Chapter 1

Home Designer

A plan review by the participating Super Good Cents utility is the basis for qualifying each Super Good Cents home. If plans do a thorough job of showing required features, plan review is quicker, bids are more accurate, and the building process goes smoother.

In most cases, Super Good Cents requirements exceed state energy codes. Subcontractors bidding and constructing Super Good Cents homes tend to be misinformed if Super Good Cents details are not shown on plans. Especially important are clear details for insulation and ventilation systems. It is helpful if plan notes reflect special equipment performance standards—air leakage-tested, IC rated recessed lights, for example.

Agreements between the utility and builder are based on what is shown on the plans. If changes are made during construction, the Super Good Cents utility representative must reevaluate the plan to see whether the house still meets program performance standards.

This chapter identifies details Super Good Cents utility representatives look for as they review plans.

DESIGN REVIEW

The Builder's Field Guide shows many ways of meeting Super Good Cents program requirements. Read through the guide so you are familiar with energy conservation and other measures that must be installed at each stage of the construction sequence. Drawings may be photocopied or redrawn as needed. Super Good Cents utilities don't necessarily require that things get done exactly the way they're shown in this guide, as long as basic program requirements are met.

Many utilities use a "Plan Intake Checklist" to verify that plans are complete before they review them. The sample Plan Intake Checklist that follows lists details needed to demonstrate compliance with Super Good Cents specifications. Many of the items already are included on typical plans. Some listed items may not apply to all homes.

Use the sample checklist to help determine if Super Good Cents plan details are complete. If some items are not clear, ask the Super Good Cents utility for help.

PLAN INTAKE CHECKLIST

Italicized items are needed for Energy Budget qualification only.

Items in boxes apply only to optional measures.

1) SITE PLAN

Non-solar designs

- North arrow yes__ no__

Solar designs/Sun tempered

- *North arrow* *yes__ no__*
- *Lot size* *yes__ no__*
- *Street location* *yes__ no__*
- *House location on lot* *yes__ no__*
- *Lot corner elevations* *yes__ no__*
- *Lot to south* *yes__ no__*
- *Sun chart* *yes__ no__*

2) FLOOR PLANS

- Show heated vs. unheated space yes__ no__
- Show vaulted ceilings yes__ no__
- Window dimensions yes__ no__
- Exterior door dimensions yes__ no__

Non-heat recovery ventilation system details

Spot fans:

- Locations yes__ no__
- CFM ratings yes__ no__

Whole house fan:

- Location yes__ no__
- Exhaust terminal type yes__ no__
- CFM rating yes__ no__
- Sone rating yes__ no__
- Fan controls yes__ no__
- Fresh air intake locations yes__ no__
- Damper locations (if necessary) yes__ no__

Heat recovery ventilation system details

- Unit location yes__ no__
- Unit make, model yes__ no__
- Unit CFM yes__ no__
- Condensate drain yes__ no__
- Supply air locations yes__ no__
- Supply air fitting type yes__ no__
- Exhaust air locations yes__ no__
- Exhaust air fitting type yes__ no__
- House volume yes__ no__
- Duct insulation yes__ no__
- Duct sealing yes__ no__

3) ELEVATIONS

- Footing to roofline yes__ no__
- All sides yes__ no__
- Window sizes, types yes__ no__
- Ventilation intake/ exhaust locations yes__ no__
- Skylight locations yes__ no__

4) WINDOWS/SKYLIGHTS

- Manufacturer yes__ no__
- Model numbers yes__ no__
- Frame type yes__ no__
- Glass type yes__ no__
- Window RO sizes yes__ no__
- NFRC tested U-factors yes__ no__
- Skylight manufacturer yes__ no__

PLAN INTAKE CHECKLIST

Skylight
model numbers yes__ no__
Skylight frame type yes__ no__
Skylight glass type yes__ no__
Skylight sizes yes__ no__
NFRC tested
U-factors yes__ no__

5) EXTERIOR DOORS
Manufacturer yes__ no__
Configuration
(panel/flush) yes__ no__
Door material
(wood/metal/
fiberglass) yes__ no__
Door RO sizes yes__ no__
Tested U-factors yes__ no__

6) SECTION DRAWINGS
Footing to roofline yes__ no__
Stem wall/foundation:
- Ventilation yes__ no__
- Ground cover yes__ no__

Slab:
- R-value perimeter yes__ no__

R-value under slab yes__ no__

- Gravel base yes__ no__
- Moisture barrier yes__ no__

Floor:
- R-value yes__ no__
- Framing system yes__ no__
- Vapor retarder yes__ no__

Wall:
- R-value yes__ no__
- Framing system yes__ no__
- Vapor retarder yes__ no__

Ceilings:
- R-value yes__ no__
- Framing system yes__ no__
- Vapor retarder yes__ no__
- Attic ventilation yes__ no__
- Roof pitch yes__ no__

7) AIR LEAKAGE CONTROL DETAILS
Air leakage details
noted yes__ no__
Air leakage specs
attached yes__ no__

8) HEATING SYSTEM
Heating system type yes__ no__
Unit location(s) yes__ no__
Duct R-value yes__ no__
Duct sealing yes__ no__
Thermostat locations yes__ no__

9) APPLIANCES

Water heater:
Manufacturer yes__ no__
Model number yes__ no__
Insulated pad (@
uninsulated floors) yes__ no__
Energy factor yes__ no__

Exhaust air heat pump yes__ no__

Gas or oil appliances:
Sealed combustion yes__ no__
Induced draft yes__ no__

Wood stoves/fireplaces:
Location yes__ no__
Outside
combustion
air to firebox yes__ no__

PLAN INTAKE CHECKLIST

Recessed lights:

Locations noted	yes__ no__
Located	yes__ no__
Air leakage tested	yes__ no__
Insulated above/ sealed	yes__ no__

Interior lighting option:

General kitchen luminaires	
50 lumens/watt	yes__ no__
CRI 79+	yes__ no__
Other lights on separate switches	yes__ no__
Kitchen lighting budget	
2 watts/ft^2	yes__ no__

Exterior lighting option:

Maximum 4 luminaires per unit,	
50 lumens/watt	yes__ no__
If operated by photocell - metal halide, high pressure sodium or minimum 9-watt fluorescent	yes__ no__
Operated by motion sensor	yes__ no__

QUALIFICATION OPTIONS - THERMAL ENVELOPE

Home designers can perform their own qualification analysis. But final qualification of a house plan is done by the Super Good Cents utility representative. Once the plan is near completion, visit the utility representative to find out if the plan qualifies as is or if changes are needed. That way final plan drawings can show exactly what's needed to qualify the home.

Both prescriptive and performance qualification methods are available. Many requirements address the thermal envelope of the building, but other requirements, concerning appliances, ventilation, and heating systems, also must be met. The first step is "Get the thermal envelope qualified." Step 2 is "Take care of other requirements."

Prescriptive Paths: LTSGC 1.2

Prescriptive paths specify component conservation levels. A prescriptive path is like a recipe: If listed R-values and U-factors are shown on plans and installed, the home meets Super Good Cents thermal standards. It's important to remember that Super Good Cents requirements for air leakage control, heating controls, and ventilation systems also must be met.

TIP: R-values are ratings of an insulation's resistance to heat flow. The higher the R-value, the better the resistance. U-factors are heat loss rates. They're typically used for rating efficiency of windows, skylights, and doors. The lower the U-factor, the lower the heat loss.

When reading prescriptive paths, the listed R-value is the lowest R-value allowed by that path. The U-factor is the highest U-factor allowed by that path.

In prescriptive paths, R-value requirements refer to the nominal R-value of the insulation, rather than overall R-value of the component. A prescriptive R-26 wall, for example, has insulation materials that total R-26. Prescriptive qualification does not recognize R-values of other building materials in the wall such as siding and framing.

U-factors in prescriptive paths refer to the rate of heat transfer for the entire component. The U-factor for a window, for example, includes the glazing, frame, sash, and edge spacers.

You'll sometimes run into something called an F-factor, a heat loss rate for concrete slab edges. The F-factor refers to heat loss per lineal foot, whereas U-factor refers to heat loss per square foot.

Your Super Good Cents representative can help you find approved R-values, U-factors, and F-factors.

Table 1.1
MCS REFERENCE PATH
(for Super Good Cents program beginning 1994)

COMPONENT		NOMINAL VALUES	REFERENCE U-FACTOR	
Ceilings	Attic	R-49 Advanced Framing		U-0.020
	Vault	R-38		U-0.027
Walls	Above Grade	R-26 Advanced Framing (Standard Framing in multifamily)		U-0.041 (U-0.044)
	Below Grade Interior (with R-5 slab edge thermal break)	R-21	2 ft below grade: 3.5 ft below grade: 7 ft below grade:	U-0.042 F-0.592 U-0.040 F-0.556 U-0.035 F-0.503
Floors	Over Crawl Space and Unheated Basement	R-30 (R-38 in Climate Zone 3)		U-0.029 (U-0.025)
	Slab-0n-Grade Perimeter	R-15		F-0.52
Glazing	(maximum tested U-factor)	U-0.35		U-0.35
Exterior Doors	(maximum tested U-factor)	U-0.19		U-0.19
Duct Insulation		R-11 (rigid duct) R-8 (flex duct)		
Air Leakage		Standard Super Good Cents air sealing		
Water Heater		From Super Good Cents utility list		
Ventilation		50 CFM in bathrooms (20 CFM if continuous) 100 CFM in kitchens (25 CFM if continuous) Whole house ventilation sized to house		

Notes:

Reference U-factors are developed from total component performance, including insulation, framing, sheathing, finish materials, etc. To be equivalent to the MCS Reference Path, a component must have a U-factor equal to or less than the Reference U-factor. Residences that comply with all measures listed in this table may have unlimited glazing area.

The disadvantage of using a prescriptive path is that it lacks flexibility. You have to follow the path exactly to qualify for the program. The advantage of using a prescriptive path is that it's simple. The only calculations needed are for floor and window areas.

There are two sources of prescriptive paths. One is called the "MCS Reference Path for Electrically Heated Residences," section 1.2 of the Super Good Cents specifications. The path is outlined in Table 1.1 on page 10. If you follow this path to the letter, there are no restrictions on glazing areas (windows, skylights, and glass doors). The other source for prescriptive paths is your local Super Good Cents utility. If the utility has developed its own special prescriptive option, glazing limits may apply.

Performance Calculations

Performance calculations allow more flexibility. You can trade higher efficiency in one part of the building for lower efficiency in another part. Let's say you can get a good price on high efficiency windows. With high efficiency windows in your design, you might be able to reduce R-values in the walls and still qualify the home. And you might save money compared to following a prescriptive path.

Typically, the Super Good Cents utility representative calculates energy performance using the WATTSUN computer program. If the house as designed doesn't qualify, the Super Good Cents representative can tell you what it would take to qualify the house.

Two measures of performance can be used for Super Good Cents qualification: Thermal Performance or Energy Budget. The house must qualify using *either* performance measure. It doesn't need to qualify under both. The WATTSUN computer program calculates both. The principle behind both calculations is to come up with a set of conservation measures that are equivalent in performance to measures in the MCS Reference Path (Table 1.1). So to qualify, you need to do calculations for the house two ways:

1. **Reference House.** First, calculate performance of the "Reference House." This is the house design you plan to build, but with R-values and U-factors matching the MCS Reference Path (Table 1.1). Rather than using the window area you plan to build, assume window area is 15 percent of heated floor space area. Window area is distributed so that 25 percent is on each cardinal compass point. For example, a 2,000 ft^2 Reference House has 300 ft^2 of windows, with 75 ft^2 each on the north, south, east, and west sides of the house: 2,000 ft^2 X 0.15 X 0.25 = 75 ft^2.
2. **Proposed House.** Next, calculate performance of the "Proposed House"—the house with the R-values, U-factors, glazing areas, and glazing orientations that you actually plan to build. If the performance of the Proposed House is equal to, or better than, performance of the Reference House, your

Proposed House qualifies. If the Proposed House doesn't qualify, make changes to your design and recalculate.

You can do these calculations using the WATTSUN computer program that Super Good Cents utility representatives use. It's available from the Washington State Energy Office, 925 Plum St. SE, Building 4, Olympia, WA 98504-3165; (360) 956-2031. The program runs on IBM-compatible hardware. The software purchase price includes a manual, phone support, and periodic technical bulletins and updates.

Thermal Performance Approach

The Thermal Performance approach is a calculation of the heat loss rate of the overall structure ("UA_o"). If "UA_o" of the Proposed House is the same or lower than "UA_o" of the Reference House, the Proposed House qualifies. UA_o represents a heat loss rate in Btu/hour/°F. It may be calculated in a number of ways. Rather than using a mathematical formula, most designers find it faster to use a computer or a worksheet that looks like Table 1.2 on page 13.

Use a photocopy of Table 1.2 for each thermal performance calculation. The left side of the worksheet is for the Reference House. The right side is for the Proposed House. The U- or F-factors for the Reference House are already filled in. These are the U- and F-factors that correspond to the MCS Reference Path (Table 1.1).

Note that window area for the Reference House is 15 percent of total heated floor area, regardless of actual window area you plan to use. Also note that F-factors rather than U-factors are used for slabs. Most of a slab's heat loss is at the edge, so you enter the length of the slab perimeter in linear feet, rather than the slab's area. (Super Good Cents homes must have insulation between slabs in heated spaces and slabs in unheated spaces. Include this boundary when figuring the perimeter length of a slab. See Chapter 3.)

On the right side of Table 1.2, enter U- and F-factors that correspond to insulation levels you plan to use for walls, floors, and ceilings. A list of approved U- and F-factors for various building components is included with the specifications in the back of this guide. See Default Heat Loss Coefficients, Exhibit X, Reference 20. For windows, skylights, and doors, enter *NFRC tested* U-factors, available from manufacturers, distributors, and your Super Good Cents utility. Enter glazing areas you plan to use for the house.

If you prefer, you may use the following formula to establish UA_o for the Reference and Proposed Houses:

Table 1.2
THERMAL PERFORMANCE CALCULATIN WORKSHEET

		REFERENCE		PROPOSED		
COMPONENT	**DIMENSIONS**	**HEAT LOSS RATE**	**HEAT LOSS** (Area X Heat Loss Rate)	**DESCRIPTION**	**HEAT LOSS RATE**	**HEAT LOSS** (Area X Heat Loss Rate)
Heated Floor Area	___ sq ft					
Below Grade						
Avr. Depth 2 ft						
Wall	___ sq ft	U=0.042			U = ___	
Slab	___ lin ft	F=0.592			F = ___	
Avr. Depth 3.5 ft						
Wall	___ sq ft	U=0.040			U = ___	
Slab	___ lin ft	F=0.556			F = ___	
Avr. Depth 7 ft						
Wall	___ sq ft	U=0.035			U = ___	
Slab	___ lin ft	F=0.503			F = ___	
Slab On Grade	___ lin ft	F=0.520			F = ___	
Floors (over unheated spaces)	___ sq ft	U=0.029* or U=0.025*			U = ___	
Windows (Reference)	___ sq ft (heated floor area x 0.15)	U=0.35				
(Proposed type 1)	___ sq ft (actual)				U = ___	
(Proposed type 2)	___ sq ft (actual)				U = ___	
(Proposed type 3)	___ sq ft (actual)				U = ___	
Glass Doors	___ sq ft				U = ___	
Opaque Doors	___ sq ft	U=0.19			U = ___	
Net Walls (gross wall minus windows, doors)	___ sq ft	U=0.041			U = ___	
Skylights	___ sq ft				U = ___	
Net Ceilings (gross ceiling minus skylights)						
Flat	___ sq ft	U=0.020			U = ___	
Vault	___ sq ft	U=0.027			U = ___	
Air Leakage	___ cu ft	0.0063			0.0063** or 0.0036**	
TOTAL						

*Use 0.029 for Climate Zones 1 and 2. Use 0.025 for Climate Zone 3 (Ask your utility if you don't know what Climate Zone you're building in.)
**Use 0.0063 for Standard Air Leakage Control. Use 0.0036 for Advanced Air Leakage Control

THERMAL PERFORMANCE FORMULA

U_OA_O = (Fbs X Pbs) + (Ubw X Abw) + (Fs X Ps) + (Ug X Ag) + (Ud X Ad) + (Uw X Aw) + (Uf X Af) + (Uc X Ac) + (Infil)

Where:

U_OA_O = Overall building Thermal Performance (Btu/hour/°F)
Fbs = F-factor of below grade slab
Pbs = Perimeter of below grade slab
Ubw = U-factor of below grade wall
@ 2 ft depth
@ 3.5 ft depth
@ 7 ft depth
Abw = Area of below grade wall
@ 2 ft depth
@ 3.5 ft depth
@ 7 ft depth
Fs = F-factor of slab on grade
Ps = Perimeter of slab on grade
Ug = U-factor of glazing
Ag = Area of glazing
Ud = U-factor of door(s)
Ad = Area of door(s)
Uw = U-factor of wall
Aw = Area of wall [net area = gross area - (Ag + Ad)]
Uf = U-factor of floor over unheated space
Af = Area of floor
Uc = U-factor of ceiling
Ac = Area of ceiling
Infil = heat loss from air infiltration

Infil = $(ach_{eff})(Vol)(C)$

Where:

Infil = heat loss from air infiltration and ventilation
ach_{eff} = effective air changes per hour (including effect of heat recovery ventilation, if used):

Standard Air Leakage Control	$ach_{eff} = 0.35$
Advanced Air Leakage Control (with non-heat recovery ventilation)	$ach_{eff} = 0.30$
Advanced Air Leakage Control (with heat recovery ventilation)	$ach_{eff} = 0.20$

Vol = volume of heated space

C = heat capacity/density product (constant):

Sea level to 2,000 ft	C = 0.018
2,000 to 3000 ft	C = 0.0168
3,000 ft and above	C = 0.0162

Sources of U- and F-Factors

Default Heat Loss Coefficients (back of this guide)

or

Super Good Cents Heat Loss Reference Vol. 2 and 4

or

WATTSUN 5.5

Energy Budget Approach

An Energy Budget calculation is an estimate of annual building energy use. The estimate accounts for typical local weather conditions, building envelope performance, building orientation (to account for solar gains), internal gains (to account for heat from people and appliances), and losses from the duct system.

First, calculate a Reference House Energy Budget using the reference U-factors from Table 1.1. The Reference House is calculated with total window area equal to 15 percent of heated floor space area, equally distributed (25 percent of window area facing each cardinal compass point). Then, model the Proposed House using actual window area and distribution and proposed envelope conservation measures. If the Energy Budget for the Proposed House equals or is less than the Reference Energy Budget, the home qualifies. If the Proposed House doesn't meet the target Energy Budget, change the plans to bring the home into compliance. Indicate any changes on the plans.

You need computer software to calculate Energy Budgets. For a given design, WATTSUN can calculate Reference and Proposed Thermal Performance and Energy Budgets. The program makes it easy to analyze how design changes affect cost and energy efficiency so you can make the most cost-effective changes. If you are already using a computer program that generates Energy Budgets, check with your utility to see if the program's calculations are acceptable.

Provide the design reviewer with component areas and a list of conservation measures you plan to use. That speeds computer entry and review time.

Your Super Good Cents utility can provide you with a WATTSUN input worksheet and instructions to help you organize data and speed computer plan analysis.

OPTIONAL MEASURES

The Super Good Cents program includes optional measures that are not required for baseline participation in the program.

If you're installing optional measures, show them on the plans you submit to the utility representative.

Options available as of January 1994 are described in the Long Term Super Good Cents Specifications for Site Built Single and Multifamily Homes, in the back of this guide. Options include:

Advanced Air Leakage Control Option

Pass a blower door test standard of 1.8 ACH50.

Heat Recovery Ventilation Options

Air-to-Air Heat Exchanger. These are ducted ventilation systems that preheat incoming fresh air with waste heat from the outgoing stale air stream. To meet the requirements of this option, Standard Air Leakage Control measures are used for baseline house qualification, but additional prescriptive Advanced Air Sealing techniques also are installed. See Chapter 9. Not all air-to-air heat exchangers meet certified equipment efficiency standards, so you need to check. Plans should show manufacturer and model information, equipment location and layout, and note the Advanced Air Sealing techniques.

Exhaust Air Heat Pump - Water Heating Only. This ventilating equipment uses refrigeration technology to extract heat from the stale air exhaust to heat household water. Plans should show manufacturer and model information, location, and exhaust duct layout.

Exhaust Air Heat Pump - Water and Space Heating. Similar to water heating-only equipment, this unit adds a space heating option. When water heating needs are satisfied, the system can provide supplemental space heating (and cooling). Standard Air Leakage Control measures are used for baseline house qualification, but additional prescriptive Advanced Air Sealing techniques also are installed. See Chapter 9. Plans should show manufacturer and model information, equipment location and exhaust duct layout, and note the Advanced Air Sealing details.

Energy Efficient Lighting Options

Efficient Interior Lighting. The kitchen must have one energy efficient luminaire, on a separate switch, for general lighting. The combined wattage of kitchen lighting (excluding the range hood) must not exceed 2 watts/ft^2. See Chapter 5 for details. Plans should show fixture model information, lamp wattages, and power budgets (watts per square foot) for kitchens.

Outside/Common Area Lighting. Label entry lighting that meets efficiency requirements on plans. See Chapter 5. Include fixture model, lamp wattage and type, controls, and wiring.

Sub-Slab Insulation Option

Requirements for this option address full sub-slab insulation. In Climate Zone 1, insulation must be at least R-5. In Climate Zones 2 and 3, insulation must be at least R-10. If you're not sure which Climate Zone you're building in, check with your Super Good Cents utility. Plans should show sub-slab location, R-value, and type of insulation. Cross sections are the best places to show this information.

SUN TEMPERING

With their minimal heating requirements, Super Good Cents homes are natural candidates for solar heating designs whenever home sites have unshaded southern exposure. Though sophisticated passive solar designs can work well in the Northwest, solar designs most likely to be successful here are simple and inexpensive.

Sunlight turns into heat when it strikes objects inside the house. Materials inside the house store the heat and release it during nighttime hours. (If these materials store enough heat, they may release it for another day or two.) In cold, sunny winter climates, large areas of south facing glass and large amounts of thermal mass (concrete, masonry, and even water storage) have been used successfully, but these designs can be expensive to build. In cloudier parts of the Northwest, there may not be enough hours of sunlight to warm up large amounts of thermal mass.

The type of solar design that works for most Northwest homes is called "sun tempered." Sun tempering means placing on the south side moderate amounts of glass—typically an area equivalent to about 8 percent of house floor area. For example, a 1,500 ft^2 house should have roughly 120 ft^2 (1,500 ft^2 X 0.08 = 120 ft^2) of windows facing south.

Advantages of sun tempering include:

- Better natural light during the daytime - Southern light cheers up a room, even on overcast days.
- Improved comfort from warmer surfaces - Sun-heated surfaces, such as walls and floors, radiate heat. People near these surfaces are warmer and more comfortable.
- Good southern views without an energy penalty - Larger areas of glass provide a good view to the south.
- Easier qualification under the Super Good Cents program – Solar heat gains may allow you to qualify a house that otherwise would be difficult or expensive to qualify.

Windows needn't face exactly true south. Up to 30° east or west of true south is OK. Avoid concentrating window area in one or two rooms, unless they're very large. Too much window area in a small room can overheat the room, especially during spring and fall. With 8 percent of floor area in south facing glass, most Super Good Cents homes have enough thermal storage mass to prevent overheating and keep the home warm most of the night. The thermal mass is in building materials (drywall, flooring, etc.) and household furnishings that are already in the house, so there's no additional cost.

When choosing windows for the south face of the house, avoid window coatings that greatly reduce solar transmission. In general, tinted windows reduce solar

heat gain. Don't use them on the south side of the house unless overheating is a major problem (in which case you have too much window area for sun tempered design).

Low-e windows reduce solar transmission compared to standard window glass. But they're suitable for south facing windows in sun tempered designs for two reasons: They reduce heat loss during hours of darkness (improving comfort and reducing heating costs), and they reduce transmission of ultraviolet light that damages fabrics and other furnishing materials. New, efficient low-e materials on the market have high *transmissivity* for greater light and heat gain and *low emissivity* for low heat loss.

Prevent Overheating

Many people worry that substantial south facing glass overheats a house on hot summer days. The good news is that in summer, the sun is nearly straight overhead most of the day, so south facing vertical glass doesn't gain much heat from direct solar radiation. You can reduce heat gain with overhangs that shade south facing windows during summer, but not winter. If the ground surface is a light color, there may be considerable gain from reflected solar energy, so avoid light ground colors in front of south facing windows.

Here are ways to design for cooling:

- Minimize east and west facing windows - They cause most summertime overheating. If the view is to the east or west, use tinted or reflective glass to reduce heat gain.
- Use movable shading devices to reduce heat gain - Exterior shades are most effective, but need to be designed carefully for easy operation. Movable devices work well because they can be opened for views and closed during peak heat gaining periods.
- Use shade screens - Good shade screens are made up of very small louvers. They're angled to provide shade and let you see well through the window. They may be most effective in cases where a movable shading device is too awkward to operate or too expensive. Occupants should remove shade screens from south facing windows during the heating season.
- Avoid large areas of overhead glazing - While small skylights (2x2 ft or 2x4 ft) are good for daylighting, large skylights can cause overheating during summer when the sun is nearly straight overhead.

Improve Daylighting

Large amounts of glass on only one side of a room can create an unpleasant glare. A strong light from one direction strains eyes trying to adjust to the strong light while the rest of the room is relatively dark.

Here are ways to avoid glare:

- Use light colored walls, floors, and ceilings to reflect incoming light deep into the room. That reduces contrasts with a strong window light source.
- Use small windows on (other than south facing) outside walls to get light deeper into the room. That reduces contrast with main window areas.
- Use a small skylight to get light to the back of a room. That reduces contrast with a strong window light source.

Solar Access

South facing windows capture significant solar heat only if they are unshaded in winter from mid-morning to mid-afternoon. To use solar heat gains to help qualify a house for the Super Good Cents program, solar glazing equal to or greater than 8 percent of the floor area must be installed on the south side and you must document that the "solar aperture" will be 80 percent unshaded from 9 a.m. to 3 p.m. during the heating season.

Obstructions to the south that can shade the house during winter include evergreen trees, buildings, and hillsides. Deciduous trees are considered to be half shading. If deciduous trees shade 30 percent of the solar aperture, for example, they only count as 15 percent shading.

You can document solar access with a sun chart. It shows the track of the sun throughout the year. Draw obstacles on the chart to determine whether they'll shade solar glazing. A number of good books are available on passive solar design. They explain how to make a sun chart for a specific site. Your Super Good Cents representative can help you find books or professional assistance for making a sunchart or help you with other ways to document solar access.

Super Good Cents specifications also require that you document future solar access. You must show on your site plan that solar glazing will not be shaded by the shadow of a 6-ft fence on your southern property line.

You also must show that a "pole" as tall as average building heights in your area, in the center of the building lot to the south, will not shade solar glazing. Your Super Good Cents representative has information on how to calculate and document shadow lines or may be able to help you with alternative ways to document future solar access.

Some localities have ordinances that protect solar access. If these ordinances are comparable to Super Good Cents specifications for solar access, you may satisfy program requirements by complying with local ordinances. Check with your utility representative to see if the building site is protected by local solar access ordinances.

COMBUSTION APPLIANCES IN NEW HOMES

Fireplaces, Wood Stoves, Fireplace Inserts

Many Super Good Cents homes and new code homes include combustion appliances. Homes are tighter than they used to be. Combustion appliances in tight homes can be extremely sensitive to negative pressure environments created by exhaust-only ventilation devices in the home.

Kitchen range hood fans and dryers tend to be the strongest exhaust-only ventilators. But bath fans and any other device that pulls air out of a home can make it more difficult for a naturally vented, solid fuel appliance to sustain strong draft.

From a health and safety standpoint, it is recommended, but not required, that balanced ventilation systems such as air-to-air heat exchangers—as opposed to exhaust-only systems—be used for whole house as well as spot ventilation in homes with combustion devices. Typical ventilation in Super Good Cents homes currently consists of a balanced whole house system and unbalanced, exhaust-only spot ventilation.

For a discussion of interactions between mechanical systems and combustion appliances in homes, order the Reliable Chimney Venting Training Manual by John Gulland from Hearth Education Foundation, 3019 Perry Lane, Austin, TX 78731; 512-450-0987.

For information about balanced central ventilation systems, see the “Heat Recovery Ventilation” section of Chapter 7 in this guide, or order “Air-to-Air Heat Exchanger Systems: Marketing, Design and Installation,” a two-part training video tape and study guide, from Oregon State University Extension Energy Program, Batcheller Hall 344, Corvallis, OR 97331-2405;503-737-3004.

For information about house pressure tests that verify whether systems are balanced, contact your participating Super Good Cents utility or state technical assistance provider.