	1
			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
			Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel Efficient Vehicles	1
			Credit 4.4	**Alternative Transportation**, Parking Capacity	1
			Credit 5.1	**Site Development**, Protect or Restore Habitat	1
			Credit 5.2	**Site Development**, Maximize Open Space	1
			Credit 6.1	**Stormwater Design**, Quantity Control	1
			Credit 6.2	**Stormwater Design**, Quality Control	1
			Credit 7.1	**Heat Island Effect**, Non-Roof	1
			Credit 7.2	**Heat Island Effect**, Roof	1
			Credit 8	**Light Pollution Reduction**	1

Yes	?	No			
			Water Efficiency		5 Points
			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
			Credit 2	**Innovative Wastewater Technologies**	1
			Credit 3.1	**Water Use Reduction**, 20% Reduction	1
			Credit 3.2	**Water Use Reduction**, 30% Reduction	1

LEED for New Construction v 2.2
Registered Project Checklist

Yes	?	No			
			Energy & Atmosphere		**17 Points**
Yes			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Yes			Prereq 1	**Minimum Energy Performance**	Required
Yes			Prereq 1	**Fundamental Refrigerant Management**	Required

***Note for EAc1:** All LEED for New Construction projects registered after June 26, 2007 are required to achieve at least two (2) points.

			Credit 1	**Optimize Energy Performance**	1 to 10
			Credit 1.1	10.5% New Buildings / 3.5% Existing Building Renovations	1
			Credit 1.2	14% New Buildings / 7% Existing Building Renovations	2
			Credit 1.3	17.5% New Buildings / 10.5% Existing Building Renovations	3
			Credit 1.4	21% New Buildings / 14% Existing Building Renovations	4
			Credit 1.5	24.5% New Buildings / 17.5% Existing Building Renovations	5
			Credit 1.6	28% New Buildings / 21% Existing Building Renovations	6
			Credit 1.7	31.5% New Buildings / 24.5% Existing Building Renovations	7
			Credit 1.8	35% New Buildings / 28% Existing Building Renovations	8
			Credit 1.9	38.5% New Buildings / 31.5% Existing Building Renovations	9
			Credit 1.10	42% New Buildings / 35% Existing Building Renovations	10
			Credit 2	**On-Site Renewable Energy**	1 to 3
			Credit 2.1	2.5% Renewable Energy	1
			Credit 2.2	7.5% Renewable Energy	2
			Credit 2.3	12.5% Renewable Energy	3
			Credit 3	**Enhanced Commissioning**	1
			Credit 4	**Enhanced Refrigerant Management**	1
			Credit 5	**Measurement & Verification**	1
			Credit 6	**Green Power**	1

LEED for New Construction v 2.2
Registered Project Checklist

Yes	?	No			
			Materials & Resources		**13 Points**
Yes			Prereq 1	**Storage & Collection of Recyclables**	Required
			Credit 1.1	**Building Reuse,** Maintain 75% of Existing Walls, Floors & Roof	1
			Credit 1.2	**Building Reuse,** Maintain 95% of Existing Walls, Floors & Roof	1
			Credit 1.3	**Building Reuse,** Maintain 50% of Interior Non-Structural Elements	1
			Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
			Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
			Credit 3.1	**Materials Reuse**, 5%	1
			Credit 3.2	**Materials Reuse**, 10%	1
			Credit 4.1	**Recycled Content**, 10% (post-consumer + 1/2 pre-consumer)	1
			Credit 4.2	**Recycled Content**, 20% (post-consumer + 1/2 pre-consumer)	1
			Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured	1
			Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured	1
			Credit 6	**Rapidly Renewable Materials**	1
			Credit 7	**Certified Wood**	1

Yes	?	No			
			Indoor Environmental Quality		**15 Points**
Yes			Prereq 1	**Minimum IAQ Performance**	Required
Yes			Prereq 2	**Environmental Tobacco Smoke (ETS) Control**	Required
			Credit 1	**Outdoor Air Delivery Monitoring**	1
			Credit 2	**Increased Ventilation**	1
			Credit 3.1	**Construction IAQ Management Plan,** During Construction	1
			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
			Credit 6.1	**Controllability of Systems**, Lighting	1
			Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
			Credit 7.1	**Thermal Comfort,** Design	1
			Credit 7.2	**Thermal Comfort,** Verification	1
			Credit 8.1	**Daylight & Views,** Daylight 75% of Spaces	1
			Credit 8.2	**Daylight & Views,** Views for 90% of Spaces	1

LEED for New Construction v 2.2
Registered Project Checklist

Yes	?	No			
			Innovation & Design Process		**5 Points**
			Credit 1.1	**Innovation in Design:** Provide Specific Title	1
			Credit 1.2	**Innovation in Design:** Provide Specific Title	1
			Credit 1.3	**Innovation in Design:** Provide Specific Title	1
			Credit 1.4	**Innovation in Design:** Provide Specific Title	1
			Credit 2	**LEED® Accredited Professional**	1

Appendix D – Portland Green Affordable Housing Guidelines Checklist

Please note that the following is the checklist only. For a copy of the full document and information about the program, please go to: http://www.portlandonline.com/shared/cfm/image.cfm?id=122094

CITY OF PORTLAND

Greening Portland's Affordable Housing

A Resource Guide to Improving Environmental Performance, Tenant Health and Long-Term Durability in Affordable Housing

Green Building Criteria for Affordable Housing

Page	Category	Strategies	New	Rehab	Code Required	CSI Division
ENHANCED DESIGN AND SITE						
14	Site Inventory	**1. Threshold: Complete a comprehensive site inventory.**	X	X		02
15	Soil & vegetation protection	**2. Threshold: Perform level 1 site assessment to determine soil conditions.**	X			02
		3. Threshold: Preserve existing trees and shrubs on site, including street trees.	X	X	X	02
		4. Do not apply herbicides or pesticides during site prep.	X	X		02
		5. Create landscaping plan that provides for bird and insect habitat, west and south facing building shading, and resident gardening. Create native plant associations and communities.	X	X		02
19	Building design & orientation	**6. Threshold: 1. For new construction, design roof eaves to overhang exterior walls and exterior surfaces (12" minimum). 2. For rehab, construct patios, decks, windowsills, and thresholds to properly drain water away from buildings.**	X(1)	X(2)		02 06 07 09
		7. Threshold: Orient building to maximize solar exposure in winter and shading in summer.	X	X		02,06 07,09
		8. Reuse and recycle parts or all of existing building during renovation or redevelopment.		X		02,06 07,08 09
		9. Reduce building footprint, simplify building shapes, and maximize space efficiency.	X			02

Page	Category	Strategies	New	Rehab	Code Required	CSI Division
22	**Stormwater management and water pollution**	**10. Threshold: Maximize on-site drainage and water catchment capacity. Design on-site stormwater facilities to City of Portland's Stormwater Manual specifications.**	x	x	x	02
		11. Threshold: Protect site from runoff erosion during construction. Design site erosion control plan based to City of Portland's Erosion Control Manual specifications.	x	x	x	02
		12. Specify and install permeable surfaces and paving in low traffic areas.	x	x		02,03 04
24	**Transportation access**	**13. Threshold: Provide secure bicycle parking.**	x	x	x	02
		14. Size parking capacity to meet minimum local zoning requirements.	x	x	x	02
		15. Site building within 1/4 mile of mass transit and 1/2 mile of stores and services.	x			02
ENERGY CONSERVATION						
30	**Building envelop & weatherization**	**1. Threshold: In new construction, install high recycled-content insulation with following R values: R-38 ceilings/R-21 walls/R-30 floors/R-15 slab edge. Rehab insulation values depend on preexisting conditions.**	x	x	x	07
		2. Threshold: Specify and install double glazed, low-e windows and sliding doors with U value 0.35 or less.	x	x		08
		3. Threshold: Flash and seal all penetrations between interior spaces and outside. Seal all penetrations for ducting, wiring, plumbing, lights, and fans.	x	x		07
		4. Perform blower door test to determine cost-effective air sealing and combustion safety.	x	x		06 07
		5. Increase insulation and reduce heat loss on one- and two-story walls with normal loads by using 2x6 @24" on center framing module for exterior walls.	x			06 07
		6. Specify and install exterior insulated core doors.	x	x		08
		7. Specify and install insulated concrete forms.	x			03,07

Page	Category	Strategies	New	Rehab	Code Required	CSI Division
		8. Insulate perimeter edge of concrete slab floor with code approved foam board. Insulate between heated space and garage slab.	x			03 07
		9. Thermally separate living areas from less energy consuming zones like entry, storage, mechanical, and utility areas.	x			03 07
36	Heating systems	**10. Threshold: Install radiant or hydronic heating with digital thermostat located in main living area. Systems may include: hydronic baseboard, radiant cove heaters, water heater /water boiler supplied room heaters. (i.e. "Turbonics"). Size heat supply based on weatherization measures (natural gas fuel preferred).**	x	x		11 15 16
		11. Preferred Alternate: Install high efficiency gas sealed combustion forced air furnaces (minimum 92% Efficiency Rating) with digital thermostat in main living area. Systems may include gas furnace, gas furnace with integrated water heater. Size heat supply based on weatherization measures.	x	x		11 15 16
		12. Install ductwork inside conditioned space OR seal ductwork in crawls and attics with mastic. Design short runs. Use flex only for straight runs; otherwise use metal.	x	x		15
38	Electrical & lighting	**13. Threshold: Specify and install Energy Star"-rated appliances, fixtures and lighting systems.**	x	x		11,12 15,16
		14. Threshold: Specify and install efficient outdoor lighting (30 lumens per watt or better) with low temperature ballasts. Install lamps with automated controls, including but not limited to photo sensors, timers, and motion control sensors.	x	x		16
39	Renewables	15. Install solar water heating system.	x	x		10,11 15,16
		16. Purchase green power.	x	x		15,16
WATER CONSERVATION						
46	Plumbing	**1. Threshold: Install water conserving plumbing fixtures: 2.0 gpm showerheads & 1.5 gpm faucet aerators.**	x	x		15

Page	Category	Strategies	New	Rehab	Code Required	CSI Division
		2. Threshold: Install high energy factor water heater (.60 for gas, .93 for electric).	**x**	**x**		**15 16**
		3. Threshold: Insulate bottom of hot water tank. Set electric tank on foam board. Set gas tank on raised platform. Insulate hot water pipes.		**x**		**07**
48	**Irrigation**	**4. Threshold: Use only native, hardy plant materials for landscaping, except for edible landscaping, street trees, and lawn. Minimize total area of turf.**	**x**	**x**		**02**
		5. Install high-efficiency drip irrigation system.	**x**	**x**		**02,15**
		6. Install rainwater catchment system for non-potable water reuse.	**x**			**02 15**
CONSERVING MATERIALS & RESOURCES						
54	**Waste management & recycling**	**1. Threshold: Develop a waste minimization plan, establishing targets for demolition and construction waste recycling by types of materials (goal: 80% total waste reuse and recycling by weight).**	**x**	**x**	**x**	**01 02**
		2. Minimize non-recyclable/non-reusable packaging during construction.	**x**	**x**		**01**
55	**Foundation**	3. Specify concrete mix with 25-50% fly ash substitution for Portland cement. Specify recycled aggregate base.	**x**			**03**
56	**Framing**	**4. Threshold: Specify engineered structural lumber.**	**x**	**x**		**06**
		5. Threshold: In wood framing, employ 24"advanced framing modules and box headers.	**x**	**x**		**06**
		6. Specify salvaged, recycled, and/or certified sustainably harvested wood products. Do not specify old growth lumber, other than "recovered" or "reused" materials.	**x**	**x**		**06**
		7. Specify regionally manufactured building materials when possible (within 500 miles).	**x**	**x**		**01**
60	**Roof & skin**	**8. Threshold: Specify durable and recycled content roof and siding materials with a 25 - 50 year lifetime warranty.**	**x**	**x**		**07**

Page	Category	Strategies	New	Rehab	Code Required	CSI Division
60	**Materials & finishes**	**9. Threshold: When dropped ceiling panels are specified, install recycled content panels.**	**X**	**X**		**09**
		10. Install formaldehyde-free or low-formaldehyde underlayment, cabinets and storage units. Replace particleboard with plywood or MDF.	**X**	**X**		**09 10 12**
		11. Specify sustainably certified wood for finish woodwork.	**X**	**X**		**12**
		12. Specify low-toxic, decay-resistant, outdoor materials. When possible, consider patio treatment instead of decking.	**X**	**X**		**02,03 04,06 09**
		13. Specify recycled content drywall. Install hard surface drywall in high-wear areas.	**X**	**X**		**09**
64	**Flooring**	**14. Threshold: Specify natural linoleum, tile, or other vinyl alternative in kitchen and bathrooms (if vinyl is necessary, specify vinyl composition tile).**	**X**	**X**		**09**
		15. Threshold: Specify solid floor finishes and/or nylon or PET carpeting with fiber or waffle pad.	**X**	**X**		**09**
ENHANCED INDOOR AIR QUALITY						
74	**Finishes**	**1. Threshold: Specify solvent free, no VOC or low VOC (below 50 g/liter) paints and primers. Specify water-based wood finishes.**	**X**	**X**		**07,09**
		2. Threshold: Specify low toxic adhesives and sealants.	**X**	**X**		**07,09**
75	**Fresh air ventilation**	**3. Threshold: Install continuous exhaust ventilation OR central exhaust fan ducted to bath. Provide make-up air vents. Specify fans with delayed timer controls. Install medium efficiency air filters in ducted forced air systems.**	**X**	**X**		**15 16**
		4. Install kitchen range hood or ceiling exhaust fan to remove excess moisture and odors OR install multi-port attic fan to exhaust kitchen and bathroom.	**X**	**X**		**15 16**
		5. Threshold: Properly ventilate building prior to occupancy.	**X**	**X**		**01**
		6. Use operable windows AND mechanical ventilation systems to assure ample fresh air for building occupants.	**X**	**X**		**08 15**

Page	Category	Strategies	New	Rehab	Code Required	CSI Division
		7. Encourage a "no smoking" policy for building (during construction & occupancy).	x	x		01
OPERATIONS & MAINTENANCE						
80	O & M Planning	**1. Threshold: Develop maintenance and tenant operating manuals with specific actions.**	x	x		01
		2. Threshold: Develop O & M plan for scheduled maintenance of vents, filters, plumbing, and combustion equipment.	x	x		01
81	O & M Practices	**3. Threshold: Provide adequate space for comprehensive resident recycling.**	x	x		01
		4. Threshold: Eliminate pesticides and herbicide use on and around building.	x	x		01
		5. Threshold: Use low-toxic or citrus-based cleaning supplies. Eliminate use of solvents.	x	x		01
		6. Threshold: Design properly ventilated separate storage area for cleaning supplies and paints.	x	x		01
		7. Threshold: Eliminate wet carpet cleaning (steam OK). Use HEPA filters on vacuum cleaners.	x	x		01

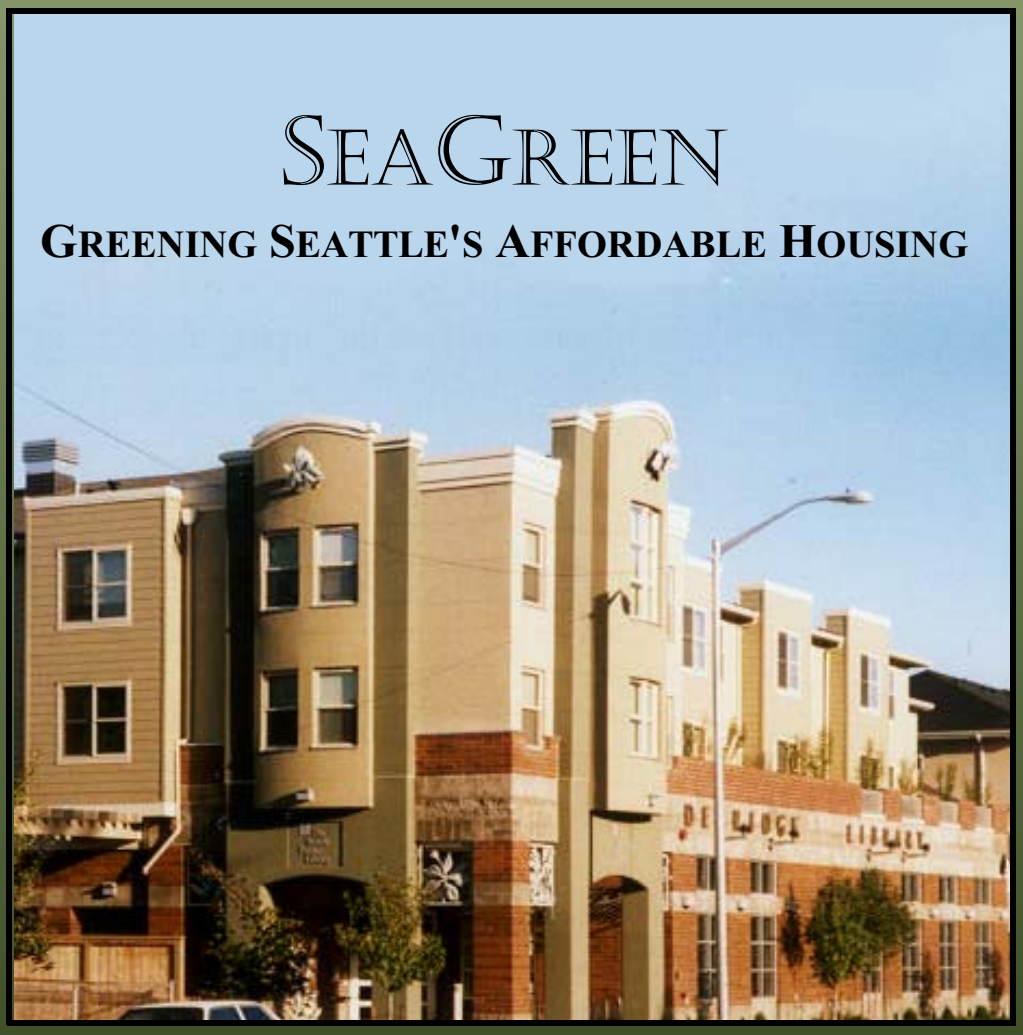
Appendix E – SeaGreen Affordable Housing Guidelines Checklist

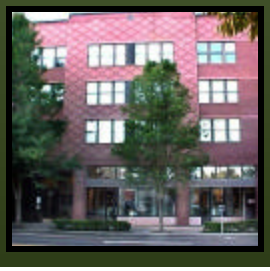
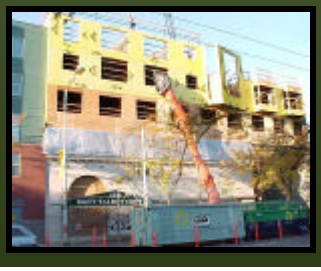
Please note that the following is the checklist only. For a copy of the full document and information about the program, please go to: http://seattle.gov/housing/SeaGreen/default.htm




SeaGreen

Greening Seattle's Affordable Housing




SEAGREEN SUSTAINABILITY PLAN TEMPLATE

CHECKLIST

Chapter 1 Enhanced Design

Design Development

NEW	REHAB	ACTION ITEM
■	■	1-1 **Essential:** Submit Sustainability Plan Template.
	■	1-2. **Essential for Rehabs:** Evaluate opportunities for deconstruction – systematic disassembly of a structure to remove and salvage usable materials prior to demolition.
	■	1-3. **Essential for Rehabs:** Inspect for asbestos and lead prior to remodel. Abate as required.
☐	☐	1-4. Site building(s) within 1/4 mile of mass transit and within 1/2 mile of stores and services. ★*2-44*
☐	☐	1-5. Preserve and create open space. ★ *2-7, 2-11, 2-43*
☐	☐	1-6. Use efficient building footprint and maximize space efficiency. ★*5-3*
☐	☐	1-7. Site buildings for optimum access to natural ventilation. Design buildings to maximize natural ventilation. ★*4-43*
☐	☐	1-8. Site buildings to maximize solar access. Design buildings to take advantage of solar heating potential and daylighting opportunities. ★*3-16, 3-17, 3-18*
☐	☐	1-9. Design below-ground space for non-occupancy uses.
☐	☐	1-10. Specify regionally manufactured building materials (within 500 miles). ★*5-33*
	☐	1-11. For Rehabs, investigate for mold and mildew prior to and during remodel. Remediate/repair as appropriate.
☐	☐	1-12. Evaluate life cycle cost benefits.
☐	☐	1-13. Provide permanent interpretive signs highlighting key environmental and other features.

Construction Documents

■	■	1-14. **Essential:** Reflect sustainability plan in your contract documents and project management.

★ *Built Green™ chapter - action point*

Close-Out

NEW	REHAB	ACTION ITEM
☐	☐	1-15. **Essential:** Reflect sustainability goals in O&M Manual.
☐	☐	1-16. Air out the building prior to occupancy. At least 2 weeks prior to occupancy restrict all use of toxic solvents, paints, etc. and for final cleaning use only low-toxic, non-toxic and environmentally benign maintenance materials and practices. ★*4-2, 4-23*
☐	☐	1-17. Conduct owner orientation/operation walk-through.
☐	☐	1-18. Conduct 3rd party verification/certification that sustainable products and practices were used in the project. ★*3-3*

Chapter 2 Site & Water

Site Management

☐	☐	2-1. **Essential:** Complete a comprehensive site inventory.
☐	☐	2-2. **Essential:** Perform level 1 site assessment to determine soil conditions and previous uses of site.
☐	☐	2-3. Perform level 2 site assessment for a more comprehensive geotechnical soil survey.
☐	☐	2-4. Preserve existing trees and shrubs on site, including street trees. ★*2-4*

Surface Water

☐	☐	2-5. **Essential:** Manage surface water. Minimum requirement is to design on-site stormwater facilities to City of Seattle's stormwater specifications. ★*2-8, 2-12, 2-16 (possibly 2-18, 2-19)*
☐	☐	2-6. **Essential:** Provide erosion and sedimentation control during construction and minimize site disturbance. Design site erosion control plan to City of Seattle's erosion control specifications. ★*2-3, 2-8, 2-9, 2-10, 2-22 (possibly 2-21 through 2-39)*

Landscape/Irrigation

☐	☐	2-7. **Essential:** Avoid herbicides and pesticides during site prep. Select least toxic natural products. ★*2-33*
☐	☐	2-8. **Essential:** Incorporate sustainable principles in landscape plan. ★*6-3*
☐	☐	2-9. **Essential:** Install landscape plan that incorporates sustainable principles. ★*6-7, 6-8, 6-9*

NEW	REHAB	ACTION ITEM
☐	☐	2-10. **Essential:** In new construction and when replacing existing landscaping, use native and drought tolerant plants and trees for landscaping, except for edible landscaping. Limit lawn to play and recreational areas. ★*6-10*
☐	☐	2-11. **Essential:** If irrigating with potable water, install high efficiency drip irrigation system. ★*6-11*
☐	☐	2-12. **Essential:** Clearly label all storm sewer inlets to inform residents about proper surface water protection.
☐	☐	2-13. Specify and install permeable surfaces and paving in low traffic areas (fire access, overflow parking, patios, driveways, pathways, etc.). ★*2-17*
☐	☐	2-14. Install rainwater catchment system for non-potable water reuse. ★*6-13*
☐	☐	2-15. Evaluate use of greywater for irrigation. ★*6-12, 6-15*
		Indoor Water Conservation
☐	☐	2-16. **Essential:** Install water conserving plumbing fixtures: 1.6 gpf toilets, 1.0 gpf urinals, 2.0 gpm showerheads or better & 1.0 gpm faucet aerators. Option for urinals: waterless type. ★*6-16, 6-17, 6-18*
☐	☐	2-17. Install water conserving appliances: Energy Star® or front-loading (horizontal or H-axis) clothes washers and energy efficient or Energy Star® dishwashing machines. ★*6-43, 6-44*
		Design
☐	☐	2-18. **Essential:** Design exterior to properly drain water away from the buildings including patios, decks, window sills, and thresholds. ★*4-25, 4-28, 4-29*
☐	☐	2-19. **Essential:** Provide secure bicycle parking. ★*6-27*
☐	☐	2-20. Provide pedestrian-friendly-design amenities.
☐	☐	2-21. Provide on-site transportation shelters OR create easy access to existing public transportation options/facilities. ★*6-28*
☐	☐	2-22. Size parking capacity to meet minimum local zoning requirements.
☐	☐	2-23. On larger projects with internal streets, install traffic calming devices, such as curb bulbs.

★ *Built Green™ chapter - action point*

Chapter 3 Energy Efficiency

Building Envelope & Air Sealing

NEW	REHAB	ACTION ITEM
☐	☐	3-1. **Essential:** Document envelope improvements of at least 10% beyond code. ★*3-1*
☐	☐	3-2. **Essential:** Flash and seal all penetrations between interior spaces and outside. Seal all penetrations for ducting, wiring, plumbing, lights and fans. ★*3-5, 3-23*
☐	☐	3-3. Upgrade energy performance of concrete slab on grade. ★*3-1*
☐	☐	3-4. Upgrade energy performance of windows and doors. ★*3-1*
☐	☐	3-5. Perform blower door test to determine cost-effective air sealing and combustion safety for sample units(s). ★*3-8*
☐	☐	3-6. Perform duct leakage test to determine cost-effective air sealing and combustion safety for sample units(s). ★*3-24*
☐	☐	3-7. Upgrade energy performance of ceiling and walls. ★*3-9, 3-10, 3-11, 3-12, 3-14, 3-15*
☐	☐	3-8. Specify and install insulated concrete forms. ★*3-6*

Mechanical/Equipment

☐	☐	3-9. **Essential:** Heating Systems—Compare two or more systems from the list (see text, Chapter 3) by completing a Life Cycle Cost Analysis.
☐	☐	3-10. **Essential:** Heating Controls—Install accurate thermostats throughout. Specify a product that provides highly accurate thermostatic control over the heating system of plus or minus 2 degrees F. ★*3-26, 3-27, 3-29*
☐	☐	3-11. **Essential:** Delivery System—If installing ductwork, install inside conditioned space and seal ductwork in crawls and attics with mastic. When installed outside conditioned space, insulate to wall insulation standard or higher. Design short runs. Use flex only for straight runs; otherwise use metal. ★*3-23, 3-25*

NEW	REHAB	ACTION ITEM
☐	☐	3-12. **Essential:** Install high-energy factor water heater (minimum = 0.64 for gas, 0.93 for electric). Option for gas water heater to go to 0.83. ★*6-37, 6-38, 6-39*
☐	☐	3-13. **Essential:** Insulate bottom of hot water tank. Insulate hot water pipes in unconditioned spaces. ★*3-32*
☐	☐	3-14. Install instant (tankless) hot water systems where appropriate to achieve energy savings. ★*6-36*
☐	☐	3-15. Install energy-efficient elevators.
Electrical, Lighting & Appliances		
☐	☐	3-16. **Essential:** Specify and install efficient outdoor lighting (30 lumens per watt or better) with low temperature ballasts. Install lamps with automated controls, including but not limited to photo sensors, timers and motion control sensors. ★*3-37, 3-39, 3-40, 3-42*
☐	☐	3-17. Specify and install Energy Star® lighting fixtures, lighting systems and appliances. ★*3-37, 3-38, 3-39, 3-40, 6-31, 6-43, 6-44, 6-45*
☐	☐	3-18. Install solar water heating system for common hot water heating. ★*3-46*
☐	☐	3-19. Provide solar site lighting for walkways or outdoor area lighting. ★*3-43*
Design		
☐	☐	3-20. Daylight interior. ★*3-35, 3-36*
Innovation		
☐	☐	3-21. Purchase Green Power.

★ *Built Green™ chapter - action point*

Chapter 4 Health & Indoor Air Quality

Materials

NEW	REHAB	ACTION ITEM
☒	☒	4-1. **Essential:** Use least-toxic, decay-resistant, outdoor building materials. No CCA (Chromated Copper Arsenic). ★*5-80, 5-81*
	☒	4-2. **Essential:** For Rehabs, provide a lead-safe environment.
☐	☐	4-3. Install urea-formaldehyde free underlayment, cabinets and storage units. ★*4-18, 4-19*
☐	☐	4-4. Specify *low-toxic*, solvent-free, no-VOC (volatile organic compound) or low-VOC (below 100 g/liter) paints and primers. Specify water-based wood finishes and stains. ★*4-23*
☐	☐	4-5. Specify low-toxic, low-VOC adhesives and sealants. ★*4-17*
☐	☐	4-6. Avoid carpets on slab-on-grade. ★*4-12*
☐	☐	4-7. Install hard surfaces in living rooms and sleeping areas. ★*4-14*
☐	☐	4-8. If using carpet, install Carpet and Rug Institute's CRI IAQ label and low pile or less allergen-attracting carpet and pad. Install carpet by tacking (no glue) and limit use to one-third of the unit's square footage. ★*4-10, 4-11, 4-13, 4-15*
☐	☐	4-9. Ensure proper installation of under-slab vapor barriers. ★*4-27*

Fresh Air Ventilation

☒	☒	4-10. **Essential:** Provide make-up air. ★*4-37*
☒	☒	4-11. **Essential:** At a minimum install medium-efficiency air filters in ducted forced air systems. Option: Use "washable" type air filter. ★*4-40*
☒	☒	4-12. **Essential:** Install kitchen range hood, bath, laundry or ceiling exhaust fan vented to the outside to remove excess moisture and odors OR install multi-port attic fan to exhaust kitchen, laundry and bathroom. ★*4-48*
☐	☐	4-13. Provide for whole house ventilation with controlled supply and exhaust providing maximum Air Changes per Hour (ACH) for 24 hours per day as required by code.

NEW	REHAB	ACTION ITEM
☐	☐	4-14. Flush out building prior to occupancy with fresh outdoor air. ★*4-5, 4-6, 5-5*
☐	☐	4-15. Use operable windows for cross ventilation in combination with mechanical ventilation systems to assure good air flow and ample fresh air for building occupants. ★*4-37, 4-43*
		Education
☐	☐	4-16. Implement a "No Smoking" policy for common areas. Consider designating smoking and non-smoking units, floors or buildings.
☐	☐	4-17. Educate residents on ways to maintain good indoor air quality including minimizing and treating mold, reducing track-in of dirt and the importance of using mechanical ventilation properly.
		Chapter 5 - Materials Efficiency
		Waste Management & Recycling
■	■	5-1. **Essential:** Develop and implement a waste minimization plan, establishing targets for demolition and construction waste recycling by types of materials. (Goal: 80% total waste reuse and recycling by weight.) ★*5-18, 5-19 through 5-30*
■	■	5-2. **Essential:** Require subcontractors to participate in waste minimization efforts. ★*5-8, 5-24*
■	■	5-3. **Essential:** Include Seattle/King County's Construction Recycling Directory and the Contractor's Guide as part of the bid package.
☐	☐	5-4. Reuse and recycle parts or all of existing building during renovation or redevelopment. Install used/salvaged building materials where appropriate. ★*5-9 through 5-17*
☐	☐	5-5. Use suppliers who offer reusable or recyclable packaging. ★*5-4*
		Foundation
■	■	5-6. **Essential:** Specify cast-in-place concrete mix with minimum 25% fly ash substitution for Portland cement. Preferred 50%. ★*5-47*
■	■	5-7. **Essential:** Specify recycled aggregate base. ★*5-48*

★ *Built Green™ chapter - action point*

Framing

NEW	REHAB	ACTION ITEM
☐	☐	5-8. Use efficient structural systems, such as Advanced Framing, engineered structural lumber, etc. ★*5-36 through 5-43*
☐	☐	5-9. Specify 3rd-party certified sustainably harvested framing. Do not specify old growth lumber, other than "recovered" or "salvaged" materials. ★*5-44, 5-45*

Roof & Skin

☐	☐	5-10 Select durable and recyclable roofing and siding materials. ★*5-63, 5-66, 5-74, 5-75, 5-76*
☐	☐	5-11. Use recycled-content insulation (e.g. cellulose insulation.) ★*5-77*

Interior Finishes

☐	☐	5-12. When suspended ceiling panels are specified, install recycled-content acoustical ceiling tiles.
☐	☐	5-13. Specify 3rd-party certified sustainably-harvested finish woodwork. ★*5-71, 5-72*
☐	☐	5-14. Specify recycled-content drywall. Install hard surface drywall in high-wear areas. ★*5-58*
☐	☐	5-15. Install alternative to sheet vinyl for kitchens and bathrooms. Other flooring choices include natural linoleum, tile and vinyl composition tile (VCT) with recycled-content. ★*5-53, 5-56, 5-57*

Chapter 6 Operations & Maintenance

☐	☐	6-1. **Essential:** Prepare a plan for annual scheduled maintenance of all aspects of the building and site, including but not limited to, building envelope, roof, vents, filters, plumbing, combustion equipment and landscaping. ★*6-2*
☐	☐	6-2. **Essential:** Prepare a sustainable landscape O&M plan. ★*6-3*

SUSTAINABILITY PLAN TEMPLATE - CHECKLIST

NEW	REHAB	ACTION ITEM
☐	☐	6-3. **Essential:** Provide adequate space and convenient placement of resident recycling. Develop recycling and disposal procedures for staff. ★*6-50, 6-51*
☐	☐	6-4. **Essential:** Design properly ventilated separate storage area for maintenance supplies and paints. ★*6-46*
☐	☐	6-5. Develop a tenant manual to provide guidance on living in a residence that incorporates green or sustainable features. ★*6-1*
☐	☐	6-6. Incorporate a garbage disposal plan in the building/site design.
☐	☐	6-7. Provide training for O&M staff. ★*6-4*

★ *Built Green™ chapter - action point*