New Home Construction

2 – Sets of Plans

2 – Sets of Site Surveys

- House needs to be staked on property
- Legal Description
- Proposed Top of Block Elevation
- Proposed Garage Floor Elevation
- Proposed Lowest Floor Elevation
- Proposed Lookout Elevation
- Proposed Walkout Elevation
- Denote Proposed Drainage
- Denote Proposed Surface Elevation
- Denote Existing Surface Elevation
- Denote a Found Iron Monument
- Denote Concrete Curb & Gutter
- Building Setbacks
- Easements of Record

Must be certified by a licensed surveyor

1 – New Construction Energy Code Compliance Certificate

List of Subcontractors and contact information

Plans:

Ceiling Heights: For rooms with a sloped ceiling, at least 50 percent of the required floor area of the room must have a ceiling height of at least 7 feet and no portion of the required floor area may have a ceiling height of less than 5 feet. Bathrooms are required to have a minimum ceiling height of 6 feet 8 inches at the center of the front clearance area for water closets, bidets, or sinks.

Window Fall Protection: For windows where the lowest part of the opening is more than 72 inches above the finished grade or surface below, the lowest part of the opening must be 36 inches or higher from the interior finished floor. Window openings lower than 36 inches will be required to provide window fall protection.

Wireless Smoke Alarms: Wireless smoke alarms will meet the requirements of being interconnected.

Automatic Fire Sprinkler System: Automatic residential fire sprinkler will be required in all townhouses, two-family dwellings, single family dwellings that are 4,500 square feet or larger. (4,500 square feet floor area includes all floor and basements, excluding garage)

Concrete Footings: Footing will be required the use of 5,000 psi concrete, this will have the effect of creating a water separation plane between the soil and the building foundation.

Foundation Waterproofing: All concrete and masonry basement foundation walls are to be waterproofed. Damp-proofing is no longer permitted.

Fire Protection of Floors: Installation of $\frac{1}{2}$ inch gypsum or 5/8 inch wood structural panel is required on the underside of floor assemblies. An area not to exceed 80 square feet can be left unprotected providing there is fire blocking installed along the perimeter of the unprotected area. The area around the furnace can be designated as the unprotected area.

Water-Resistive Barrier: The water-resistive barrier needs to overlap required flashings not less than 2 inches. This would require that the flashing have a minimum 2-inch vertical leg to be overlapped. The 2-inch vertical flashing leg and water-resistive barrier overlap protects or limits wind driven water intrusion. The water resistive barrier will be installed continuous up to the underside of the rafter or truss top cord. Flashing is required at the intersection of the foundation

and rim joist framing when the exterior wall covering does not lap the foundation insulation.

Kick Out Flashing: Kick-out flashing on the roof need to be a minimum of 2 ½ inches long.

Radon Requirements: See Handout

Energy Code Requirements:

Construction Documents:

- Insulation Materials and their R-values
- Fenestration U-factor and SHGC calculations
- Mechanical system design criteria
- Mechanical and service water heating system and equipment type, sizes and efficiencies
- Equipment and system controls
- Fan motor horsepower and controls
- Duct sealing, and location insulation of ducts and pipes
- Lighting fixture schedule with wattage and control narrative
- Air sealing details

Window: U-factor of 0.32 or less for exterior window and doors

Attic Ceilings: Attic insulation will be a minimum of R-49. Roof/Ceiling assemblies must have a minimum 6-inch energy heel.

Wood Frame Wall Insulation: Wood frame wall insulation is R-21

Floor Insulation: Floor insulation must maintain permanent contact with the underside of the subfloor decking. Floor R values are R-38.

Basement Wall Insulation: Minimum R values for basements are now R-15

Slab Insulation: Slab insulation to be R-10. Insulation to be installed to a depth of 5 feet.

Air Leakage Testing: Blower door test and verified as having an air leakage rate of not to exceed 3 air changer per hour at a pressure of 50 Pascals. Testing should take place after all exterior penetrations have been made and sealed.

Duct Sealing: Sealing is required on all ducts, air handlers, and filter boxes. Duct seams must be fastened using sheet metal screws (or compression straps for flex duct) before being sealed. UL Standard 181 regulates both tape and mastics for air ducts.

Sealed Air Handlers: Air Handlers to have a manufacturer's designation for and air leakage of no more than 2 percent of the design air flow rate.

Duct Leakage Testing: Confirm duct tightness with performance testing (unless the ducts and air handlers are located entirely within the thermal enclosure)

Framing Cavities are Not Duct Work: Building framing cavities are not to be used as supplies, returns or plenums.

Balanced Ventilation: Mechanical Ventilation systems are to be balanced within +/- 10% of the system's design capacity fort the continuous and total mechanical ventilation requirements. Using HRV's, ERV's, or a mechanical ventilation system as part of a forced air circulation system can meet this requirement. Outdoor air intakes and exhausts will need to have automatic or gravity dampers that close when the ventilation system is not operation.

Ventilation Airflow Verification: All mechanical ventilation system airflows greater than 30 cfm at the building exhaust or intake need to be tested and verified.

Hot Water Pipe Insulation: R-3 pipe insulation on hot water piping.

Energy Efficient Lighting: 75% of the bulbs in permanently installed light fixtures must be high efficacy. This requirement applies to indoor and outdoor fixtures, including accessory structures and garages.

Waterproofing for Poured and Masonry Block Walls: Waterproofing need to extend from the top interior wall edge, across the top of the wall, and down the exterior wall face to the top of the footing. If a full width, closed cell material is installed to create a seal between the sill plate and the top of the foundation wall, the installation is deemed to meet the requirements for the top of the wall waterproofing.

New Construction Energy Code Compliance Certificate

Per R401.3 Certificate. A building certificate shall be posted on or in the electrical distribution panel.

Date Certificate Post	

City of BRAHAM

"Building A Better Tomorrow"

Mailing Address of the Dwelling or Dwelling Unit	City
Name of Residential Contractor	MN License Number

THERMAL ENVELOPE

Insulation Location	Total R-Value of all Types of Insulation	Type: Check All That Apply								Other Please Describe Here
		Non or Not Applicable	Fiberglass, Blown	Fiberglass, Batts	Foam, Closed Cell	Foam Open Cell	Mineral Fiberboard	Rigid, Extruded Polystyrene	Rigid, Isocynurate	
Below Entire Slab										
Foundation Wall										
Perimeter of Slab on Grade										
Rim Joist (1st Floor)										
Rim Joist (2nd Floor+)										
Wall										
Ceiling, flat										
Ceiling, vaulted										
Bay Windows or cantilevered areas										
Floors over unconditioned area										
Describe other insulated areas										

RADON CONTROL SYSTEM

	Passive (*No Fan*)
	Active (*With fan and monometer or other system monitoring*
Location (or future location) of Fan:	

Building envelope air tightness:	**Duct system air tightness:**

Windows & Doors		**Heating or Cooling Ducts Outside Conditioned Spaces**	
Average U-Factor (*excludes skylights and one door*) U:			Not applicable, all ducts located in conditioned space
Solar Heat Gain Coefficient (SHGC):			R-value

MECHANICAL SYSTEMS

Appliances	Heating System	Domestic Water Heater	Cooling System
Fuel Type			
Manufacturer			
Model			
Rating or Size	Input in BTUS:	Capacity in Gallons:	Output in Tons:
Efficiency	AFUE or HSPF%		SEER /EER
Residential Load Calculatio	**Heating Loss**	**Heating Gain**	**Cooling Load**

Make-up Air *Select a Type*

	Not required per mech. code
	Passive
	Powered
	Interlocked with exhaust device. Describe:
	Other, describe:
Location of duct or system:	
	Cfm's
	" round duct OR
	" metal duct

MECHANICAL VENTILATION SYSTEM

Describe any additional or combined heating or cooling systems if installed: (e.g. two furnaces or air source heat pump with gas back-up furnace):

Select Type

	Heat Recover Ventilator (HRV) Capacity in cfms:	Low:		High:	
	Energy Recover Ventilator (ERV) Capacity in cfms:	Low:		High:	
	Balanced Ventilation capacity in cfms:				
	Location of fan(s), describe:				
	Capacity continuous ventilation rate in cfms:				
	Total ventilation (intermittent + continuous) rate in cfms:				

Combustion Air *Select a Type*

	Not required per mech. code
	Passive
	Other, describe:
Location of duct or system:	
	Cfm's
	" round duct OR
	" metal duct

Table 501.4.1 Procedure to Determine Makeup Air Quantity for Exhaust Equipment in ~~Dwellings~~Dwelling Units Use the Appropriate Column to Estimate House Infiltration				
	One or multiple power vent or direct vent appliances or no combustion appliances[A]	One or multiple fan-assisted appliances and power vent or direct vent appliances[B]	One atmospherically vented gas or oil appliance or one solid fuel appliance[C]	Multiple appliances that are atmospherically vented gas or oil appliances or solid fuel appliances[D]
1a) pressure factor (cfm/sf)	0.15	0.09	0.06	0.03
b) conditioned floor area (sf) (including unfinished basements)				
Estimated House Infiltration (cfm): [1a x 1b]				
a) clothes dryer	135	135	135	135
b) 80% of largest exhaust rating (cfm): (not applicable if recirculating system or if powered makeup air is electrically interlocked and matched to exhaust)				
c) 80% of next largest exhaust rating (cfm): (not applicable if recirculating system or if powered makeup air is electrically interlocked and matched to exhaust)	not applicable			
Total Exhaust Capacity (cfm): [2a+2b+2c]				
3. Makeup Air Requirement a) Total Exhaust Capacity (from above)				
b) Estimated House Infiltration (from above)				
Makeup Air Quantity (cfm): [3a – 3b] (if value is negative, no makeup air is needed)				
4. For Makeup Air Opening Sizing, refer to Table 501.3.2				

A Use this column if there are other than fan-assisted or atmospherically vented gas or oil appliances or if there are no combustion appliances.

B Use this column if there is one fan-assisted appliance per venting system. Other than atmospherically vented appliances may also be included.

C Use this column if there is one atmospherically vented (other than fan-assisted) gas or oil appliance per venting system or one solid fuel appliance.

D Use this column if there are multiple atmospherically vented gas or oil appliances using a common vent or if there are atmospherically vented gas or oil appliances and solid fuel appliances.

Table 501.4.2 Makeup Air Opening Sizing Table for New and Existing ~~Dwellings~~Dwelling Units					
	One or multiple power vent or direct vent appliances or no combustion appliances[A]	One or multiple fan-assisted appliances and power vent or direct vent appliances[B]	One atmospherically vented gas or oil appliance or one solid fuel appliance[C]	Multiple appliances that areatmospherically vented gas or oil appliances or solid fuel appliances[D]	Passive makeup air opening duct diameter[E,F,G]
Type of opening or system	(cfm)	(cfm)	(cfm)	(cfm)	(inches)
Passive Opening	1-36	1-22	1-15	1-9	3
Passive Opening	37-66	23-41	16-28	10-17	4
Passive Opening	67-109	42-66	29-46	18-28	5
Passive Opening	110-163	67-100	47-69	29-42	6
Passive Opening	164-232	101-143	70-99	43-61	7
Passive Opening	233-317	144-195	100-135	62-83	8
Passive Opening with Motorized Damper	318-419	196-258	136-179	84-110	9
Passive Opening with Motorized Damper	420-539	259-332	180-230	111-142	10
Passive Opening with Motorized Damper	540-679	333-419	231-290	143-179	11
Powered Makeup Air[H]	>679	>419	>290	>179	not applicable

A Use this column if there are other than fan-assisted or atmospherically vented gas or oil appliances or if there are no combustion appliances.

B Use this column if there is one fan-assisted appliance per venting system. Other than atmospherically vented appliances may also be included.

C Use this column if there is one atmospherically vented (other than fan-assisted) gas or oil appliance per venting system or one solid fuel appliance.

D Use this column if there are multiple atmospherically vented gas or oil appliances using a common vent or if there are atmospherically vented gas or oil appliances and solid fuel appliance(s).

E An equivalent length of 100 feet of round smooth metal duct is assumed. Subtract 40 feet for the exterior hood and ten feet for each 90-degree elbow to determine the remaining length of straight duct allowable.

F If flexible duct is used, increase the duct diameter by one inch. Flexible duct shall be stretched with minimal sags.

G Barometric dampers are prohibited in passive makeup air openings when any atmospherically vented appliance is installed.

H Powered makeup air shall be electrically interlocked with the largest exhaust system.

1346.6012 IFGC APPENDIX E, WORKSHEET E-1.

IFGC Appendix E, Worksheet E-1

Residential Combustion Air Calculation Method
(for Furnace, Boiler, and/or Water Heater in the Same Space)

Step 1: Complete vented combution appliace information:

Furnace/Boiler:
____ Draft Hood (Not fan Assisted) ____ Fan Assisted & Power Vent ____ Direct Vent Input: _____Btu/hr

Water Heater:
____ Draft Hood (Not fan Assisted) ____ Fan Assisted & Power Vent ____ Direct Vent Input: _____Btu/hr

Step 2: Calculate the volume of the Combustion Appliance Space (CAS) containing combustion appliances.

The CAS includes all spaces connected to one another by code compliant openings. CAS volume: ____ ft³

Step 3: Determine air Changes per Hour (ACH)[1]

Default ACH values have been incorporated into Table E-1 for use with Method 4b (KAIR Method). If the year of construction or ACH is not known, use method 4a (Standard Method).

Step 4: Determine Required Volume for Combustion Air.

4a. Standard Method

Total Btu/hr input of all combustion appliances (DO NOT COUNT DIRECT VENT APPLIANCES) Input: _____Btu/hr

Use Standard Method column in Table E-1 to find Total Required Volume (TRV) TRV: _____ ft³

If CAS Volume (from Step 2) ***is greater than*** TRV then no outdoor openings are needed.

If CAS Volume (from Step 2) ***is less than*** TRV then go to **STEP 5.**

4b. Known Air Infiltration Rate (KAIR) Method

Total Btu/hr input of all fan-assisted and power vent appliances (DO NOT COUNT DIRECT VENT APPLIANCES) Input: _____Btu/hr

Use Fan-Assisted Appliances column in Table E-1 to find Required Volume Fan Assisted (RVFA) RVFA: _____ ft³

Total Btu/hr input of all non-fan-assisted appliances Input: _____Btu/hr

Use Non-Fan-Assisted Appliances column in Table E-1 to find Required Volume Non-Fan-Assisted (RVNFA) RVNFA: ____ ft³

Total Required Volume (TRV) = RVFA + RVNFA TRV = _____ + _____ = _____ ft³

If CAS Volume (from Step 2) ***is greater than*** TRV then no outdoor openings are needed.

If CAS Volume (from Step 2) ***is less than*** TRV then go to **STEP 5.**

Step 5: Calculate the ratio of available interior volume to the total required volume.

Ratio = CAS Volume (from Step 2) ***divided by*** TRV (from Step 4a or Step 4b) Ratio = ___ / ___ = ___

Step 6: Calculate Reduction Factor (RF).

RF = 1 ***minus*** Ratio RF = 1 - _____ = _____

Step 7: Calculate single outdoor opening as if all combustion air is from outside.

Total Btu/hr input of all Combustion Appliances in the same CAS (EXCEPT DIRECT VENT) Input: _____Btu/hr

Combustion Air Opening Area (CAOA):
Total Btu/hr ***divided*** by 3000 Btu/hr per in² CAOA = ____ /3000 Btu/hr per in² = _____ in²

Step 8: Calculate Minimum CAOA.

Minimum CAOA = CAOA ***multiplied by*** RF Minimum CAOA = _____ x _____ = _____ in²

Step 9: Calculate Combustion Air Opening Diameter (CAOD)

CAOD = 1.13 ***multiplied by the square root of*** Minimum CAOA CAOD = 1.13 x $\sqrt{\text{Minimum CAOA}}$ = _____ in

[1]If desired, ACH can be determined using ASHRAE calculation or blower door test. Follow procedures in Section 304.

1346.6014 IFGC APPENDIX E, TABLE E-1.

IFGC Appendix E, Table E-1 Residential Combustion Air Required Volume (Required Interior Volume Based on Input Rating of Appliances)					
		Known Air Infiltration Rate (KAIR) Method (ft^3)			
Input Rating	Standard Method	Fan Assisted		Non-Fan-Assisted	
(Btu/hr)	(ft^3)	1994[1] to Present	Pre 1994[2]	1994[1] to Present	Pre 1994[2]
5,000	250	375	188	525	263
10,000	500	750	375	1,050	525
15,000	750	1,125	563	1,575	788
20,000	1,000	1,500	750	2,100	1,050
25,000	1,250	1,875	938	2,625	1,313
30,000	1,500	2,250	1,125	3,150	1,575
35,000	1,750	2,625	1,313	3,675	1,838
40,000	2,000	3,000	1,500	4,200	2,100
45,000	2,250	3,375	1,688	4,725	2,363
50,000	2,500	3,750	1,875	5,250	2,625
55,000	2,750	4,125	2,063	5,775	2,888
60,000	3,000	4,500	2,250	6,300	3,150
65,000	3,250	4,875	2,438	6,825	3,413
70,000	3,500	5,250	2,625	7,350	3,675
75,000	3,750	5,625	2,813	7,875	3,938
80,000	4,000	6,000	3,000	8,400	4,200
85,000	4,250	6,375	3,188	8,925	4,463
90,000	4,500	6,750	3,375	9,450	4,725
95,000	4,750	7,125	3,563	9,975	4,988
100,000	5,000	7,500	3,750	10,500	5,250
105,000	5,250	7,875	3,938	11,025	5,513
110,000	5,500	8,250	4,125	11,550	5,775
115,000	5,750	8,625	4,313	12,075	6,038
120,000	6,000	9,000	4,500	12,600	6,300
125,000	6,250	9,375	4,688	13,125	6,563
130,000	6,500	9,750	4,875	13,650	6,825
135,000	6,750	10,125	5,063	14,175	7,088
140,000	7,000	10,500	5,250	14,700	7,350
145,000	7,250	10,875	5,438	15,225	7,613
150,000	7,500	11,250	5,625	15,750	7,875
155,000	7,750	11,625	5,813	16,275	8,138
160,000	8,000	12,000	6,000	16,800	8,400
165,000	8,250	12,375	6,188	17,325	8,663
170,000	8,500	12,750	6,375	17,850	8,925
175,000	8,750	13,125	6,563	18,375	9,188
180,000	9,000	13,500	6,750	18,900	9,450
185,000	9,250	13,875	6,938	19,425	9,713
190,000	9,500	14,250	7,125	19,950	9,975
195,000	9,750	14,625	7,313	20,475	10,238
200,000	10,000	15,000	7,500	21,000	10,500
205,000	10,250	15,375	7,688	21,525	10,763
210,000	10,500	15,750	7,875	22,050	11,025
215,000	10,750	16,125	8,063	22,575	11,288
220,000	11,000	16,500	8,250	23,100	11,550
225,000	11,250	16,857	8,438	23,625	11,813
230,000	11,500	17,250	8,625	24,150	12,075

[1]The 1994 date refers to dwellings constructed under the 1994 Minnesota Energy Code. The default KAIR used in this section of the table is 0.20 ACH.
[2]This section of the table is to be used for dwellings constructed prior to 1994. The default KAIR used in this section of the table is 0.40 ACH.

Subfloor preparation

- The gas-permeable layer shall consist of one of the following:
  - 1. A uniform layer of clean aggregate, a minimum of 4 inches (102 mm) thick. The aggregate shall consist of material that will pass through a 2-inch (51 mm) sieve and be retained by a 1/4 inch (6.4 mm) sieve.
  - 2. A uniform layer of sand (native or fill), a minimum of 4 inches (102 mm) thick, overlain by a layer or strips of geotextile drainage matting designed to allow the lateral flow of soil gases.
  - **3. Other materials, systems or floor designs with demonstrated capability to permit depressurization across the entire sub-floor area.**

SOIL-GAS RETARDER

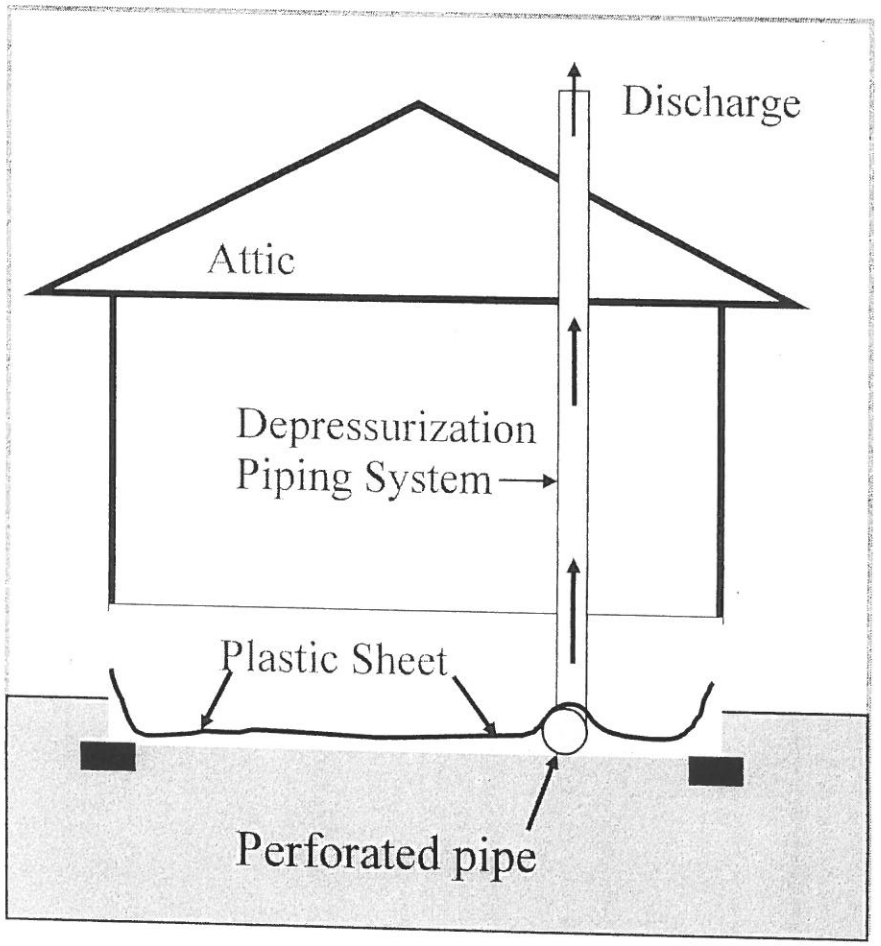
- A continuous membrane of 6-mil (0.15 mm) polyethylene, 3 mil (0.075 mm) cross-laminated polyethylene, or other equivalent material used to retard the flow of soil gases into a building.

Vent Pipe

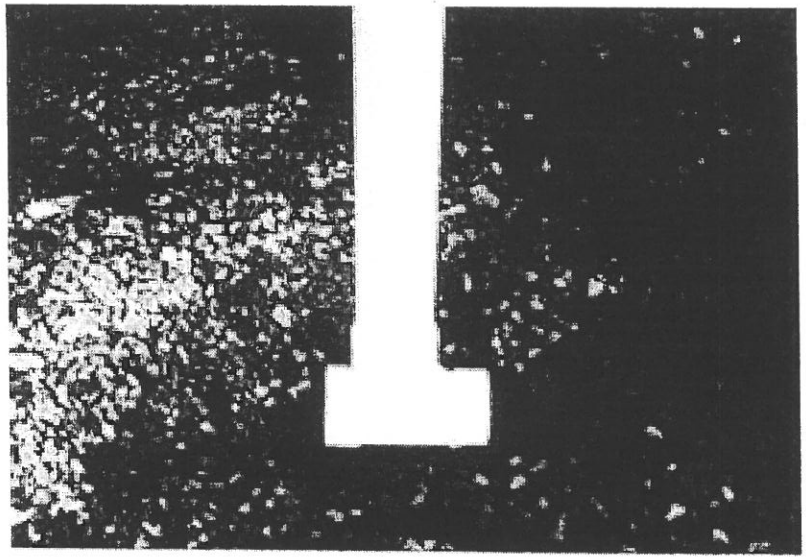
- A plumbing tee or other approved connection with one ten foot section of a perforated pipe connected to each side shall be inserted horizontally beneath the sheeting and connected to a 3" or 4" vertical pipe extended up through the building floors and terminate at least 12" above the roof in a location at least 10 feet away from any window or other opening into the conditioned space…

Passive System Concept for Crawl Spaces

- Suction point is under plastic sheet placed over exposed soil or rock
- Radon is collected and exhausted outdoors
- Seams and edges are sealed
  - Polyurethane caulk
  - Duct Tape

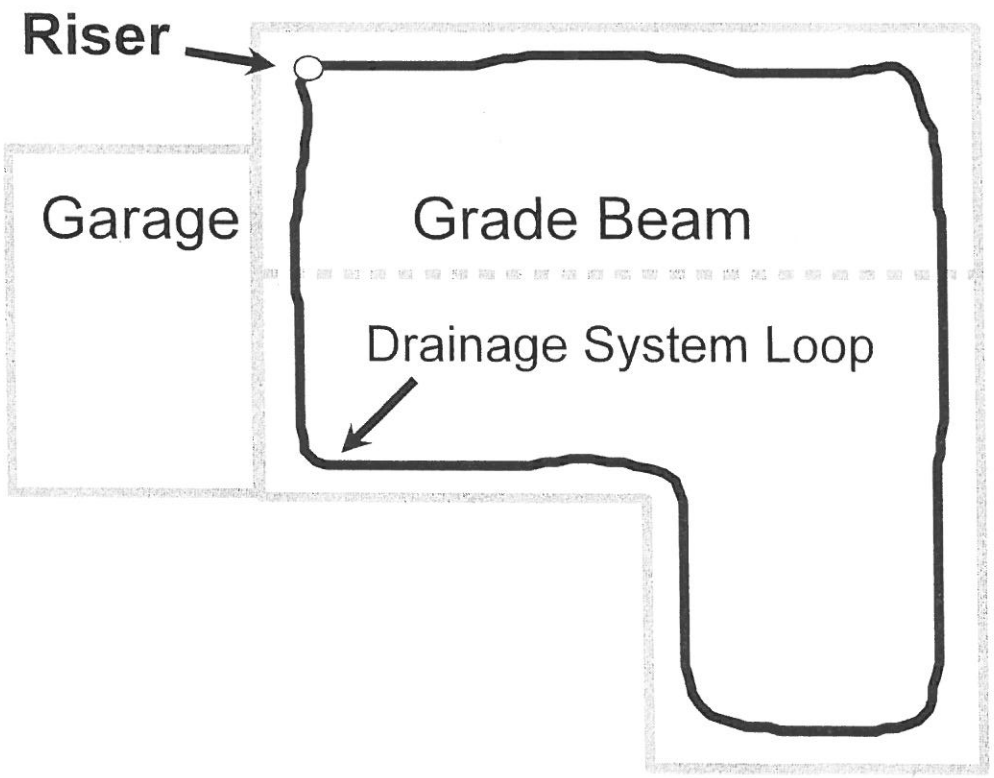


AF103.6.1 Vent Pipe



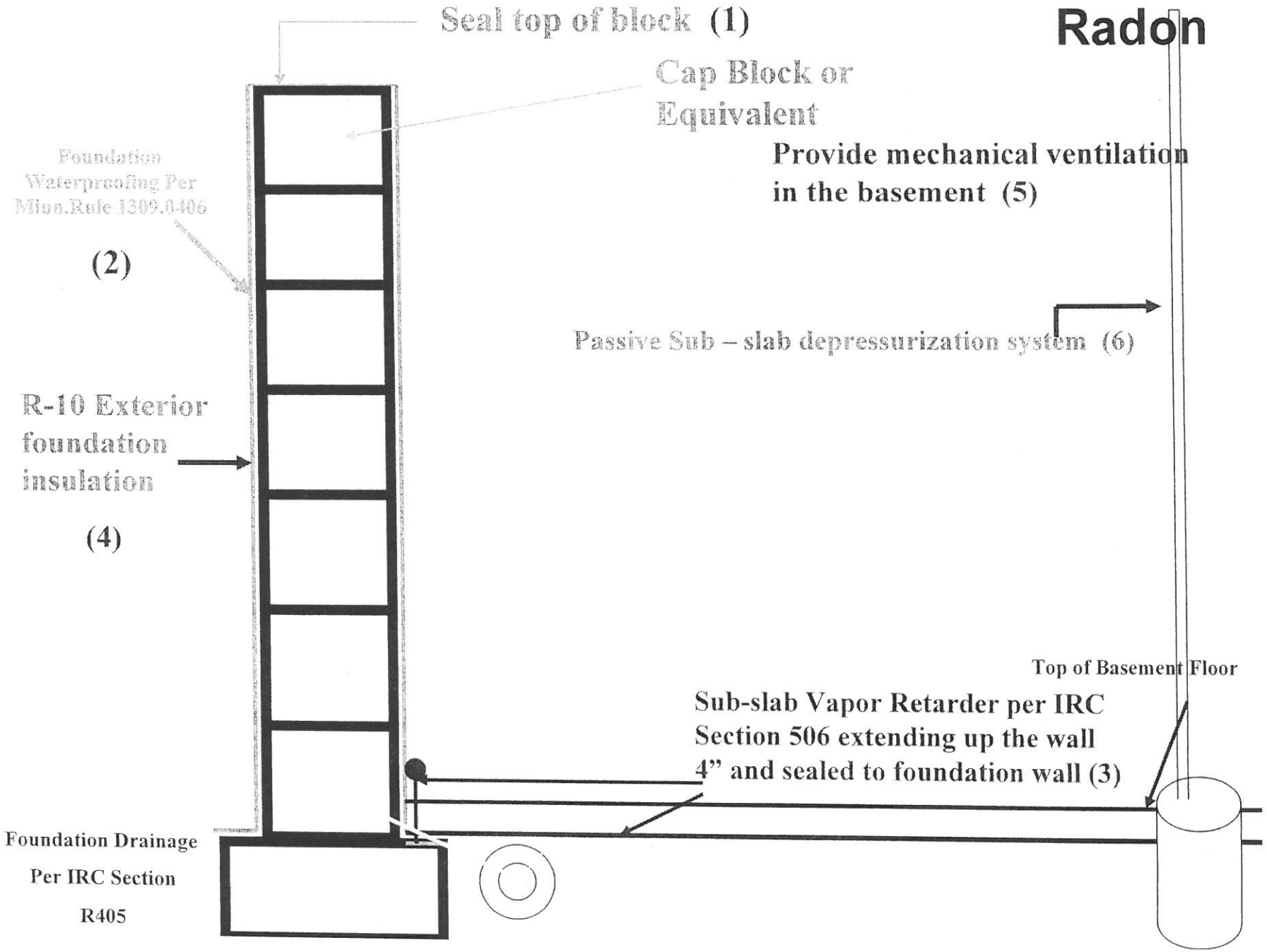
- Connect vent pipe to aggregate layer.
- Tee beneath slab
- Add one ten foot section of perforated pipe in each direction

Vent Pipe



- Connect vent pipe to interior perimeter drain tile.
- Make provisions for pipe to penetrate obstructions.

Radon


Seal top of block (1)
Cap Block or Equivalent
Provide mechanical ventilation in the basement (5)
Foundation Waterproofing Per Minn.Rule 1309.0406
(2)
Passive Sub – slab depressurization system (6)
R-10 Exterior foundation insulation
(4)
Top of Basement Floor
Sub-slab Vapor Retarder per IRC Section 506 extending up the wall 4" and sealed to foundation wall (3)
Foundation Drainage Per IRC Section R405

Radon

- A uniform layer of sand (native or fill), a minimum of 4 inches (102 mm) thick, overlain by a layer or strips of geotextile drainage matting designed to allow the lateral flow of soil gases.