



# Integrated Design Charrette

## Introduction:

This activity is designed to provide an opportunity to discuss the type of issues that come up in a charrette. Ask the instructor if you have questions or encounter problems during the exercise.

## Assign one member of the group to each role(combine roles if necessary).

- Executive Director - Owner: \_\_\_\_\_
- Maintenance Staff: \_\_\_\_\_
- Neighbor: \_\_\_\_\_
- Architect: \_\_\_\_\_
- Engineer: \_\_\_\_\_
- Green Building Consultant: \_\_\_\_\_
- Builder: \_\_\_\_\_
- Development consultant: \_\_\_\_\_
- Potential tenant: \_\_\_\_\_
- Recording Secretary: \_\_\_\_\_

## Background

Small Town is a village in New England (a cold climate) with a large student population contributing to the population of 5,000. The units being proposed by the Small CDC (SCDC) are urgently needed; there has only been one affordable rental project for families built in the past ten years. To the extent that affordable housing is available, the quality is poor and energy costs are very high. As it is a college town with a large demand for student housing, the limited supply of affordable housing is in great demand. As such, high quality, affordable units have a vacancy rate of effectively zero.

The local infrastructure has recently been upgraded, including the streets bordering the site. The water pressure is considered good and capacity is excellent. The municipal sanitary treatment plant, new in 1986, is currently undergoing an upgrade. Secondary effluent is discharged into an area creek. Adjacent roads have both recently been repaved and both have new sidewalks.

The site is made up of two adjacent parcels; the smaller parcel has frontage on MacArthur Avenue and the larger parcel with frontage on Grove Street. The total of these two parcels is approximately 1.5 acres and both are zoned R3

Zoning will allow for up to 4 units per site (for a total of 8) although the site area requirements would allow 16 units on the site (This will require a variance).

All: Introduce yourself

All: Discuss goals for the project:

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Architect presents: preliminary sketches of five options for discussion that included single-family cottages, townhouses and apartment buildings of varying density, layout and open space. She/he also provided photographs of many multi-family housing projects around the country for aesthetic consideration.

All: Discuss preferred design approach. Recommendations may include changes to the options presented.

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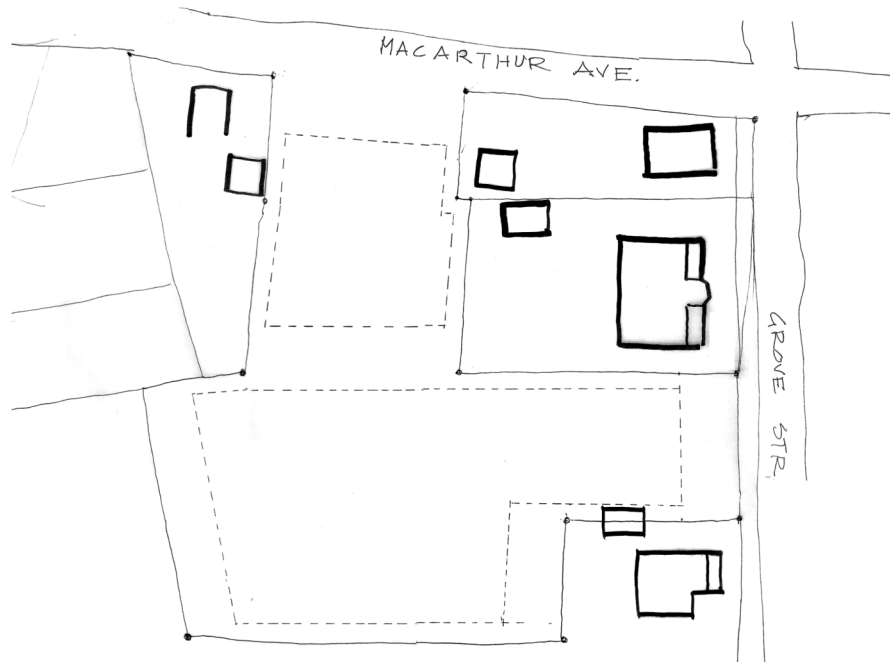
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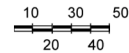
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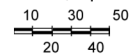
Dorgan Architecture & Planning  
 10 Eastwood Road  
 Storrs, CT 06268

Schoharie RPC Green Family Homes, Base Plan  
 Date: 11/02/2009  
 Scale: 1" = 50'



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 10 Eastwood Road  
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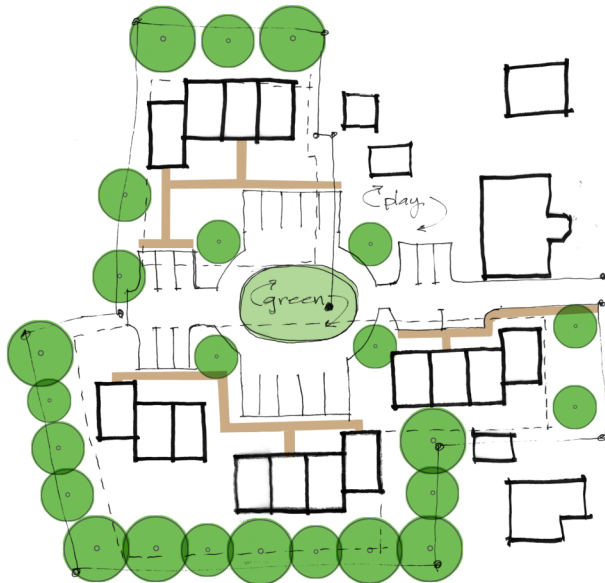
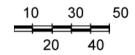
Schoharie RPC Green Family Homes, Opt. A  
 Date: 11/02/2009  
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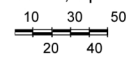
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Schoharie RPC Green Family Homes, Opt. D  
 Date: 11/02/2009  
 Scale: 1" = 50'



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 Storrs, CT 06268

Schoharie RPC Green Family Homes, Opt. E  
 Date: 11/02/2009  
 Scale: 1" = 50'



Development Consultant: There are three potential scenarios for site density; 4, 8 or 12 units could all be feasible.

Neighbor: The best strategy was to pursue 8, three-bedroom units, with each measuring approximately 1,050 - 1200 square feet in size as this density is likely to be the most acceptable for the surrounding community.

All: What layout does your group prefer? And why? Who is responsible for follow up?

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Executive Director: This project is to be non-government subsidized affordable housing with an estimated rent of \$500-600 per month. This development will be purely housing; no supportive services will be provided and no special groups will be targeted for tenancy.

Development Consultant: Design considerations include that each unit must be visitable, meaning that there is access and a restroom on the first floor. State funding requirements requires that at least 20% of the units built are adaptable, and at least 5% (one unit) is to be fully accessible.

Green Building Consultant: Regarding greening goals, at this time the project will meet State Green Building Criteria.

Maintenance Staff: Is it decided to use the Enterprise Green Communities as a guideline for greening strategies? Will we use LEED? Are other standards required?

All: Discuss which standards are appropriate for this project.

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## Site and Landscaping

Engineer: The site has undergone a Phase I Environmental Site Assessment. There were no recognized environmental conditions identified on adjacent properties that would appear to impact the property.

All: Discuss site considerations, including roads, outdoor space, grading and drainage with some initial parameters outlined.

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## Layout

ED: There will not be any garages or carports; however, space for parking needs to be taken into consideration.

Neighbor: Zoning requires that each unit have a minimum of 1.5 parking spaces, so under an 8 unit scenario, the site would require a minimum of 12 parking spaces.

Builder: The site must accommodate emergency vehicles so their access must be taken into account during site planning. The idea of a through-street connecting to both MacArthur and Grove was discussed as a possibility to allow for easier site access.

Potential tenant: This is family housing and the nearest playground is not within walking distance, space for children to play should be included in the design.

All: The group discussed the benefits and challenges of having the play area for children located in a common space versus individual backyards. What does your group think? Who is responsible for next steps?

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Irrigation and Planting

Engineer: No invasive species are allowed: use native and introduced species instead. It is also important to consider the drought tolerance of the plantings selected; where possible plants with a high drought tolerance should be used in order to encourage a low-maintenance landscape.

All: What are other landscape considerations? Who is responsible for follow up?

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Stormwater Management

Engineer: This site does not present any topographical or hydrological restrictions. The soil is clay/loam and semi-permeable. The natural slope is to the south where the creek lies.

All: What are considerations for retention, grading, and materials selection? Who is responsible?

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**Energy**

Performance Targets

Engineer: ASHRAE standards are required. I recommend the following benchmark standards:

- Outstanding performers = 3- 5 BTU/sq ft/HDD
- Energy Star rated = 6 - 10 BTU/sq ft/HDD
- Typical existing buildings = 10 -15 BTU/sq ft/HDD
- Older, very poor performers = 25 - 30 BTU/sq ft/HDD

All: What should be the target for this project? Why? Who is responsible?

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*Building Orientation*

Green Building Consultant: In one study, units facing north used 30-40% more gas for heating than those facing south. How should units face? Why? Who is responsible?

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*Building Envelope*

Architect: The building envelope determines energy efficiency and resident comfort. A tight, well-insulated envelope can help minimize the size of the mechanical system and keep long-term operational costs low.

Builder: Insulation minimum per local code for exterior walls is R19 and for roofs R38.

Green Building Consultant: Target R-values that have been used for super-insulated buildings: R10 in slab, R20 in basement walls, R40 in exterior walls and R60 in roofs.

Architect: The group might consider a 2x6 wall with blown-in cellulose or icynene and 1 inch of rigid insulation.

Green Building Consultant: 1-inch rigid insulation is a good choice to reduce impact of thermal bridging. 2-inch is better.

Builder: 2" may require strapping for attachment and longer nails may be needed to attach siding.

Development Consultant: The icynene would work to stop infiltration, but the skin of rigid insulation will also combat infiltration. Icynene use (coupled with the exterior rigid insulation) may therefore be redundant, as it has the same R value of other less expensive products.

Green Building Consultant: Dense-pack cellulose, with the added rigid insulation and close attention to the air barrier, works just as well and is less expensive.



All: What wall and insulation system do you prefer? Why? What further information is needed? Who is responsible for follow through?

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Green Building Consultant: It is important to have detailed drawings for places where assembly meets assembly (e.g. wall meeting window) as these are typically where leaks are introduced.

Development Consultant: One potential funding source will require central air conditioning be included in the project. If that funding is awarded, then there cannot be a vapor barrier to the inside of the building envelope or moisture may condense within the wall system, creating mold problems.

Green building consultant: An interior vapor barrier should be avoided.

Builder: I'm concerned about an exterior vapor barrier. I've had good results with interior vapor barriers.

All: How do you recommend that this conflict be resolved? Who is responsible? What are next steps for the building envelope?

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### Foundation

Maintenance: There has not been any radon testing done specifically for this project, however, the site is in EPA Zone 1, meaning there is high potential for radon.

Green Building consultant: I suggest [buildingscience.com](http://buildingscience.com) as an excellent resource for crawl space design.

Engineer: I recommended a radiant heating system.

All: Discuss the benefits and challenges of slab on grade versus a crawl space. Is it preferable to have the living space above ground level? Should a crawl space provide a place for mechanical systems?

*What is the group's recommendation for foundation design? What are the next steps?*

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*Air Sealing*

Engineer: Air infiltration can have a significant impact on a building's energy efficiency.

Maintenance: Will we do blower door tests and target infiltration rates?

Architect: I recommend the air-tight drywall approach to reduce air changes.

Engineer: I recommend performance specifications for the general contractor to meet based on the air infiltration rates.

Builder: I don't think I should be responsible for this.

Green Building consultant: In order to ensure that the design of the building can meet the performance requirements before it is given to the general contractor, the proposed envelope design should undergo peer review.

Neighbor: Isn't an interim blower door test a good idea?

Maintenance: What HERS rating do we require to qualify through the Energy Star for Homes program?

Engineer: The contractor should 'own' project testing to simplify coordination and to ensure that the contractor has an incentive to solve the problems.

Development Consultant: Placing the financial risk of failed testing results and retesting measures with the contractor creates a strong financial incentive for air sealing to be done properly.

*All: How does the team suggest that air sealing be accomplished? Who should be responsible?*

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Window Selection

Architect: I recommend metal clad wood windows instead of a vinyl windows.

Neighbor: How do those look?

Green Building Consultant: I advise against vinyl windows because their production and disposal have significant environmental costs and their high coefficient of thermal expansion can be problematic in operation.

Architect: Local code calls for a U-value of .35.

Neighbor: I recommended that Energy Star, low-e, argon filled windows with a U-value of .33 be used.

Maintenance: Single hung windows (fixed upper) are a way to better seal the window and reduce maintenance issues.

Tenant: Casements don't work and leak.

Development Consultant: We've had problems on other projects with pan-flashing.

Maintenance: Water that comes through windows can cause rot and mold and decrease a wall's durability.

*What are the next steps for windows? Who should take what responsibility?*

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**Mechanical Systems**

Metering

Executive Director: Water will be on a single common meter while gas and electric will likely be individually metered.

Development Consultant: A single gas meter might be worth consideration. A master gas meter with sub-meters is an effective way to allocate costs to tenants but it adds administrative costs for meter reading and requires a protocol be developed for tenant issues that may arise from delinquent payments.

Tenant: Can we trust submetering? Is it legal?

*What are other metering issues? What are the next steps? Who should be responsible?*

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### Heating

Green Building Consultant: At least a 92% efficient condensing hydronic boiler is recommended for a gas fired heating system.

Architect: Due to efficient unit design (building orientation, air sealing and insulation) the heating demand might be so low that it may be difficult to find a boiler that truly operates at design efficiency. (This may lead to consideration of combined systems with sub-metering).

Maintenance: There's a different maintenance protocol for this type boiler, so we need training. Can we get parts locally?

Engineer: Low temperature baseboard was recommended to keep the boiler operating in the condensing mode, which is most efficient.

Tenant: A panel type (flat profile) is desired as fin tube baseboard takes a fair amount of abuse in rental housing.

Executive Director: The panel should be covered because they will be between 100-110 degrees in a setting where there may be small children.

Development Consultant: The State has a program that might finance geothermal. While there are positive aspects of the system, for instance it creates a smaller carbon footprint and uses less energy, there are concerns as well.

### Cooling

Executive Director: Central air conditioning is not recommended or desired, but may be required by one of the potential funding sources. If required, a geothermal heating and cooling system becomes an option worth exploring.

All: What are other issues concerning cooling and cooling equipment? Who should be responsible for follow through?

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### Domestic Hot Water

All: Discuss domestic hot water heater options including electric or gas tankless, on demand systems, solar and conventional systems.

What are issues that should be considered in making this decision? Who is responsible for follow through?

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### Ventilation

Tenant: While a tight building envelope is desirable from an energy consumption standpoint, it can create indoor air quality problems for residents. It is important to properly ventilate the units to ensure a supply of fresh air.

Engineer: We'll use ASHRAE Standard 62.2: Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings is the standard for designing the ventilation system.

Development Consultant: The baseline ventilation system would include continuously running bath fans in each bathroom. All bath fans will require periodic cleaning.

Architect: An energy recovery ventilator (ERV), could temper fresh air from outside with the building's exhaust air. The conditioned air would then be pushed back through the units. Cost was a concern. However,

- By using an ERV, boilers (and chillers if central cooling is installed) can be downsized.
- These units are not to be installed in bathrooms or kitchen as humid and grease-laden air can cause problems.
- If an ERV is chosen, a standard fan that switches on with the light or is on a timer is adequate for bath ventilation.

- Kitchen air exhaust and any combustion equipment should be ducted directly out of building.

All: What are other ventilation concerns? Should smoking be allowed? What are the responsibilities for following up on this issue?

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Lighting

Architect: I plan to spec ceiling mounted fixtures in all hallways and rooms except the living room.

Maintenance: SCDC’s policy is to provide and replace bulbs in its senior housing; I don’t know if we’ll do the same for family housing.

Executive Director: We want Energy Star fixtures for the interior and exterior fixtures.

Energy Consultant: Pin-based fixtures will ensure that incandescent bulbs are not installed. If SCDC opts to provide the bulbs for tenants, it may be a good idea to consider a common space/equipment shed for bulbs and other equipment storage.

Tenant: Lighting design should take advantage of daylighting opportunities where possible and reduce the lighting power density (watts/sq.ft.) if feasible.

Development Consultant: Funders’ requirements required exterior lighting to use photocells. Sensors may also be an option for some lighting, though safety concerns will need to be considered.

All: *Lighting Next Steps:* Decide whether bulbs will be provided for residents and if so, determine maintenance protocol. Specify Energy Star fixtures. Plans to include exterior photocells and sensors where feasible.

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Appliances

Executive Director: SCDC stated will be providing kitchen range exhaust hoods, a stove and oven, refrigerators and a washer/dryer hook-up for each unit.

Development Consultant: Only Energy Star appliances are to be specified and installed.

Executive Director: Discussed whether SCDC would provide the washers and dryers or if tenants would be responsible for bringing their own. If SCDC is able to provide the units, they will be able to select efficient models whereas tenants may have older models that are not as efficient. Additionally, if the machines are provided, there will be less wear and tear to the unit as tenants would not be moving equipment in and out.

Green Building Consultant: noted that significant water savings could be achieved by specifying front loading washers that are limited to 7.5 gallons/load.

Neighbor: Can washers be plumbed to provide only cold water, or only cold water rinsing (need to check code to see if this is permissible)? Dryers with humidity sensors are great water and energy saving strategies.

Maintenance: Will SCDC would provide dishwashers? While there is an up-front cost for the machines, on average, a dishwasher uses less water (if run when full) than doing dishes by hand, especially given the family demographic.

*All: Appliance Next Steps:*

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Renewable Energy

Green Building Consultant: Solar photovoltaic systems are expensive and cost approximately \$10-12/watt (installed cost). However, NYSERDA currently offers incentives of up to \$3.00/watt which may make it more financially feasible. As there is no common area electricity use it would only benefit the tenants and not SCDC directly.

Neighbor: Buildings be 'solar ready' so that new incentives or lower cost technologies can easily be taken advantage of if the opportunity arises. It is inexpensive to plan for at this stage.

Architect: Being solar ready includes considerations such as the pitch of the roof, running conduit from the roof to the mechanical space, ensuring an unobstructed southern face on the roof, installing a disconnect for fire purposes, and designing the roof to withstand the additional load of the rack and photovoltaics.

*All: Renewable Energy Next Steps:*

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*Modeling/Verification*

Development Consultant: The project team discussed the Energy Star for Homes program and its current state of funding. As many of the state's programs are currently in flux, specifics surrounding the program and its requirements should be made clearer in 2013. It may be possible that the program will offer free energy modeling. Modeling will need to be revisited once the state's revised programs have been rolled out.

Engineer: recommends that independent commissioning of the HVAC system be completed - this is typically estimated to be 1-3% of total MEP cost.

Green Building Consultant: It might be possible to do more targeted commissioning and only select certain equipment, which will bring costs down.

Executive Director: SCDC will consider whether commissioning is financially feasible for the project.

*Modeling/Verification Next Steps:*

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## Water Conservation

Green Building Consultant: The average U.S. residential water use is 69 gallons/person/day. This project can reduce this consumption rate by including water conserving flush and flow fixtures at little or no incremental cost. We recommend \*\*\*\*\* with a 1.5 gpm flow-rate. Showerheads should be specified separately, not as part of a shower system or there is a risk of paying for duplicate showerheads. It is important that a high performing showerhead be specified as residents will remove it otherwise.

Maintenance: Tamper-proof aerators are recommended for the bathroom ( 0.5 gpm) and kitchen ( 1.5 gpm). Inspection of aerators should be included on any walk-thru checklists with fines levied if they have been removed.

Architect: I recommended that regardless of what type of toilet is specified it should meet certain performance goals; it should be able to flush between 800-1,000 grams as set forth under the MaP testing standards.

Green Building Consultant: I will share the most recent MaP report with the team to aide in selecting a high performance toilet.

*All: Water Conservation Next Steps:*

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## Materials

### Recycling Construction Waste

Maintenance: Recycling construction waste is important.

Green Building Consultant: The specific percentage of total recycled material should be set and written directly into the specifications. The team agreed that setting a minimum requirement to recycle 50% of demolition and construction waste seemed feasible.

Builder: I will need to specify that the recycling company give a project specific percent of waste diverted rather than just daily averages for that facility. The team will be able to better track the waste diversion rate this way.

Neighbor: The possibility may exist to grind bio-degradable material for use on-site.

Maintenance: There may be an opportunity to salvage some material from the existing building to make a sign and/or a storage shed for the new development.

*Recycling Construction Waste Next Steps:*

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Regional Sourcing

Executive Director: It is important to us that we use as much local material and labor as possible.

*All: Discuss regional sourcing options. Regional Sourcing Next Steps:*

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Recycled Content Materials

Neighbor: Efforts should be made to coordinate between architect and the contractor to identify and specify cost-effective recycled materials.

Maintenance: I recommend that a minimum of 30% fly ash should be specified for all concrete as it not only includes recycled content but also increases the structural strength.

Executive Director: Is flooring an area where recycled content could be introduced?

*All: Recycled Content Next Steps:*

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**Indoor Air Quality**

Green Building Consultant: The quality of air and the environment inside the building is particularly important, as 90% of our time is spent indoors.

## Flooring

Maintenance: Clean wipeable surfaces are recommended wherever possible.

Green Building Consultant: Recommend ceramic tiles in the bathrooms. While the first cost of ceramic tile is high, VCT has to be replaced every seven years, so when considering life-cycle costs, the investment in ceramic tile may become more financially feasible.

Tenant: I like carpet in living spaces.

Engineer: Carpet can have a negative effect on indoor air quality, including absorbing and holding allergens, and can be difficult to clean.

Green Building Consultant: If carpet is chosen for any part of the unit, Green Label Plus Certified carpet, installed in tiles (so that when replacing it, only worn parts would need replacement) should be specified.

Builder: Carpet should be installed after paints and sealants have dried to avoid absorption of harmful VOCs.

Maintenance: Linoleum or recycled vinyl product are possible alternative. Slate is a longwearing option for small, high traffic areas (perhaps at the front door) and may be available locally.

Development Consultant: Although presenting a higher initial cost, lower quality hardwoods have a very long life and can be installed with a water-base adhesive.

Neighbor: Are those FSC rated?

Architect: A recycled bamboo plywood, is an inexpensive option that the team may want to consider. Some bamboo is harvested too early (before 3 years) and as a result can be soft, wearing out and scratching easily under high traffic conditions.

*All: Flooring Next Steps:*

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Paints, Sealants, and Adhesives

Executive Director: Low VOC paints that meet Green Seal standards, and sealants and adhesives that meet SCAQMD rules.

Green Building Consultant: These specific VOC limits should be written into the plans and specs to assist the project’s subcontractor’s compliance with the VOC requirements.

Builder: It may be helpful to list two or three alternative manufacturers for the paints, sealants, and adhesives that meet these VOC requirements to ensure compliance.

*All: Paints, Sealants, and Adhesives Next Steps:*

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Cabinetry

Development Consultant: Funders require that cabinetry have low amounts of urea-formaldehyde.

Builder: \*\*\*\*\* HUD Severe Use cabinets were discussed as an option to meet the requirements for low urea- formaldehyde levels.

Executive Director: Let’s select a formaldehyde-free cabinetry such as \*\*\*\*\*.

Development Consultant: The HUD cabinets are considerably less costly than the other option.

Engineer: Where plywood is specified inside the moisture protection barrier, exterior-grade plywood should be used because it contains phenol-formaldehyde, rather than urea-formaldehyde, which off-gases at room temperature.

*All: Cabinetry Next Steps:*

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## Operations and Maintenance

Maintenance: How are we going to train staff about the green elements of the building, their intended use, and the subsequent maintenance protocol necessary to sustain a green building.

Development Consultant: It is a good idea to have an Operations & Maintenance manual in place for staff along with checklists and protocol for unit inspections.

Green Building Consultant: It is important to have building policies for residents in place at the very beginning of occupancy.

Neighbor: We could host a welcome to the neighborhood and an orientation and training session to educate new residents about the green elements of their home.

Executive Director: It is also recommended that a greening guide be provided for each family.

Maintenance: I'd like to consider the creation and implementation of incentive programs aimed at changing occupant behavior may be considered.

Tenant: What do you mean by that?

All: Discuss

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## Recycling

Neighbor: Waste and recyclables will be removed from each home rather than shared dumpsters via a contracted hauler(s). The hired contractor should be periodically checked to ensure recycling is done as contracted.

## Cleaning and Pest Management

Development Consultant: The resident guide should include a section on green cleaning and low toxicity cleaning agents.

Tenant: Walk off mats or grills should be installed as to reduce the number of outdoor elements being brought inside.

Maintenance: Pest management issues should be dealt with in the least toxic way feasible. SCDC should consider implementing an integrated pest management policy to address any potential pest issues in the most environmentally friendly way possible.

*All: Operations and Maintenance Next Steps:*

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**Information Required:**

**Summary of Recommendations:**