

# Green Guidelines for Saginaw County Habitat for Humanity

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## A. INTRODUCTION

**Our Approach to Green** As an affiliate of Habitat for Humanity, our attention to conservation of resources begins as a mission to provide for quality, simple, decent and affordable housing. We are attentive to resource efficiency because it assures that we are good stewards of donor money and resources. Less waste and the reuse of recyclable materials results in lower costs for Habitat partner families.

We build modestly-sized houses which use fewer raw materials than large houses. Smaller houses are less expensive to build and easier to heat and cool. Purchasing smaller quantities of materials, Habitat decreases the environmental impact of raw material extraction, processing and transportation and also reduces the amount of waste. We seek out opportunities to reuse and recycle leftover materials. We designate an area on the work site for reusable and recyclable materials, making it easier for volunteers to channel them back into house construction or to materials recyclers.

In an effort to raise funds while conserving resources, we operate a ReStore. Our ReStore sells reusable and surplus building materials to the public, using the proceeds to fund local Habitat house projects and, as a result, they both support resource efficiency and help Habitat build more houses. By using and re-using materials efficiently, we are encouraging good stewardship— of both Habitat's resources and the earth's resources.

These guidelines are designed to be used in all situations but are also designed to acknowledge situations and various constraints that are unique to Saginaw Habitat for Humanity such as costs, mandated location, and donated materials or cooperative procurement practices. Although in some ways these constraints limit greening opportunities in Habitat projects, they also highlight the potential and opportunities to implement further sustainable practices at low cost to the homeowner.

The goals of these green guidelines are to provide the occupants of homes built by Saginaw County Habitat for Humanity with residences that conserve natural resources, are energy efficient, economical to operate and maintain, healthy to live in and bring pride of ownership to the family. We believe that as an organization we have an opportunity to improve the efficiency and impact of our entire operation, and therefore these guidelines focus not just on construction, but provide guidance and recommendations for operations of the affiliate, from travel to the ReStore to the Board of Directors.

## **B. OFFICE, BUILDING OPERATIONS AND MAINTENANCE** **GUIDELINES**

Office operations, operations of the Restore and other functions of Saginaw Habitat for Humanity should follow the same philosophical approach to being “green” as is proposed for the new home construction, renovation and partner families. Guidelines for office related green functions are relatively straight forward, and for the most part, do not have justification provided as it is relatively self explanatory.

### **Be Resource Minded In the Office**

- Use the backs of already-used paper in fax machines, and as scratch pads.
- Ask for email addresses and send email instead of paper when possible, including information to the Board of Directors
- Program thermostats for maximum efficiency
- Turn down thermostat in basement when not in use
- Turn off lights when area is not in use
- As lights and bulbs need replacing, do so with higher efficiency materials
- Use environmentally friendly cleaning solutions when possible
- Recycle paper, cardboard, metal, glass, and appropriate plastics
- Use natural cleaning products
- Utilize natural bright light whenever possible in lieu of the fluorescent overhead lights.
- Designate a printer for drafts only and reuse
- Set computers to Sleep mode after being idle for several minutes (rather than letting screen savers run for long periods of time).
- Turn off computers and/or monitors overnight (calculate savings vs. wear & tear)
- Investigate reducing number of newsletters mailed
- Purchase paper products with a high percentage of recycled (preferably post-consumer) content
- Recycle ink jet and laser printer cartridges

### **Be Resource Minded Outside the Office**

- Plan vehicle use to carpool when possible
- Go to trainings as close to office as possible
- Encourage walking when it is less than a mile (bank, post office, meetings, lunch)
- Make walking easy—and provide bike racks

### **ReStore**

- Re-sell old furniture and equipment from SHFH and from donors
- Recycle paint (if it cannot be re-used or re-sold)
- Re-use plastic bags from grocers
- Investigate GPS for truck vs. printing a color map for each pick-up
- Close overhead doors if heat or air is on
- Close exit doors if heat or air is on

## Warehouse

- Insulate warehouse walls, ceiling
- Close overhead doors if heat or air is on
- Close exit doors if heat or air is on

## C. CONSTRUCTION AND BUILDING GUIDELINES

Within the constraints and limitations of land offered for construction of Habitat Homes or homes and/or neighborhoods offered or requested to be considered for renovations and/or repair, the organization should consider the following criteria before accepting properties.

### 1. Locations and Linkages

#### Access to Transportation

**Intent-** To reduce impacts of development and the associated vehicle pollution and urban sprawl, development lands should occur within urban or suburban areas with adequate access to transportation corridors.

**Desired Conditions-** The development site is located near basic services including grocery shopping facilities, bank, day care, place of worship, medical care, laundry/dry cleaning, pharmacy, post office, school, public transit stop, park, restaurant and hardware store. 50 % of the above facilities should be located within ¼ mile of the development site, which will allow for convenient biking or walking. Public transportation should be available within one-half mile. The distance from site to public transportation access should be ¼ mile. (add , less if available)

**Best Management Practice =** The Board of Directors should identify lands prior to donation to determine that the residents will not be unduly reliant of the use of their automobile to access services.

#### Building Lot Selection

**Intent-** Habitat homes should be located on lands, which are safe for the residents and the surrounding community both human and natural and should not contribute to the degradation of agricultural or natural resources. Additionally the building location should lend itself towards efficient land utilization by building in higher density areas.

**Desired Conditions-** To avoid contributing to urban sprawl, building sites ideally will be located on formally developed areas, in existing neighborhood areas or on abandoned or underutilized areas. All efforts must be made to avoid any Habitat construction on prime agricultural lands, former parklands, wetlands, and woodlots. Whenever possible efforts should be made to avoid construction within a 100 year flood plane. Lands utilized for Habitat construction should be located on vacant or de-habituated lands whenever possible in order to take advantage of existing infrastructure. Density of five to six (5 to 6) units per acre should be pursued. Ideally lots or renovated homes would be located in reasonable proximity to commercial and social needs and be in a mixed use setting with open space.

**Best Management Practices =** Habitat homes should be built to take best advantage in the utilization of scarce lands, prime agricultural lands should never be used to construct homes.

Ideally Habitat homes will be built on land within existing developed areas to avoid increased costs or environmental impacts in infrastructure development. Ideally lots will allow the home to be constructed on an East/West axis to allow for solar access.

## **2. Site Conditions**

These guidelines cover the construction practices at the job site and address some issues related to site preparation.

### **Construction Waste Management Plan**

**Intent-** EPA research found that the typical waste from frame construction ranged from 3.5 to 7.5 pounds of waste per square foot of house. The intent of this guideline is to reduce the level of waste generated to the landfill from Habitat construction to less than 2.5 pounds of waste per square foot.

**Desired Conditions-** On all Habitat job sites planning will occur prior to the project to reduce construction debris through source reduction, reuse and recycling.

**Best Management Practice =** Each Habitat project will have a plan in place, which is followed throughout the project to minimize waste generation. This proactive process will lower construction costs, reduce impacts on the local landfills and demonstrate Habitat's commitment to green home construction.

### **Source Reduction**

**Intent-** Reducing excess materials from entering the job site is an important process of greening the construction process. Excess materials require additional handling and effort to recycle or dispose of in a responsible manner.

**Desired Conditions-** On all Habitat job sites planning will be performed to keep materials entering the site to the minimum required while achieving the construction process. Control of access to dumpsters during non-construction periods can reduce deposition of non-project materials.

**Best Management Practice =** Careful planning and accurate takeoff will be performed to reduce overage in ordering of materials. Whenever possible pallets arriving with materials will be returned to the vendor for reutilization. During periods of non-construction, dumpsters should be monitored to prevent unwanted dumping.

## Reuse of Construction Materials

**Intent-** Full utilization of all materials on the job site is the desired condition. Adaptive use of materials has the additional benefit of reducing costs in material procurement and in reducing waste disposal costs.

**Desired Conditions-** Materials generated in the construction process will be reutilized when ever possible on site. These uses can include using cutoff 2x wood waste for stakes, bracing, shims, blocking and as drywall nailers. Concrete waste material can be used as rubble backfill around the foundation or for drainage in landscaping. Unused materials or materials with useful potential will be retained for further Habitat projects or delivered to the "Restore" for revenue generation.

**Best Management Practice =** Innovation in reuse of materials is a desired criterion on all Habitat projects. The reuse of materials is basic to Habitats goal of providing low cost homes with minimal costs.

## Recycle Job Site Construction Materials

**Intent-** Recycling reduced pressure on landfills, saves monies by reducing tipping fees, raises funds through sale of some materials and provides materials for future building projects. Over 50% of most construction debris are wood and cardboard which can easily be recycled.

**Desired Conditions-** On all Habitat job sites provisions will be made to sort and recycle construction debris.

**Best Management Practice =** Provide a location at the construction site where materials are sorted prior to disposal. On larger sites provide separate disposal bins for trash and recyclable materials, in some areas the recycle bin may be provided at no cost in conjunction with the regular trash bin service. All materials that can be not be reutilized will be sorted for scrap value and sold for revenue if possible. In addition onsite generation of waste related to volunteer activity would be kept to a minimum through education and collection points for recyclable beverage containers.

## Stormwater Management/Water Catchment

**Intent-** Retention of rainwater runoff on site reduces the volume of polluted waters reaching storm drains and the water supply and reduces the need for utilization of treated domestic water for irrigation purposes.

**Desired Conditions-** Most storm water runoff is retained on site through percolation into the soils and/or the existing infrastructure in the area.

**Best Management Practice =** Provide for guttering systems on all Habitat homes that channels the water to turf areas for replenishment of soils moisture. Downspout placement should not allow for the direct runoff onto hard surface areas that lead to storm drainage.

## Erosion Control and Reduced Site Disturbance

**Intent-** Control of erosion during construction to reduce negative impacts on water quality.

**Desired Conditions-** As part of the construction plan develop a site sedimentation and control plan which prevents loss of soil during construction by storm runoff or wind erosion, prevents soils sedimentation in the storm drain system and reduces dust and air pollution at the job site.

**Best Management Practice =** Any soils disturbed during the construction process should be stockpiled for later landscaping works. Disturbance on site should be limited 20' beyond the new building, 5' beyond the primary road, curbs, walkways or utility trenches. Install fencing if and when require, to delineate areas for reduced construction impacts. Do not allow concrete trucks to washout on site as per local regulations, or if required only in a designated non-disruptive area within 20 feet of the foundation.

### **3. STRUCTURAL MATERIALS**

#### **FOUNDATION**

##### **Incorporate Recycled Flyash in Concrete**

**Intent-** Flyash is a byproduct of coal burning power plants and can be an inexpensive substitute for a portion of the Portland cement used in concrete. This not only provides for the recycling of materials but also reduced the energy requirements in the manufacturing of Portland cements.

**Desired Conditions-** At a minimum all concrete will be specified to contain 15-20% flyash in the cement mix. The maximum desired content of 20% would be used for any non-structural flatwork including driveways, walkways and patios.

**Best Management Practice =** Habitat homes in this area are almost always built as slab-on-grade construction. By incorporating recycled materials to the maximum allowable content, new material requirements will be reduced. This is an important goal of the greening initiative and can be achieved in this clause with no increase in cost. Local concrete suppliers are now supplying all standard concrete mixes with 120% flyash for interior applications

##### **Reuse of Form Materials**

**Intent-** Reduction of the cost for forming materials both fiscally, in material use or material consumption is desired in the greening of Habitat homes.

**Desired Conditions-** New lumber materials should not be utilized in forming of concrete works on Habitat job sited. Reusable form materials such as aluminum either rented or procured will greatly reduce the demand to procure wood forming. Any use of sawn boards for forming should be limited and all form boards should be salvaged for reutilization.

**Best Management Practice =** Form materials used on Habitat job sites should be reused in the construction process where ever appropriate or retained for use on other job sites.

##### **Insulated Foundations**

**Intent-** Foundations should be all insulated with R10 or greater rigid foam to minimize heat loss to reduce energy bills in Michigan.

**Desired Conditions** - All foundations should be insulated. Use of rigid foam concrete forms provides dual utilization and can eliminate the requirement for board foundation forming.

**Best Management Practice** = Use R10 or greater rigid foam to minimize heat loss. Consideration should be given to using rigid foam concrete forms for basements.

## Structural Frame

### Use of Chromium and Arsenic Free Treated Woods

**Intent-** Treated woods used for sill plates that contain chromium or arsenic can present health and safety issues during use (splinters and sawdust), is not recyclable, and should not be burned for heat and can be unhealthy for contact by children. Use of woods treated with Alkaline Copper Quaternar (ACQ) or Wolman Natural Select are healthier alternatives.

**Desired Conditions-** No habitat home should be constructed with toxic materials when healthier alternatives are available.

**Best Management Practice** = In keeping with the goal of providing a healthier home for the occupants, Habitat for Humanity should eliminate the use of any toxins when alternative materials are available. All required treated woods should be specified to use either the Wolman Natural or ACQ treatment.

### Substitute Sawn Lumber with Engineered Lumber

**Intent-** Solid sawn lumbers in sizes larger than 2x10 typically come from old growth forests while engineered lumber is manufactured from fast growing farm trees. Engineered lumber uses the wood fiber more efficiently resulting in stronger, straighter and defect free construction. Engineered lumber includes glulam beams, laminated veneer lumber, wood I-joists, OSB and parallel strand lumber.

**Desired Conditions-** Wherever allowed by code engineered lumbers should be utilized in Habitat homes. Applications would include structural headers and beams, floor joists and sheathing.

**Best Management Practice** = Construction of Habitat homes should at all times strive to reduce their environmental impacts. Use of engineered wood products is an important step in this direction. The design of Habitat homes should specify use of engineered lumber products wherever allowed by code.

### Use OSB Sheathing

**Intent-** Oriented Strand Board (OSB) is manufactured from fast growing farm trees and can be utilized in place of plywood for sheathing and subfloor applications. Specified OSB uses lower formaldehyde content adhesive that can lead to improved indoor air quality. In addition OSB is stronger than traditional sheet plywood and is cost competitive and at times can be less expensive.

**Desired Conditions-** In all applications allowed by code substitute OSB for traditional sheet plywood.

**Best Management Practice** = The use of OSB leads to a greener home y reducing impacts on forests, improves indoor air quality and can reduce the cost of the structure. All components that provide value to the green Habitat home.

### Use Finger Jointed Studs

**Intent-** Finger jointed studs are available in standard lengths of 2x4 and 2x6 sizes and are manufactured from shorter lengths of wood. They reduce the demand for sawn studs and are straighter and stronger than conventional studs.

**Desired Conditions-** Where allowed by code finger jointed studs will be used to reduce the demand for sawn lumber, to provide straighter and stronger walls while reducing waste.

**Best Management Practice** = Wherever allowed by code and practical in terms of availability and cost Habitat construction will utilize finger jointed studs which can cost less that conventional framing materials and provide the occupants with a better constructed home.

### Use of Reclaimed Material

**Intent-** Reclaimed lumber can originate from building demolition, salvage or donation. The use of any reclaimed material has a direct reduction in the demand for forest products and construction costs. Often these older materials are of higher quality than newer grown materials.

**Desired Conditions-** Reclaimed lumber if available and allowed by code should be used in any non-structural application. Some deconstructed materials are available for use in structural applications when they have been re-graded and stamped for approval.

**Best Management Practice** = To reduce the demand for forest products, Habitat construction should utilize reclaimed materials wherever practical.

## 4. PLUMBING

### Install Water Conservation Plumbing Fixtures

**Intent-** Flow reducers and low flush toilets are mandatory in almost every new home construction project and should be the standard in all Habitat homes. Flow reducers can lower water usage at faucets and showerheads by up to 40% with little noticeable effect.

**Desired Conditions-** Low flow showerheads and faucets combined with low flush toilets will be installed in all Habitat homes to keep residents utility costs as low as possible.

**Best Management Practice** = Low flow showerheads and faucets combined with low flush toilets will be installed in all Habitat homes to keep residents utility costs as low as possible.

### Consider Water Conservation in Home Design

**Intent-** Design homes which provide central usage of the utilities. This will reduce energy consumption and water usage. This conservation in demand reduces the need for circulation pumps and their associated installation, operation and maintenance costs.

**Desired Conditions-** Minimal piping runs are required between the source of hot water and the service points.

**Best Management Practice =** Habitat for Humanity should continue the practice of designing homes that consolidate utility uses in one area. This is a commendable practice, which reduces energy and water consumption by placing uses near the source of the hot water.

## 5. ELECTRICAL

### Install Compact Fluorescent Light Bulbs

**Intent-** Installing Compact Fluorescent Lamps (CFL) in place of incandescent bulbs will reduce lighting load electrical consumption by two-thirds. Although higher in initial cost, each CFL bulb may last up to 10 years and save over one hundred dollars over the life of the bulb. Additionally the CFL bulbs can last up to eight times longer than a conventional bulb and reduce the amount of material entering the landfill.

**Desired Conditions-** Perform initial installation of CFL's in all locations in the home except or closets and attic spaces. Provide the occupant with warrantee information on the bulbs in case replacements are required.

**Best Management Practice =** In all locations in the home which require screw in bulbs, except for the attic or closet spaces will be provided with CFL bulbs. As part of the family education, they will be provided with information of the benefits of the bulbs and why it is important to replace them with similar technology when required. Additionally the family will be provided with the warranty information of the provided bulbs to encourage like kind replacement in the event of failure. Purchasing bulbs at a location such as Home Depot will provide the family with return and replacement options.

### Install Ceiling Fans-

**Intent-** Ceiling fans can improve interior comfort as they circulate the air in the house. Reversible fans can bring warm air down during the winter or upwards during the summer. In Habitat homes without air conditioning, ceiling fans can provide an adequate level of comfort during the summer months while they reduce heating requirements during the winter.

**Desired Conditions-** Fans shall be installed in all living areas and bedrooms.

**Best Management Practice =** Homeowners should be encouraged to have ceiling fans for all bedrooms and living room areas. As part of the education program for the occupants they should be instructed on the fans energy savings benefits and the proper operation during the different seasons. All rooms should be prewired and fan support blocking and ceiling boxes shall be installed as part of the construction process.

## 6. ROOFING

### Consider Colored Roofing

**Intent-** Dark colored roofing materials absorb heat making the house warmer during the summer months, whereas light colored roofing reflects heat away from the building. Light colored materials decrease attic heat, reduce heat discomfort in the building and increase the life span of roofing materials that can be degraded by excessive heating.

**Desired Conditions-** Select and install appropriately colored roofing materials to reduce heat loading of the structure.

**Best Management Practice** = Habitat homes should be constructed, with homeowner direction, with a roofing material that is a color that will enhance the homes appeal but also be energy efficient. In certain situations, light colored roofing to reduce heat buildup in the residences and reduce the requirements for installation of air conditioners should be considered.

### Install Durable roofing

**Intent-** Roofing materials come in a variety of materials and each has varying life cycles. Selection of the best materials can depend on a variety of environmental conditions or the design of the roof itself. Minimum shingle spec will be 25 year life. Whenever possible a longer life roofing materials should be selected as the longer life reduces loading on landfills and expense for the homeowner when roof replacement occurs.

**Desired Conditions-** All home construction should be roofed with durable long life roofing products.

**Best Management Practice** = Habitat for Humanity of Saginaw County should continue to pursue best material/installation product value for all new and rehabbed projects.

## 7. INSULATION

### Upgrade Wall and Ceiling Insulation to Meet or Exceed Energy Code Requirements-

**Intent-**The insulation in a home serves to reduce the demand for heating and keeps the house cooler during the summer months making the home more comfortable for the occupants and saves them money by keeping energy costs down.

**Desired Conditions** – SHFH new build standard is 6 inch walls with R 19 insulation and blown in cellulose to R 36 for ceilings. In addition, Tyvek or similar materials are used to wrap the house, all window and door openings are further wrapped with Tyvek or similar sealing according to their procedure.

**Best Management Practice** = New construction requires that Habitat homes will be insulated to above minimal levels. The increased cost of adding extra ceiling and wall insulation during the construction process is offset by the reduced energy costs for the family.

### Install Formaldehyde Free Insulation-

**Intent-** The indoor air quality of the home is greatly affected by the materials used during the construction process. Some insulation products contain formaldehyde binders, which are slowly released into the home environment. Use of formaldehyde free insulation is one part of the strategy of improving the environmental health of the home.

**Desired Conditions-** Allow only formaldehyde free and recycled content insulation on the jobsite.

**Best Management Practice** = In the majority of cases, insulation for Habitat projects is purchased at the Home Depot or received through donations. In this area the environmental policy of Home Depot is to provide only formaldehyde free insulation. The best management practice is to ensure that only formaldehyde free insulation is provided on the Habitat job site. In addition the insulation provided at Home Depot is manufactured with recycled content which is another greening aspect of this building element.

### Install Blown In or Loose Fill Cellulose Insulation in ceiling areas-

**Intent-** Batt type fiberglass insulation often does a poor job of preventing infiltration around pipes, light fixtures or framing elements as gaps or openings remain after installation. Blown In or Loose Fill insulation does a superior job of sealing and filling the voids prevalent throughout the attic.

**Desired Conditions-** Install loose fill cellulose insulation to the ~~R-30~~ (R-36) Level in the attic of the home.

**Best Management Practice** = Contractors or Volunteers can easily install loose fill cellulose insulation on Habitat projects. The insulation is available at similar cost to fiberglass batts, contains no formaldehyde and is more comfortable during the installation process.

### Consider Alternate Insulation Materials-

**Intent-** As technology changes or new materials appear on the market, there will continue to be opportunities to reevaluate the installation of fiberglass insulation. One such product entering the market is manufactured from cotton fibers. Once supplies become readily available this Ultra Touch Insulation <http://www.bondedlogic.com> should be considered for Habitat Homes.

## 8. MECHANICAL SYSTEMS

### Install 90% or Greater Efficiency Forced Air Gas Furnace-

**Intent-** A properly sized gas furnace is more economical to operate, saves natural resources, reduces emissions and creates a cleaner environment in the home. Installing a higher efficiency rated furnace during initial construction has low incremental costs but typically have paybacks for the residence in less than 4 years.

**Desired Conditions-** Gas forced air furnaces are installed which have an efficiency rating of 90% or higher.

**Best Management Practice** = Habitat homes shall have Energy Star rated furnaces installed. These rated furnaces have a 90% Annual Fuel Utilization Efficiency (AFUE).

### Install Programmable Thermostat-

**Intent-** New homes constructed in California require the installation of a setback or programmable thermostats. These units control time of use requirements of the heating system to provide only the heat when required. A properly programmed thermostat can reduce heating costs.

**Desired Conditions-** Install Energy Star Labeled thermostats.

**Best Management Practice** = All habitat constructed or renovated homes shall have programmable thermostats installed.

### **Vent Range Hood to the Outside-**

**Intent-** Cooking produces gasses, smoke and other particulates and moisture in the kitchen. Besides the smell issues, these materials can be unhealthy to breathe. The outside venting of the range hood will expel these gasses out of the building envelope. This is even more important when gas ranges are installed as is typically the case for Habitat built homes.

**Desired Conditions-** Vent all ranges to the outside(except for Plan 5).

**Best Management Practice** = All habitat homes should be designed to position the range adjacent to an exterior wall to allow for easy access for range ventilation. If design considerations require an interior location the ductwork should be kept as short as possible to the exterior wall or through the ceiling to prevent grease build up in the ducts. The exterior venting of the range will improve the indoor air quality for the residents.

### **Install Ductwork within Conditioned Space-**

**Intent-** Heating ducts which run through uninsulated attic spaces and interior walls can lose a significant amount of energy through convection. All ductwork should be insulated to prevent energy loss especially all metal joints and taped areas. By providing chases for the ductwork in the conditioned areas of the home, the heating system will operate more economically and use less energy.

**Desired Conditions-** Habitat homes will run all ductwork through conditioned living spaces to reduce energy losses. Homes with crawl spaces will be evaluated on a case by case basis.

**Best Management Practice** = Habitat homes should be designed with chases which lead ductwork through conditioned spaces inside the insulated building envelope to reduce energy losses. This action will make the home more economical to heat and provide for more efficient occupant comfort.

### **Clean All Ducts Before Occupancy-**

**Intent-** During the construction process heating ducts can become contaminated with dusts and debris, which can cause allergic reactions in residents. Children are especially sensitive to micro particles such as drywall dust. Cleaning and vacuuming the ductwork reduces dust in the residence after it is occupied. The cleaning of ductwork should be performed after the drywall is finished and prior to the installation of carpets and finishes. One helpful strategy is to block the ductwork at the registers to prevent dust buildup.

**Desired Conditions-** Sealing ducts during construction and cleaning of the ductwork will occur as part of the final construction process.

**Best Management Practice** = To improve the indoor air quality of the residence, care will be taken to avoid dust buildup in ductworks and they will be cleaned prior to occupancy of the home.

## 9. RENEWABLE ENERGY

### Provide for Natural Cooling

**Intent-** Passive design features incorporated into the structure and landscaping of the home have the capacity to reduce overheating of the home. This is very important for homes that are not equipped with air conditioning. The features can include deciduous trees, roof overhangs, window films and radiant heat baffles in the attic.

**Desired Conditions-** Provide design features which passively cool the residential envelope.

**Best Management Practice =** Habitat homes should provide for roof overhangs on south side windows to shade the glazed surfaces from summer suns. The passive design will reduce heat loading on the home and provide for increased occupant comfort. Additionally the sites landscaping plan should provide for the planting of deciduous trees to shade the south facing surfaces of the home. (but not the solar array)

## 10. FINISH MATERIALS

The materials used to finish the exterior and interior of the house offer several opportunities for utilization of sustainable products. Additionally the materials commonly used in the interior of the home often contain toxic materials that can affect the indoor air quality and health of the residents. Therefore the selection of the materials used to finish the home should be made with care.

### INTERIOR MATERIALS

#### Use Low/No-VOC and Formaldehyde-Free Paint

**Intent-** As paint dries it releases volatile organic compounds (VOCs) into the home. This is a major source of indoor air pollution and the formation of urban smog. Paints with low/no VOC are now available and can be applied just like conventional paints. As with regular paints, high washability should be specified for the kitchen, bathrooms and children's bedrooms.

**Desired Conditions-** Use only low/no-VOC paints.

**Best Management Practice =** To reduce the emission of toxic materials into the home and improve indoor air quality only low/no-VOC paints should be used in finishing Habitat homes. This will reduce indoor pollution and provide for a healthier home.

#### Use Low VO, Water-Based Wood Finishes

**Intent-** As with paints, water based wood finishes are now available which are used in most applications where solvent based materials would be used. These products are safer to use in an environment that has children present.

**Desired Conditions-** Use only low/no VOC wood finishes.

**Best Management Practice** = If wood finishes are required in the Habitat home only low/no VOC materials should be used to improve the indoor air quality of the home. If solvent bases wood finished are required, they should be allowed to outgas for three to four weeks prior to occupancy.

### **Use Solvent-Free Adhesives**

**Intent-** A wide selection of solvent free adhesives are now available to the builder. Use of these products will reduce the outgas of harmful materials into the home. An additional benefit to using these products is that they are often stronger than conventional adhesives.

**Desired Conditions-** Use only solvent free adhesives on Habitat projects.

**Best Management Practice** = The use of solvent free adhesives is one more step in improving the indoor air quality for the family. Habitat should not allow solvent bases material use when healthier alternatives are available.

### **Use Formaldehyde-Free MDF (Medium Density Fiberboard)**

**Intent-** MDF is often used in home construction to fabricate shelving, cabinets and for trim. Conventional MDF is manufactured from sawdust and an adhesive that contains urea formaldehyde that will outgas into the home and degrade indoor air quality. MDF is now available that is manufactured without formaldehyde binders.

**Desired Conditions-** Eliminate the utilization of materials in the home which contain formaldehyde.

**Best Management Practice** = To improve indoor air quality, no formaldehyde MDF should be used in the construction of Habitat homes. These actions will improve the health of the home for all occupants.

### **Seal all Exposed Particleboard or MDF**

**Intent-** If particleboard or MDF must be used that can not be certified to be formaldehyde free than the materials should be sealed with two coats of low permeable paint or sealer to reduce the release of harmful gasses. All exposed edges of cabinets, undersides of countertops, shelves and other locations where MDF or particleboard is used should be sealed prior to installation.

**Desired Conditions-** This step is only required when formaldehyde free products are not available.

**Best Management Practice** = To protect the health of the Habitat home this step is necessary to reduce the out gassing of harmful materials. This is the next best solution to the elimination of particleboard in home construction.

### **Use Finger Jointed Trim Material**

**Intent-** Finger jointed trim materials are manufactured from short pieces of clear wood that is glued together to make finish trim. This material can be used in any application in which the trim will be painted. Finger jointed material is both straighter and stable than conventional materials

which reduces construction wastage and save the project money while natural resources are conserved.

**Desired Conditions-** Use finger jointed materials for all painted trim.

**Best Management Practice =** To conserve natural resources, finger jointed trim should be used whenever possible in finishing Habitat homes.

### **Install Carpets and Underlayment made with Recycled Content Materials**

**Intent-** Recycled content carpet is available at comparable costs to conventional carpets. The recycled carpet is manufactured from recycled bottles, wool or cotton and is often more durable and color fast than regular carpet. Up to 40 two-liter soda bottles are recycled to make one yard of carpet. In addition the carpet underlayment is also available in recycled materials. Use of recycled carpets diverts landfill material, saves resources in manufacturing and

**Desired Conditions-** All carpet and underlayment installed will be manufactured from recycled content materials.

**Best Management Practice =** Habitat should evaluate and use recycled content carpet whenever possible to improve the conservation of natural resources. The recycled carpet is more durable and often has a longer life than economy carpet. This increased lifecycle will save the resident family in replacement and cleaning costs.

## **11. APPLIANCES**

Simple actions can make a big difference. If just one in 10 homes used ENERGY STAR qualified appliances, the change would be like planting 1.7 million new acres of trees. For top performance, premium features, and energy savings, look for energy-efficient clothes washers, refrigerators, dishwashers, room air conditioners and dehumidifiers that have earned the ENERGY STAR. This mark may appear on the appliance, the packaging or on the Energy Guide Label.

### **Refrigerators**

**Intent-** Refrigerators are usually the largest single user of electricity in the home. Newer units on the market now operate on one third of the energy compared to refrigerators manufactured 10 years ago. Energy Star rated units use less electricity, have safer refrigerants and are quieter in operation.

**Desired Conditions-** Provide Energy Star rated refrigerator for the Habitat family.

**Best Management Practice =** Habitat has an established partnership with Whirlpool, which is currently providing Energy Star Refrigerators to Habitat families. Habitat and whirlpool should continue this commendable partnership as it promotes energy conservation and preservation of resources. The refrigerator provided by Whirlpool is rated to use an average of 434 kW per year.

### **Washing Machine**

**Intent-** Installing an energy star rated washing machine saves energy both in the electricity to run it, in the reduced water used per load and in the reduced amount of hot water required. Typically these rated appliances use up to 50% less energy and water and extract more water during the spin cycle, which reduces drying time. Horizontal axis machines generate the most savings, but have a higher initial investment cost.

**Desired Conditions-** Install Energy Star rated washing machine.

**Best Management Practice =** Habitat families who chose to install washing machines should be educated on the benefits of installing Energy Star rated units. Families should also be provided with tips to reduce costs by using cold water and doing full loads.

### Dryer

**Intent-** The best clothes dryer from an energy standpoint is the clothesline which uses direct solar power to perform its functions. If powered dryers are purchased the most economical to operate are those models which have moisture sensors that automatically shut off the dryer when the clothes are dry. A timed drying cycle often wastes large amounts of energy by running longer than required. The wasted time running also cause unnecessary wear on clothing which shortens their life.

**Desired Conditions-** Install Energy efficient clothes dryers.

**Best Management Practice =** Habitat families which chose to purchase clothes dryers should be encouraged to acquire a unit which has moisture sensor cycles and to air dry clothes whenever possible to maximize savings.

### Range

**Intent-** Ranges and ovens are should be selected which offer the most economical mode of operation. Gas ranges that have electronic ignition offer savings over those that use pilot lights. The standing flames of pilot lights use energy continuously and decreases air quality in the home.

**Desired Conditions-** Install ranges which are the most energy efficient.

**Best Management Practice =** The range provided to Habitat families is an electronic ignition model which saves gas by not having pilot lights.

“Save Energy, Save Money” When buying an appliance, remember that it has two price tags: what you pay to take it home and what you pay for the energy and water it uses.

## 12. INDOOR AIR QUALITY

One of the primary goals of this greening initiative is to provide the Habitat families with safe and healthy homes. The indoor air quality of the home has direct effects on the health of the occupants. Young children are especially susceptible to health issues related to dusts, toxic out gassing of materials and the effect of "sick building syndrome". Careful selection of materials

and performance of certain steps during the construction process will improve the indoor air quality of the home.

### **Eliminate Formaldehyde Containing Products**

**Intent-** Materials selected for inclusion in the home should be evaluated and specified to contain no Formaldehydes. This includes insulation, MDF, particleboard and cabinets. See the chapter on Finish Materials and Insulation for more information.

**Desired Conditions-** Allow no Formaldehyde containing materials to enter the jobsite.

**Best Management Practice =** To provide a healthy home for the family, Habitat should eliminate or minimize the use of any Formaldehyde containing materials in constructing the home.

### **Use only Low VOC or Solvent Free Materials**

**Intent-** Use of low VOC or solvent free paints will greatly improve the air quality for the residents. See the chapter on Finish Materials for more information.

**Desired Conditions-** No VOC or solvent materials shall be allowed on the jobsite.

**Best Management Practice =** To provide a healthy home for the family, Habitat should eliminate or minimize the use of any VOC containing materials in constructing the home.

### **Control Construction Dusts and Debris**

**Intent-** Dust and debris accumulating on the jobsite can become a health hazard for those with respiratory ailments. By performing regular sweepings and cleanings of the jobsite the hazard can be minimized. In addition the clean job site will be safer to work in, instill pride in the volunteer workforce and show donors that Habitat prides itself on a professional approach to construction management.

**Desired Conditions-** Regular cleaning of the jobsite and cleaning of ductwork should be part of the construction management plan.

**Best Management Practice =** As part of the construction management plan the Habitat job site will be kept clean for safety, show and pride. The cleaning of ducts and the home will provide better indoor air quality for the resident family.

### **Install Carbon Monoxide Detector**

**Intent-** Carbon Monoxide is emitted from gas appliances, car exhausts and fire. A carbon monoxide detector functions as an early warning device and can save lives. This simple tool is a safety device that also served to warn the residents of unhealthy air quality.

**Desired Conditions-** Have at least one carbon monoxide detector mounted in the residence.

**Best Management Practice =** As Habitat homes use gas for heat, cooking, hot water and clothes drying is very important that the home be equipped with a carbon monoxide detector. The unit should be installed at the same time that the mandatory smoke alarms are installed. The resident family should receive education on the importance of this detector.

## **Install HEPA Filters**

**Intent-** High Efficiency Particulate Air (HEPA) filters reduce ones exposure to dust and the fine particulate matter that can exist within the home. Installing HEPA filters on the furnace and vacuum cleaners can substantially cut down on the amount of dust and debris in the home.

**Desired Conditions-** Equip all furnaces with HEPA rated filters.

**Best Management Practice =** All habitat homes should initially have the furnace equipped with a HEPA filter. The resident family shall receive education on the importance of maintaining the furnace, the HEPA filter and on installing them in their vacuum cleaner.

## **13. LANDSCAPING**

### **Design Resource Efficient Landscapes and Gardens**

**Intent-** Resource efficient landscaping can include practices such as "xeriscaping" to provide the residents with landscaped areas that minimize operation and maintenance costs. These design features can save the families up to 75% of the maintenance costs over planted turf areas.

**Desired Conditions-** Landscaped areas will include no more than 25% turf, with the remaining areas with the remaining areas being planted with vegetable gardens, shrubbery and native plants appropriate for the local conditions.

**Best Management Practice =** The Habitat homes landscaping will be designed to minimize requirements for utilization of resources for irrigation, fertilization and maintenance. The planted turf area if provided, should not exceed 25% of the landscaped area. Turf types should be selected appropriate for the local conditions that require minimal water for irrigation. Provisions should be made to allow for the family to have a garden area that can provide home grown fruits and vegetables to lower monthly food costs. The family should be educated in resource efficient practices to include composting, plant maintenance and water conservation.

### **Minimize Disruption of Existing Trees and Plants**

**Intent-** On homes sites which have existing trees and plants, provisions should be made during the planning process to retain as many of the features as possible. Retaining these features reduces landscaping costs, diverts waste from the landfill, maximizes natural cooling features, prevents soil erosion and maintains community character.

**Desired Conditions-** Existing trees and landscaping features will be incorporated into the homes landscape.

**Best Management Practice =** On any building site provided for Habitat projects a pre-construction plan will include evaluation of preservation of existing features which will benefit the family.

## D. HOME OPERATION, MAINTENANCE AND OCCUPANT EDUCATION

Living green is more than a collection of physical attributes; it also is an attitude and lifestyle. Even with incorporating the provisions made in these Green Building Guidelines it is up to the Habitat families to continue the process and maintain the green condition of their home. Therefore it is critical that Habitat, the partner family and the homeowner families work together to learn about the benefits of living green which include saving resources, living in a healthier environment and having less impact on the environment while maintaining quality of life.

Specific topic areas to be covered in these green education criteria would include-

- ◆ Selecting appliances with regard to their lifecycle costs and how to operate them in the most cost-effective manner.
- ◆ Energy efficiency and tips for keeping utility costs under control.
- ◆ Green Landscaping, techniques for reducing watering, fertilization and pesticide applications and maintenance costs. Included in this segment would be information on gardening and composting.
- ◆ Keeping a house clean and green, selection and use of low toxic cleaners and solvents.
- ◆ Recycling and waste management.
- ◆ Home maintenance including painting, servicing the furnace and performing repairs.

Keeping a Home Green requires the occupant to utilize a variety of practices and products to clean, maintain and sustain the home. By utilizing the techniques in this clause the occupant will not degrade indoor air quality, safety or the environment while maintaining their home. Education on these practices will greatly increase the health of the Habitat families.

### **Use Low-Toxic or Citrus-Based Cleaning Supplies-**

**Intent-** Most cleaning supplies are now available in less toxic forms that are much safer to use than conventional products. Many of these products are based on citrus-based materials that are particularly effective and have a more pleasant odor than harsh bleach, ammonia or perfumed products.

**Desired Conditions-** Only low toxic cleaning supplies will be used in the home.

**Best Management Practice =** By educating the family on this practice, Habitat can improve the healthy living environment of the home.

### **Install HEPA Grade Filters on Vacuum Cleaner**

**Intent-** HEPA filters greatly reduce the amount of fine particulate dusts that typically is blown about during vacuuming. The reduction in dusts will improve indoor air quality making the home healthier for children and those with respiratory conditions. Indoor particle dusts have been determined by the USEPA to be a significant health hazard.

**Desired Conditions-** HEPA filters will be used on all vacuums.

**Best Management Practice** = By educating the family on this practice, Habitat can improve the healthy living conditions in the home.

### **Place Doormats at All Exterior Doors.**

**Intent-** Many toxic contaminants like pesticides and fertilizers and other dirt borne materials can enter the home on shoes. By providing doormats or leaving the shoes at the entry these sources of contamination can be reduced. The doormat is an inexpensive method to improve indoor air quality.

**Desired Conditions-** Each exterior door will be provided with a doormat to reduce dust and toxic contaminants in the home.

**Best Management Practice** = By educating the family on this practice, Habitat can improve the healthy living conditions in the home.

### **Keep Cleaning Supplies and Paints Safely Stored in Enclosed Ventilated Area**

**Intent-** Even while using safer low toxic cleaning supplies their storage should be considered to keep them safely out of reach of children. Additionally paints and other materials should be stored in ventilated areas to avoid reducing indoor air quality and fire hazard. Too often storage areas end up being cluttered with materials that can create hazardous conditions. By providing areas outside for storage of gardening supplies, paint storage in the garage and cleaning supplies in the utility room the occupants will improve the environmental health of their home.

**Desired Conditions-** Provide designated areas for the storage of household materials which can be hazardous.

**Best Management Practice** = By educating the family on this practice, Habitat can improve the healthy living conditions in the home.

### **Use organic or Low Toxic Fertilizer and Pesticides**

**Intent-** With balanced landscaping practices, the need to use these fertilizer and pesticides will be reduced. However when they are required, there are many products that give the users the option to reduce toxic contamination in the home while achieving the desired results. It is particularly important to reduce toxic chemical use in yards and gardens with children as they spend so much time playing outdoors and can come into close contact with these materials.

**Desired Conditions-** Only low toxic or organic materials will be used to maintain landscaping areas.

**Best Management Practice** = By educating the family on this practice, Habitat can improve the healthy living conditions in the home.

### **Provide Recycling Containers in the Residence**

**Intent-** Although each resident may have different waste disposal services, all can benefit both

fiscally and environmentally by increasing their recycling success. By providing recycling containers for ease of use, the material is easily diverted from the landfill.

**Desired Conditions-** Provide equipment and establish recycling programs in each household.

**Best Management Practice =** Habitat should partner with the local waste management authority to obtain recycling containers, composting equipment and related materials to establish recycling in each home as a routine operation.

## E. Options to Consider

In preparation of these green guidelines, several green alternatives were considered which were not included as guidelines or best practices. Some of the items are vast departures from what we do now and are relatively new to mid Michigan as a whole. While it may not be appropriate to consider these achievable, best practice elements for Saginaw HFH **now**, the options below were identified as items which warrant future consideration and should be considered as time, local practices change and opportunities arise.

### Permeable Paving

Permeable paving allows water to penetrate to sub-surface areas to replenish soil moisture as it absorbs the water rather than allowing it to run into the storm drains. This is important as there is less polluted water reaching the drains and will also reduce the requirements for the homeowner to utilize domestic water for irrigation. Permeable paving could be used in place of poured concrete sidewalks and parking areas and could be considered and installed where feasible. This type of pavement system would reduce runoff and replenish soil moisture. It is recommended that a minimum 50% of uncovered patio areas, walkways or driving surfaces are pervious and allow for the passing of ¼" of moisture per hour.

### Water Catchment

Retention of rainwater runoff on site reduces the volume of polluted waters reaching storm drains and the water supply and reduces the need for utilization of treated domestic water for irrigation purposes. Storm water runoff may be able to be further retained on site through catchment barrels. Rainwater catchment is provided at a volume of 50 gallons per 300 square feet of roof area. The catchment barrels should be plumbed with to allow for water utilization or drilled to allow for the slow release of the water onto the soils

### Use Forest Stewardship Council (FSC) Certified Trim and Finish Materials

FSC certified materials come from forests managed in accordance with sustainable forest practices. As FSC materials become available they should be selected for use in Habitat homes to conserve natural resource and preserve old growth forests and landscapes. If stain grade trim is required for Habitat projects, the material should come from FSC certified suppliers. Locally Home Depot is providing certified wood molding items in a variety of shapes and sizes. Also Home Depot offers a large selection of hardboard interior and exterior doors from certified sources.

### Use of Certified Sustainable Woods

Certified wood comes from forests that are managed in accordance with sustainable forest practices developed by the Forest Stewardship Council. Certified solid sawn lumbers and plywood are now available. As an example this link is a listing of the [certified wood products](#) available in the western region Home Depot Stores. Typically certified wood products can cost up to twice the cost of uncertified materials but at the Home Depot the costs are similar and in many cases only certified products are offered.

Depending on product availability and funding constraints, Habitat for Humanity could use certified sustainable wood.

### Decking Materials

Reduction in pressure on grown materials, use of recycled materials and reduction in maintenance and environmental costs can occur through the utilization of recycled content decking. Materials are available which perform with greater durability than conventional wood products in decking applications. These materials do not splinter, rot or crack, require no toxic treatment or preservatives and require no staining or painting. In addition they are resistant to termite infestation and provide a quality looking finish.

Any deck constructed by Habitat should have the decking material be made from recycled component materials, either plastic or woodfiber composite material. Due to local construction policy, decks are not provided on local Habitat homes. If however due to plan changes or accessibility requirements, decks become a component of habitat homes, recycled component materials will be utilized.

### **Use Duct Mastic on all Duct Joints**

Typically heating ducts are sealed with duct tape which can begin failing after 3-5 years which can cause leakage of the heated air and energy into the attic or chase areas. Duct mastic lasts for decades and provides good seal at duct joints and elbows. Leaking ducts can cause negative air pressure that can cause natural gas appliances to draft improperly and allow carbon monoxide to enter the home. To seal ducts and prevent loss of heat and energy all Habitat homes should have ductwork joints and elbows sealed with duct mastic. This simple step during construction will have long term benefits in energy savings for the resident families.

### **Install Tankless Hot Water Heater**

Tankless hot water heaters provide hot water on demand through an efficient flash burner. The energy uses is directly related to the demand, unlike conventional tanks that lose 15% of their energy through tank loss. Tankless heaters also have a longer life cycle and typically last up to twenty years unlike conventional tanks which last 5-12 years. Although higher in initial costs, considering the longer life span, reduced replacement costs, reduction in landfill disposal impacts and greater efficiency. Over a twenty year life cycle the tankless water heater will cost \$3,540 to operate and replace, while a standard 6 year warranty, 40 gallon tank will cost \$5,307 to operate and replace. Look at the life cycle of the home and appliance, the tankless water heater definitely qualifies as a "best buy". Habitat for Humanity should continue to investigate the cost-benefit of a tankless hot water heater.

### **Install Lighting Controls**

Occupancy sensors or user activated timers prevent inadvertent wastage of electricity in unoccupied spaces. Occasional use rooms such as a utility room and exterior lighting are areas that should have control sensors installed. Install lighting controls with sensors or control timers in all practical areas to prevent energy waste.

### **Install Energy Efficient Windows**

Windows play an important part of the energy efficiency of the home. During the summer they can let in unwanted heat to the home and during the winter up to 25% of the home heat loss can be attributed to the windows. Therefore window selection should be made to provide the most efficient energy performance for the location in which the home shall be built. Windows with a low emissivity rating use a glass coating to reduce heat transfer of the window. This is most important on windows that are exposed to direct sun conditions to prevent over heating of the home during summer months. SHFH should consider installing low-E windows on all south or west facing windows and elsewhere in the house install double-glaze windows with low conductive frames. In this environment the overall benefit of low emissivity windows needs to be

addressed on a case by case basis. They should be installed when they will provide positive energy cost reductions for the family.

### **Install Fluorescent Light Fixtures**

Installation of standard fluorescent fixtures wherever they provided a cost-effective lighting application should be considered. All standard fluorescent fixtures should be of the T-8 size as they use one-third of the electricity of a T-12 bulb while providing similar lighting conditions. Additionally only green tipped mercury free tubes will be utilized in construction projects. Green tipped T-8 fixtures will be installed in the kitchen, garage and hallways that will provide more economical and environmentally preferable lighting. The family will be educated on the need to replace the bulbs as required with similar environmental friendly tubes.