

PARTIAL BUILDING GUIDE LINES

Michigan Residential Code

Applicable Code. These provisions are taken from the *Michigan Residential Code for One- and Two-Family Dwellings* and applies to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, removal and demolition of detached one- & two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with a separate means of egress and their accessory structures. **NOTE: This document is used as general reference to common violations and questions and is not intended to replace a code book. If you wish to order a code book contact our office.**

SUBMITTAL DOCUMENTS.

1. Construction documents, special inspection and structural observation programs, and other data shall be submitted in one or more sets with each application for a permit. The construction documents shall be prepared by or under the direct supervision of a registered design professional where required by article 20 of 1980 PA 299, MCL 339.101 et seq., and known as the Michigan occupational code. E.g. greater than 3500 S.F. of habitable space. Where special conditions exist, the building official is authorized to require additional construction documents to be prepared by a registered design professional.

INSPECTION REQUESTS.

2. It shall be the duty of the permit holder or their agent to notify the building official that such work is ready for inspection. It shall be the duty of the person requesting any inspections required by this code to provide access to and means for inspection of such work. **REQUIRED INSPECTIONS.**

3. **Foundation Inspection.** Inspection of the foundation shall be made after poles or piers are set or trenches or basement areas are excavated and any required forms erected and any required reinforcing steel is in place and prior to the placing of concrete. The foundation inspection shall include excavations for thickened slabs intended for the support of bearing walls, partitions, structural supports, or equipment and special requirements for wood foundations.
4. **Frame and Masonry Inspection.** Inspection of framing and masonry construction shall be made after the roof; all framing, firestopping, draftstopping and bracing are in place and after the plumbing, mechanical and electrical rough inspections are approved. Masonry inspections shall be normally made before the installation of masonry veneer and after the installation of base course flashing and water-resistant barrier. **Final Inspection.** Final inspection shall be made after the permitted work is complete and prior to occupancy.
5. **Other Inspections.** In addition to the called inspections above, the building official may make or require any other inspections to ascertain compliance with this code and other laws enforced by the building official. (R109.1.5)
 - a. **Floodplain Inspections.** For construction in areas prone to flooding upon placement of the lowest floor, including basement, and prior to further vertical construction, the building official shall require submission of documentation, prepared and sealed by a registered design professional, of the elevation of the lowest floor, including basement, required in the code.
6. **Fire-resistance-rated Construction Inspection.** Where fire-resistance-rated construction is required between dwelling units or due to location on property, the building official shall require an inspection of such construction after all lathing and/or wallboard is in place, but before any plaster is applied, or before wallboard joints and fasteners are taped and finished.
7. **SITE ADDRESS**

8. **Premises identification.** Approved numbers or addresses shall be provided for all new buildings in such a position as to be plainly visible and legible from the street or road fronting the property.

DESIGN CRITERIA

9. Buildings and structures, and all parts thereof, shall be constructed to safely support all loads, including dead loads, live loads, roof loads, flood loads, snow loads, wind loads and seismic loads as prescribed by this code. The construction of buildings and structures shall result in a system that provides a complete load path capable of transferring all loads from their point of origin through the load-resisting elements to the foundation. **NOTE: Ground Snow** loads in Newaygo County are both 40 & 50 PSF depending on location. Contact our Department with exact job location to determine specific load.

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW LOAD	WIND SPEED ^a (mph)	SEISMIC DESIGN CATEGORY ^g	SUBJECT TO DAMAGE FROM				WINTER DESIGN TEMP ^f	ICE SHIELD UNDER-LAYMENT REQUIRED ^j	FLOOD HAZARDS ^h	AIR FREEZING INDEX ⁱ	MEAN ANNUAL TEMP ^k
			Weathering ^a	Frost line depth ^b	Termite ^e	Decay ^d					
40 / 50	90	A	Severe	24 / 42	Slight	Slight	5°	Yes	Twp/City	1500	45°

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS
(in pounds per square foot)

USE	LIVE LOAD
Attics with storage	20
Attics without storage	10
Decks	40
Exterior balconies	60
Fire escapes	40
Guardrails and handrails	200
Guardrails in-fill components	50
Passenger vehicle garages	50
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40

LIGHT, VENTILATION AND HEATING

10. **Habitable Rooms.** All habitable rooms shall be provided with aggregate glazing area of not less than 8 percent of the floor area of such rooms. Natural ventilation shall be through windows, doors, louvers or other approved openings to the outdoor air. Such openings shall be provided with ready access or shall otherwise be readily controllable by the building occupants. The minimum open able area to the outdoors shall be 4 percent of the floor area being ventilated. **Stairway Illumination.** All interior and exterior stair-ways shall be provided with a means to illuminate the stairs, including the landings and treads. **Required heating.** When the winter design temperature is below 60° F, every dwelling unit shall be provided with heating facilities capable of maintaining a minimum room temperature of 68° F at a point 3 feet above the floor and 2 feet from exterior walls in all habitable rooms at the design temperature. The installation of one or more portable space heaters shall not be used to achieve compliance with this section. **MINIMUM ROOM AREAS**

11. **Minimum Area.** Every dwelling unit shall have at least one habitable room that shall have not less than 120 square feet of gross floor area. **Other Rooms.** Other habitable rooms shall have a floor area of not less than 70 square feet **Exception:** Kitchens.
12. **Minimum Dimensions.** Habitable rooms shall not be less than 7 feet in any horizontal dimension. **Exception:** Kitchens.

CEILING HEIGHT

13. **Minimum Height.** Habitable rooms, hallways, corridors, bathrooms, toilet rooms, laundry rooms and basements shall have a ceiling height of not less than 7 feet. The required height shall be measured from the finish floor to the lowest projection from the ceiling.

Exceptions:

1. Beams and girders spaced not less than 4 feet on center may project not more than 6 inches below the required ceiling height.
2. Ceilings in basements without habitable spaces may project to within 6 feet, 8 inches of the finished floor; and beams, girders, ducts or other obstructions may project to within 6 feet, 4 inches of the finished floor.
3. Not more than 50 percent of the required floor area of a room or space is permitted to have a sloped ceiling less than 7 feet in height with no portion of the required floor area less than 5 feet in height.
4. Bathrooms shall have a minimum ceiling height of 6 feet 8 inches over the fixture and at the front clearance area for fixtures. A shower or tub equipped with a showerhead shall have a minimum ceiling height of 6 feet 8 inches above a minimum area 30 inches by 30 inches at the showerhead.

GARAGES AND CARPORTS

14. **Separation Required.** The garage shall be separated from the residence and its attic area by not less than 1/2-inch gypsum board applied to the garage side. Garages beneath habitable rooms shall be separated from all habitable rooms above by not less than 5/8-inch Type X gypsum board or equivalent. Where the separation is a floor-ceiling assembly, the structure supporting the separation shall also be protected by not less than 1/2-inch gypsum board or equivalent.
15. **Floor Surface.** Garage floor surfaces shall be of approved noncombustible material. The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway or a 4 inch step up from the garage to the house.
16. **Carports.** Carports shall be open on at least two sides

EMERGENCY ESCAPE AND RESCUE OPENINGS

17. **Emergency escape and rescue required.** Basements with habitable space and every sleeping room shall have at least one openable emergency escape and rescue opening. Where basements contain one or more sleeping rooms, emergency egress and rescue openings shall be required in each sleeping room, but shall not be required in adjoining areas of the basement.
 1. **Minimum opening area.** All emergency escape and rescue openings shall have a minimum net clear opening of 5.7 square feet Exception: Grade floor openings shall have a minimum net clear opening of 5 square feet
 2. **Minimum opening height.** The minimum net clear opening height shall be 24 inches
 3. **Minimum opening width.** The minimum net clear opening width shall be 20 inches
 4. **Operational constraints.** Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools. **Ladder and steps.** Window wells with a vertical depth greater than 44 inches shall be equipped with a permanently affixed ladder or steps usable with the window in the fully open position.

MEANS OF EGRESS

18. **Under stair protection.** Enclosed accessible space under stairs shall have walls, under stair surface and any soffits protected on the enclosed side with 1/2-inch gypsum board.
19. **Hallways.** The minimum width of a hallway shall be not less than 3 feet.
20. **Exit door required.** Not less than one exit door shall be provided for each dwelling unit. Door type and size. The required exit door shall be a side-hinged door not less than 3 feet in width and 6 feet 8 inches in height. Other doors shall not be required to comply with these minimum dimensions.
21. **Landings at doors.** There shall be a floor or landing on each side of each exterior door .Exception: Where a stairway of two or fewer risers is located on the exterior side of a door, other than the required exit door, a landing is not required for the exterior side of the door. The floor or landing at the exit door required by shall not be more than 1.5 inches lower than the top of the threshold. The floor or landing at exterior doors other than the exit door shall not be required to comply with this requirement but shall have a rise no greater than 7-3/4 inches.

22. **Headroom.** The minimum headroom in all parts of the stairway shall not be less than 6 feet 8 inches measured vertically from the sloped plane adjoining the tread nosing or from the floor surface of the landing
23. **Stair treads and risers.**
1. **Riser height.** The maximum riser height shall be 8-1/4 inches. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch
 2. **Tread depth.** The minimum tread depth shall be 9 inches. Every landing shall have a minimum dimension of 36 inches measured in the direction of travel.
24. **Handrails.** Handrails shall be provided on at least one side of each continuous run of treads or flight with four or more risers.
1. **Height.** Handrail height, measured vertically from the sloped plane adjoining the tread nosing, or finish surface of ramp slope, shall be not less than 34 inches and not more than 38 inches
25. **Stairway illumination.** All interior and exterior stair ways shall be provided with a means to illuminate the stairs, including the landings and treads. Interior stairways shall be provided with an artificial light source located in the immediate vicinity of each landing of the stairway. For interior stairs the artificial light sources shall be capable of illuminating treads and landings to levels not less than 1 foot-candle, measured at the center of treads and landings. Exterior stairways shall be provided with an artificial light source located in the immediate vicinity of the top landing of the stairway. Exterior stairways providing access to a basement from the outside grade level shall be provided with an artificial light source located in the immediate vicinity of the bottom landing of the stairway.
- Exception:** An artificial light source is not required at the top and bottom landing, provided an artificial light source is located directly over each stairway section. **Light activation.** The control for activation of the required interior stairway lighting shall be accessible at the top and bottom of each stairway without traversing any steps. The illumination of exterior stairways shall be controlled from inside the dwelling unit.
- Ramps.** Ramps shall have a maximum slope of one unit vertical in twelve units horizontal
1. **Landings required.** A minimum 3-foot-by-3-foot landing shall be provided:
 - a. At the top and bottom of ramps,
 - b. Where doors open onto ramps,
 2. Where ramps change direction.
 3. **Handrails required.** Handrails shall be provided on at least one side of all ramps exceeding a slope of one unit vertical in 12 units horizontal

GUARDS

26. **Guards required.** Porches, balconies or raised floor surfaces located more than 30 inches above the floor or grade below shall have guards not less than 36 inches in height. Open sides of stairs with a total rise of more than 30 inches above the floor or grade below shall have guards not less than 34 inches in height measured vertically from the nosing of the treads. Porches and decks which are enclosed with insect screening shall be provided with guards where the walking surface is located more than 30 inches above the floor or grade below.
27. **Guard opening limitations.** Required guards on open sides of stairways, raised floor areas, balconies and porches shall have intermediate rails or ornamental closures which do not allow passage of a sphere 4 inches or more in diameter.

28. SMOKE ALARMS

29. **Smoke alarms.** Smoke alarms shall be installed in the following locations:
1. In each sleeping room.
 2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
 3. On each story of a building, including basements.
30. **Interconnection.** When more than one smoke alarm is required to be installed within an individual dwelling unit the alarm devices shall be inter connected in such a manner that the actuation of one alarm will activate all of the alarms in the individual unit. The alarm shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed.

31. Alterations, repairs and additions. When interior alterations, repairs or additions requiring a permit occur, or when one or more sleeping rooms are added or created in existing dwellings, the individual dwelling unit shall be provided with smoke alarms located as required for new dwellings; the smoke alarms shall be interconnected and hard wired.

Exceptions:

1. Smoke alarms in existing areas shall not be required to be interconnected and hard wired where the alterations or repairs do not result in the removal of interior wall or ceiling finishes exposing the structure, unless there is an attic, crawl space, or basement available which could provide access for hard wiring and interconnection without the removal of interior finishes.

32. Repairs to the exterior surfaces of dwellings are exempt from the requirements of this section.

33.

34. Power source. In new construction, the required smoke alarms shall receive their primary power from the building wiring when such wiring is served from a commercial source, and when primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for over current protection. Smoke alarms shall be permitted to be battery operated when installed in buildings without commercial power or in buildings that undergo alterations, repairs or additions

FOAM PLASTIC

35. Thermal barrier. Foam plastic, except where otherwise noted, shall be separated from the interior of a building by minimum 1/2-inch (12.7 mm) gypsum board or an approved finish material. The gypsum board shall be installed using a mechanical fastening system. Reliance on adhesives to ensure that the gypsum board will remain in place when exposed to fire shall be prohibited.

INSULATING REQUIREMENTS (MICHIGAN UNIFORM ENERGY CODE) 2003

36. Walls must be R-21 or greater.

37. Ceilings must be R-49

38. Energy efficient windows with sealed, two pane construction should be used with an average of R-2.8 depending on the percentage of windows area to exterior wall area.

39. Floors over un-conditioned spaces, should have R-21

40. Slabs on grade, should have R-13 for unheated slabs and R-5 for heated slabs.

41. Crawl space walls, R-20.

42. Basement walls, R10.

MOISTURE VAPOR RETARDERS

43. Moisture control. In all framed walls, floors and roof ceilings comprising elements of the building thermal envelope, a vapor retarder shall be installed on the warm-in-winter side of the insulation.

PROTECTION AGAINST DECAY

44. Location required. In areas subject to decay damage, the following locations shall require the use of an approved species and grade of lumber, pressure treated in accordance with AWPAC1, C2, C3, C4, C9, C15, C18, C22, C23, C24, C28, C31, C33, P1, P2 and P3, or decay-resistant heartwood of redwood, black locust, or cedars.

1. Wood joists or the bottom of a wood structural floor when closer than 18 inches (457 mm) or wood girders when closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated area located within the periphery of the building foundation.
2. All wood framing members that rest on concrete or masonry exterior foundation walls and are less than 8 inches from the exposed ground.
3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.
4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than 0.5 inch on tops, sides and ends.
5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches from the ground.

6. Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier.
 7. Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below grade except where an approved vapor retarder is applied between the wall and the furring strips or framing members.
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FOUNDATIONS

45. **Minimum depth.** Minimum depth for footings, including under walkout doors, shall be 24" in sand and 42" in heavy soils such as clay or heavy loam. **Size.** Typical footings are 8" thick and 16" wide and extend below the frost line.
46. **Removal of debris.** The under-floor grade shall be cleaned of all vegetation and organic material. All wood forms used for placing concrete shall be removed before a building is occupied or used for any purpose. All construction materials shall be removed before a building is occupied or used for any purpose.
47. **Access.** Access shall be provided to all under-floor spaces. Access openings through the floor shall be a minimum of 18 inches by 24 inches (457 mm x 610 mm). Openings through a perimeter wall shall be 16 inches by 24 inches. When any portion of the through wall access is below grade, an areaway of not less than 16 inches by 24 inches shall be provided. The bottom of the areaway shall be below the threshold of the access opening. Through wall access openings shall not be located under a door to the residence.
48. **Foundation Anchorage**
 1. Foundation anchor bolts shall be $\frac{1}{2}$ " x $7\frac{1}{2}$ " long and placed 6 feet on center and not more than 6 inches from the corners
 2. Metal straps shall be installed according to manufacturer's specifications, typically 3 feet on center. With straps spread before installation, otherwise the plates must be drilled.
49. **Drainage.** Final grade shall be sloped away from the walls and shall fall a minimum of 6" within the first ten feet.
50. **Height above finished grade.** Concrete, masonry and ICF (Insulated Concrete Form) foundation walls shall extend above the finished grade adjacent to the foundation at all points a minimum of 4 inches where masonry veneer is used and a minimum of 6 inches elsewhere
51. **Backfill placement.** Backfill shall not be placed against the wall until the wall has sufficient strength and has been anchored to the floor above, or has been sufficiently braced to prevent damage by the backfill.
52. **Concrete or masonry foundation drainage.** Drains shall be provided around all concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below grade. Drainage tiles, gravel or crushed stone drains, perforated pipe or other approved systems or materials shall be installed at or below the area to be protected and shall discharge by gravity or mechanical means into an approved drainage system. Gravel or crushed stone drains shall extend at least 1 foot beyond the outside edge of the footing and 6 inches above the top of the footing and be covered with an approved filter membrane material. The top of open joints of drain tiles shall be protected with strips of building paper, and the drainage tiles or perforated pipe shall be placed on a minimum of 2 inches of washed gravel or crushed rock at least one sieve size larger than the tile joint opening or perforation and covered with not less than 6 inches (153 mm) of the same material.

53. **Exception:** A drainage system is not required when the foundation is installed on well-drained ground or sand-gravel mixture soils according to the Unified Soil Classification System, Group I Soils, as detailed in

**TABLE R405.1
PROPERTIES OF SOILS CLASSIFIED ACCORDING TO THE UNIFIED SOIL CLASSIFICATION SYSTEM**

SOIL GROUP	UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOL	SOIL DESCRIPTION	DRAINAGE CHARACTERISTICS ^a	FROST HEAVE POTENTIAL	VOLUME CHANGE POTENTIAL EXPANSION ^b
Group I	GW	Well-graded gravels, gravel sand mixtures, little or no fines.	Good	Low	Low
	GP	Poorly graded gravels or gravel sand mixtures, little or no fines.	Good	Low	Low
	SW	Well-graded sands, gravelly sands, little or no fines.	Good	Low	Low
	SP	Poorly graded sands or gravelly sands, little or no fines.	Good	Low	Low
	GM	Silty gravels, gravel-sand-silt mixtures.	Good	Medium	Low
	SM	Silty sand, sand-silt mixtures.	Good	Medium	Low
Group II	GC	Clayey gravels, gravel-sand-clay mixtures.	Medium	Medium	Low
	SC	Clayey sands, sand-clay mixture.	Medium	Medium	Low
	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	Medium	High	Low
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Medium	Medium	Medium to Low
Group III	CH	Inorganic clays of high plasticity, fat clays.	Poor	Medium	High
	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Poor	High	High
Group IV	OL	Organic silts and organic silty clays of low plasticity.	Poor	Medium	Medium
	OH	Organic clays of medium to high plasticity, organic silts.	Unsatisfactory	Medium	High
	Pt	Peat and other highly organic soils.	Unsatisfactory	Medium	High

For SI: 1 inch = 25.4 mm.

- a. The percolation rate for good drainage is over 4 inches per hour, medium drainage is 2 inches to 4 inches per hour, and poor is less than 2 inches per hour.
- b. Soils with a low potential expansion typically have a plasticity index (PI) of 0 to 15, soils with a medium potential expansion have a PI of 10 to 35 and soils with a high potential expansion have a PI greater than 20.

Table

**TABLE R404.1.1(1)
PLAIN CONCRETE AND PLAIN MASONRY FOUNDATION WALLS**

MAXIMUM WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT ^a (feet)	PLAIN CONCRETE MINIMUM NOMINAL WALL THICKNESS (inches)			PLAIN MASONRY ^a MINIMUM NOMINAL WALL THICKNESS (inches)		
		Soil classes ^b					
		GW, GP, SW and SP	GM, GC, SM, SM-SC and ML	SC, MH, ML-CL and inorganic CL	GW, GP, SW and SP	GM, GC, SM, SM-SC and ML	SC, MH, ML-CL and inorganic CL
5	4	6	6	6	6 solid ^d or 8	6 solid ^d or 8	6 solid ^d or 8
	5	6	6	6	6 solid ^d or 8	8	10
6	4	6	6	6	6 solid ^d or 8	6 solid ^d or 8	6 solid ^d or 8
	5	6	6	6	6 solid ^d or 8	8	10
	6	6	8 ^g	8 ^g	8	10	12
7	4	6	6	6	6 solid ^d or 8	8	8
	5	6	6	8 ^g	6 solid ^d or 8	10	10
	6	6	8	8	10	12	10 solid ^d
	7	8	8	10	12	10 solid ^d	12 solid ^d
8	4	6	6	6	6 solid ^d or 8	6 solid ^d or 8	8
	5	6	6	8	6 solid ^d or 8	10	12
	6	8 ^h	8	10	10	12	12 solid ^d
	7	8	10	10	12	12 solid ^d	Footnote e
9	4	6	6	6	6 solid ^d or 8	6 solid ^d or 8	8
	5	6	8 ^g	8	8	10	12
	6	8	8	10	10	12	12 solid ^d
	7	8	10	10	12	12 solid ^d	Footnote e
	8	10	10	12	12 solid ^d	Footnote e	Footnote e
9	4	6	6	6	6 solid ^d or 8	6 solid ^d or 8	8
	5	6	8 ^g	8	8	10	12
	6	8	8	10	10	12	12 solid ^d
	7	8	10	10	12	12 solid ^d	Footnote e
	8	10	10	12	12 solid ^d	Footnote e	Footnote e
9	4	6	6	6	6 solid ^d or 8	6 solid ^d or 8	8
	5	6	8 ^g	8	8	10	12
	6	8	8	10	10	12	12 solid ^d
	7	8	10	10	12	12 solid ^d	Footnote e
	8	10	10	12	12 solid ^d	Footnote e	Footnote e

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square inch = 6.895 Pa.

- a. Mortar shall be Type M or S and masonry shall be laid in running bond. UngROUTED hollow masonry units are permitted except where otherwise indicated.
- b. Soil classes are in accordance with the Unified Soil Classification System. Refer to Table R405.1.
- c. Unbalanced backfill height is the difference in height of the exterior and interior finish ground levels. Where an interior concrete slab is provided, the unbalanced backfill height shall be measured from the exterior finish ground level to the top of the interior concrete slab.
- d. Solid grouted hollow units or solid masonry units.
- e. Wall construction shall be in accordance with Table R404.1.1(2) or a design shall be provided.
- f. A design is required.
- g. Thickness may be 6 inches, provided minimum specified compressive strength of concrete, *f_c*, is 4,000 psi.

**TABLE R404.1.1(2)
REINFORCED CONCRETE AND MASONRY^a FOUNDATION WALLS**

MAXIMUM WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT ^a (feet)	MINIMUM VERTICAL REINFORCEMENT SIZE AND SPACING ^{b, c} FOR 8-INCH NOMINAL WALL THICKNESS		
		Soil classes ^d		
		GW, GP, SW and SP soils	GM, GC, SM, SM-SC and ML soils	SC, MH, ML-CL and inorganic CL soils
6	5	#4 at 48" o.c.	#4 at 48" o.c.	#4 at 48" o.c.
	6	#4 at 48" o.c.	#4 at 40" o.c.	#5 at 48" o.c.
7	4	#4 at 48" o.c.	#4 at 48" o.c.	#4 at 48" o.c.
	5	#4 at 48" o.c.	#4 at 48" o.c.	#4 at 40" o.c.
	6	#4 at 48" o.c.	#5 at 48" o.c.	#5 at 40" o.c.
8	7	#4 at 40" o.c.	#5 at 40" o.c.	#6 at 48" o.c.
	5	#4 at 48" o.c.	#4 at 48" o.c.	#4 at 40" o.c.
	6	#4 at 48" o.c.	#5 at 48" o.c.	#5 at 40" o.c.
	7	#5 at 48" o.c.	#6 at 48" o.c.	#6 at 40" o.c.
9	8	#5 at 40" o.c.	#6 at 40" o.c.	#6 at 24" o.c.
	5	#4 at 48" o.c.	#4 at 48" o.c.	#5 at 48" o.c.
	6	#4 at 48" o.c.	#5 at 48" o.c.	#6 at 48" o.c.
	7	#5 at 48" o.c.	#6 at 48" o.c.	#6 at 32" o.c.
	8	#5 at 40" o.c.	#6 at 32" o.c.	#6 at 24" o.c.
9	9	#6 at 40" o.c.	#6 at 24" o.c.	#6 at 16" o.c.

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Mortar shall be Type M or S and masonry shall be laid in running bond.
- b. Alternative reinforcing bar sizes and spacings having an equivalent cross-sectional area of reinforcement per lineal foot of wall shall be permitted provided the spacing of the reinforcement does not exceed 72 inches.
- c. Vertical reinforcement shall be Grade 60 minimum. The distance from the face of the soil side of the wall to the center of vertical reinforcement shall be at least 5 inches.
- d. Soil classes are in accordance with the Unified Soil Classification System. Refer to Table R405.1.
- e. Unbalanced backfill height is the difference in height of the exterior and interior finish ground levels. Where an interior concrete slab is provided, the unbalanced backfill height shall be measured from the exterior finish ground level to the top of the interior concrete slab.

54. Concrete and Masonry foundation walls (Maximum Height of Fill). Concrete and concrete masonry and clay masonry foundation walls shall be constructed as set forth in Tables in the code book.

55. Concrete and masonry foundation dampproofing. Except where required to be waterproofed foundation walls that retain earth and enclose habitable or usable spaces located below grade shall be dampproofed from the

top of the footing to the finished grade. Masonry walls shall have not less than 3/8 inch portland cement parging applied to the exterior of the wall. The parging shall be dampproofed with a bituminous coating, 3 pounds per square yard of acrylic modified cement, 1/8-inch coat of surface-bonding mortar complying with ASTM C 887 or any material permitted for waterproofing. Concrete walls shall be dampproofed by applying any one of the above listed dampproofing materials or any one of the waterproofing materials to the exterior of the wall.

56. **Concrete and masonry foundation waterproofing.** In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose habitable or usable spaces located below grade shall be waterproofed with a membrane extending from the top of the footing to the finished grade. The membrane shall consist of 2-ply hot-mopped felts, 55 pound roll roofing, 6-mil polyvinyl chloride, 6-mil polyethylene or 40-mil polymer-modified asphalt. The joints in the membrane shall be lapped and sealed with an adhesive compatible with the waterproofing membrane.

TREATED-WOOD FOUNDATIONS

57. Wood foundations.

1. **Fasteners.** Fasteners used below grade to attach plywood to the exterior side of exterior basement or crawl-space wall studs, or fasteners used in knee wall construction, shall be of Type 304 or 316 stainless steel. Fasteners used above grade to attach plywood and all lumber-to-lumber fasteners except those used in knee wall construction shall be of Type 304 or 316 stainless steel, silicon bronze, copper, hot-dipped galvanized (zinc coated) steel nails, or hot-tumbled galvanized (zinc coated) steel nails. *Electro-galvanized steel nails and galvanized (zinc coated) steel staples shall not be permitted.*

FLOORS

58. Drilling and notching.

Structural floor members shall not be cut, bored or notched in excess of the limitations specified in this section.

1. **Sawn lumber.** Notches in solid lumber joists, rafters and beams shall not exceed one-sixth of the depth of the member, shall not be longer than one-third of the depth of the member and shall not be located in the middle one-third of the span. Notches at the ends of the member shall not exceed one-fourth the depth of the member. The tension side of members 4 inches or greater in nominal thickness shall not be notched except at the ends of the members. The diameter of holes bored or cut into members shall not exceed one-third the depth of the member. Holes shall not be closer than 2 inches to the top or bottom of the member, or to any other hole located in the member. Where the member is also notched, the hole shall not be closer than 2 inches to the notch.
2. **Engineered wood products.** Cuts, notches and holes bored in trusses, laminated veneer lumber, glue-laminated members or I-joists are not permitted unless the effects of such penetrations are specifically considered in the design of the member.

WALLS

59. Grade.

Studs shall be a minimum No. 3, standard or stud grade lumber.

Exception: Bearing studs not supporting floors and non-bearing studs may be utility grade lumber,

Drilling and Notching.

1. **Studs.** Any stud in an exterior wall or bearing partition may be cut or notched to a depth not exceeding 25 percent of its width. Studs in nonbearing partitions may be notched to a depth not to exceed 40 percent of a single stud width. Any stud may be bored or drilled, provided that the diameter of the resulting hole is no greater than 40 percent of the stud width, the edge of the hole is no closer than 5/8 inch to the edge of the stud and the hole is not located in the same section as a cut or notch.

2. Exceptions:

- a. A stud may be bored to a diameter not exceeding 60 percent of its width, provided that such studs located in exterior walls or bearing partitions are doubled and that not more than two successive studs are bored.
 - b. Approved stud shoes may be used when installed in accordance with the manufacturer's recommendation.
60. **Top plate.** When piping or ductwork is placed in or partly in an exterior wall or interior load-bearing wall, necessitating cutting, drilling or notching of the top plate by more than 50 percent of its width galvanized metal tie of not less than 0.054 inches thick (16ga) and 1 1/2 inches wide shall be fastened to each plate across and to each side of the opening with not less than eight 16d nails at each side
61. **Wall Brace Spacing.** Spacing of braced wall lines shall not exceed 35 feet on center in both the longitudinal and transverse directions in each story.
- Exception:** Spacing of braced wall lines not exceeding 50 feet shall be permitted where:
1. The wall bracing provided equals or exceeds the amount of bracing multiplied by a factor equal to the braced wall line spacing divided by 35 feet, and
 2. The length-to-width ratio for the floor/wall diaphragm does not exceed 3:1.
62. **Fireblocking required.** Fireblocking shall be provided to cut off all concealed draft openings (both vertical and horizontal) and to form an effective fire barrier between stories, and between a top story and the roof space. Fireblocking shall be provided in wood-frame 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:
 - a. Vertically at the ceiling and floor levels.
 - b. Horizontally at intervals not exceeding 10 feet.
 2. At all 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 R311
 4. At openings around vents, pipes, and ducts at ceiling and floor level, with an approved material to resist the free passage of flame and products of combustion.
 5. For the fireblocking of chimneys and fireplaces,
 6. Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation.
63. **Gypsum backer.** Gypsum board utilized as the base or backer for adhesive application of ceramic tile or other nonabsorbent finish material shall conform to ASTM C630 or C1178. Water-resistant gypsum backing board (green board) shall be permitted to be used 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 vapor retarder in a shower or tub compartment. All cut or exposed edges, including those at wall intersections, shall be sealed as recommended by the manufacturer.
64. **Weather-resistant sheathing paper.** Asphalt-saturated felt free from holes and breaks, weighing not less than 14 pounds per 100 square feet and complying with ASTM D 226 or other approved weather-resistant material shall be applied over studs or sheathing of all exterior walls as required. Such felt or material shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches. Where joints occur, felt shall be lapped not less than 6 inches
- Exception:** Such felt or material is permitted to be omitted in the following situations:
1. In detached accessory buildings.
 2. Under panel siding with shiplap joints or battens.
 3. Under exterior wall finish materials as permitted
 4. Under paperbacked stucco lath.

ROOF ASSEMBLIES

5. **Cutting and notching.** Structural roof members shall not be cut, bored or notched in excess of the limitations specified in this section.

6. **Sawn lumber.** Notches in solid lumber joists, rafters and beams shall not exceed one-sixth of the depth of the member, shall not be longer than one-third of the depth of the member and shall not be located in the middle one-third of the span. Notches at the ends of the member shall not exceed one-fourth the depth of the member. The tension side of members 4 inches or greater in nominal thickness shall not be notched except at the ends of the members. The diameter of the holes bored or cut into members shall not exceed one-third the depth of the member. Holes shall not be closer than 2 inches to the top or bottom of the member, or to any other hole located in the member. Where the member is also notched, the hole shall not be closer than 2 inches to the notch.
 7. **Exception:** Notches on cantilevered portions of rafters are permitted provided the dimension of the remaining portion of the rafter is not less than 4-inch nominal and the length of the cantilever does not exceed 24 inches.
 8. **Engineered wood products.** Cuts, notches and holes bored in laminated veneer lumber, glue-laminated members or I-joists are not permitted unless the effect of such penetrations are specifically considered in the design of the member.
65. **Truss design drawings.** Truss design drawings, , shall be provided to the building official and approved prior to installation
66. **Alterations to trusses.** Truss members shall not be cut, notched, drilled, spliced or otherwise altered in any way without the approval of a registered design professional. Alterations resulting in the addition of load (e.g., HVAC equipment, water heater) that exceeds the design load for the truss shall not be permitted without verification that the truss is capable of supporting such additional loading.
67. **Roof tie-down.** Roof assemblies subject to wind uplift pressures of 20 pounds per square foot or greater, shall have truss or rafter-to-bearing wall ties provided
68. **Ventilation - Minimum area.** The total net free ventilating area shall not be less than 1 to 150 of the area of the space ventilated except that the total area is permitted to be reduced to 1 to 300, provided at least 50 percent and not more than 80 percent of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated at least 3 feet above eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents. As an alternative, the net free cross-ventilation area may be reduced to 1 to 300 when a vapor barrier having a transmission rate not exceeding 1 perm is installed on the warm side of the ceiling. **Attic access.** In buildings with combustible ceiling or roof construction, an attic access opening shall be provided to the attic and an attic access of 22" x 30" shall be provided

ROOFING

69. **Ice protection.** In areas where the average daily temperature in January is 25° F or less or when Table R301.2 (1) criteria so designates, an ice barrier that consists of a least two layers of underlayment cemented together or of a self-adhering polymer modified bitumen sheet, shall be used in lieu of normal underlayment and extend from the eave's edge to a point at least 24 inches inside the exterior wall line of the building.
Exception: Detached accessory structures that contain no conditioned floor area. (
70. **Sidewall flashing.** Flashing against a vertical sidewall shall be by the step-flashing method.
71. **Roof covering application.** Roof coverings shall be applied in accordance with the manufacturer's installation instructions.
72. **Asphalt shingles.** The installation of asphalt shingles shall comply with the provisions of this section.
1. **Sheathing requirements.** Asphalt shingles shall be fastened to solidly sheathed decks.
 2. **Slope.** Asphalt shingles shall only be used on roof slopes of two units vertical in 12 units horizontal (2:12) or greater. For roof slopes from two units vertical in 12 units horizontal (2:12) up to four units vertical in 12 units horizontal (4:12), double underlayment application is required.
 3. **Underlayment.** Unless otherwise noted, required underlayment shall conform with ASTM D 226, Type I,
73. **Recovering versus replacement.** New roof coverings shall not be installed without first removing existing roof coverings where any of the following conditions occur:
1. Where the existing roof or roof covering is water-soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.

2. Where the existing roof covering is wood shake, slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering.

MASONRY CHIMNEYS

74. **Support.** Masonry chimneys shall be supported on foundations of solid masonry or concrete at least 12 inches thick and at least 6 inches beyond each side of the exterior dimensions of the chimney. Footings shall be founded on natural, undisturbed earth below the frost line. In areas not subject to freezing, footings shall be located a minimum of 12 inches below finished grade.
75. **Termination.** Chimneys shall extend at least 2 feet higher than any portion of a building within 10 feet, but shall not be less than 3 feet above the highest point where the chimney passes through the roof.
76. **Wall thickness.** Masonry chimney walls shall be constructed of solid masonry units or hollow masonry units grouted solid with not less than a 4-inch nominal thickness.

MANUFACTURED HOMES.

77. **Manufacturer's installation instructions.** The installation instructions as provided by the manufacturer of the manufactured home shall be used to determine permissible points of support for vertical loads and points of attachment for anchorage **Foundation System**. Footings shall have a minimum depth below finished grade of 12 inches unless a greater depth is recommended by a foundation investigation.
78. **Skirting and permanent perimeter enclosures.** Skirting and permanent perimeter enclosures shall be installed.

R313.4. Smoke alarm locations in existing buildings constructed before November 6, 1974. Within each dwelling unit or sleeping unit, a single-station smoke alarm shall be installed in the following locations:

1. In each sleeping room or each area directly outside the sleeping room.
2. On each floor level including the basement level. For sleeping units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than 1 full story below the upper level.

R313.5. Equipment requirements. The required equipment for smoke alarms shall consist of the following:

1. **Installation.** Smoke alarm devices shall be listed and installed in accordance with the manufacturer's installation requirements, the provisions of the code and the provisions of NFPA 72, which is adopted by reference in these rules.
2. **Power Source.** The equipment shall be operable by power from 1 of the following primary sources.
 - a. The building wiring provided that such wiring is served from a commercial source and is equipped with a battery backup. Wiring shall be permanent and without a disconnecting switch other than as required for overcurrent protection.
 - b. A non-rechargeable battery that is capable of operating the smoke alarm in the normal condition for a life of 5 years.
 - c. A rechargeable battery, with proper charging, able to power the alarm for a life of 5 years and shall be automatically recharged by an AC circuit of the commercial light and power source.
 - d. A household use alarm system with battery backup listed and approved in accordance with the household fire warning equipment provisions of NFPA 72,
3. **Audible Alarm Notification.** The activation of the alarm signal shall produce a sound that is audible in all occupiable dwelling areas.
4. **Testing and Maintenance.** The owner of a dwelling unit, in which required or optional fire detection or fire protection systems equipment is installed, shall be responsible for the proper operation, testing, and maintenance of the equipment in accordance with the manufacturer's instructions included with the equipment. The occupant of rental dwelling units shall be responsible for the periodic operational testing and periodic cleaning of the installed equipment within the rental unit in accordance with the testing instructions provided in the manufacturer's instructions for the equipment. If the system fails, breaks, or is out of service, it shall be repaired and functional within 30 days.

Exception: Smoke alarms and devices installed in buildings constructed before November 6, 1974 where an installation was approved by the appropriate enforcing agency under regulations in effect at the time of the installation shall be considered to comply with the provisions of the code.

MRC Michigan Residential Code

Emergency Escape & Rescue Opening Code Requirements for One & Two Family Dwellings

- **Emergency Escape & Rescue Openings:** Basements and every sleeping room shall have at least one open able emergency escape and rescue window. They shall have a sill height of not more than 44 inches above the floor. The net clear opening dimension shall be a minimum of 5.7 square feet X min. Net opening height shall be 24 inches = min. width opening of 34-1/4 inches. Net clearing opening of 5.7 sq ft. X min. Net clear opening width shall be 20 inches min. height opening of 41 inches. And shall be obtained by the normal operation of the window or door opening from the inside.
- **Natural Light:** Habitable rooms shall be provided with natural light be means of exterior glazed opening with an area no less than (8%) of the floor area of such rooms with a min. of 10 sq ft. with the deductions for the bathrooms, closets, halls, storage and utility space square footage. Sleeping rooms and habitable rooms shall be provided with natural ventilation by means of open able exterior openings with an area of not less than (4%) of the floor are of such rooms with a min. of 5 sq ft.
- **Window Wells:** The horizontal dimensions of a window well shall allow the emergency escape and rescue opening to be fully opened. The horizontal dimensions of the window well shall provide a minimum net clearance area of (9) square feet with a minimum horizontal projections and width of 36 inches. Exception: The ladder or steps required by section R310.2.1 shall be permitted to encroach a maximum of 6 inches into the required dimensions of the window well.
- **Ladder and Steps:** Window wells with a vertical depth greater than 44 inches below adjacent ground level shall be equipped with a permanently affixed ladder or steps usable with the window in the fully open position. Ladders or rungs shall an inside width of at least 12 inches, shall project at least 3 inches from the wall and shall be spaced not more than 18 inches on center vertically for the full height of the window well.
- **Bars, Grills, Covers and Screens:**
 - Placed over emergency escape and rescue opening or window wells that serve as such opening shall be releasable or removable from the inside without the use of a key, tool or special knowledge.