Chapter 3

General Contractor

When Super Good Cents homes have concrete structural elements, the concrete contractor is responsible for meeting key insulation, moisture protection, and ventilation requirements that affect the home's thermal performance, long-term durability, and indoor air quality.

CRAWL SPACE STEM WALL VENTILATION

1994 LTSGC 4.2.2

Vents in stem walls help keep floor insulation and floor framing dry. In areas with radon problems, crawl space vents reduce the potential for radon buildup under the floor and radon entry into the house.

Most building codes require crawl space ventilation—typically 1 ft^2 per 150 ft^2 of crawl space. You need to meet Super Good Cents program minimums even if your locality does not have ventilation requirements.

How Many Vents?

Vents are rated in terms of their "net free area": the open area through which air can flow. Since air does not flow through the vent frame, louvers, and wire mesh, net free area is always less than overall area of the vent.

Manufacturers typically stamp net free area on vents. If the vent manufacturer does not provide information on net free area, assume that it is about half of the overall vent area.

Super Good Cents specifications require 1 ft^2 net free area of vent for each 150 ft^2 of crawl space floor. When allowed by local building officials, area may be reduced to 1 ft^2 net free area for each 300 ft^2 of crawl space floor if the soil is dry and the crawl space is well drained.

Example 1:

The crawl space area of a home is 1,400 ft^2. How many ft^2 of crawl space venting do you need to meet Super Good Cents specifications?

1,400 ft^2/150 = 9 ft^2 net free vent area

If the vent provides 1 ft^2 net free area per vent, you need 9 ft^2/1 ft^2 = 9 vents.

If the vent provides 0.8 ft^2 net free area per vent, you need 9 ft^2/0.8 ft^2 = 11 vents.

Example 2:

If the building official allows you to use 1 ft^2 of venting per 300 ft^2 of crawl space, how many ft^2 of venting do you need for the 1,400 ft^2 house in Example 1?

1,400 ft^2/300 = 5 ft^2 net free vent area

Vent Placement

Place vents at opposing points on the stem wall for good cross ventilation (preferably at all four comers of the crawl space).

Some vents come with plastic foam plugs. They help keep the crawl space warmer in winter. Others come with closeable flaps. If you use closeable vents, place the plugs or flap control levers on the outside of the stem wall so they may be opened or closed without having to crawl under the floor.

Energy efficient homes may have 9 to 10 inches of insulation beneath the floor. Think ahead. Where possible, place vents low enough in the stem wall so they will not be blocked by floor insulation. However, vents must be above finish grade level. The insulation contractor must baffle vents if they are not below the floor insulation level.

Figure 3A shows a plan view of a crawl space with vents providing good cross ventilation. The section drawing shows vent placement below floor insulation level.

SLAB ON GRADE

Insulation Requirements

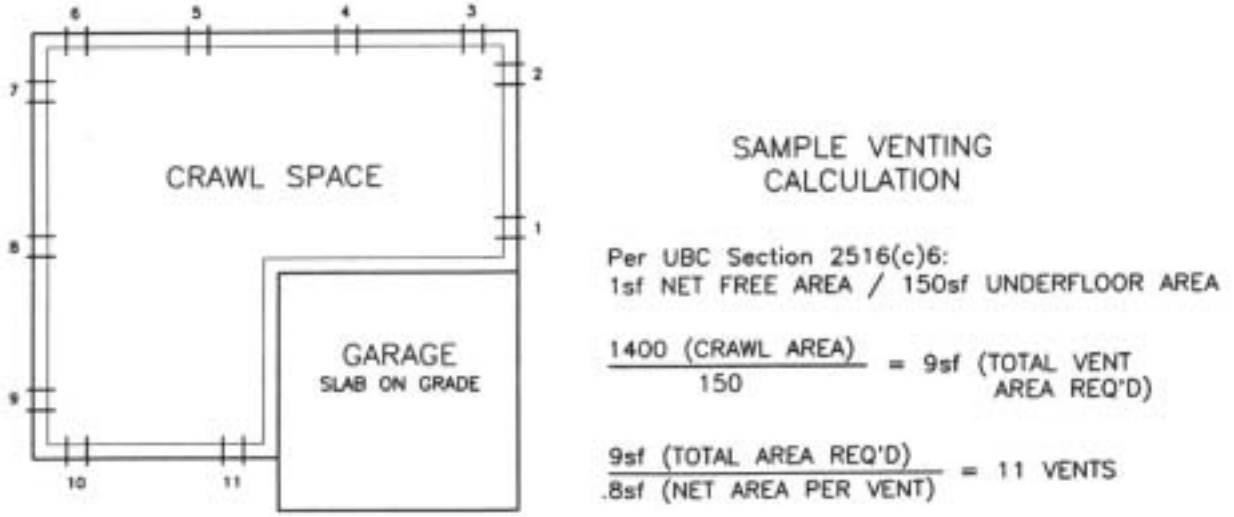
1994 USGC 2.1.8 and 4.1.2; Reference 3, Appendix A, Chapter 5

Figures 3B through 3H show approaches to slab construction and perimeter insulation. All slabs in heated spaces must be insulated at their perimeters. Typically, a minimum 24 inches of R-15 insulation is placed vertically or vertically and horizontally at the slab edge.

Slabs containing radiant heating systems are an exception. Radiant slabs must have R-15 at the perimeter and R-10 below the remainder of the slab.

Monolithic slabs must be insulated a minimum of 24 inches from the top of the slab to the bottom of the thickened edge. Three inches of polystyrene insulation, R-15, exceeds many local energy codes.

Figure 3A
CRAWL SPACE VENTILATION



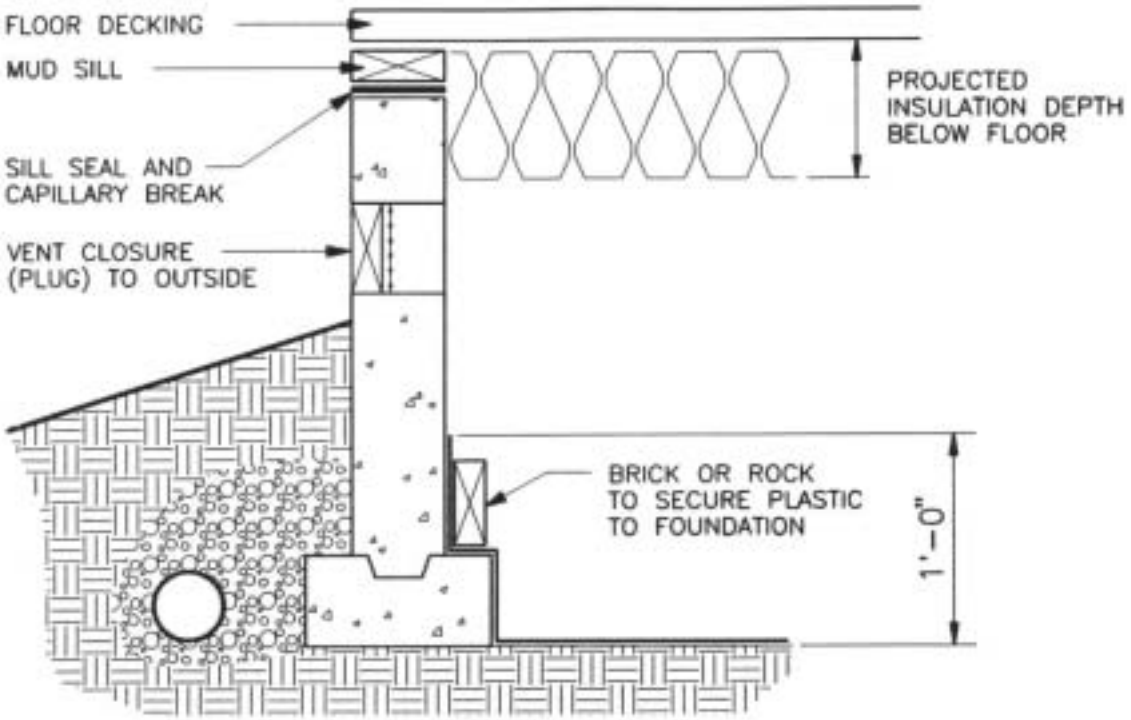
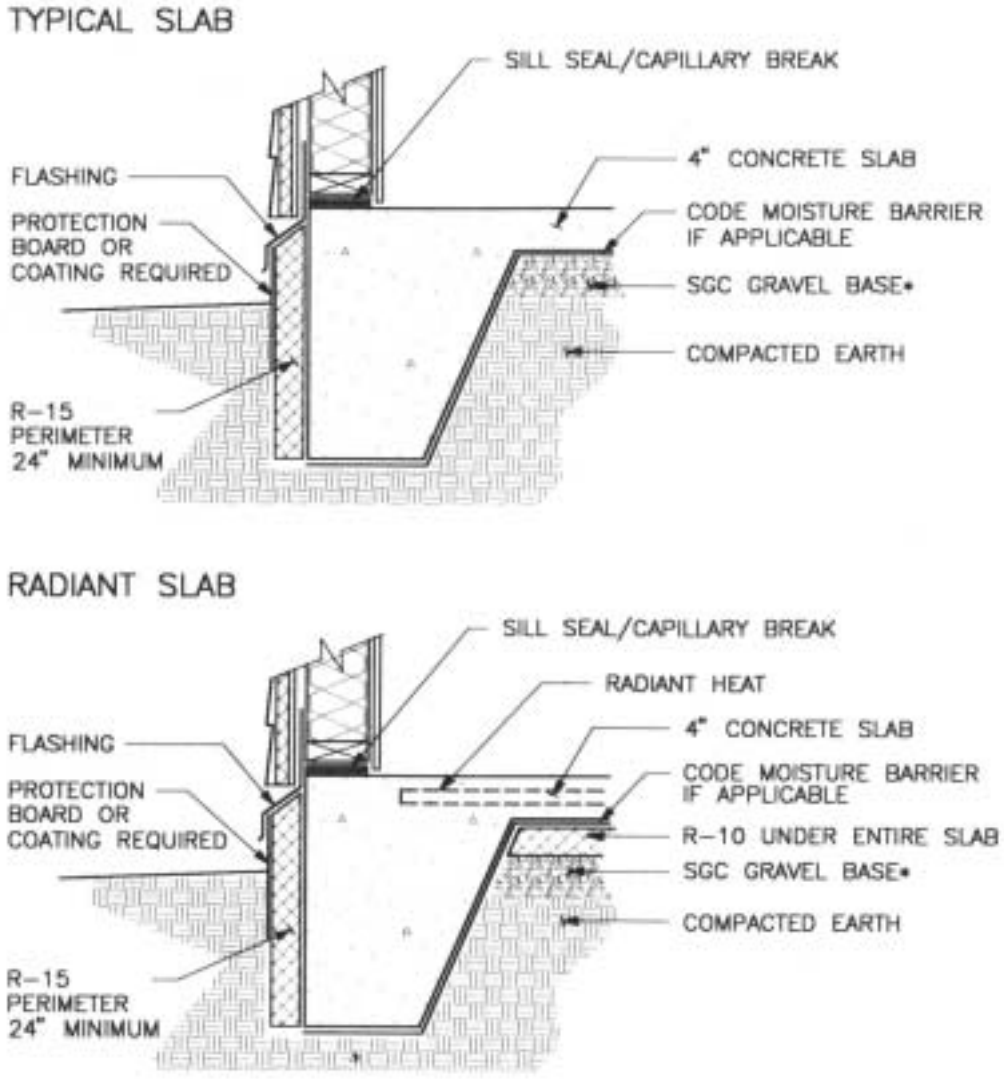
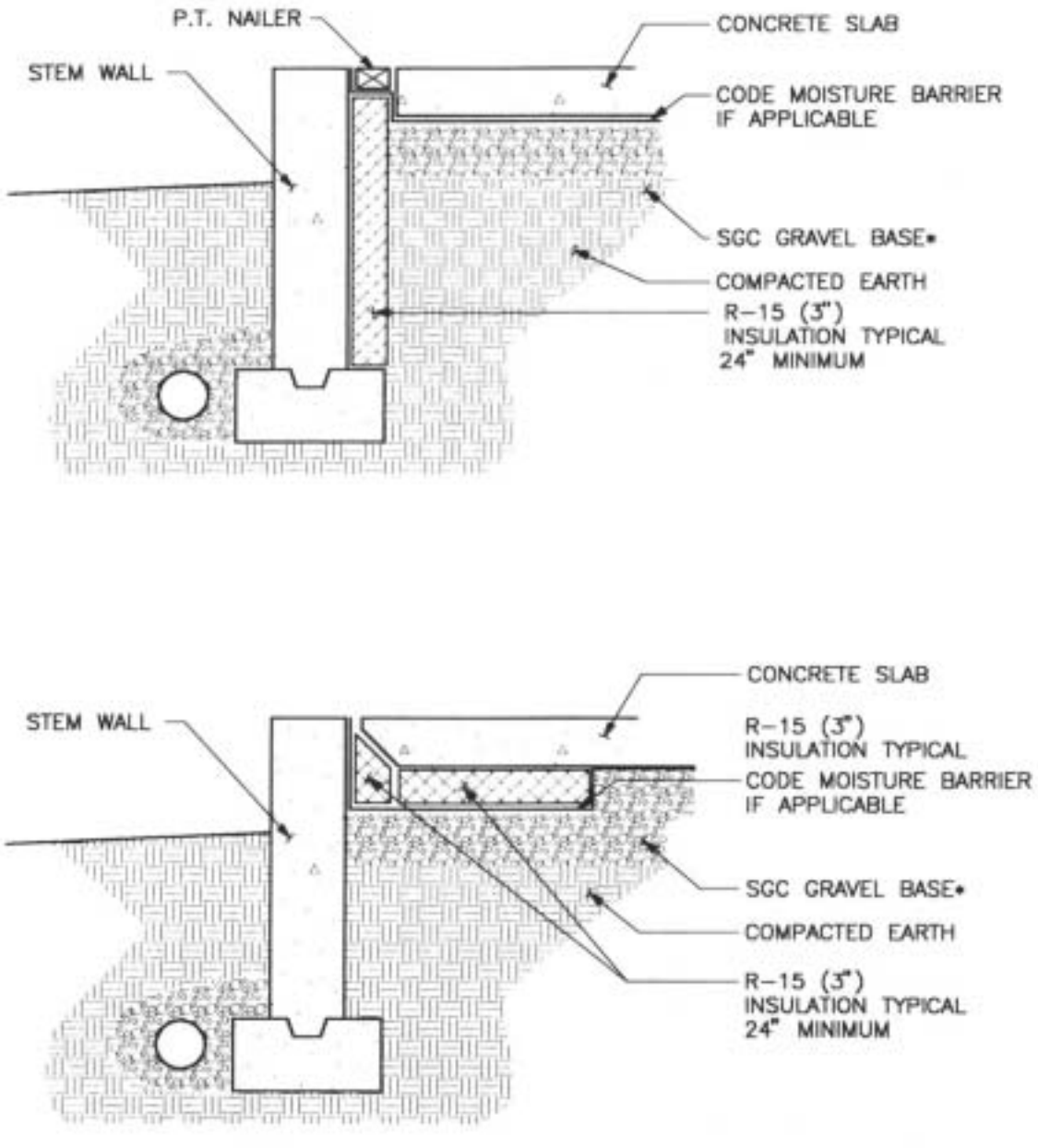


Figure 3B
MONOLITHIC SLAB INSULATION



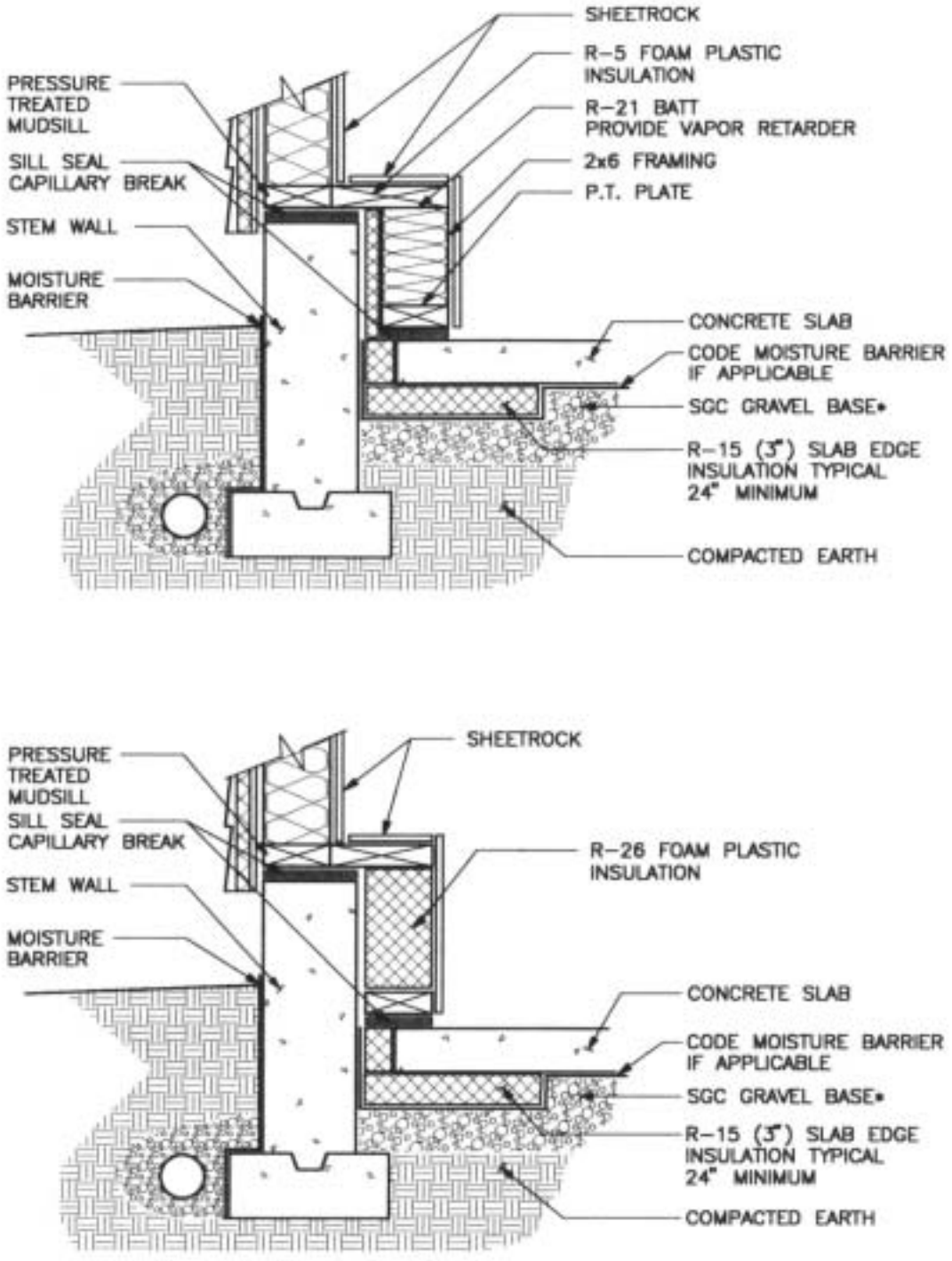
*SEE 1994 LONG-TERM SUPER GOOD CENTS TECHNICAL SPECIFICATIONS 4.1.2 FOR APPROPRIATE AGGREGATE STANDARDS.

Figure 3C
FLOATING SLAB ON GRADE
WITH INTERIOR PERIMETER INSULATION



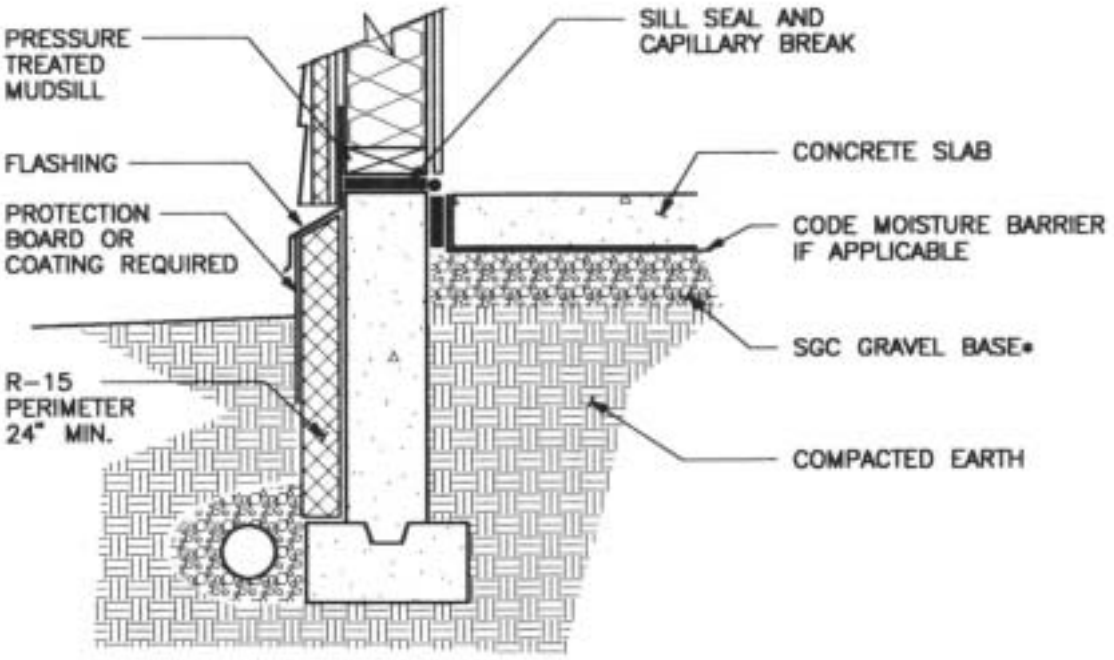
*SEE 1994 LONG-TERM SUPER GOOD CENTS TECHNICAL SPECIFICATIONS 4.1.2 FOR APPROPRIATE AGGREGATE STANDARDS.

Figure 3D
FLOATING SLAB/STUB WALL INSULATION OPTIONS



*SEE 1994 LONG-TERM SUPER GOOD CENTS TECHNICAL SPECIFICATIONS 4.1.2 FOR APPROPRIATE AGGREGATE STANDARDS.

Figure 3E
FLOATING SLAB ON GRADE
WITH EXTERIOR PERIMETER INSULATION



*SEE 1994 LONG-TERM SUPER GOOD CENTS TECHNICAL SPECIFICATIONS 4.1.2 FOR APPROPRIATE AGGREGATE STANDARDS.

Figure 3F
INSULATION BETWEEN SLABS IN HEATED AND UNHEATED SPACES

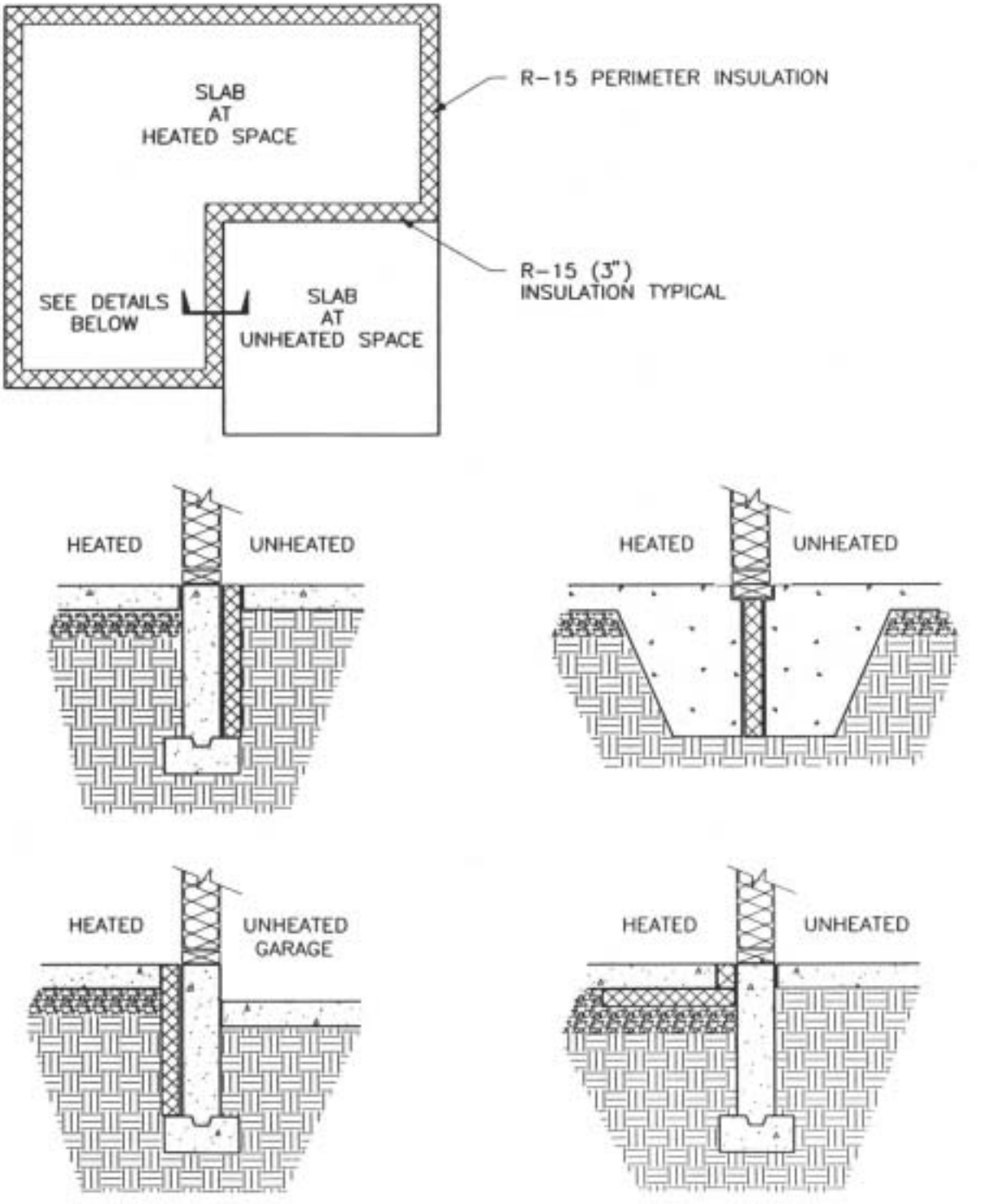


Figure 3G
INSULATION BETWEEN SLABS AND CRAWL SPACES

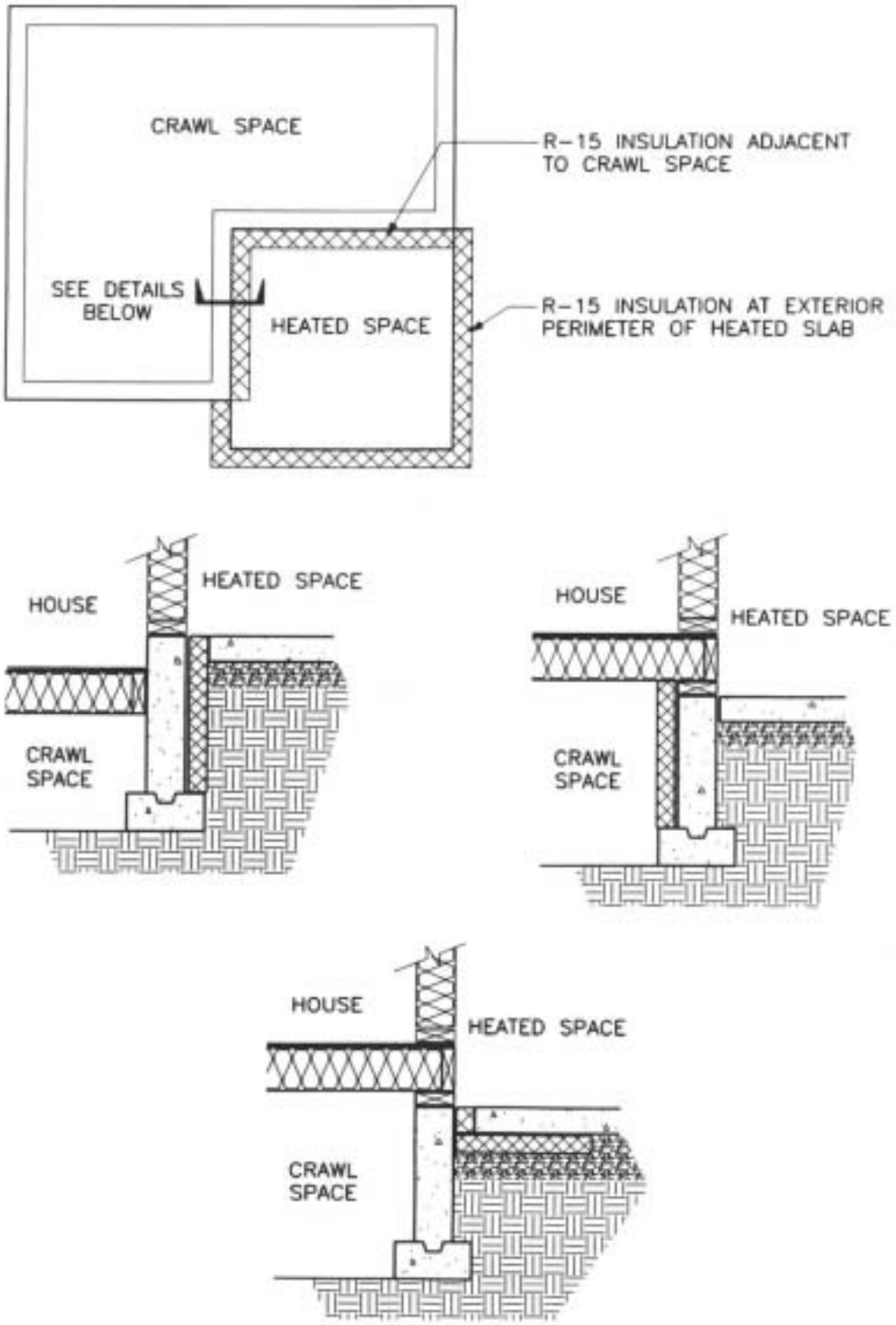
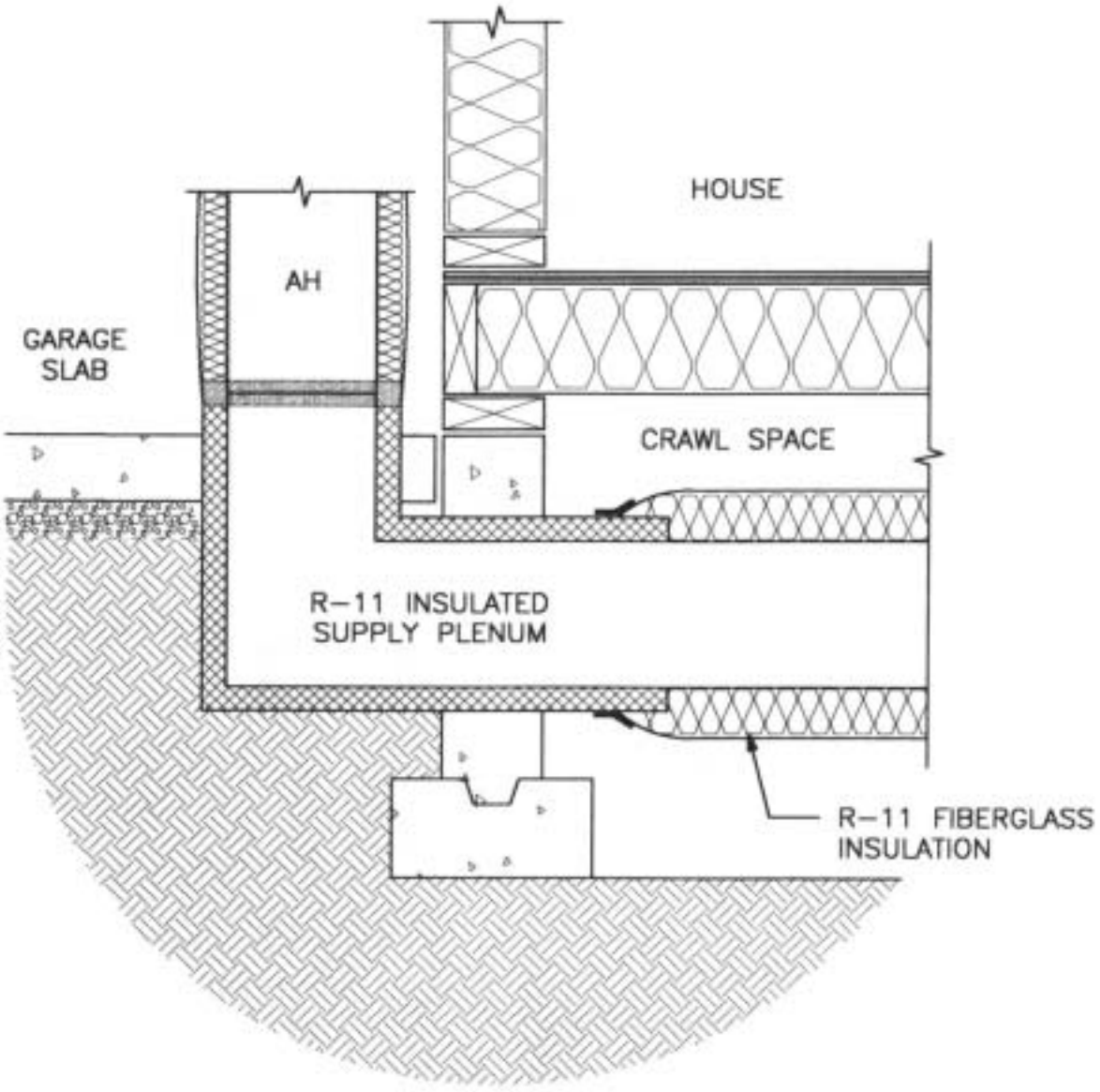


Figure 3H
INSULATED SUPPLY PLENUM IN GARAGE SLAB



If you are making a hole in the garage slab for the furnace supply plenum, make sure the hole can accommodate the supply plenum and R-11 (2 to 2-1/2 inches rigid foam) insulation on all sides. See Figure 3H. Verify hole dimensions with the heating contractor.

Floating slabs must be insulated from the top of the slab vertically for a distance of 24 inches, or to the bottom of the slab and then horizontally for a total of 24 inches. The general contractor may want you to supply a nailable surface (such as a pressure treated lx) on top of the insulation for attaching carpet or other floor finish material. Be sure to talk over your approach to this detail before you finalize your bid.

It is important to keep in mind the exact locations of heated slab edges. If a kitchen or family room slab is next to a garage slab, for example, there must be full insulation between the two slab areas. Another slab edge that can be overlooked is where slabs are adjacent to crawl spaces. Figures 3F and 3G show possible insulation details for these areas.

The utility representative needs to see the insulation before it is covered.

Full Sub-Slab Insulation Option

As an option, builders may insulate the entire area under the slab. For slab on grade, R-15 perimeter insulation is installed as usual. Below grade slabs must have an R-5 minimum thermal break from all piers and footings with ground contact and from slabs in unheated spaces. The underslab insulation is either R-5 in Climate Zone 1 (typically 1-inch-thick foam) or R-10 in Climate Zones 2 and 3 (2-inch-thick foam).

Below grade slab insulation must be continuous under the slab. Place insulation over gravel and cover insulation with a minimum of 2 inches of sand.

Sub-Slab Gravel Requirements

1994 LTSGC 4.1.2

Super Good Cents requires a gravel base under slabs in heated spaces to provide a capillary break from ground moisture. If radon is a problem where you build, the gravel base has an additional side benefit: In the event radon is detected in a home, the gravel base can be ventilated to remove radon.

The gravel base course must be at least 4 inches deep. Gravel must meet one of the following standards:

1. ASTM Standard C33, “Standard Specifications for Concrete Aggregates.” Gravel shall be size #67 or larger.

2. 1988 Washington State Department of Transportation specification 9-03.1(3), "Coarse Aggregate for Portland Cement Concrete." Gravel shall be of Grade 5 or larger.
3. Gravel must be screened, washed, and free of deleterious substances in a manner consistent with ASTM C33, with 100 percent of the gravel passing a 1-inch sieve and less than 2 percent passing a #4 sieve. Sieve characteristics shall conform to those acceptable under ASTM C33.

Your supplier is likely to be familiar with one or more of these standards. Using gravel that meets these requirements ensures a good capillary break and allows effective ventilation if necessary to reduce radon levels.

Although not required by the Super Good Cents program, radon entry can be further reduced by sealing cracks and joints in slabs and below grade walls. Use sealants designed for use with concrete, and follow manufacturer's application instructions.

The ground moisture barrier that most building codes require under slabs also helps reduce radon passage. The moisture barrier works best for radon protection when it is immediately below the slab. Local code may require the moisture barrier to be located there.

Some contractors are reluctant to pour concrete directly over a moisture barrier. They are worried about cracking caused by trapped excess water. To minimize cracking, use low-slump concrete with no excess water and plasticizing additives that allow low-slump concrete to flow. Plasticizers are mixed at the plant by special order.

Carefully curing concrete also minimizes cracking. The slab cures best if its top and bottom have nearly equal moisture content. Keep the top of the slab wet for several days. Or paint a curing agent onto the slab after the finish troweling. The curing seal helps keep moisture content uniform throughout the slab.

A helpful publication on this subject is Recommended Practice for Concrete Floor and Slab Construction, from the American Concrete Institute, Box 19150, Redford Station, Detroit, MI 48219.

If you install a sand base over the moisture barrier and radon is a concern, minimize radon passage by sealing seams, gaps, holes, and tears in the barrier before you place the sand.

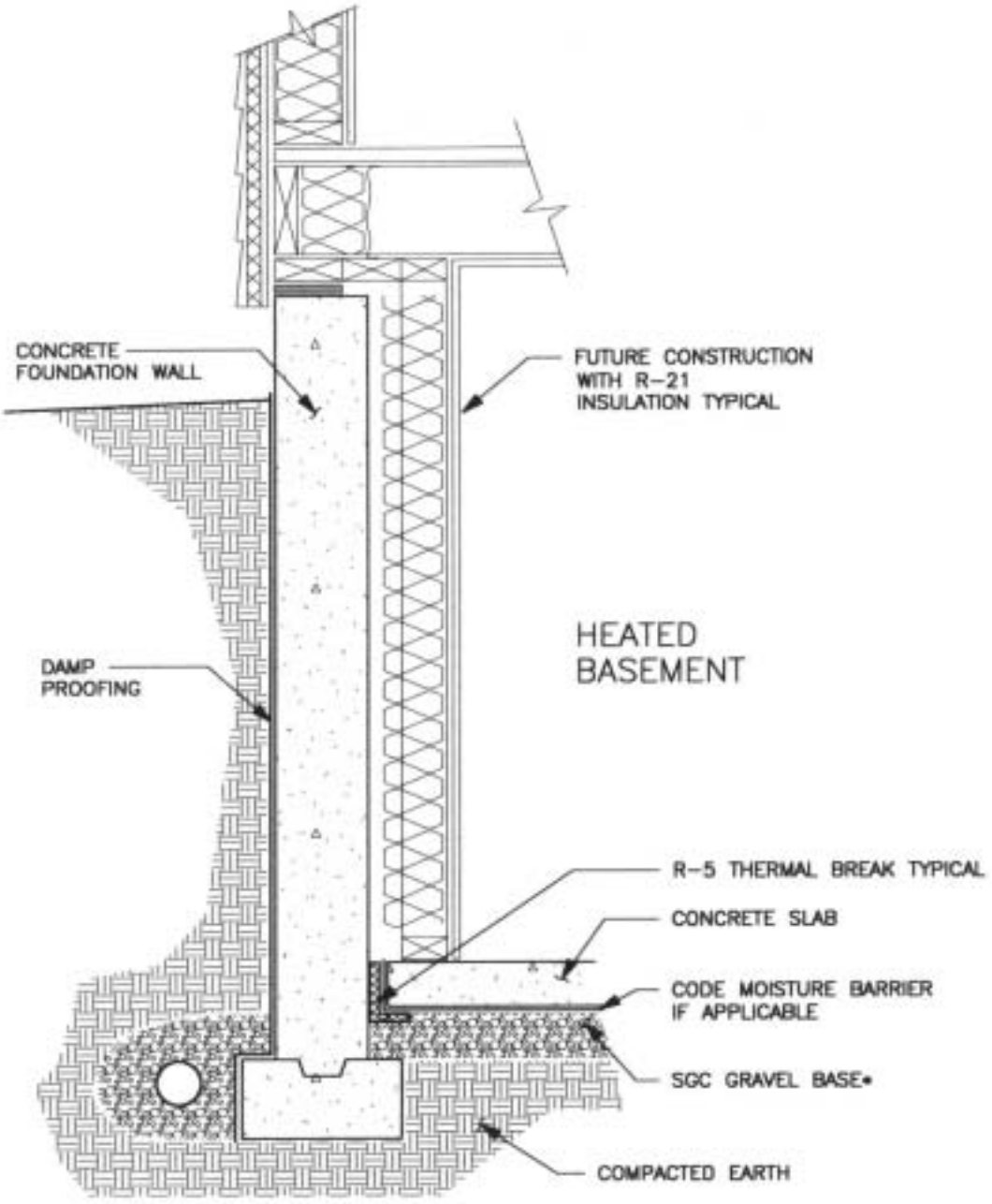
BELOW GRADE CONSTRUCTION

Insulation Requirements

1994 LTSGC 7.1.6

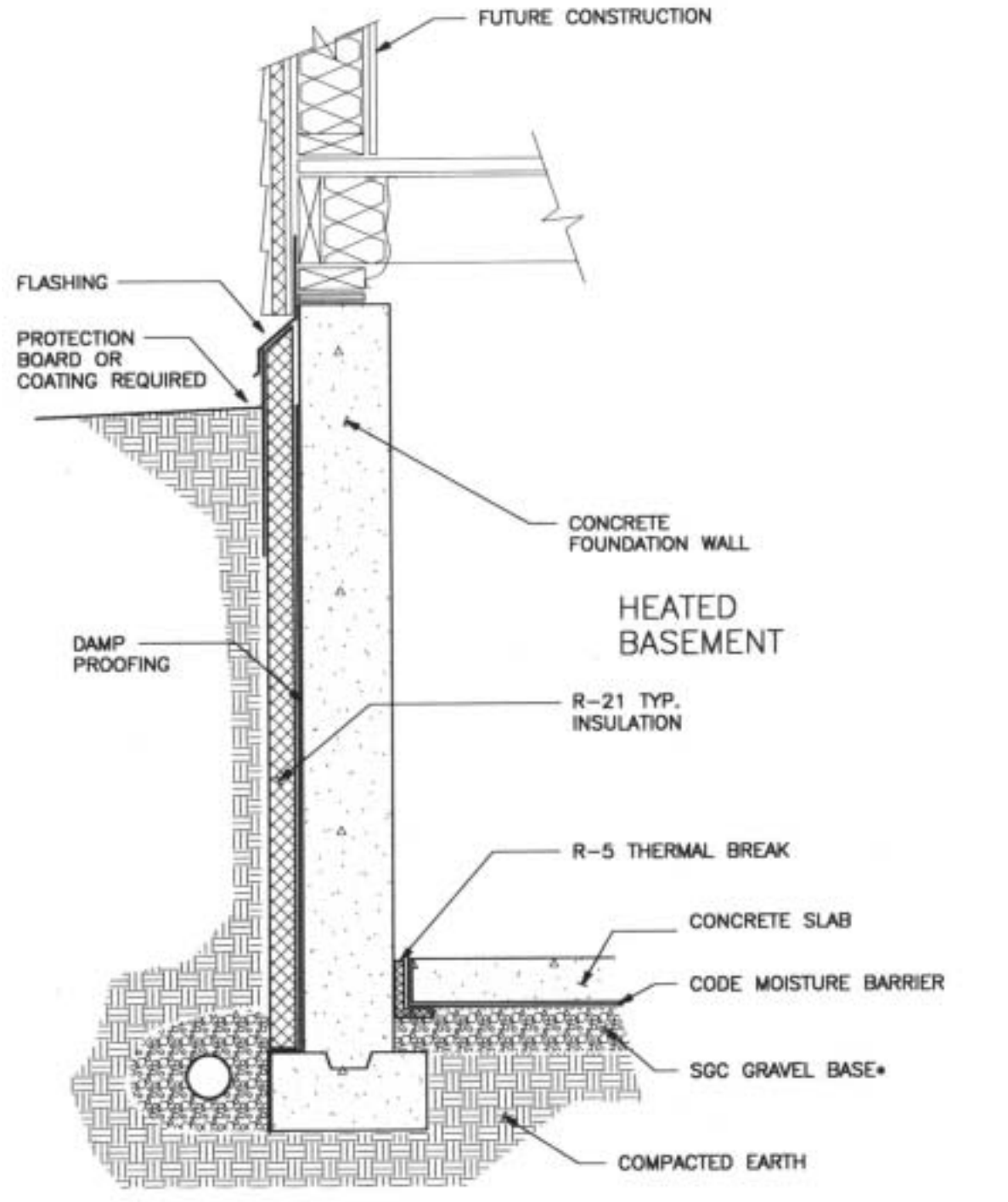
Exterior insulation of basement walls may fall within the scope of concrete work. Insulate the entire below grade wall after you apply damp proofing. Figures 31 through 3K show below grade wall insulation options.

Figure 3I
BELOW GRADE WALL WITH INTERIOR INSULATION



•SEE 1994 LONG TERM SUPER GOOD CENTS TECHNICAL SPECIFICATIONS 4.1.2 FOR APPROPRIATE AGGREGATE STANDARDS.

Figure 3J
BELOW GRADE WALL WITH EXTERIOR INSULATION



*SEE 1994 LONG TERM SUPER GOOD CENTS TECHNICAL SPECIFICATIONS 4.1.2 FOR APPROPRIATE AGGREGATE STANDARDS.

Figure 3K

BELOW GRADE MONOLITHIC SLAB WITH BELOW GRADE BLOCK WALL: COMNATION INTERIOR AND EXTERIOR INSULATION