

Residential Foundations and Basements

Disclaimer

All of the following information is based on the 2006 International Residential Code with Kentucky Amendments. As some information is paraphrased, article numbers are listed for reference to the actual code article. The visual aids used are taken from the above referenced code or the 2003 IRC study companion. They are not created by OMPC. This information is presented to answer or clarify common code questions and is not intended to be a complete review of all code requirements. A permit holder is required to comply with all building codes pertinent to the construction undertaken.

General Foundation Information

Treated Wood

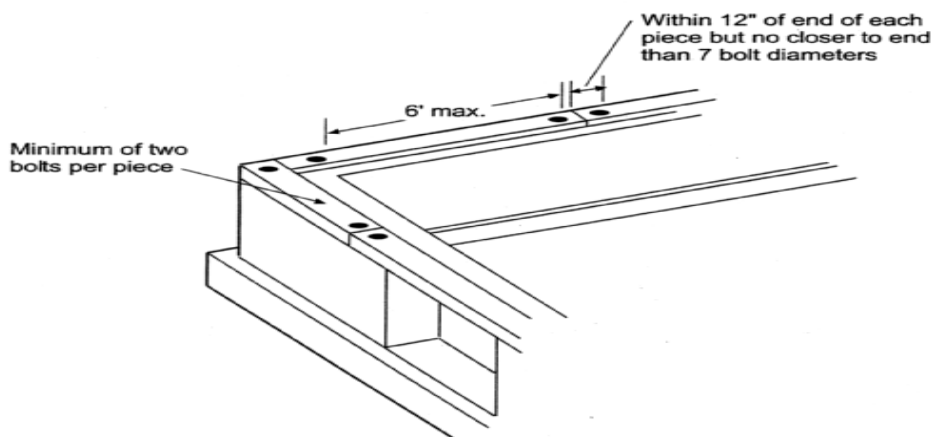
R319.1 (2) All wood framing members that rest on concrete or are within eight inches (8") of the exposed ground shall be treated or resistant to decay. This means sill plates, girder beams and wood siding.

Drainage

R401.3 Lots shall be graded to drain surface water away from the foundation wall. The grade shall fall at least six inches (6") in the first ten feet (10') away from the structure.

Anchor Bolts

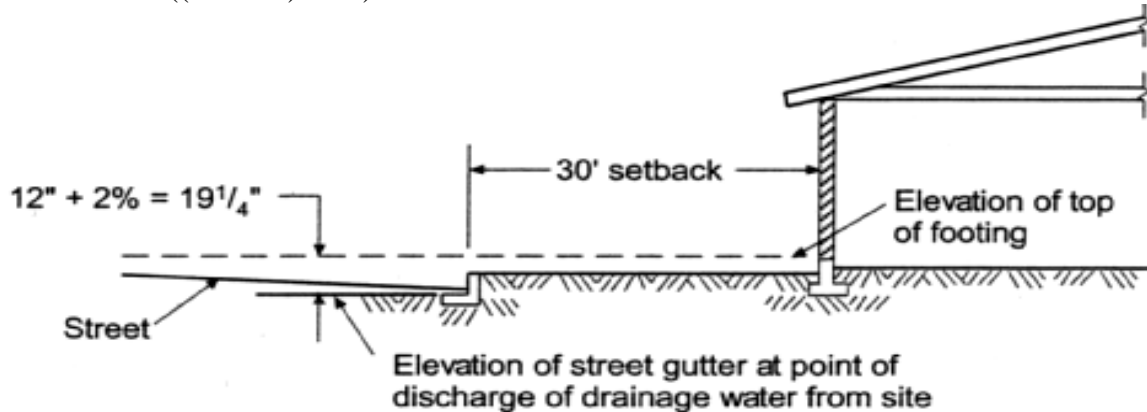
R403.1.6 The sill plate shall be anchored to the foundation with anchor bolts. The bolts shall be spaced a maximum of six feet (6') on center. There shall be a minimum of two bolts per plate section. They shall be located between three and one half inches (3.5") and twelve inches (12") from each end of the plate. The bolts shall be at least one half inch (1/2") in diameter and extend into the masonry or concrete at least seven inches (7"). A nut and washer shall be tightened on every bolt.



Wood sill plate anchorage

Foundation Elevation

R403.1.7.3 The top of the foundation shall be a minimum of twelve inches (12") above the street gutter or inlet of an approved drainage, plus 2% of the distance from the foundation to said gutter or inlet. For example, if the foundation's front wall is thirty feet (30') from the street gutter it must be at least nineteen and one quarter inches (19 1/4") above that gutter ((30'*.02)+12")=19.25".



Footing elevation on graded sites

Height Above Finished Grade

R404.1.6 The Concrete or Masonry foundation wall shall be at least four inches (4") above the finished grade when applying brick to the exterior. In all other situations, the foundation wall must be six inches (6") above the adjacent ground.

Removal of Debris

R408.5 The ground under the floor shall be cleaned of all vegetation and organic material. Grass, roots, and sticks left under the house will decay causing bad odors that may permeate the home and be difficult to remove. On a slab floor, when the material decays voids are created under the slab allowing the floor to crack or settle.

Slab Foundation

Fill Material

R506.2 Fill may be any type of stone available at the local rock yard. No. 8 limestone works very well as it is easy to move around, settles out well and does not track up much under foot traffic. Pea gravel is even easier to move and use, but shifts underfoot causing pits under the concrete if care is not taken to work them out. The smaller the rock used, the more tonnage it will take to fill the slab. No. 8 limestone and pea gravel cost more per ton than river rock fill gravel. River rock fill gravel is economical and less dense than other fill, which equates to a higher volume. Some pieces in this are as large as No. 3 limestone. Regardless of the type of fill used, it should be free from vegetation, dirt and

construction debris. Special care should be taken when filling around plumbing and HVAC in the slab. The weight of the rock can collapse or shift these if not done correctly. The best practice is to spill the rock lightly over the pipe like pouring water over it to rinse. The rock will flow in under the pipe and create a bed first and then anchor the pipe in place as it covers.

Vapor Retarder

R506.2.3 There shall be a six mil polyethylene film placed over the fill material and beneath the concrete floor for slab construction. This vapor barrier will keep moisture from seeping up through the concrete. Where pieces of the vapor barrier overlap, the lapped seam should be at least six inches (6") wide. The vapor barrier may extend out over the foundation wall and lap up on the inside of the sill plate. This will keep the concrete from flowing down in the block cores if they have not previously been filled with rock.

Insulation

N1102.2.7 The inner walls of the foundation shall be lined with at least one and one half inch (1 ½") thick polystyrene insulation from the bottom of the concrete slab to the grade level. This is usually at least sixteen inches (16") high. Conveniently, a sheet of polystyrene is perforated every sixteen inches (16") length ways and is easily broken by hand along these perforations.

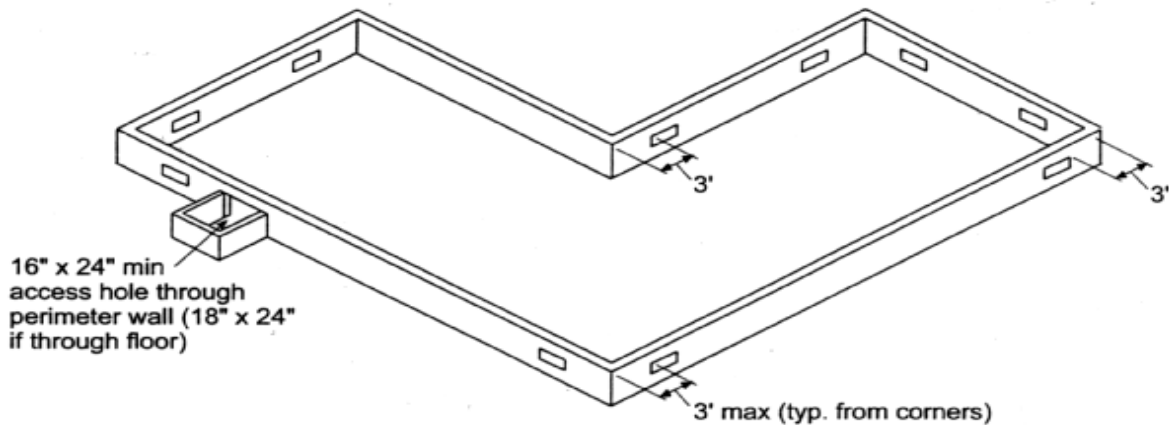
Concrete Slab

R506.1 The slab shall be at least three and one half (3.5") inches thick.

Crawl Space Foundation

Ventilation

R408.1 There shall be vents in the foundation walls to allow the removal of moisture. There shall be one square foot of vent opening for every one hundred and fifty (150) square feet of under floor area. The average block shaped vent has an area of only eight tenths (0.80) of a square foot. Additionally, there shall be a vent within three feet (3') of each corner in the foundation. If no vents are desired in the crawl space, refer to **R408.3** to review the appropriate code regulations to construct an unventilated crawl space.



Screened openings (mesh opening $\geq \frac{1}{8}$ in.) through foundation wall to crawl space
 Total net clear area of openings equals the crawl space area divided by 150

Vapor Barrier

Just as in the slab foundation, the bare ground below the floor shall be covered with a six mil polyethylene film from foundation wall to foundation wall with joints lapped at least six inches (6").

Insulation

Polystyrene insulation shall be attached to the inside of the foundation walls to insulate the under-floor area during winter. This should be at least one and one half inch (1 1/2") thick polystyrene.

Ground Clearance to Floor Joists

R319.1 (1) Untreated floor joists must be held at least eighteen inches (18") above the under-floor grade. Untreated wood girders that hold the floor joists must be at least twelve inches (12") above the under-floor grade.

Access

R408.4 Access shall be provided to all under-floor spaces. Openings in the floor itself shall be a minimum of eighteen inches (18") by twenty-four inches (24"). Openings through the perimeter foundation wall shall be sixteen inches (16") by twenty-four inches (24"). If any part of this access door is below grade a hole shall be placed in front of the door twenty-four inches (24") wide and extending sixteen inches (16") back from the door. The bottom of the hole shall be level with the bottom of the access door. Appropriate drainage measures shall be installed to keep this place from collecting water.

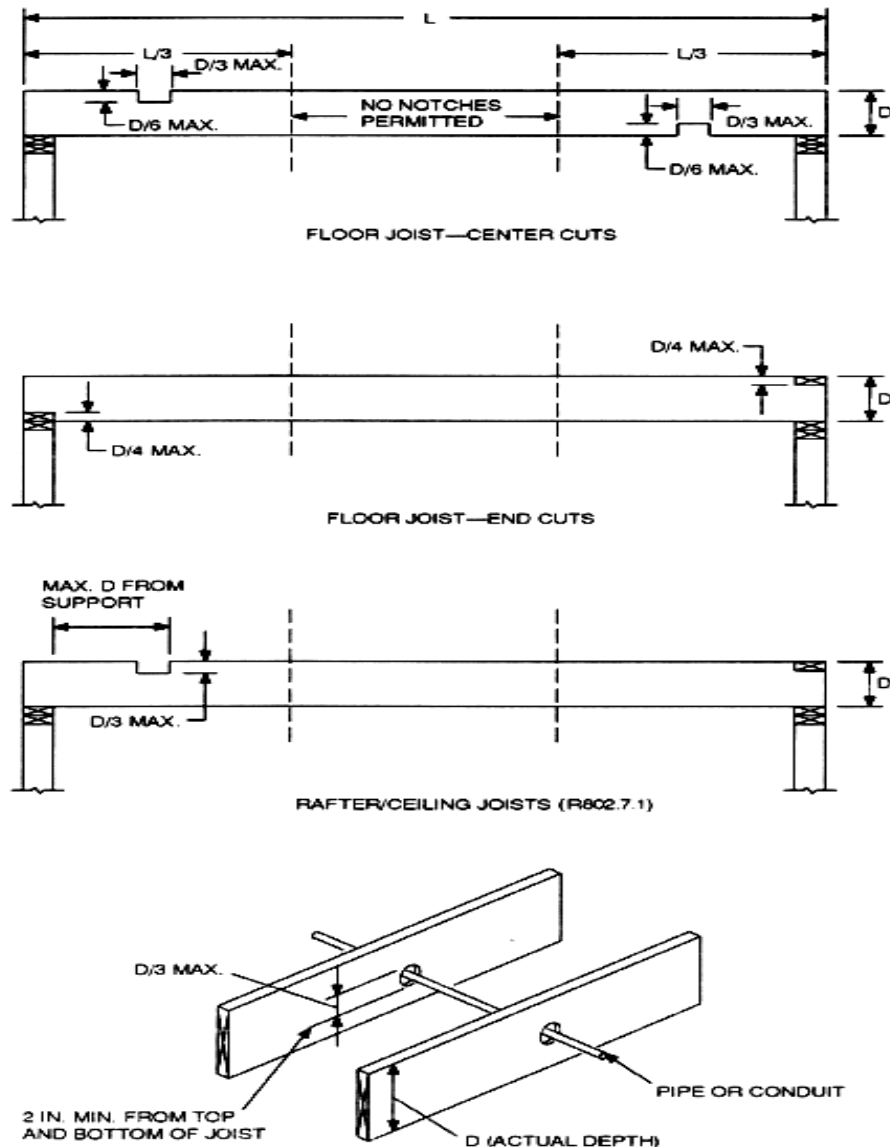
Finished Grade

R408.6 The finished grade under the floor may typically be cut down as low as the bottom of the footer. However, if the lot has drainage and water problems the dirt under the foundation shall be at least as high as the ground outside the foundation. Also if there is a trench left on the inside of the block wall from the footer, it shall be filled in level with the rest of the ground under the foundation. This is most easily done before the floor is installed.

Drilling and Notching Floor Joist

R502.8

Notches shall not exceed one-sixth the depth of the member, shall be no longer than one-third the depth of the member, and shall not be located in the middle third of the span. Notches at the ends shall not exceed one-fourth the depth of the member. The diameter of holes bored in the member shall not exceed one-third the depth and shall not be closer than two inches from the top or bottom of the member or to any other holes or notches. The tension side of a member four inches or greater in thickness shall not be notched. Please observe the following illustration from the 06 IRC.



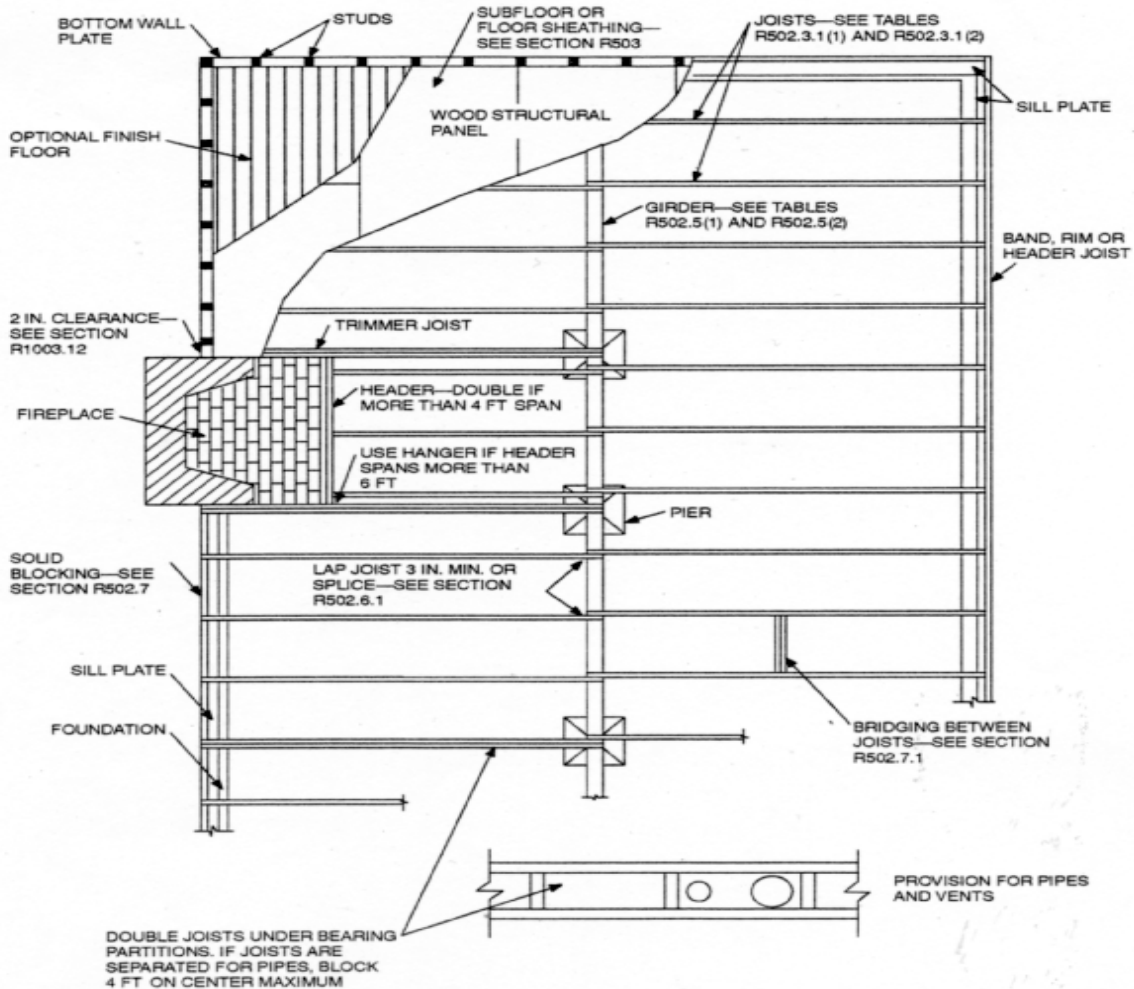
For SI: 1 inch = 25.4 mm.

FIGURE R502.8
CUTTING, NOTCHING AND DRILLING

Framing of Openings

R502.10

Openings in floor framing shall be framed with a header and trimmer joist. When the header span does not exceed four feet (4') it may be a single member the same size as the floor joists. A single trimmer joist may be used to carry a single header that is within three feet (3') of the trimmer's bearing point. When the header span exceeds four feet (4'), it shall be doubled. If the header span exceeds six feet (6'), an approved hanger shall be used to support the header. Tail joists over twelve feet (12') long shall be supported at the header by framing anchors or a ledger strip not less than two inches (2") by two inches (2").



inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE R502.2
FLOOR CONSTRUCTION

Basements

Foundation Drainage

R405.1

Drains shall be provided around all concrete and masonry foundations that retain earth and enclose habitable or usable spaces located below grade. Drains shall discharge by gravity or mechanical means. They shall be installed at or below grade of the area that is to be protected.

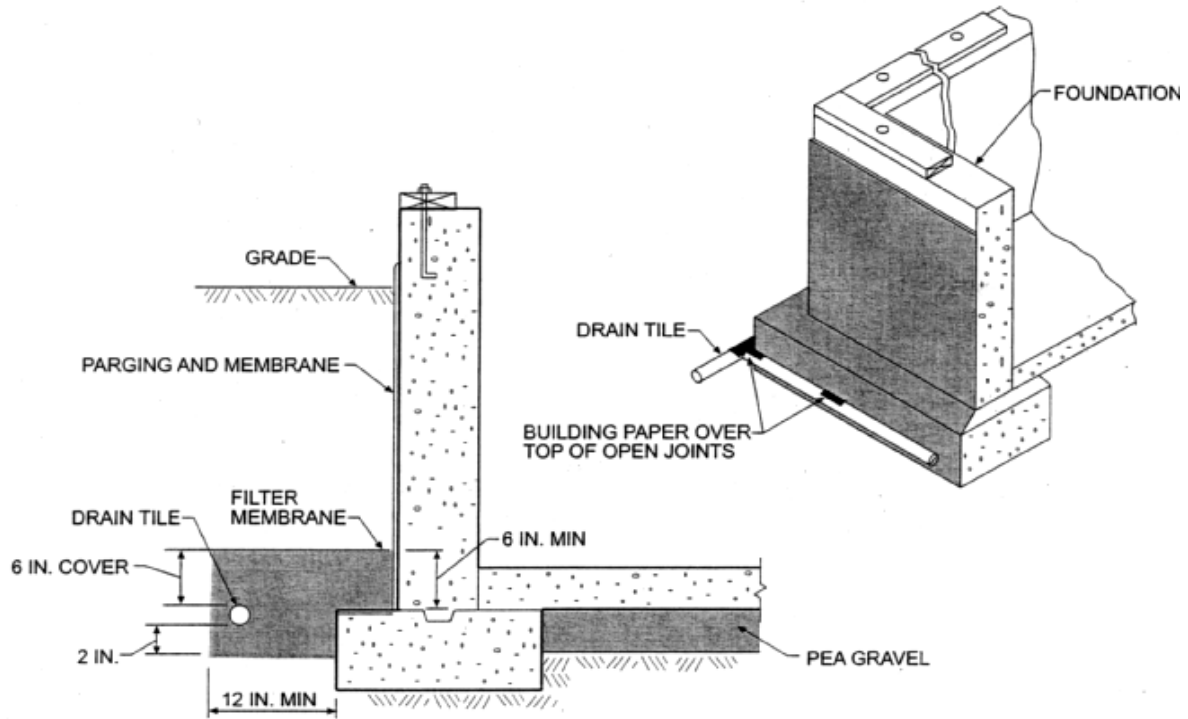


Figure R405.1(1)
FOUNDATION DRAINAGE FOR HABITABLE SPACE BELOW GRADE

Base

R 405.2.1

A four inch (4") thick layer of gravel or sand is required under the basement floor and it shall be automatically drained by gravity or mechanical means.

Moisture Barrier

R405.2.2

A six mil polyethylene moisture barrier shall be applied over the porous layer under the basement floor.