



Chapter 2

General Contractor

The Builder's Field Guide is designed to help general contractors communicate about energy efficient construction details with each subcontractor on the job. This chapter covers details that need to be addressed early in the building process—to make sure building materials and supplies you order meet Super Good Cents specifications and to get subcontractors off on the right foot. It is important to communicate about Super Good Cents requirements with subcontractors, because if the subcontractor's work does not meet program specifications, the home may fail to qualify for the program.

If you build custom houses, it's common to have customers request changes during construction. Some changes will affect energy efficiency of the house—window, door and skylight changes, or changing flat ceilings to vaults, for example. These changes don't just affect *your* bottom line—they affect the *energy* bottom line too. So when you need to make a change that affects energy performance of the house, let your Super Good Cents utility representative know. Your representative will make sure the proposed changes don't knock your house out of the program.

THINGS TO DISCUSS WITH THE CONCRETE CONTRACTOR

Foundation/Slab Insulation

1994 LTSGC 2.1.8

Super Good Cents slab insulation R-values exceed most energy code standards. The concrete contractor needs to be reminded about extra insulation requirements for below grade slab edges (R-5) and on-grade slab edges (R-15). Sometimes walls for heated basements are insulated on the outside (R-21). If you have agreed to install optional full slab insulation, the concrete contractor must thermally break the slab from footings. The concrete contractor is most likely to assume code levels of insulation and will miss these details unless you point them out. If the concrete contractor does not place the right insulation the right way, your home does not meet LTSGC specifications. Show the concrete contractor the details in Chapter 3.



Typical R-values are:

Heated basement walls	R-21
Below grade slab perimeters (thermal break between foundation wall/footing and slab)	R-5
Slab on grade perimeters	R-15
Below slab insulation (optional measure)	R-5 to R-10

Extruded polystyrene is most commonly used below grade. It has high compressive strength, resists water penetration, and stands up well to abuse on the construction site. Extruded polystyrene has an R-value of about R-5 per inch.

Other materials also are suitable for below grade applications, including:

- High density expanded polystyrene (beadboard) - Typically R-3.5 to R-4 per inch. Check with the manufacturer for recommended applications (not all are suitable for below grade applications).
- High density fiberglass - Also used as drainage board. Typically R-4 per inch. Not widely marketed in the U.S.
- Polyurethane - Typically R-6 per inch. Check with the manufacturer for moisture protection requirements.

A common mistake when planning slab perimeter insulation is to forget to insulate slab edges adjacent to unheated spaces (such as garages). Your concrete contractor may not be used to separating the garage pour from the rest of the slab or crawl space stemwall with R-15. You need to point this out when getting bids. See Chapter 3 for details on how to insulate these areas.

Duct Chases Through Slabs

If a forced air furnace will be located in the garage, the concrete contractor may be responsible for boxing out a hole in the slab so the supply plenum can run from the garage to the crawl space. The box-out needs to be big enough for the plenum plus R-11 insulation on all sides of the plenum. If the concrete contractor misses this detail, the plenum cannot be insulated.



Slab Moisture Protection

1994 LTSGC 4.1.2

Most building codes call for a moisture barrier under the slab. Typically, 6 mil polyethylene or other material approved for below grade use is installed. For moisture protection, Super Good Cents specifications call for a minimum of 4 inches of gravel under a slab. The type of gravel specified provides a capillary break from ground water. However, some local building codes require a moisture barrier even if you pour over gravel, so you may need to put a moisture retarder down even if your Super Good Cents utility representative does not require it.

Crawl Space Ventilation

1994 LTSGC 4.2.2

If Super Good Cents specifications for crawl space ventilation exceed local code requirements, you need to calculate ventilation requirements (see Chapter 3) and make sure the concrete contractor puts enough vents in. If the foundation wall is high enough, have vents installed below the level of the floor insulation. This will avoid having to baffle vents to keep them clear of deeper floor insulation.

THINGS TO DISCUSS WITH THE FRAMING CONTRACTOR

Structural Panels With Low Formaldehyde Ratings

1994 LTSGC 4.4

If the framing contractor supplies framing materials, be sure he or she orders sheathing and structural panels bearing one of the following grade stamps: “Exposure 1,” “Exterior,” or “HUD-Approved.” The stamps indicate that products emit only low levels of formaldehyde. Structural sheathing that doesn’t bear these stamps doesn’t meet Super Good Cents specifications.

Keeping formaldehyde sources out of the house makes it a healthier place to live.

Advanced Wall Framing: Use Structural Sheathing Rated for 24 Inches on Center

If advanced wall framing is part of your agreement with the utility, make sure the framer uses sheathing and siding rated for 24-inch on center framing. See Chapter 4 for details on advanced framing.



Insulating Wall Sheathing

Many Super Good Cents homes qualify using R-26 walls. That typically requires rigid foam sheathing rated from R-5 to R-7.2. Foam insulation thickness can affect siding nail size, trim and corner details, and thickness of nailers. Make sure the framers are aware of proper installation details for foam sheathing. Chapter 4 shows details for installing rigid insulation on the interior or exterior wall surface.

Special Trusses

Plans for many Super Good Cents homes call for “advanced” roof/ceiling framing. You’ll need special “energy” trusses that allow full insulation depth at the exterior wall. See Chapter 4 for details. If your agreement with your Super Good Cents utility calls for advanced ceilings (energy trusses) and standard trusses are installed, your house won’t meet Super Good Cents specifications unless you improve energy efficiency of another part of the house.

Floor Framing Details

Check to see that the proposed floor insulation will really fit in the floor framing cavity. If floor framing depth and floor insulation depth don’t match, insulation support systems will be needed to keep floor insulation in place. It’s better to match the floor frame to the insulation depth.

Windows

1999 LTSGC 2.2.1

Windows either contribute to or reduce the home’s energy efficiency. In general, because heat loss through windows is so high, the more windows a home has, the harder it is to qualify for the Super Good Cents program. An important exception to this rule is solar (southern) glazing, which usually helps qualify the home.

Make sure to order windows that meet U-factor requirements specified (0.35 or less) on approved plans.

U-factors describe the rate of heat transfer through a window unit. The lower the U-factor, the lower the rate of heat transfer, and the better the energy performance of the window.

Window U-factors accepted by the Super Good Cents program are determined by independent laboratory testing. 1994 Super Good Cents specifications require windows that have been NFRC (National Fenestration Rating Council) certified and labeled.



If you change windows in midstream, make sure the U-factor of the new window is equal to or lower (better) than the U-factor of the window it's replacing.

If you add window area after your Super Good Cents representative approves the plans, let your representative know so he or she can check whether the house still qualifies.

Your Super Good Cents utility representative can help you find U-factor information for most windows manufactured and sold in the Northwest. Window distributors also should have information on NFRC U-factors for windows they sell.

Some approved windows have slot vents. They provide air intake for the home ventilation system. Make sure they're installed in the locations shown on the plans. Stick with the approved windows, or be sure changes to windows don't affect compliance with ventilation specifications.

Exterior Doors

Entry and garage passage doors are part of the thermal envelope of a building. Their energy performance helps determine whether the home meets Super Good Cents specifications. Insulated metal and fiberglass doors are commonly used to qualify homes for the program. (Wood entry doors won't exclude a house from the program. They just make it a little harder to qualify.)

Changing doors can affect house qualification. It's better to plan on a glazed door when qualifying a home and change to a solid door than to qualify using a solid door and change to a glazed door during construction. If you're considering door changes, check with the Super Good Cents representative to make sure a door change doesn't knock you out of the program.

Skylights

Skylights also are part of the building's thermal envelope. Most lose heat more rapidly than windows. The plan approval process includes checking skylight sizes and models.

If you make changes that add skylights, or are considering alternates to approved models, make sure new skylights have a U-factor equal to or less than the skylights on the approved plans. Check with your Super Good Cents representative to be sure additional skylight area doesn't prevent the home from qualifying.

Skylights haven't been as widely tested as windows, but NFRC testing is proceeding. Your Super Good Cents representative or skylight dealer should have information on U-factors of locally available skylights.



Fan Jacks

One way to make sure ventilation systems work is to use short duct runs from the fans to the outside. Fan ducts work better if they terminate at dedicated fan jacks close to the fan—instead of running 20 feet to an attic vent at the other end of the building. The shorter the duct run, the better the fan works.

Have fan jacks (as well as attic vents) onsite during roof framing. Framers can cut holes for the jacks directly above bath, kitchen, and other fan locations. They can leave the jack pinned near the hole for the roofer to install. If you run fan ducts horizontally to the eave or gable end, pick the shortest run that involves the least amount of elbows. Remember that end fittings must terminate outside the house, not just near an eave vent.

TIP: Some fan jacks have a collar extending below the roof sheathing. The collar makes it easy to make a positive, sealed connection to the fan duct. Match jack collar size to fan duct size—typically 4 inches. Many fan manufacturers supply roof and wall jacks designed for their fans. Collars may be installed separately to allow a positive mechanical connection between the fan duct and fan jack.

Keep two things in mind if you use a fan jack:

1. You can't count this jack as roof ventilation if it's connected to a fan. You'll need to add another roof jack to your order.
2. Make sure the open area of the jack is at least as large as the area of the duct so the jack won't restrict airflow.

Through-the-Wall Fresh Air Intake Vents

1994 LTS GC 4.3.7, 4.3.8, 4.3.9

Many Super Good Cents homes have a ventilation system that includes through-the-wall fresh air intake vents in each bedroom and one for each 300 ft² of main living area. Slot vents in windows may be used in place of through-the-wall vents.

Exhaust fans draw small amounts of fresh air into the home through intake vents. Vents are “designed holes” in the building envelope, sized to provide small amounts of fresh air. They're placed near the ceiling to provide fresh air without creating noticeable drafts.

Your Super Good Cents representative can help you find suppliers for through-the-wall vents.



Window Fresh Air Vents

1994 LTSGC 4.3.7, 4.3.8, 4.3.9

Window slot vents are an alternative to through-the-wall vents. These closeable vents provide a slow flow of fresh air when exhaust fans operate. Windows with slot vents need to be in each bedroom and in main living areas. Make sure the framers install vented windows in locations marked on the plans.

Framing Systems

Choices of framing systems and materials for floors, walls, and ceilings have a significant impact on the building's energy performance. See Chapter 4 for details on energy efficient framing.

Attic Ventilation

1994 LTSGC 4.2.1

The Super Good Cents program may call for more ceiling or attic ventilation than your local code. If this is the case, let your framers and roofers know before they submit their bids. You may need to provide additional ventilating and baffling materials. See Chapter 4 for ceiling ventilation details.

THINGS TO DISCUSS WITH THE ELECTRICIAN

The electrical contractor needs to bid equipment that meets Super Good Cents appliance and control standards. In homes that include optional energy efficient lights, special light fixtures and luminaires must be installed.

Spot Ventilation Fans

1994 LTSGC 4.3.4

The Super Good Cents program requires a minimum 50 CFM of fan-powered exhaust in bathrooms and a minimum 100 CFM in kitchens. Some building codes allow operable windows to substitute for fans, but the Super Good Cents program doesn't. Make sure your electrician's bid includes fans for all bathrooms and kitchens. Ventilation in bathrooms can be reduced to 20 CFM and in kitchens to 25 CFM if spot ventilation is continuous.



If fan jacks are not in place, tell the electrician where they will be located so he or she can aim the fan outlet collar in the direction that provides the most direct route (shortest, with fewest elbows) to the fan jack location.

Whole House Fans

1994 LTSGC 4.3

In addition to spot ventilation, the Super Good Cents program requires whole house ventilation systems. This is a major departure from typical practice. The whole house exhaust fan can be remotely or surface mounted. Surface mounted whole house fans must have a sound rating of 1.5 sones or less for intermittent systems and 1 sone or less for continuous systems. When the electrician installs the fan, sound attenuating material must be placed between the fan supports and the framing. If fan jacks are not in place, tell the electrician where they will be located so he or she can aim the fan duct outlet collar in the direction that provides the most direct route (shortest, with fewest elbows) to the fan jack or termination device.

If an electrician has not wired a Super Good Cents house before, these requirements may be unfamiliar. The Super Good Cents representative can help clarify requirements and track down appropriate equipment. See Chapter 5 for details on ventilation systems.

Whole House Ventilation Controls

1994 LTSGC 4.3.6

Intermittently operated whole house ventilation systems are typically controlled by a 24-hour timer with a manual override switch. Your electrical contractor should include this timer in the bid. Heat recovery ventilation systems (air-to-air heat exchangers or exhaust air heat pumps) require specific controls. Be sure to get the equipment manufacturer's instructions to your electrician so he or she can bid the job right.

Some whole house ventilation systems are integrated with a forced air heating system. The electrical contractor may need to coordinate with the heating contractor for installation of any required control wiring, transformers, and relays.



Heating System Controls

1994 LTSGC 3.2

For central heating systems, low-voltage, heat-anticipating, micro processor controlled or electronic thermostats must be used. Zonal systems, such as baseboards and wall fan heaters, must use one heat-anticipating, micro processor controlled, or electronic thermostat per zone, mounted on a wall, not on the heater. Super Good Cents thermostats cost a little more, but are widely available and contribute significantly to comfort and energy savings.

Recessed Light Fixtures

1994 LTSGC 2.5

Recessed lighting fixtures in insulated cavities must meet two standards. Recessed lights must be IC (insulation cover) rated, so they can be in contact with insulation without creating a fire hazard. And they must have passed an air tightness test or be made airtight onsite. Be sure to let the electrical contractor know about recessed light requirements. There's more information in Chapter 5.

Efficient Interior Lighting Option

1994 LTSGC Appendix A, Chapter 4

If you're installing optional energy efficient indoor lighting, tell the electrical contractor about efficiency requirements for the general lighting fixture in the kitchen. Make sure the electrician is aware of the 2 watt/ft² kitchen lighting budget. See Chapter 5 for details.

Outdoor/Common Area Lighting Option

1994 LTSGC Appendix A, Chapter 4

If you're installing optional efficient exterior lighting, tell the electrical contractor what fixture types and controls you need. Lights must meet efficiency requirements or be controlled by motion sensors. See Chapter 5 for details.



THINGS TO DISCUSS WITH THE PLUMBER

Water Heater

1994 LTSGC 2.7

The Super Good Cents program requires water heaters that exceed federal minimum standards. You can get a list of approved water heater models from the Super Good Cents representative, so your plumber can choose an approved unit.

Any water heater on an uninsulated floor—including concrete slabs and platforms in garages—must sit on an R-10 pad. Make sure the plumber is aware of this requirement. It's a pain to correct if it's overlooked.

Exhaust Air Heat Pump Option

1994 LTSGC Appendix A 3.2

Typically, heating contractors install exhaust air heat pumps (EAHPs)—combination heat recovery ventilation/water heating systems. For some systems, the plumber must provide a water supply at the bottom of the tank, rather than at the top as is typical. The plumber also must install a condensate drain. Be sure your plumber and heating contractor coordinate to install this equipment. Chapter 6 includes information on EAHPs.

Air Leaks From Plumbing

Plumbing holes account for some of the biggest air leaks in most homes. Plumbers often do not carry materials with them for sealing plumbing penetrations. The air sealing person on your jobs should coordinate with the plumber. It is likely that the plumber is not familiar with the special air sealing techniques and materials shown in Chapter 6.

THINGS TO DISCUSS WITH THE HEATING CONTRACTOR

Ducts

1994 LTSGC 1.2 and 3.3

Metal duct must be insulated with at least R-11 insulation. This includes supply plenums or other ducts that run through slabs. Flexible duct and duct board systems must be insulated to at least R-8. Super Good Cents duct insulation levels are higher than most codes require. Make the heating contractor aware of these requirements before bidding the job.



Super Good Cents specifications also require air sealing supply and return ducts, air handler cabinets and plenums, inside and outside heated space, at all joints, and corners. Air sealing requirements far exceed any current building code. Check Chapter 7 for details.

Controls

1994 LTSGC 3.2

All thermostats must be either micro processor or electronically controlled or have a heat anticipation feature. See Chapter 7 for details. Make your heating contractor aware of special control requirements.

Ventilation Systems

All Super Good Cents homes must have whole house ventilation systems. Often, the heating contractor is involved in installing the system. The most common cases requiring careful coordination with the heating contractor are:

1. When you use a remotely mounted exhaust system ducted to several locations in the house - It may be a complete ventilation system sold for that purpose, or a system with a high quality fan and other parts assembled for the purpose.
2. When you use a whole house ventilation system that supplies fresh air through heating/cooling system ducts.
3. When you use air-to-air heat exchangers - They're often installed by heating contractors familiar with quality duct installation and balancing airflows. Special equipment efficiency standards apply. Consult the equipment manufacturer's installation instructions.
4. When you use exhaust air heat pumps - They're usually installed by heating contractors familiar with quality duct installation and refrigeration equipment. Consult the equipment manufacturer's installation instructions.

See Chapter 7 for more information on these topics.

Room Pressure Relief/Distributed Returns

Many homes with forced air heating systems have one central return grill serving all the supply registers. Many homes with forced air heating also contain naturally vented combustion appliances. When people close interior doors, supply air delivered to the closed room cannot get back to the central return grill. The return grill becomes "starved for air," and air pressures in the return zone go "negative." If the



combustion appliance is in the return zone and the return zone goes “negative,” odors or combustion gasses can be pulled into the home.

In addition, if the heating contractor doesn’t seal ducts well, supply side duct leakage can create negative pressure inside the home. Negative pressure can induce spillage from naturally vented combustion appliances.

If your home will have forced air heat and naturally vented combustion appliances, avoid spillage potential by carefully sealing ducts as they are installed. Passive grills or distributed returns in each room with a supply are ways to avoid negative pressures caused by door closure.

INSTALLING COMBUSTION APPLIANCES

1994 LTSGC 2.6

Combustion appliances include fireplaces, wood stoves, combustion furnaces, auxiliary heaters for heat pumps, combustion water heaters, gas clothes dryers, and gas cooktops. Some utilities restrict combustion devices in Super Good Cents homes; others do not.

The Super Good Cents program includes requirements for outside combustion air and venting that slightly exceed most building code requirements. Before you have combustion devices installed, make sure specific models meet requirements covered in Chapter 8, and be sure installers are aware of combustion air requirements.

All new 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 videotape 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.

PREVENTING AIR LEAKAGE

1994 LTSGC 2.3.1 and 2.3.2; Appendix A, Chapter 2 and 3.3

Chapter 9 is titled “Air Tightening Specialist,” a trade that doesn’t even exist in many locales. The best quality control in air sealing occurs when a single person is responsible (rather than when each trade seals its own leaks) and develops expertise by doing air sealing at each job site.

The air tightening specialist could come from a number of trades, including carpenters, insulation contractors (some are adding air sealing to their services), and even general contractors. An important advantage of having one person in charge of all air sealing is that you get a better handle on costs for time and materials.

The Super Good Cents program gives you a choice between Standard Air Leakage Control (extensive caulking and sealing of air leaks somewhat tighter than typical construction) or Advanced Air Leakage Control (a very tight house with a “continuous air barrier”).

Advanced Air Leakage Control can be used in the Super Good Cents program in two ways:

1. As a program option. The house must qualify using Standard Air Leakage Control. Adding Advanced Air Leakage Control measures and passing a blower door test satisfy the optional requirements.
2. To help qualify the house for the Super Good Cents program - It may be less expensive to install Advanced Air Leakage Control measures than other energy conservation measures. When using Advanced Air Leakage Control to qualify the house, you need to pass a blower door test. See Chapter 9.

If you have an experienced air tightening specialist, Advanced Air Leakage Control often isn’t a big stretch. It could save you money compared to other measures. Chapter 9 includes details on both Standard and Advanced Air Leakage Control.



THINGS TO DISCUSS WITH THE INSULATION CONTRACTOR

1994 LTS GC 1.2

Compared to homes built to code minimum, the Super Good Cents program requires higher insulation levels, different insulation details for advanced framing, and better quality control. These factors affect the insulation contractor's cost. Go over requirements before contractors bid on the job. Chapter 10 covers these issues in detail.

Quality Control

Super Good Cents specifications call for minimizing compression and voids in insulation. Minimizing compression requires careful cutting and fitting of insulation. Super Good Cents representatives look for quality installation when they visit the site. Make sure the insulation contractor understands this before bidding.

Floor Insulation

Most Super Good Cents homes have at least R-30 underfloor insulation. This makes floors with shallow framing cavities more difficult to insulate. In general the idea is to match the floor framing cavity to the depth of the insulation batt. See Chapter 10. I-beam floor cavities are wider than cavities created with dimension lumber, so I-beam floors require special "full width" batts to fill the space. Regular width batts in I-beam floors leave a gap at each edge and do not provide a true dead air space below the floor.

Discuss with the insulation contractor who will supply the floor vapor retarder and crawl space ground cover. That way the insulation contractor will know whether to include these materials in the bid.

Wall Insulation

If you qualified the house using advanced wall framing (see Chapter 4), let your insulator know you're using 24-inch on center framing. Otherwise the insulator may show up onsite with the wrong size batts. (Obviously, this isn't a worry if you're using a blown in material.) If you're using rigid insulation on either side of wall framing, be clear about which subcontractor will install it.

If the insulation subcontractor is going to supply the vapor retarder (either attached to the insulation or separate), make that part of the bid.

Specify that insulation must be cut to fit around obstacles in walls, such as wires, electrical boxes, and plumbing.



Recessed fixtures on exterior walls, such as electrical panels and medicine cabinets, must have 2 inches of rigid insulation behind them. Depending on scheduling, if the insulation contractor doesn't have access (or if you haven't told the contractor that the material will be needed onsite), you may be responsible for providing this insulation.

If your insulation subcontractor is using wet or damp spray materials, they need time to dry before drywalling. Find out about required drying time.

Ceiling Insulation

If you're building an advanced frame ceiling (see Chapters 4 and 10), you may want to talk to your insulation contractor to see if you can save money by using high R-value per inch insulation at the ceiling perimeter instead of advanced frame trusses. High R-value foam baffles may be less expensive than special trusses. You might want to get bids both ways.

Be sure to discuss who's supplying the ceiling vapor retarder.

THINGS TO DISCUSS WITH THE DRYWALL CONTRACTOR

Here are a few things the drywaller needs to know before making a bid:

1. If faced insulation will be used, flanges may be stapled to the face of the studs. This can increase labor for the drywaller.
2. If there are polyethylene vapor retarders (or air barriers), extra care must be taken during drywall installation to avoid damaging them. Also, drywall can't be glued over polyethylene. During cold weather, polyethylene vapor retarders in ceilings should be insulated before taping and texturing. Otherwise, moisture may condense in ceiling drywall, causing extensive moisture damage. See Chapter 11.
3. If you're doing Advanced Air Leakage Control (see Chapter 9), the drywaller must take care to avoid damaging gaskets, sealant applications, and polyethylene sheets.
4. If your insulation subcontractor is using wet spray materials, they may need time to dry before drywalling. Schedule accordingly.
5. With R-49 ceiling insulation typical in Super Good Cents homes, you should specify 5/8-inch ceiling drywall.



THINGS TO DISCUSS WITH THE PAINTERS

The painting contractor doesn't have much impact on the home's energy performance. However, if the painter applies vapor retarder paint as a drywall sealer, the insulation contractor can use less expensive unfaced batts. See Chapter 12 for details on this cost saver.