

SECTION 5

CLEARANCES

The electric line clearances shown in Tables 5-1 are required for buildings, structures, and surfaces to comply with requirements of the National Electric Safety Code, the Wisconsin Administrative Code, and the Department of Labor, Occupational Safety and Health Administration, Safety and Health Regulations for Construction, [OSHA subsection, N1926.416 (g) (2)].

Unless otherwise noted, all clearances are from surface-to-surface and all distances are measured center-to-center.

5.1 Clearances for Electrical Overhead Services

Table 5-1
Clearances for Electrical Overhead Services

Triplex & Quadruplex Cables (most common)		Type A	
Open Wire Insulated Cables or Bare Cables		Type B	
Note that the following are the minimum clearances needed. Allow extra clearance to account for thermal loading, ice loading, and snow depth when looking at vertical clearances.			
VERTICAL CLEARANCES		TYPE A	TYPE B
Roads, Street, Driveways, Parking Lots, Alleys, Cultivated Land, Grazing, Forest, Orchards, and other areas subject to truck traffic.		19'	19'
Residential driveway with no truck traffic.		16'	16.5'
Spaces & ways subject to pedestrian or restricted traffic only (no horses riding or vehicles over eight feet). Less than 300 volts.		12'	12.5'
Spaces & ways subject to pedestrian or restricted traffic only (no horses riding or vehicles over eight feet). More than 300 volts.		15'	15'
Over or under roofs or projections not readily accessible (no permanent stairs or ladder, etc., to the roof; no vehicles).		8'	10.5'
Over or under roofs or projections not readily accessible with a 4/12 pitch or greater.		3'	10.5'
Overhanging portion of roof where 4 feet or less is crossed by 6 feet or less of service cable (does not exceed 300 volts)		1.5'	1.5'
Over or under roofs & balconies readily accessible to pedestrians (as part of structure to which service is not attached).		11'	11.5'
Over roof or balconies over which they pass and the service is attached to that structure.	Accessible	11'	11.5'
	Non-Accessible	8'	8'
Over or under catwalks & other surfaces upon which personnel walk.		11'	11.5'
Other vertical clearances to signs, chimneys, billboards, radio & TV antennas, tanks, and other installations not classified as building or bridges.		3.5'	6'
HORIZONTAL CLEARANCES			
To walls, projections, windows, and areas not readily accessible to pedestrians.		5'	5.5'
Horizontal clearances to signs, tanks, chimneys, billboards, radio & TV antennas & other installations not classified as buildings or bridges.		5'	5.5'

Note: Where these clearances cannot be obtained, the conductors and rigid live parts shall be guarded. (NESC 234C2). Reduced clearance may be allowed under specific conditions, contact MU.

5.2 Padmounted Transformer Clearances

The following underground equipment clearances are reprinted from Volume 1 of the Wisconsin State Electrical Code. These clearances apply to the location of oil-insulated padmounted transformers near buildings.

Combustible or non-rated walls are walls of Type No. V buildings as determined by Wisconsin Building Code (Construction Classification IBC Chapter 6). Type No. III and IV buildings can be considered combustible or non-rated. Check with the local building inspector, before locating transformers, for building ratings. All other walls are considered to be non-combustible or rated.

A. NON-COMBUSTIBLE WALLS

Padmounted oil-insulated transformers may be located within 3 feet of noncombustible walls, if all of the following clearances are maintained from doors, windows, and other building openings.

1. Doors

Padmounted oil-insulated transformers shall not be located within a zone extending 20 feet outward and 10 feet to either side of a building door.

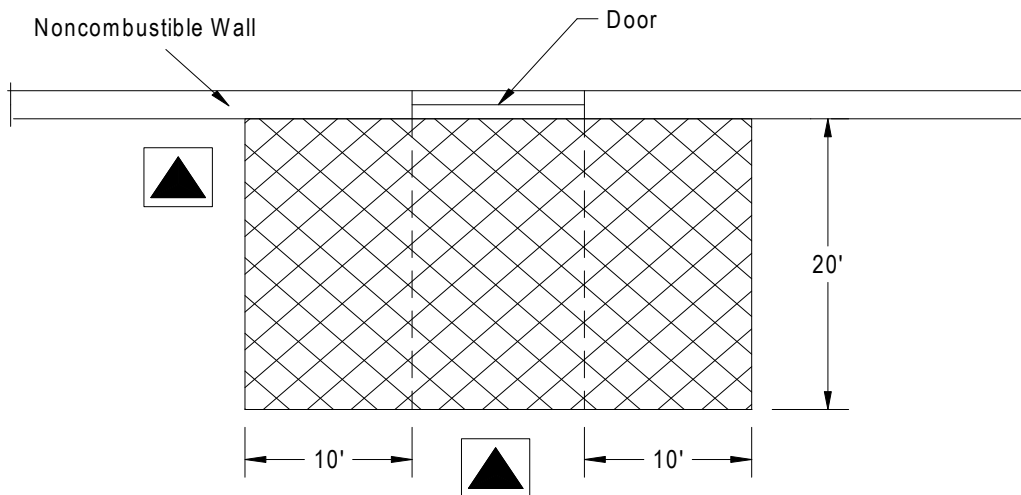


Figure 5-1
Pad-Mount Transformer Door Clearance

2. Air Intake Openings

Padmounted oil-insulated transformers shall not be located within a zone extending 10 feet outward and 10 feet to either side of an air intake opening. If the air intake opening is directly above the transformer, there must be a 25 feet vertical distance from the opening to the transformer.

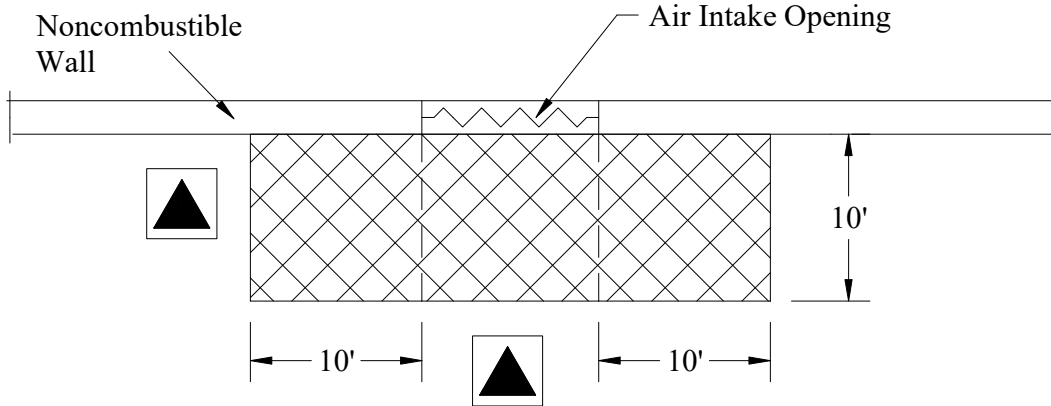


Figure 5-2
Pad-Mount Transformer Air Intake Clearance

3. Windows or openings other than air intake

a. First Story

Padmounted oil-insulated transformers shall not be located within a zone extending 10 feet outward and 3 feet to either side of a building window or opening other than an air intake. Exception: This does not apply to a glass block or fire window meeting the requirements of the Wisconsin Commercial Building Code (Fire Window IBC Chapter 7, Section 714.3).

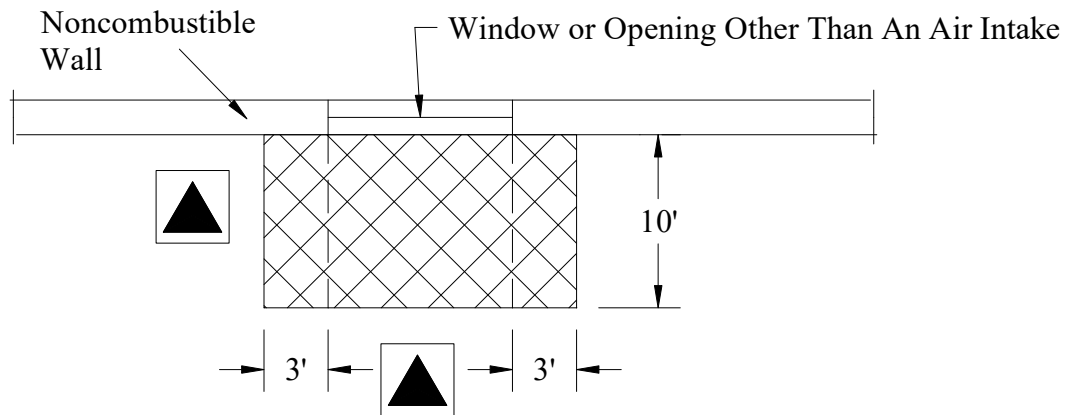


Figure 5-3
Pad-Mount Transformer First Story Opening Clearance

b. Second Story

Padmounted oil-insulated transformers shall not be located less than 5 feet from any part of a second story window. Exception: This does not apply to a glass block or fire window meeting the requirements of the Wisconsin Commercial Building Code (Fire Window IBC Chapter 7, Section 714.3).

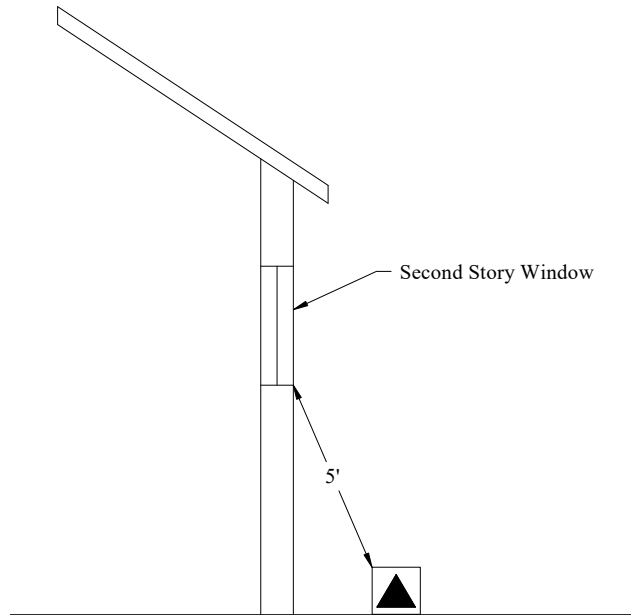


Figure 5-4
Pad-Mount Transformer Second Story Window Clearance

C. COMBUSTIBLE WALLS

Padmounted oil-insulated transformers in sizes up to and including 100 kVA shall be located according to the provisions set forth for non-combustible walls.

Padmounted oil-insulated transformers in sizes above 100 kVA shall be located a minimum of 10 feet from the building wall in addition to the clearances from building doors, windows, and other openings set forth for non-combustible walls.

In addition to PSC 114 MU also requires:

Installations using 75 kVA three phase padmounted transformers should be designed using the clearance requirements for above 100-kVA transformers to permit a future capacity upgrade.

D. BARRIERS

If the required clearances specified above cannot be obtained, a fire-resistant barrier shall be constructed in lieu of the required separation. The following methods of construction are acceptable:

1. Non-Combustible Walls

The barrier shall extend to a projection line from the corner of the padmounted transformer to the furthest corner of the window, door or opening in question. The height of the barrier shall be 1 foot above the top of the padmounted transformer.

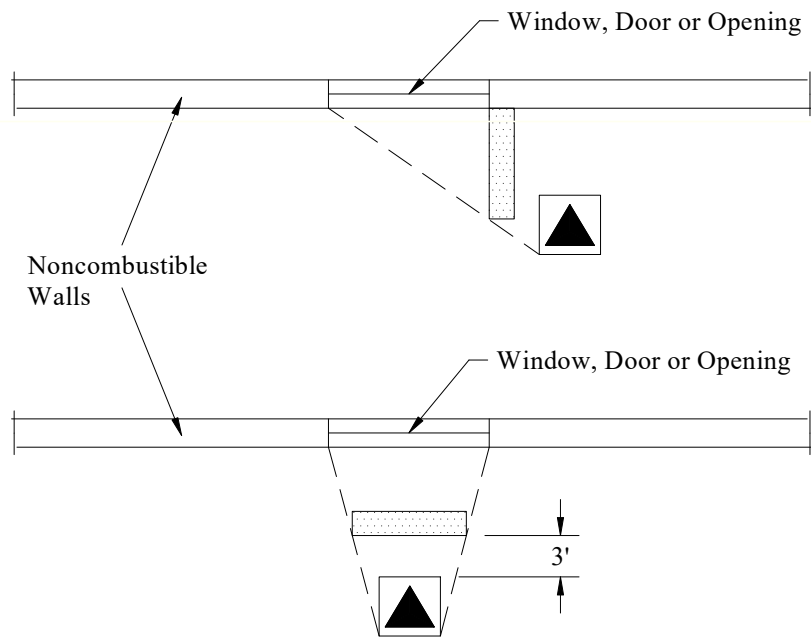


Figure 5-5
Pad-Mount Transformer Non-Combustible Wall Clearance

2. Combustible Walls

The barrier shall extend 3 feet beyond each side of the padmounted transformer. The height of the barrier shall be 1 foot above the top of the transformer.

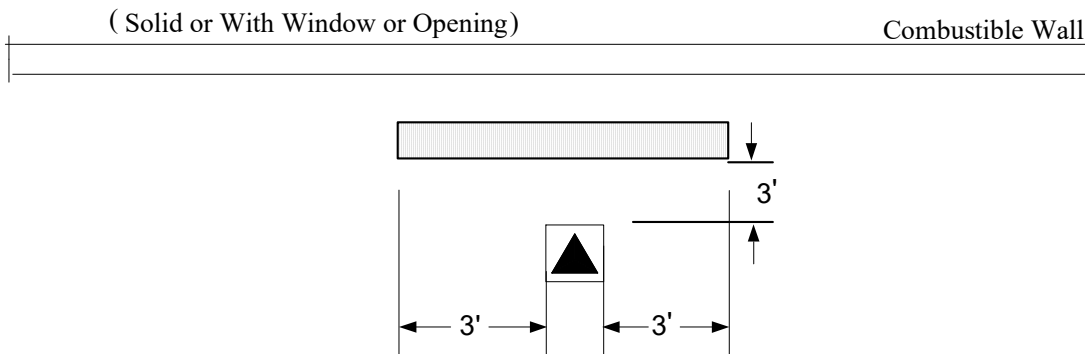


Figure 5-6
Pad-Mount Transformer Combustible Wall Clearance

E. FIRE ESCAPES

1. Horizontal Clearance - Padmounted oil-insulated transformer shall not be located within a zone extending 20 feet outward and 10 feet to either side of the point where a fire escape meets the ground.
2. Vertical Clearance - Padmounted oil-insulated transformers located beneath fire escapes shall have a vertical clearance of not less than 10 feet from the top of the transformer to the bottom of the fire escape.

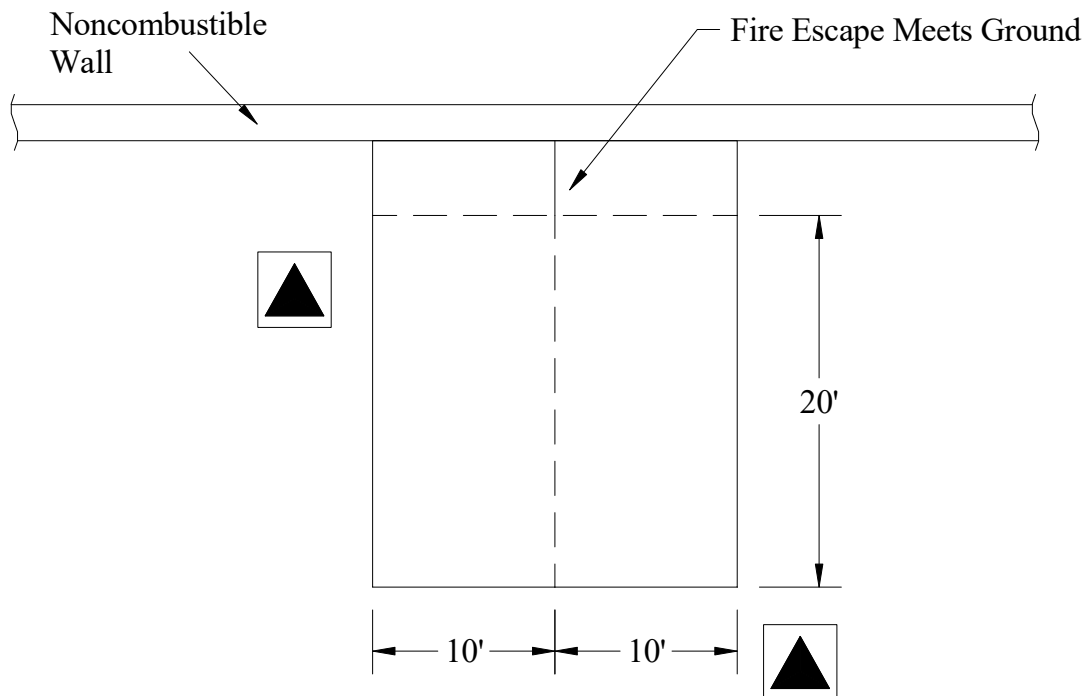


Figure 5-7
Pad-mount Transformer Fire Escape Clearance

E. Generators

Generators shall not be located within 20 feet horizontally of any of the following: padmounted transformer, electrical metering, electrical service equipment, or normal power distribution equipment. The 20 feet requirement may be reduced to a minimum of 3 feet where a noncombustible barrier is installed that extends at least 3 feet. Beyond each side of the widest piece of electrical equipment (generator, transformer, metering, etc.) and 1 foot above the top of the tallest piece of involved equipment, provided all clearances required by the generator manufacturer are met. The 3 feet minimum would have to be increased depending on location of over current protection devices and voltage levels. The noncombustible barrier cannot be located less than 3 feet to the distribution transformer.

5.3 Gas Lines

The separation in any direction from as measured from the nearest duct in the conduit shall be a minimum of 12 inches and should have sufficient space to permit use of pipe maintenance equipment.. [NESC 320.B (5)] If this clearance cannot be attained, the gas line shall be protected from damage that might result from the proximity of the electric supply or communication direct-buried system.

5.4 Clearance of Lines near Wells

Overhead open supply conductors shall not run over wells. A horizontal clearance with conductors at rest shall be no less than $\frac{3}{4}$ of the vertical clearance to ground, and a horizontal clearance of not less than 10 feet with conductors displaced by wind.

Underground supply cable should be installed with a 5 feet separation to the well installation.

5.5 Clearance to Sewers

The horizontal separation between service cable and other underground structures should not be less than 12 inches to permit access to ground maintenance of either facility without damage to the other.

Drain field, alternate field, and septic tank separation to service cable should be at 5 feet if less than 480 volts and 10 feet if 480 volts or more by MU policy and/or local ordinance as applicable.

Separation between service cable and mound systems should be 20 feet. The 20 feet should be measured from the perimeter of the mound system.

5.6 Stored Materials

Overhead lines shall not be run over designated material storage areas where material is regularly stored and handled by cranes, dump trucks, elevators or other types of high machinery unless the clearance of such lines is adequate to permit the full use of the equipment while maintaining all code required clearances.

5.7 Clearance of Lines near Fuel Storage Tanks

Electric lines shall not be run over aboveground flammable liquids or liquefied petroleum gas (LPG) storage tanks. A horizontal clearance of not less than 8 feet is required for services and secondary cables and 15 feet for all other conductors. LPG tanks with a capacity of 1000 gallons or less or tanks enclosed in a building or fully covered by a roof or canopy capable of preventing a falling overhead supply conductor from directly contacting the tank are exempt from this requirement.

Underground supply cables shall not come within 10 feet of above ground or below ground fuel storage tanks. Underground cables shall not go under fuel storage tanks.

5.8 Antennas

Outdoor antennas and supporting structures attached to buildings shall have a horizontal clearance from utility electric lines at least 10 feet greater than the total height of the antenna and supporting structure.

Service cables of 150 volts or less to ground shall have a minimum clearance of 3 feet 6 inches from the antenna and supporting structure except a minimum clearance of 2 feet is permitted from the service conductor drip loop.

5.9 Buildings

Underground electric lines are only permitted under buildings if installed in conduit. MU approval is required.

5.10 Swimming Pools

The following parts of swimming pools shall not be placed under existing service-drop conductors or any other open overhead wiring nor shall such wiring be installed above the (1) pool and 10 feet horizontally from the inside walls of the pool; (2) diving structure; or (3) observation stands, towers, or platforms.

Exception: Structures listed in (1), (2), and (3) above shall be permitted under utility-owned supply lines or service drops (insulated wires 750 volts or less) where such installations provide the following clearances for utility service drops:

A = 22.5 feet, B = 14.5 feet, C = 10 feet minimum or normal clearances. [NEC 680.8(a)]

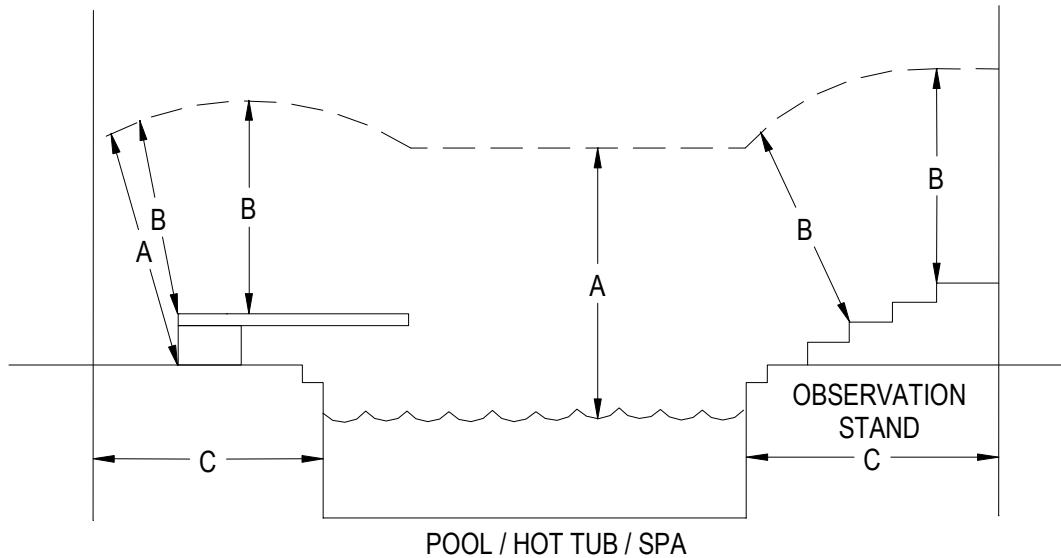


Figure 5-8
Underground Cable Pool Clearance

Underground cable shall not be installed under or within 5 feet of a swimming pool, hot tub, or spa.

5.11 Grain Bins

A clearance of not less than 18 feet in all directions must be maintained for a grain bin and any related equipment for all wires, conductors, and cables. MU should be consulted before installing grain bins near any wires, conductors, or cables.

5.12 Alternate Sources of power

Alternate sources of power located outdoors for emergency systems shall be located at least 10 feet horizontally from any combustible portion of a Type III, Type IV, or Type V building and at least 20 feet from an outdoor electrical transformer, electrical metering, service equipment, or normal power distribution equipment. These dimensions may be reduced by one-half where a noncombustible barrier is installed that extends at least 3 feet beyond each side of the transformer and alternate power source. The height of the barrier shall be at least one foot above the top of the transformer, electrical metering, service equipment, or alternate power source, whichever is higher.