Building Guide

Colorado Chapter of the International Code Council

Single Family Residential Basement Finish

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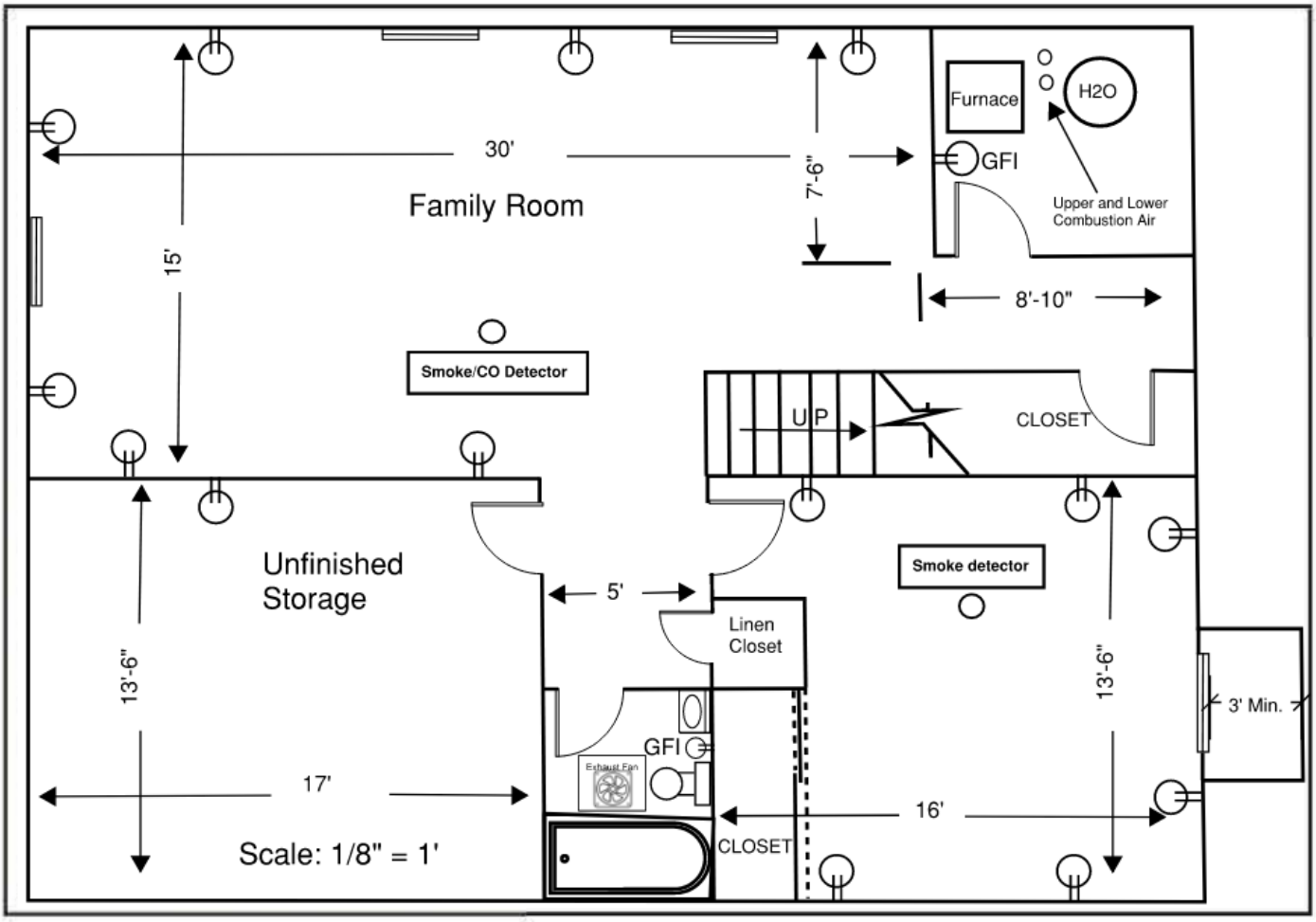

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Directions

- Identify modifications to the existing structure such as posts,
- Draw a floor plan with dimensions drawn to scale, showing the layout of the entire basement. Label the use for all of the rooms.
- Show electrical outlets, smoke alarms, carbon monoxide alarms, lighting, fans, plumbing modifications, cleanouts, furnace/heating appliances, and water heater.
- List window sizes and types, identify emergency escape and rescue windows, and egress window wells with ladder and clear dimensions of window well.
- Indicate height of dropped ceiling areas less than 7 feet.
- A shower or tub equipped with a showerhead shall have a minimum ceiling height of 6‘ 8” above a minimum area 30” by 30” at the showerhead. See Exception 2, P2708.1.
- See page 4 for minimum plumbing fixtures clearances.
- Show insulation values.

Basement Finish Requirements

1. Ceiling Heights:
If the finished ceiling will be less than 7', please consult your Building Department.

2. Emergency Escapes:
All basements and sleeping rooms must have an emergency escape window or exterior door. Emergency escape windows with a sill height below grade must be provided with an emergency escape window well and ladder if more than 44inches deep. (For emergency escape window and window well requirements, see page 3.)

3. Smoke Alarms:
Smoke alarms are required in all basements. If the finished basement contains a sleeping room, a smoke alarm must be installed on the ceiling or wall in the sleeping room and in the hallway or area immediately outside of the sleeping room. Smoke alarms added to satisfy the above requirements must be hard-wired with battery backup and interconnected with existing smoke alarms. Smoke alarms are required to be hardwired and interconnected in new and existing bedrooms, halls and on each level unless removal of interior wall or ceiling finishes would be required. In this case, battery operated devices are acceptable. Listed wireless alarms are acceptable.

4. Carbon Monoxide Alarms:
Carbon Monoxide alarms are required on each floor with bedrooms. They are recommended to be located no farther than 15 ft. from any bedroom entrance. Do not install within 15 ft. of a fuel burning appliances. Follow manufacturer’s recommendations for location testing and replacement.

5. Fuel Burning Appliances:
Furnaces and water heaters cannot be located in a bedroom or bathroom unless appliances are installed in a dedicated enclosure in which all combustion air is taken directly from outdoors, and a weather-stripped solid door equipped with an approved self-closing device is installed. If the furnace and water heater are enclosed, adequate combustion air must be provided for these appliances to operate properly (exception - direct vent appliances). For maintenance purposes, a minimum of 30 inches of clear working space must be provided in front of furnaces and water heaters. Maintenance or removal of each appliance must be possible without removing the other or disturbing walls, piping, valves, ducts, vents, wiring or junction boxes. For typical furnace and water heater clearances see page 4.

6. Fire blocking:
Fire blocking must be installed in concealed spaces of wood-furred walls at the ceiling level, at 10-foot intervals along the length of the wall and at all interconnections of concealed vertical and horizontal spaces such as intersection of stud walls and soffits or dropped ceilings. A detail of typical fire blocking is included on the following page of this handout. Fire blocks may be constructed of 1-1/2 inch lumber, 3/4 inch plywood, OSB or particle board, 1/2 inch gypsum board or fiberglass insulation 16 inches minimum in height, securely fastened.

7. Floated Walls:
In areas subject to floor heaving, non-bearing walls on basement floor slabs should be built to accommodate not less than 1-1/2 inches of floor movement. A detail of a typical floated wall is included on Page 3 of this hand-out.

8 Insulation:
Check with your Building Department for insulation requirements.

9.Space Under Stairs:
If access to the area or space under the basement stairs is provided for storage or other uses, the walls and ceiling of this enclosed space must be protected on the inside with1/2 inch gypsum board.

10.Bathrooms:
Toilets must be provided with a minimum of 21 inches in front of the toilet and 15 inches from the center of the toilet and any sidewall or other obstruction. Showers shall have a minimum inside dimension of 900 square inches, capable of encompassing a 30-inch circle and be finished 72 inches above the floor with non-absorbent materials. Shower door minimum clear opening width is 22 inches.

A ventilation fan is required in toilet rooms and bathrooms with unopenable windows. The fan must be vented to the exterior of the building and not to terminate within 3 feet of an opening.

11.Lighting & Ventilation:
Lighting and ventilation are required for any finished portion of the basement. Contact your Building Department for specific requirements.

The Building Department can help you determine what is necessary to meet minimum safety requirements.

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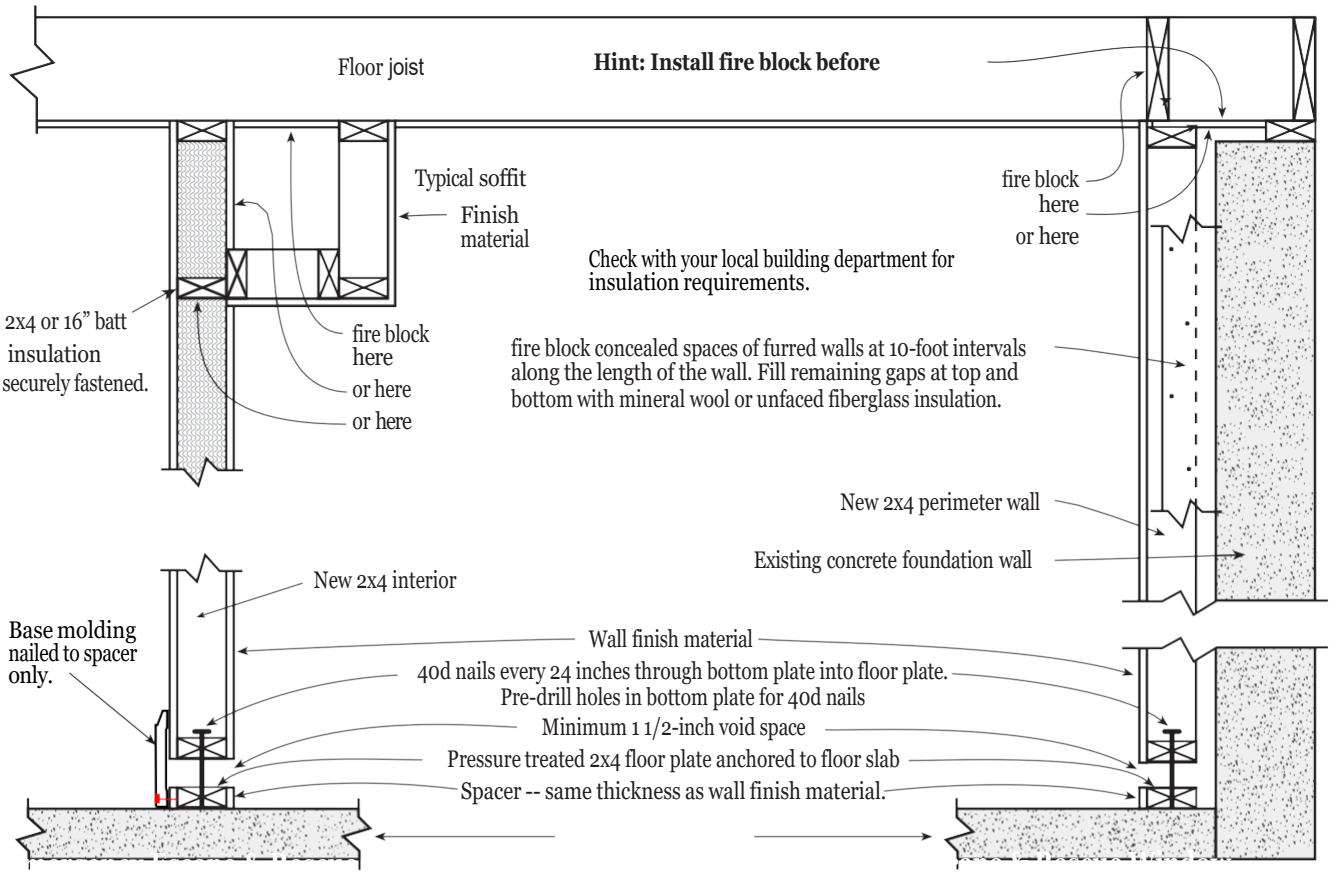
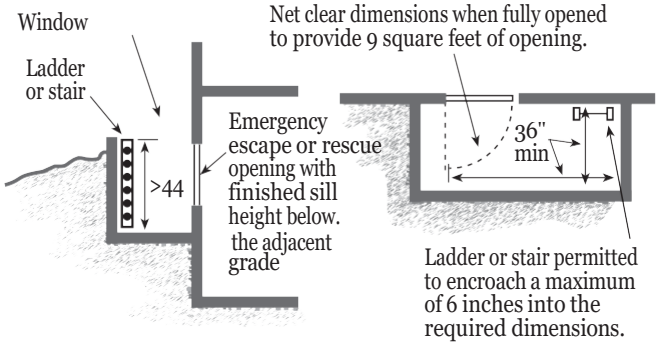
Basement Finish Details



Emergency Escape & Rescue Window Well

Emergency Escape and Rescue window wells must provide a minimum area of 9 square feet with a minimum dimension of 36 inches and shall enable the window to open fully. If the depth of the window well exceeds 44 inches, a permanently affixed ladder must be provided. The ladder must not interfere with the operation of the window.

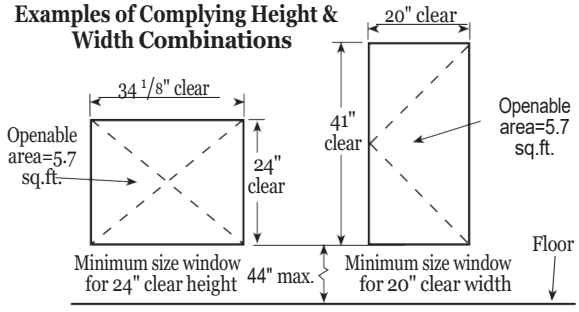


Emergency Escape & Rescue Window

Emergency Escape and Rescue Windows must meet the following criteria:

- A minimum total openable area of not less than 5.7 square feet
- A minimum clear openable height of not less than 24 inches
- A minimum clear openable width of not less than 20 inches.
- A finished sill height of not more than 44 inches above the floor and the window should be openable from the inside with normal operation and without the use of tools, keys, or special knowledge.

Examples of Complying Height & Width Combinations



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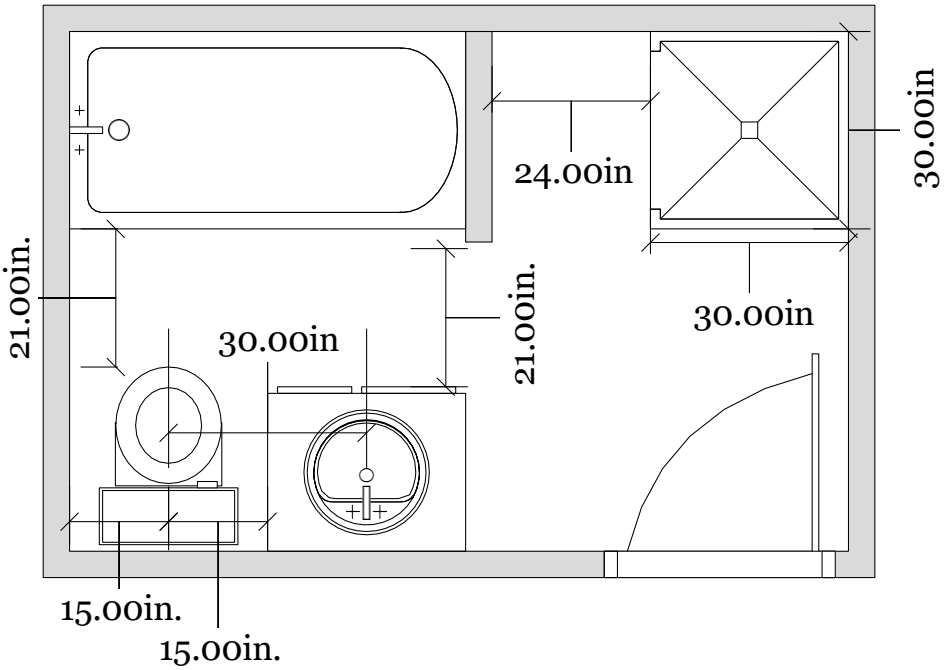
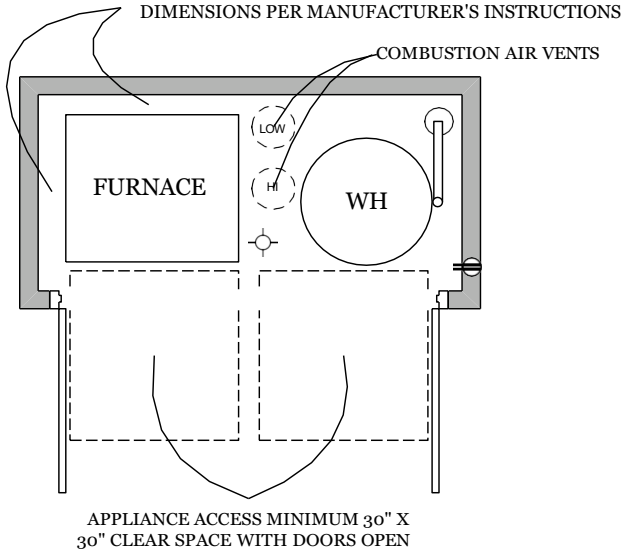
Bathroom Fixture Clearances



Furnace and water heater clearances



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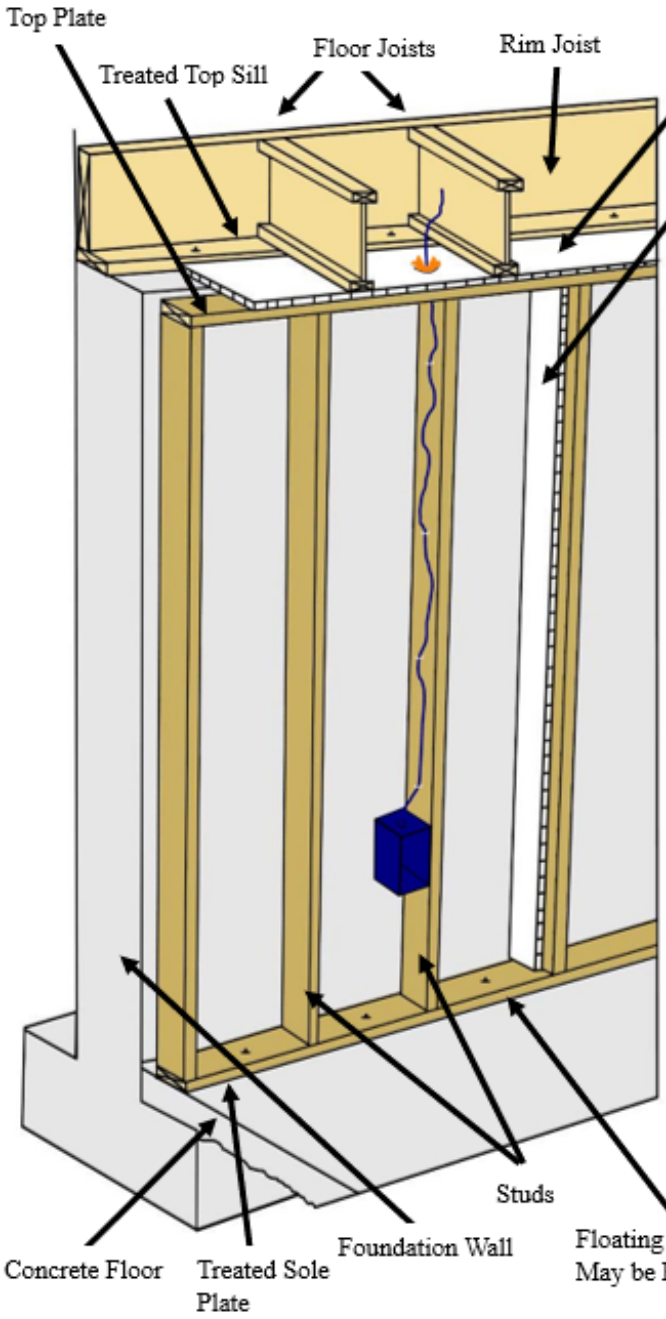
TYPICAL FIRE BLOCKING DIAGRAM



R302.11 Fireblocking.

In combustible construction, fireblocking shall be provided to cut off both vertical and horizontal concealed draft openings and to form an effective fire barrier between stories, and between a top story and the roof space.

Fireblocking shall be provided in wood-framed construction in the following locations:

1.In concealed spaces of stud walls and partitions, including furred spaces and parallel rows of studs or staggered studs, as follows:

1.1.Vertically at the ceiling and floor levels.

1.2.Horizontally at intervals not exceeding 10 feet (3048 mm).

2.At interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings and cove ceilings.

3.In concealed spaces between stair stringers at the top and bottom of the run. Enclosed spaces under stairs shall comply with Section R302.7.

4.At openings around vents, pipes, ducts, cables and wires at ceiling and floor level, with an approved material to resist the free passage of flame and products of combustion. The material filling this annular space shall not be required to meet the ASTM E136 requirements.

5.For the fireblocking of chimneys and fireplaces, see Section R1003.19.

6.Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation

See next page for Fireblocking materials.

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R302.11.1 Fireblocking materials.
Except as provided in Section R302.11, Item 4, fireblocking shall consist of the following materials.
1. Two-inch (51 mm) nominal lumber.
2. Two thicknesses of 1-inch (25.4 mm) nominal lumber with broken lap joints.
3. One thickness of 23/32-inch (18.3 mm) wood structural panels with joints backed by 23/32-inch (18.3 mm) wood structural panels.
4. One thickness of 3/4-inch (19.1 mm) particleboard with joints backed by 3/4-inch (19.1 mm) particleboard.
5. One-half-inch (12.7 mm) gypsum board.
6. One-quarter-inch (6.4 mm) cement-based millboard.
7. Batts or blankets of mineral wool or glass fiber or other approved materials installed in such a manner as to be securely retained in place.
8. Cellulose insulation installed as tested for the specific application.

R302.11.1.1 Batts or blankets of mineral or glass fiber.
Batts or blankets of mineral or glass fiber or other approved nonrigid materials shall be permitted for compliance with the 10-foot (3048 mm) horizontal fireblocking in walls constructed using parallel rows of studs or staggered studs.

R302.11.1.2 Unfaced fiberglass.
Unfaced fiberglass batt insulation used as fireblocking shall fill the entire cross section of the wall cavity to a minimum height of 16 inches (406 mm) measured vertically. When piping, conduit or similar obstructions are encountered, the insulation shall be packed tightly around the obstruction.

R302.11.1.3 Loose-fill insulation material.
Loose-fill insulation material shall not be used as a fireblock unless specifically tested in the form and manner intended for use to demonstrate its ability to remain in place and to retard the spread of fire and hot gases.

R302.11.2 Fireblocking integrity.
The integrity of all fireblocks shall be maintained.

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Code Requirements for Basement Finishes

(Must be kept attached to plans and available to inspectors)

- ✓ Minimum R-19 cavity insulation or R-15 continuous insulation is required at exterior walls.
  - Exception: Existing continuous insulation that is R-10 or greater.

  For walls where cavity insulation must be installed, 2x4 framing is acceptable provided the walls are spaced far enough from the concrete to provide the full depth for the insulation.
- ✓ Minimum ceiling height is 7 feet.
- ✓ A “floating” wall system is required for slab on grade basement floors.
- ✓ Bedrooms shall have at least one operable emergency escape and rescue window and window well. The minimum opening size at the top of egress window wells for new bedrooms must be 36”x36”. Existing wells that do not meet this requirement must be replaced.
- ✓ A Carbon Monoxide Detector is required outside of bedrooms within 15 feet of bedroom doors.
- ✓ Smoke detector locations must be updated to current code prior to final. All new bedrooms must be provided with a hardwired, battery-backup smoke detector interconnected with the smoke detector system.
- ✓ Water resistant gypsum board shall not be used where there is direct exposure to water.
- ✓ Use of water-resistant gypsum backing board shall be permitted on ceilings where framing spacing does not exceed 12 inches on center for 1/2-inch-thick or 16 inches for 5/8-inch-thick gypsum board. Water-resistant gypsum board shall not be installed over a Class I or II vapor retarder in a shower or tub compartment. Cut or exposed edges, including those at wall intersections, shall be sealed as recommended by the manufacturer.
- ✓ Minimum ventilation rate for a bathroom is 50 cu. ft./min intermittent, 20 cu. ft./min. continuous.
- ✓ Bathroom ventilation fans shall be exhausted directly to the exterior of the house.
- ✓ Provide a minimum of 15 inches from centerline of water closet to walls, cabinets and showers and provide a minimum of 21 inches in front of the water closet.
- ✓ Liners for site-formed shower pans constructed on wood floors must have a separate test and inspection.
- ✓ Bathrooms shall be on a separate 20-amp circuit.
- ✓ Bathroom receptacles and receptacles within 6 feet of a bar sink shall have GFCI protection. A receptacle must be located within 36” of the outside edge of each bathroom sink.
- ✓ Lighting located above a shower or bathtub must be labeled for damp locations.
- ✓ All circuits in habitable rooms must be arc-fault protected.
- ✓ All receptacles must be GFCI protected. Receptacles installed in finished areas shall also be AFCI protected.
- ✓ Outlets shall be spaced so that no point along the wall is more than 6’ from an outlet. Walls

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- ✓ Every habitable room and bathroom must have at least one wall switch-controlled light except that, in other than bathrooms, one or more receptacles controlled by a wall switch is allowed.
- ✓ Dryers must be vented to the outside and shall be no closer than 3 feet from other openings into the building. Duct length shall not exceed 35 feet; this length must be reduced 5 feet for each 90-degree bend.
- ✓ Provide ½" drywall on walls and ceiling under stairway if enclosed and accessible.
  - Does not apply to under-stair spaces that are open to larger storage or mechanical rooms.
- ✓ Drywall applied without adhesive must be fastened according to the following table:

TABLE R702.3.5 MINIMUM THICKNESS AND APPLICATION OF GYPSUM BOARD AND GYPSUM PANEL PRODUCTS

THICKNESS OF GYPSUM BOARD OR GYPSUM PANEL PRODUCTS (inches)	APPLICATION	ORIENTATION OF GYPSUM BOARD OR GYPSUM PANEL PRODUCTS TO FRAMING	MAXIMUM SPACING OF FRAMING MEMBERS (inches o.c.)	MAXIMUM SPACING OF FASTENERS (inches)	
				Nails[a]	Screws[b]
Application without adhesive					
1/2	Ceiling	Either direction	16	7	12
	Ceiling[d]	Perpendicular	24	7	12
	Wall	Either direction	24	8	12
	Wall	Either direction	16	8	16
5/8	Ceiling	Either direction	16	7	12
	Ceiling	Perpendicular	24	7	12
	Type X at garage ceiling beneath habitable rooms	Perpendicular	24	6	6
	Wall	Either direction	24	8	12
	Wall	Either direction	16	8	16
Application with adhesive					
1/2 or 5/8	Ceiling	Either direction	16	16	16
	Ceiling[d]	Perpendicular	24	12	16
	Wall	Either direction	24	16	24

This plan review is based on the 2024 International Residential Code and represents a list of corrections necessary to comply with the requirements contained within them. This review is not a building permit. The approval of plans and specifications does not permit the violation of any section of federal, state, or local regulations. All comments in this report are based on the information provided on the drawings and supporting documentation provided for review. The City of Thornton does not accept any responsibility for any condition that was not known at the time of this plan review report. The City of Thornton reserves the right to amend this plan review report if additional information is received.

► For application without adhesive, a pair of nails spaced not less than 2 inches apart or more than 2 1/2 inches apart may be used with the pair of nails spaced 12 inches on center.

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Mechanical room requirements

- ✓ Provide an approved path for basement return air to the furnace. Return air openings must be located not less than 10' from an open combustion chamber or draft hood of another appliance located in the same room or space.
- ✓ A 30"x30" clear working space must be provided adjacent to the control side of furnaces. Doors with a minimum width of 30" that open in front of the furnace shall not be considered an obstruction to the working space.
- ✓ Combustion air must be maintained to fuel burning appliances that have open draft hoods by compliance with one of the following options:

Option 1: Mechanical rooms or spaces created by the construction of new walls and have existing outside combustion air ducts that open into the room require a fully gasketed door, and insulation within the room as follows:

- Interior walls R-30 (exterior foundation walls within the mechanical room exempt)
- Ceilings R-30
- Ducts R-8 (including the combustion air duct outside the mechanical room)
- Water pipes R-3

The interior walls and ceiling of the mechanical room, space or closet must be completely drywalled. In some cases, it may be advisable to construct a smaller mechanical room within a larger unfinished storage space.

Option 2: The open combustion air ducts to the exterior must be removed or capped and the mechanical room provided with combustion air taken from interior spaces. Such spaces shall freely communicate with each other and the mechanical room and shall have a combined volume of at least 50 cubic feet per 1,000 Btu/h of the combined appliance input rating of all draft-hood equipped appliances within the enclosure. No additional insulation for the mechanical room is required with this option.

Example: A 900 square foot basement with 7'-6" ceilings has a 300 sq. ft. bedroom, and a 520 sq. ft. family room. The mechanical room is 80 sq. ft. with an 80,000 btuh furnace and a 40,000 btuh water heater both with draft hoods:

Furnace input rating:	__80000___ btuh
Water heater input rating:	__40000___ btuh
Additional furnace/water heater(s)	_____ btuh
Total:	**__120000__ btuh**

Total btuh÷1,**000** multiply by 50= **____6,000___** ft^3

Mechanical room ___80__ ft^2 x ceiling height ___7.5___ = ___600____ft^3
Interior space area __ 300__ft^2 x ceiling height ___7.5___ = __2,250___ft^3
Interior space area __ 520__ft^2 x ceiling height ___7.5___ = __3,900___ft^3
Total volume: ___6,750___ft^3 ≥ 6,000 ft^3

Divide **total btuh** by 1,000 for each required mech room openings ___120____ in^2

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If Option 2 is chosen, Complete worksheet and provide to the inspector at rough inspections.

Indoor combustion air option worksheet:

Calculate appliance input rating (this number can be found on the appliance nameplate)
Enter all fuel burning appliances with open draft hood:

Furnace input rating:	_____ btuh
Water heater input rating:	_____ btuh
Additional furnace/water heater(s)	_____ btuh
Total:	_____ **btuh**

Calculate **required volume** of inside spaces:

Total btuh ÷ **1,000** multiply by 50= _____ cubic feet

Calculate interior space volume (Enter mechanical room and all spaces that communicate directly with each other and mechanical room**):

Mechanical room _____ ft^2 x ceiling height _____ = _____ ft^3
Interior space area _____ ft^2 x ceiling height _____ = _____ ft^3
Interior space area _____ ft^2 x ceiling height _____ = _____ ft^3
Total volume of interior spaces: _____ ft^3

**If additional volume is needed, the area in the upper levels may be used if they communicate with the basement through opening(s) having 2 square inches for each 1,000 btuh total appliance input rating.

A minimum of two openings are required between the mechanical room and basement. Each opening shall have a minimum free area of 1 square inch per 1,000 Btu/h of the total input rating of all draft-hood equipped appliances in the space, but not less than 100 square inches. One opening shall commence within 12 inches of the top and one opening shall commence within 12 inches of the bottom of the enclosure. The minimum dimension of air openings shall be not less than 3 inches. Such openings must be provided to connect any spaces in the basement used to provide the required volume of inside combustion air and should be blocked out at framing inspection.

Calculate required mechanical room openings to interior space.

Divide **total btuh** by 1,000 for each required mech room openings _____ in^2

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