

Published  
01/01/13

CL

CLEARANCES

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I. Conditions of Application

The vertical clearances in Table I apply for the following conductor temperature and loading conditions, whichever produces the largest final sag.

- A. 120°F (50°C), no wind displacement.
- B. The maximum conductor temperature for which the line is designed to operate, if greater than 120°F (50°C), with no wind displacement. (See [Std OHC20](#)). New construction should be designed for 194°F maximum conductor temperature.
- C. 32° F (0° C) no wind displacement, with one-half inch radial thickness of ice.

II. Table I

The clearances in Table I are for worst case conditions and shall never be exceeded. See Section I.

III. Point of Crossing (manual calculation process)(not part of code)

- A. The point of crossing for roads, streets, alleys, and driveways is the edge of the traveled way farthest from the nearer support of the crossing span. For railroad crossings, the point of crossing is the farthest rail from the nearer support of the crossing span. In other situations, the point of crossing will be determined by any prevailing topographical feature under the conductors.
- B. To determine the sag at the point of crossing, determine the midspan maximum sag as required by Section I. Multiply it times the factor in figure 1. See Std OHC20 and sag tables.

Distance from nearer support of crossing span to point of crossing in % of crossing span length	Factor
5	0.19
10	0.36
15	0.51
20	0.64
25	0.75
30	0.84
35	0.91
40	0.96
45	0.99
50	1.00

Figure 1

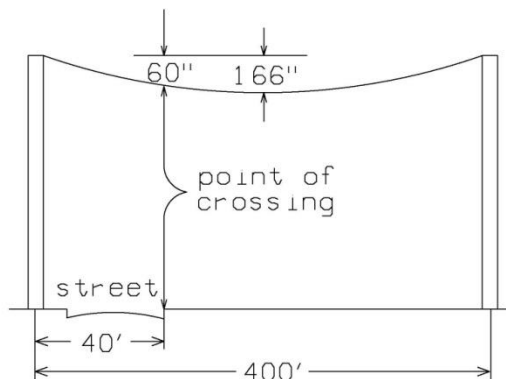


Fig. 2

Example: Conductor 336.4 ACSR (See [OSAG130](#))

Midspan sag at 194° = 166"

40 ÷ 400 = .1 = 10%

Point of crossing = 10%

Factor = .36

166" x .36 = 60" at the point of crossing.

Table I

Vertical clearance of wires, conductors, and cables above ground roadway, rail, or water surfaces. (Voltages are phase to ground for effectively grounded circuits and phase to phase for ungrounded wye and delta circuits.)

	[11][15] Insulated communication conductors and cable; messengers; surge protection wires; grounded guys; neutral conductors	Non-insulated communication conductors; supply cables (triplex and quadruplex) of 0 to 750V [27][34]	Supply cables over 750V [28] open supply conductors 0 to 750V [14][27][34]	Open supply conductors, over 750V to 22KV [14][27]
Nature of surface underneath wires, conductors, or cables	(Ft.)	(Ft.)	(Ft.)	(Ft.)
Where wires, conductors, or cables cross over or overhang				
1. Track rails of railroads (except electrified railroads using overhead trolley conductors. [2][16][22][30])	23.5	24.0	24.5	26.5
2. Roads, streets, and other areas subject to truck traffic. [23][27][31]	15.5	16.0	16.5	18.5
3. Driveways, parking lots, and alleys. [23][32]	15.5 [7][13]	16.0 [7][13]	16.5 [7]	18.5
4. Other land traversed by vehicles, such as cultivated, grazing, forest, orchard, etc. [26]	15.5	16.0	16.5	18.5
5. Spaces and ways subject to pedestrians or restricted traffic only. [9]	9.5	12.0 [8]	12.5 [8]	14.5
6. Water areas not suitable for sailboating or where sailboating is prohibited. [21]	14.0	14.5	15.0	17.0
7. Water areas suitable for sailboating, including lakes, ponds, reservoirs, tidal waters, rivers, streams, and canals with an unobstructed surface area of [17][18][19][20][21][29]:				
a. Less than 20 acres	17.5	18.0	18.5	20.5
b. 20 to 200 acres	25.5	26.0	26.5	28.5
c. 200 to 2000 acres	31.5	32.0	32.5	34.5
d. Over 2000 acres	37.5	38.0	38.5	40.5
8. Established boat ramps and associated rigging areas; areas posted with sign(s) for rigging or launching sailboats.	Clearance above ground shall be 5 feet greater than in 7 above for the type of water areas served by the launching site.			
Where wires, conductors, or cables run along and within the limits of highways or other rights-of-way but do not overhang the roadway				
9. Roads, streets, alleys	15.5 [24]	16.0	16.5	18.5
10. Roads in rural districts where it is unlikely that vehicles will be crossing under the line.	13.5 [10][12]	14.0 [10]	14.5 [10]	16.5

## Footnotes for Table I

- [1] The following footnote numbers are not used: [1][3][4][5][6][25]
- [2] For wire, conductors, or cables crossing over mine, logging and similar railways which handle only cars lower than standard freight cars, the clearance may be reduced by an amount equal to the difference in height between the highest loaded car handled and 20 ft., but the clearances shall not be reduced below that required for street crossings.
- [7] Where the height of attachment to a building or other installation does not permit service drops to meet these values, the clearances may be reduced to the following (feet) (cables are triplex and quadruplex):
- |    |   |      |
|----|---|------|
| a. | Insulated supply service drops limited to 300V to ground.               | 12.5 |
| b. | Insulated drip loops of supply service drops limited to 300V to ground. | 10.5 |
| c. | Supply service drop cables limited to 150V to ground.                   | 12.0 |
| d. | Drip loops only of service drop cables limited to 150V to ground.       | 10.0 |
| e. | Insulated communication service drops                                   | 11.5 |
- [8] Where the height of a building or other installation does not permit service drops to meet these values, the clearance may be reduced to the following (feet) (cables are triplex and quadruplex):
- |    |   |      |
|----|---|------|
| a. | Insulated supply service drops limited to 300V to ground.               | 10.5 |
| b. | Insulated drip loops of supply service drops limited to 300V to ground. | 10.5 |
| c. | Supply service drop cables limited to 150V to ground.                   | 10.0 |
| d. | Drip loops only of service drop cables limited to 150V to ground.       | 10.0 |
- [9] Spaces and ways subject to pedestrians or restricted traffic only are those areas where riders on horseback, vehicles, or other mobile units, exceeding a total height of 8 ft, are prohibited by regulation or permanent terrain configurations or are otherwise not normally encountered nor reasonably anticipated.
- [10] Where a supply or communication line along a road is located relative to fences, ditches, embankments, etc., so that the ground under the line would not be expected to be traveled except by pedestrians, this clearance may be reduced to the following values (feet):
- |    |   |      |
|----|---|------|
| a. | Insulated communication conductor and communication cables                | 9.5  |
| b. | Conductors of other communication circuits                                | 9.5  |
| c. | Supply cables of any voltage and supply cables limited to 150V to ground. | 9.5  |
| d. | Insulated supply cables limited to 300V to ground.                        | 12.5 |
| e. | Guys  | 9.5  |
- [11] No clearance from ground is required for anchor guys not crossing tracks, rails, streets, driveways, roads, or pathways.
- [12] This clearance may be reduced to 13 ft. for communication conductors and guys.
- [13] Where this construction crosses over or runs along alleys, driveways, or parking lots not subject to truck traffic, this clearance may be reduced to 15 feet.
- [14] Ungrounded guys and ungrounded portions of span guys between guy insulators shall have clearances based on the highest voltage to which they may be exposed due to a slack conductor or guy.
- [15] Anchor guys insulated in accordance with NESC Rule 279 may have the same clearance as grounded guys.

- [16] Adjacent to tunnels and overhead bridges which restrict the height of loaded rail cars to less than 20 feet, these clearances may be reduced by the difference between the highest loaded rail car handled and 20 feet if mutually agreed to by the parties at interest.
- [17] For controlled impoundments, the surface area and corresponding clearances shall be based upon the design high water level. For other waters, the surface area and clearances shall be based on the normal high water level. The clearance over rivers, streams, and canals shall be based upon the largest surface area of any one-mile long segment which includes the crossing. The clearance over a canal, river, or stream normally used to provide access for sailboats to a larger body of water shall be the same as that required for the larger body of water (as modified by PSC 114.230I #17) (similar to new NESC Table 232-1 Note 19).
- [18] For uncontrolled water flow areas, the surface area shall be that enclosed by its annual high-water mark. Clearances shall be based on the normal flood level; if available, the 10 year level may be assumed as the normal flood level.
- [19] See Note #17 for modification of this NESC note.
- [20] Where an overwater obstruction restricts vessel height to less than the clearance required in Column 1, call the Materials & Standards Group for possible reduced clearances. However, the clearance shall never be reduced below what is required for the surface area on the line crossing side of the obstruction. See NESC Table 232-1 Note 20.
- [21] Where the US Army Corps of Engineers or the State or surrogate thereof has issued a crossing permit, clearances of that permit shall govern.
- [22] See Std CL25 for the required horizontal and diagonal clearances to rail cars.
- [23] For the purpose of this rule, trucks are defined as any vehicle exceeding 8 ft. in height. Areas not subject to truck traffic are areas where truck traffic is not normally encountered nor reasonably anticipated.
- [24] Communication cables and conductors may have a clearance of 15 feet where poles are back of curbs or other deterrents to vehicular traffic.
- [26] When designing a line to accommodate oversized vehicles, these clearance values shall be increased by the difference between the known height of oversized vehicle and 14 feet.
- [27] A diagonal clearance the same as the vertical clearance shall be maintained to uneven or sloping terrain within a horizontal distance of 3/4 of the vertical clearance, all distances to be measured from the conductors in their wind-displaced position as defined in II C in Std CL25 (PSC 114.230I #27).
- [28] This applies to insulated, non-shielded conductors rated not over 5 KV lashed to or twisted with a multi-grounded messenger or neutral (comes from NESC 230.C.3).
- [29] The surface area of lakes, ponds and reservoirs shall be the area as shown in "Michigan Lakes and Ponds" for Wisconsin; see the DNR Pub. 7-3600(74) "Wisconsin Lakes."
- [30] These clearances apply on public right-of-way. When we cross railroads by permit on railroad right-of-way, greater clearances may apply. Refer to [Joint Use Manual Section 700](#), page 11 for Wisconsin Central Railroad exceptions.
- [31] The minimum clearance of conductors (worst case sag conditions) over the traveled portion of highways where the Wisconsin DOT has maintenance jurisdiction (permitting authority) shall be 17 feet. Refer to the Utility Accommodation Policy Book, section 96.22 paragraph (B). The MI 22 foot rule applies to transmission lines only per the MI PSC. In Michigan, the minimum clearance of aerial wire crossings (worst case sag conditions) over state trunk lines shall not be less than 18 feet (MI DOT specifications).

- [32] Apartment building driveways are to be considered subject to truck traffic. A building with three or more living units is to be considered an apartment building (Company guideline).
- [33] See NESC Table 232-3 and PSC 114.232-3 for basic code design heights. See NESC Table 232-2 and PSC 114.232-2 for clearance of pole-mounted equipment above ground and in relation to walkway obstructions.
- [34] See the [Gas and Electric Service Manual](#) clearance section for additional information on service drop clearances.

Example 1

Road Clearance New Installation

#2 ACSR 350 Foot Span

Ambient Temp 32°F

Max. Conductor Operating Temp of 194°

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Initial Sag at 32°F = 27"

32°F w/ Ice (worst case) = 93"

Difference: 66" or 5.5'

Clearance Required at 32°F

Primary 18.5' + 5.5' = 24'

Neutral 15.5' + 5.5' = 21'

Example 2

Road Clearance Existing Installation

#2 ACSR 350 Foot Span

Ambient Temp 32°F

Less than 58 Amps (lightly loaded line, old)

Max. Conductor Operating Temp of 194°

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Final Sag at 32°F = 47"

32°F w/ Ice (worst case) = 93"

Difference: 46" or 3.8'

Clearance Required at 32°F:

Primary 18.5' + 3.8' = 22.3'

Neutral 15.5' + 3.8' = 19.3'

I. Vertical Clearances

A. Conditions

To apply the clearances in Table I, you must investigate the extreme conditions as stated in Std CL5. Both conductors are simultaneously subjected to the same ambient air temperature and wind conditions.

Example 1: Ambient air temperature 32 degrees F. Upper conductor at 32 degrees F, 1/2" radial ice and no wind. Lower conductor at 32 degrees F, no ice and no wind.

Example 2: Ambient air temperature 30 degrees F. Upper conductor with full electrical load: See page 508-1,2. Upper conductor at 194 degrees F, no wind and final sag. Lower conductor at 30 degrees F, no wind and initial sag.

II. Horizontal Clearances

A. Basic

A horizontal clearance of 5 feet is required between conductors on different supports.

B. Conditions

The same wind loads apply to both conductors so the wind should be considered to come from a direction that would blow the conductor with the greatest sag toward the conductor with the least sag. The sags shall be calculated at 60 degrees F final sag. The wind load shall be six pounds in open areas and four pounds in sheltered areas. See Std CL25 for sag multipliers to calculate blow out.

Table I

Lower Level	Upper Level Voltages are Phase to Ground				
	Communication conductors and cables and messengers (ft)	Guys, span wires, neutral conductors and surge protection wires (ft)	Supply cables and supply cables of 0 to 750V (ft)	Open supply conductors 0 to 750V supply cables over 750V (ft)	Open supply conductors over 750V to 22 KV [1] (ft)
1. Effectively grounded supply guys, span wires, neutral conductors, and surge protection wires	2 [1]	2 [1]	2	2	2
2. Effectively grounded communication guys, span wires and messengers, communication conductors and cables.	2 [1]	2 [1]	2	4 [8]	5 [5]
3. Supply cables 0-750V	2	2	2	2	2
4. Open supply conductors 0-750V and supply cables over 750V	4 [9]	2	2	2	2
5. Open supply conductors 750V to 22 KV	5 [5][9]	2	2 [9]	2 [9]	2

□ Note:

1. For systems above 22KV, contact owner of higher voltage system for requirements.

[1] This clearance may be reduced where both guys are electrically interconnected.

[5] This clearance may be reduced to 4 feet where supply conductors of 750V to 8.7 kV cross a communication line more than 6 feet horizontally from a communication structure.

[7] These clearances may be reduced by not more than 25% to a guy insulator, provided that full clearance is maintained to its metallic end fittings and the guy wires. The clearance to an insulated section of a guy between two insulators may be reduced by not more than 25%, provided that full clearance is maintained to the uninsulated portion of the guy.

[8] This clearance may be reduced to 2 feet for supply service drops.

[9] In general, this type of crossing is not recommended.

[10] Footnotes [2][3][4] and [6] not used.

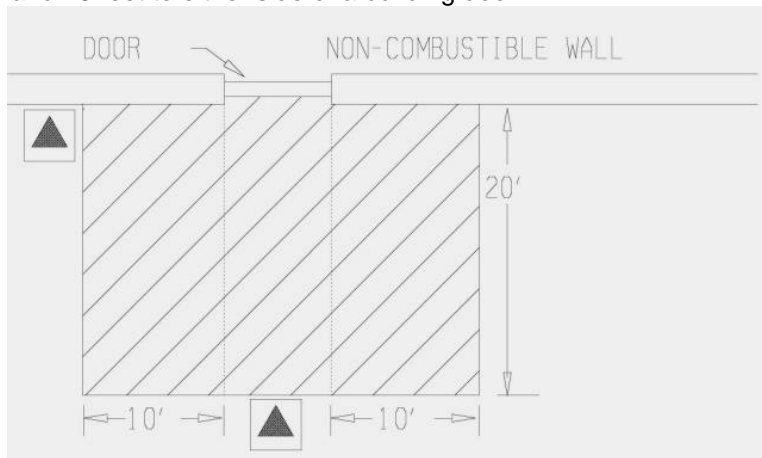
For the purpose of this section, combustible walls are walls of Type No. 8 buildings as determined by Wisconsin Building Code (Construction Classification IBC Chapter 6). All other walls are considered to be non-combustible.

I. Non-Combustible Walls

Padmounted oil-insulated transformers may be located directly next to non-combustible walls, if all of the following clearances are maintained from doors, windows and other building openings.

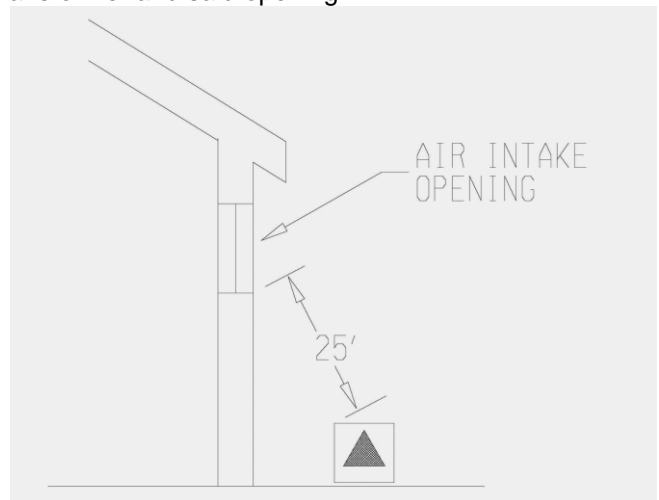
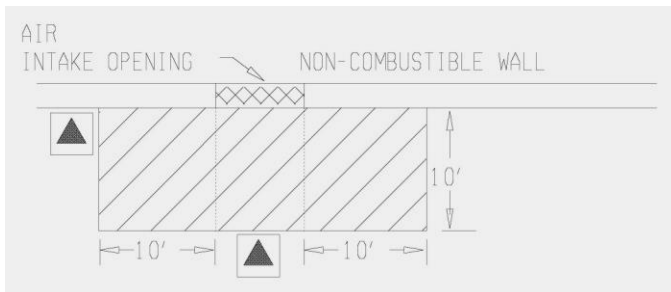
A. Doors

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.



B. Air Intake Openings

Padmounted oil-insulated transformers shall not be located within a zone extending 3.0 m (10 feet) outward and 3.0 m (10 feet) to either side of an air intake opening. Such transformers may be located within said zone beneath an air intake opening, provided there is not less than 7.6 m (25 feet) diagonal separation between the transformer and said opening.





C. Windows or Openings Other Than Air Intake

1. First Story

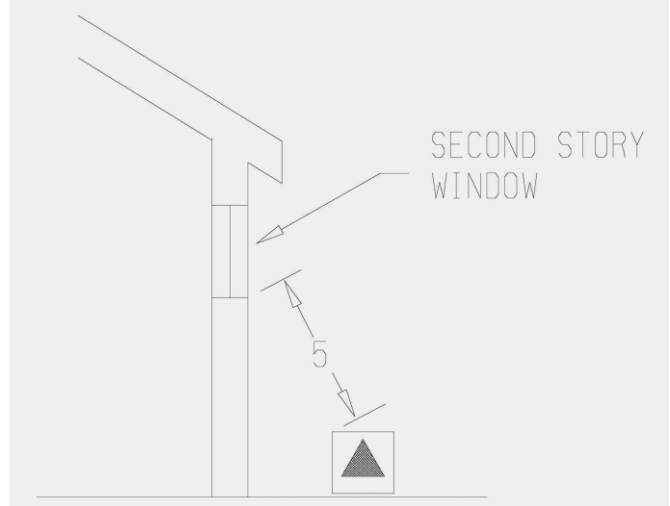
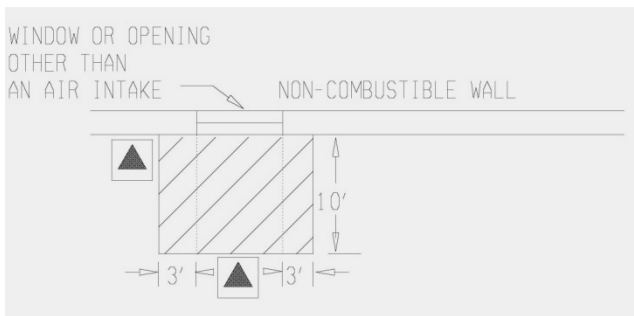
Padmounted oil-insulated transformers shall not be located within a zone extending 10 feet outward and 3 feet to either side of a building window or opening other than an air intake.

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).

2. Second Story

Padmounted oil-insulated transformers shall not be located less than 5 feet from any part of a second story 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).



II. Combustible Walls

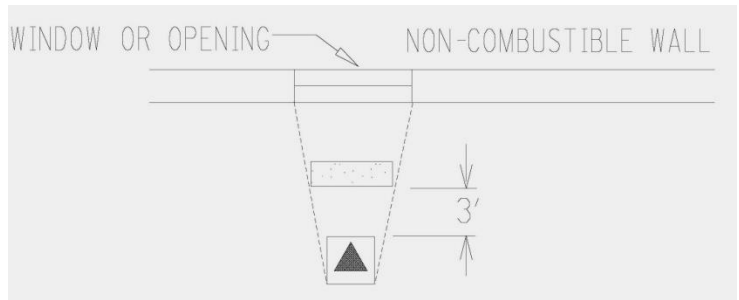
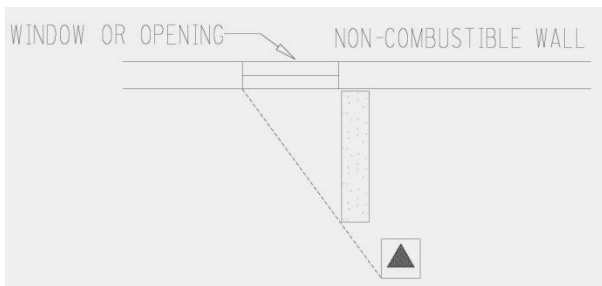
- A. Padmounted oil-insulated transformers in sizes up to and including 100 KVA shall be located according to the provisions set forth for non-combustible walls.
- B. Padmounted oil-insulated transformers in sizes above 100 KVA shall be located a minimum of 10' from the building wall, in addition to the clearances from building doors, windows and other openings set forth for non-combustible walls. Also, a sump shall be installed for transformers in sizes exceeding 500 KVA if the immediate terrain is pitched toward the building. Contact the Materials & Standards Group for sump specifications.

III. Barriers

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

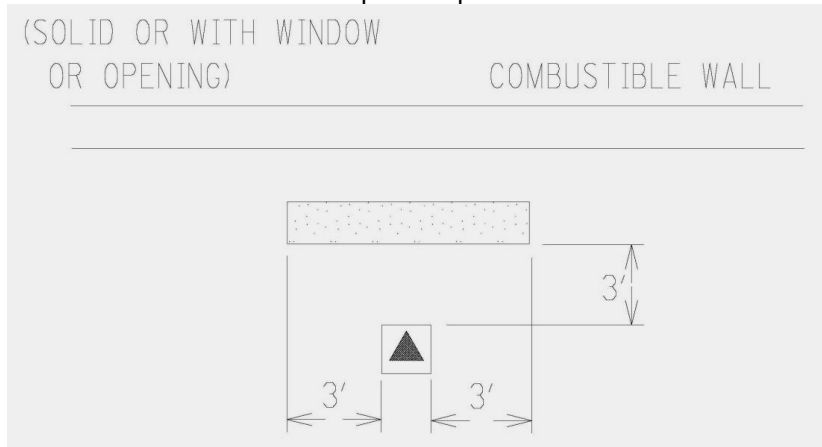
A. Non-combustible Walls

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



B. Combustible Walls

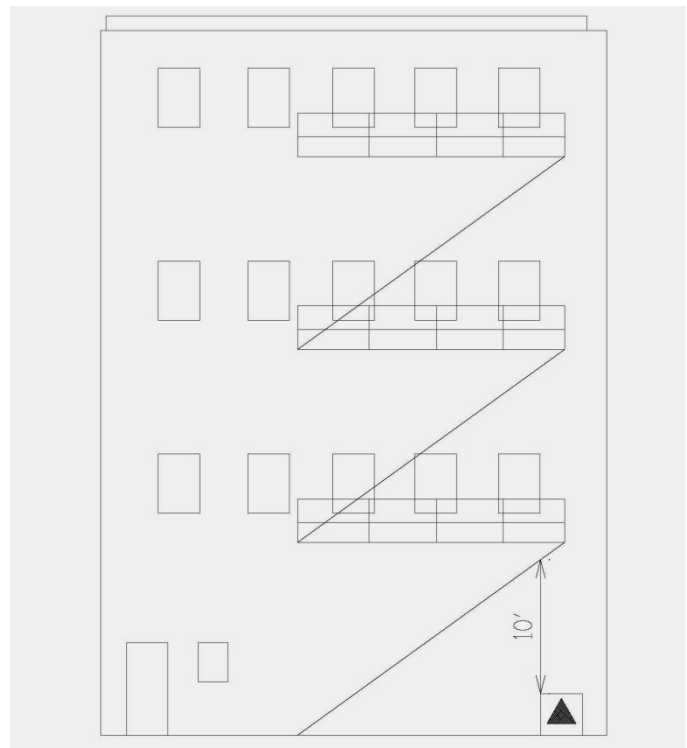
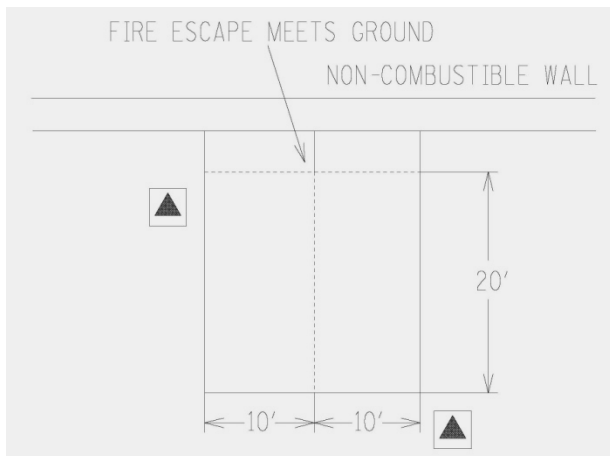
The barrier shall extend 3' beyond each side of the padmount transformer. The height of the barrier shall be 1' above the top of the padmount transformer.



IV. Fire Escapes

Padmounted oil-insulated transformers 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.

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.



Conductor Clearance Requirements to Buildings and Other Equipment in Transit

This standard is intended to give practical information to the line crews and designers on how to deal with moving buildings and other large pieces of equipment under very controlled and very rare circumstances. Normal conditions are covered by OSHA (or MIOSHA) rules (Std CL30) and normal building clearances (Std CL25). This standard is intended for only controlled, short time occurrences, with qualified company personnel on site.

When buildings and other oversized equipment are being moved, a minimum clearance, both horizontal and vertical, shall be maintained between overhead wires and cables, and the building or other equipment in transit as follows:

## A. Non-Metallic Buildings and Other Equipment

Phase to Phase Voltage	Clearance (Feet)
Neutrals	1.5
Insulated Secondary Cable, 0-600V	2
0 thru 25 KV	3
46 KV and 69 KV	4
115 KV and 138 KV	5
345 KV	9

## B. Metallic Buildings and Other Equipment

Phase to Phase Voltage	Clearance (Feet)
Neutrals	1.5
Insulated Secondary Cable, 0-600V	2
600 V to 25 KV	4
46 KV thru 345 KV	10

## Notes:

- This table and standard deals with special clearances under controlled conditions. It is important that qualified company personnel be on site when these clearances are used. If qualified company personnel are not on site, the normal OSHA (MIOSHA) or electrical code clearances apply. The electrical code (NESC) is based on 1.5 feet to the neutral, 2.0 feet to secondary cables, and 4.5 feet to the phases (0-22kv), assuming no one on top of or along side of the building while passing under the line. The assumed normal vehicle height on a road, per the NESC is 14.0 feet.
- The clearance indicated is the distance required at the time the work is done. This is important because significant changes in sag can occur due to temperature or line loading between time of measurements and the time work is done.
- Exceptions:
  - Neutrals and Secondary Cables: The clearance required for system neutrals and secondary cables can be reduced to simply mechanical clearance (not touching), if the conductor can be temporarily held by company personnel. The most that a system neutral or secondary cable can be lifted is about 1 foot (assuming a long span). There must also be sufficient clearance to the phase conductors to be able to lift the neutral or secondary cable. When considering lifting a neutral or secondary cable, consideration must be given to being able to get to it with a bucket truck while the building or piece of equipment is being moved down the road.
  - Neutrals: The system neutral can be jumpered out and dropped to the ground temporarily, if traffic and public safety can be controlled.
- Outages can be taken and phase conductors or secondaries dropped. Because of reliability concerns, this shall only be done if it involves less than 20 residential customers. An attempt shall be made to contact all affected residential customers. These residential customers should be limited to 2 such outages in a year's time. This comes into play when a large number of houses are being moved in advance of a development. This would also apply for dropping the same customers repeatedly while moving down a road with multiple crossings. Commercial and industrial customers can also be outaged, but only after working out agreeable outage times.

Exceptions can be made to these outage criteria if the affected customers agree or if approved by the Regional Manager. An example when the Regional Manager may approve an exception is when a building of historical or community significance is being moved.

5. If outages are taken, it is important to restore power as soon as reasonable. It is not acceptable to leave customers off until after the whole move is complete, unless the customers agree to a longer outage.
6. If the above clearances or allowed outages do not provide the necessary clearances, it will be necessary to take other action. Normally, the most economic is for the contractor moving the building or equipment to reduce the height of the item being moved. If this is not possible, the company must relocate its facilities and bill such expenses to the responsible party. Consideration can be given to temporary relocations, if reasonable. One option may be to lay out the emergency cable reel. Consult your Field Application Engineer for questions on temporary relocations.
7. It is company policy to bill for actual costs on building or equipment moving expenses. We should try to work out a reasonable cost estimate based on the above criteria.
8. For instances where the moving contractor chooses to violate the above rules, consult the [Electric Operating Procedures D-1.70](#) and contact your supervisor.
9. Clearances for 69 KV and over are here for reference. It is important to work with the owner of such facilities, normally the American Transmission Company (ATC), on any such building or equipment moves.

I. General

- A. Clearance is defined as the clear distance between two objects measured surface to surface.
- B. These are clearances that are allowed when the buildings and structures are in place and the lines are passing by them. When the buildings or structures are being erected or maintained, the OSHA clearances for unqualified workers may have to be observed. See Std CL30.
- C. For Service Drop Clearances of voltages less than 300 volts between conductors, see the [Gas and Electric Service Manual](#) for additional information on service drop and meter clearances.

II. Buildings

## A. General

Transmission lines (lines operating in excess of 35 KV to Grd) shall not be built over dwelling occupancies or mobile homes intended for residential occupancy. See NEC for definition of Dwelling Unit (PSC 114.234A4).

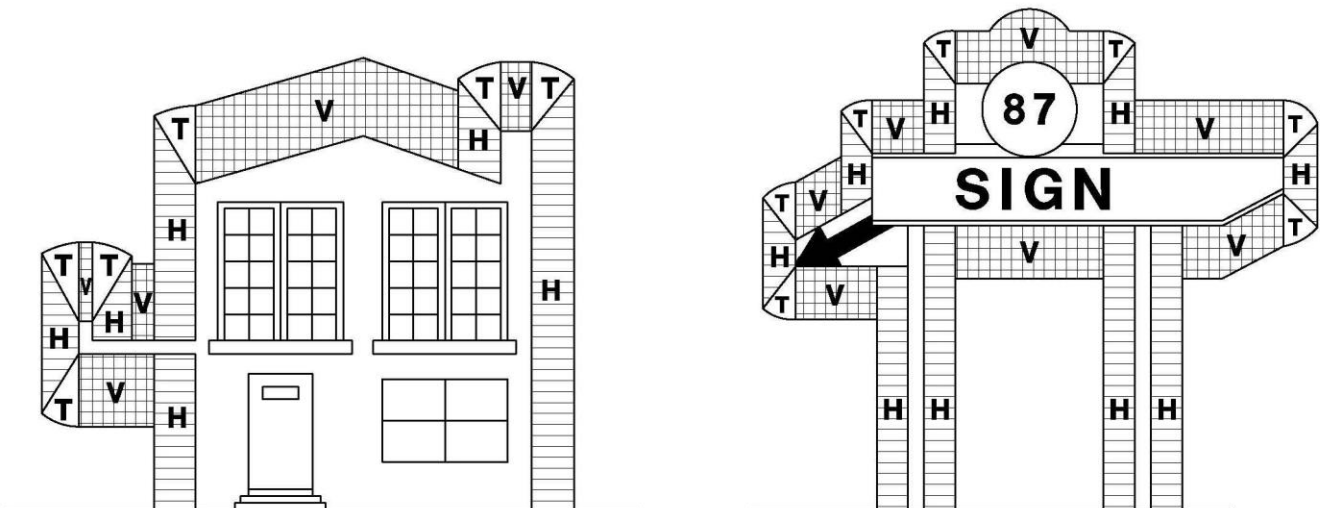
## B. Diagonal Clearances

For diagonal clearances, the horizontal clearance governs above the roof level or top of an installation to the point where the diagonal equals the vertical clearance requirement. This also applies above or below projections from buildings, signs, or other installations (see Figure 1).

## C. Horizontal Clearances (with wind displacement)

For all span lengths, a factor must be added to the horizontal clearance for horizontal displacement due to wind. At the point of maximum sag for the span, this factor is calculated by multiplying the final sag at 60°F (obtained from the proper table in [Section OSAG Standards](#)) by one of the multipliers listed in Std CL25.

EXCEPTION: The wind displacement adder is not needed for guys, messengers, neutrals. Cabled secondaries and cabled services.



T = Minimum transitional arc clearance.  
 V = Minimum vertical clearance.  
 H = Minimum horizontal clearance.

FIG. 1 Clearance Diagram for Buildings and other structures

Table I – No Wind Displacement

Clearance of wires, conductors, cables and unguarded live parts adjacent but not attached to buildings. (Voltages are phase to ground for effectively grounded circuits and phase to phase for ungrounded wye and delta circuits.)	Insulated communication conductors and cable; messengers; surge protection wires; grounded guys; neutral conductors (ft) [13]	Supply cables (triplex and quadruplex) of 0 to 750V (ft)	Open supply conductors 0 to 750V, supply cables over 750V, unguarded rigid live parts 0-750V and non-insulated communication conductors (ft) [17]	Open supply conductors, over 750V to 22KV, unguarded rigid live parts 750V to 22 KV (ft) [17]
<b>1. Buildings</b>				
<b>A. Horizontal</b>				
1) To walls, projections and guarded windows	4.5 [1][2][7]	5.0 [1][2]	5.5 [1][2][9]	7.5 [1][2][10][11]
2) To unguarded windows [8]	4.5	5.0	5.5 [9]	7.5 [10][11]
3) To balconies and areas accessible to pedestrians [3]	4.5	5.0	5.5 [9]	7.5 [10][11]
<b>B. Vertical [14]</b>				
1) Over or under roofs or projections not readily accessible to pedestrians [3]	8.0 [16][19]	8.0 [16][20]	10.5	12.5
2) Over or under balconies and roofs readily accessible to pedestrians [3]	10.5	11.0	11.5	13.5
3) Over roofs accessible to vehicles but not subject to truck traffic [6]	10.5	11.0	11.5	13.5
4) Over roofs accessible to truck traffic [6]	15.5	16.0	16.5	18.5
<b>2. Signs, chimneys, billboards, commercial radio and television antennas, tanks with nonflammable liquids, and other installations not classified as buildings or bridges.</b>				
<b>A. Horizontal [4]</b>				
1) To portions that are readily accessible to pedestrians [3]	4.5	5.0	5.5 [9][18]	7.5 [10][11][18]
2) To portions that are not readily accessible to pedestrians. [3]	3.0	3.5	5.5 [1][2][9]	7.5 [1][2][10][11]
<b>B. Vertical</b>				
1) Over or under catwalks and other surfaces upon which personnel walk.	10.5	11.0	11.5	13.5
2) Over or under other portions of such installations. [4]	3.0	3.5	6.0 [1]	8.0

Footnotes to Table I.

- [1] Where building, sign, chimney, antenna, tank, or other installation does not require maintenance such as painting, washing, changing of sign letters, or other operations which would require persons to work or pass between supply conductors and structure, the clearance may be reduced by 2 ft.
- [2] Where available space will not permit this value, the clearance may be reduced by 2 ft. provided the conductors, including splices and taps, have covering which provides sufficient dielectric to limit the likelihood of a short circuit in case of momentary contact with a structure or building.
- [3] A roof, balcony, or area is considered readily accessible to pedestrians if it can be casually accessed through a doorway, ramp, window, stairway, or permanently mounted ladder by a person on foot who neither exerts extraordinary physical effort nor employs special tools or devices to gain entry. A permanently mounted ladder is not considered a means of access if its bottom rung is 8 ft. or more from the ground or other permanently installed accessible surface.
- [4] The required clearances shall be to the closest approach of motorized signs or moving portions of installations.
- [5] Ungrounded guys and ungrounded portion of guys between guy insulators shall have clearances based on the highest voltage to which they may be exposed to a slack conductor or guy.
- [6] For the purpose of this rule, trucks are defined as any vehicle exceeding 8 ft in height.

- [7] This clearance may be reduced to 3 inches for the grounded portions of guys.
- [8] Windows not designed to open may have the clearances permitted for walls and projections.
- [9] This clearance shall be not less than 3.5 ft with the conductor or cable displaced by wind; see Table II.
- [10] This clearance shall be not less than 4.5 ft with the conductor displaced by wind; see Table II.
- [11] Where available space will not permit this value, the clearance may be reduced to 7.0 feet for conductors limited to 8.7 KV to ground.
- [12] This footnote not used.
- [13] The anchor end of guys insulated in accordance with NESC Rule 279 may have the same clearance as grounded guys.
- [14] For clearances above railings, walls, or parapets around balconies or roofs, use the clearances required by row 1b(1). For clearances where an outside stairway exists, use the clearances required for row 1b(2).
- [15] Does not include multi-grounded neutral conductors.
- [16] For WI, this clearance may be reduced to 3 feet for supply conductors limited to 300V to ground and communication conductors and cables if the roof has a slope of not less than 1 (vertical) to 3 (horizontal).
- [17] Unguarded rigid live parts and non-insulated communication conductors may have one half foot less clearance than these values.
- [18] Unguarded rigid live parts may have one half foot less clearance than these values plus the reduction of 1 and 2 if they apply.
- [19] For MI 3.0 feet.
- [20] For MI 3.5 feet.

Table II

Conductor	Horizontal Clearance Required When Displaced by Wind (ft)
Open supply conductors, 0 - 750V	3.5
Open supply conductors, 751V - 22KV	4.5

See footnotes [9] and [10] to Table I.

Table III

Sag Multipliers for Horizontal Displacement at Final Sag at 60°F

	Unsheltered Areas *	In areas sheltered by buildings, terrain or other obstacles **
#2 ACSR	.836	.712
#1/0 ACSR	.808	.675
#4/0 ACSR	.695	.542
336.4 ACSR	.683	.529
4/0 AA	.796	.659
336.4 AA	.726	.575
795 AA	.566	.417
1/0 3/C Sec. Cable	.751	.604

Note: Consult Field Application Engineer for conductors other than the above.

Where minimum clearance is not at midspan, the horizontal clearance calculated using Tables II and III may be reduced by multiplying by one of the factors in Table IV.

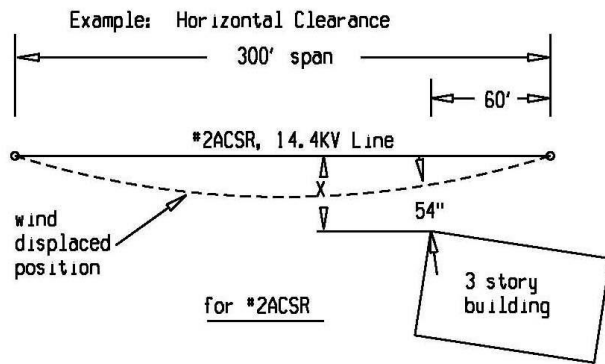
\* Wind speed of 50 mph figured or 6#/ft<sup>2</sup>

\*\* Wind speed of 40 mph figured or 4#/ft<sup>2</sup>

Table IV

Distance from nearer support of crossing span to point of crossing in percentage of crossing span length (manual calculating, not part of code)	Factors*
5	0.19
10	0.36
15	0.51
20	0.64
25	0.75
30	0.84
35	0.91
40	0.96
45	0.99
50	1.00

\* Interpolate for intermediate values



$$X = \text{horizontal clearance} = 4.5' + (43'' \times .836 \times .64) = 77''$$

↑ from table II      ↑ 60' sag from sag table      ↑ from table III      ↑ from table IV

- D. Vertical and Horizontal Clearances (No wind displacement)
- The clearances in Table I apply under the following conditions, whichever one produces the closest approach.
1. Operating temperature of 120°F
  2. 32°F with 1/2" radial ice
  3. Maximum design operating temperature if over 120°F. (See [Std OHC20.](#)) New construction should be designed for 194°F.
  4. Minimum conductor temperature for which the line is designed, initial sag.



- E. Service-Drop Conductors Attached to Buildings  
See the [Gas and Electric Service Manual](#) for service drop clearances not in excess of 750 V.  
There are differences between MI and WI.

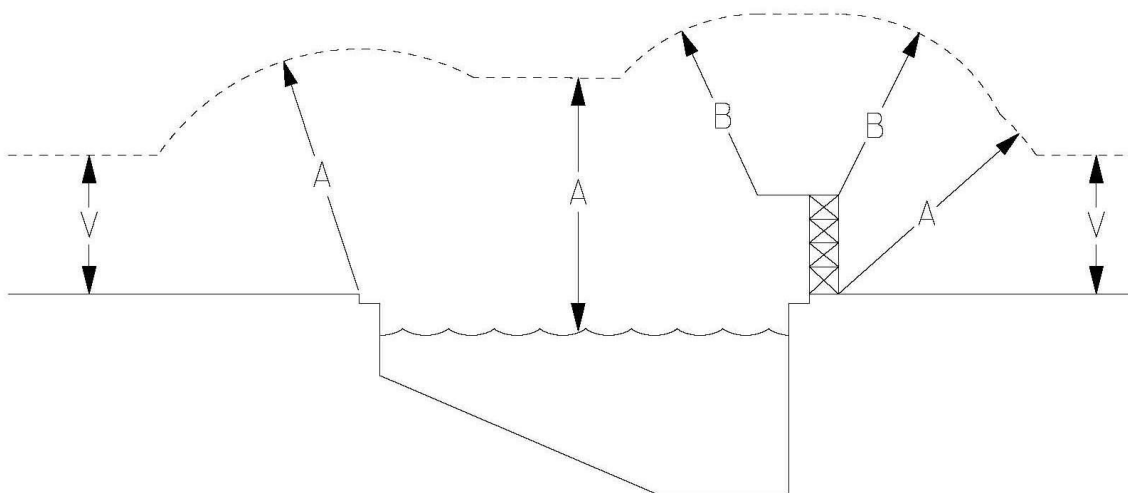
Communication and customer-owned circuits cannot be attached to the electrical entrance periscopes (NEC 230.28) after 1995.

No part of the drip loop or service drop conductor within 3 feet of the service head and service drop attachments shall be less than 12 inches from communication conductors or cables.

### III. Swimming Areas

Overhead electric lines should avoid swimming areas. If the conductors need to be near swimming areas, see below: The horizontal clearances in Table V are for conductor clearances with no wind.

#### A. Swimming Pools



V= Clearances as required by page CL5

FIG. 2 Swimming Pool Clearances

- B. Beaches and Waterways Restricted to Swimming (Sailboating Prohibited).  
Where rescue poles are used by lifeguards at supervised swimming beaches, the vertical and horizontal clearances shall not be less than those shown in Table V. Where rescue poles are not used, the clearances shall be as specified on Std CL5.
- C. Waterways Subject to Waterskiing (Sailboating Prohibited).  
Clearances, Std CL5.
- D. Underground supply cables should not be installed within 5 feet of a swimming pool or its auxiliary equipment. If 5 feet is not attainable, supplemental mechanical protection shall be provided.

Table V

Basic Clearance of Cables and Conductors over or Near Swimming Areas (no wind displacement)

	Voltage to Ground		
	Neutrals (ft) [3]	Supply cables (triplex & quadruplex) of 0 to 750V (ft) [3]	Open supply conductors over 750V to 22KV (ft) [2]
A. [1] Clearance in any direction from the water level, edge of pool, base of diving platform or anchored raft.	22.0	22.5	25
B. [1] Clearance in any direction to the diving platform, tower, water slide, or other fixed pool-related structures.	14.0	14.5	17

This limit shall extend to the outer edge of the diving structure, observation stands, towers, or platforms, but not less than 10'.

## Footnotes to Table V.

- [1] A and B are shown in Figure 2.
- [2] Consult the Materials & Standards Group on any rigid live parts, open supply conductors (0-750V), or guy wire clearances.
- [3] These do not apply when these conductors are 10 feet or more horizontally from the edge of the pool, diving platform, diving tower, water slide, or other pool-related structure.

IV. Antennas

Employees shall report any residential antenna installations which could fall into primary or secondary lines, are attached to our poles, or the antenna lead-in wires which are attached to our poles or pass over or under our primary or secondary conductors or pass over services. For information on residential antennas, see the [Gas and Electric Service Manual](#) clearance section. See Table I for clearances required by code for commercial antennas.

V. Stored Material

Lines shall not be run over designated material storage areas where material is regularly stored and handled by cranes or other types of high machinery unless the clearance of such lines is adequate to permit full use of the equipment (PSC 114.234 C6).

VI. Above-Ground Fuel Storage TanksA. Overhead Wires (PSC 114.234 C7)

A horizontal clearance of at least 15 feet shall be maintained between above-ground flammable liquids storage tanks and open conductors. A horizontal clearance of 8 feet shall be maintained from cabled secondaries and services.

NOTE: THIS REQUIREMENT DOES NOT APPLY TO LPG TANKS WITH CAPACITY OF 1,000 GALLONS OR LESS. THIS REQUIREMENT ALSO DOES NOT APPLY TO TANKS ENCLOSED IN A BUILDING OR FULLY COVERED BY A ROOF OR CANOPY CAPABLE OF PREVENTING FALLING OVERHEAD SUPPLY CONDUCTORS FROM DIRECTLY CONTACTING THE TANK. IN THIS CASE, SEE NORMAL BUILDING CLEARANCES.

B. Underground Wires (NEC)

1. Not under the tank.
2. 10 feet from the fill pipe.
3. 20 feet from dispensing device on tank.
4. 10 feet from remote pump.

VII. Wells

For bare overhead wires a horizontal clearance of at least 3/4 of the vertical clearance of the conductors to ground required by Std CL5 shall be maintained between supply conductors and wells. (WI requirement per PSC 114.234C8). Note OSHA and MIOSHA working clearances of at least 10 feet.

VIII. Flagpoles

A horizontal clearance of 4.5 ft from the wind blown flag. The vertical clearance is the same as signs, chimneys and billboards in 2 b. of Table I.

IX. Light Standards, Structures Supporting Other Lines, or Traffic Signal Supports

Conductors of one line passing near a lighting standard, traffic signal support, or a structure supporting a second line, without being attached to them, shall have the following clearances:

- A. A horizontal clearance of 5 feet without wind (with wind see Table II and use 60°F for sag calculations).
- B. A vertical clearance of 4.5 feet for voltages below 22 KV line to ground and 5.5 feet between 22-50 KV line to ground. The conditions in II C in the "Buildings" section also apply here.

Exception: For guys, messengers, multi-grounded neutrals, secondary and service cables of 300 volts or less to ground the vertical clearance may be reduced to 2 feet and horizontal clearances may be reduced to 3 feet. The additional vertical clearances in the "Building" section apply here (Section II).

X. Railroads and Railroad CarsA. Overhead Lines

- 1. Vertical Crossing (see Std CL5).
- 2. Horizontal: All conductors, wires or cables run along railroad tracks shall be outside of the dotted line in Fig 3 where:
  - V: The minimum vertical clearance from the conductor above the top of the rail as specified in Std CL5 minus 20 feet.
  - H: The minimum horizontal clearance from the conductor to the nearest rail, which is equal to the vertical clearance as specified in Std CL5 minus 15 feet.

- B. Poles, crossarms, braces, anchor guys and pole mounted equipment attached at less than 22 ft. above the nearest track rail shall be located not less than 12 ft. from the nearest track rail.

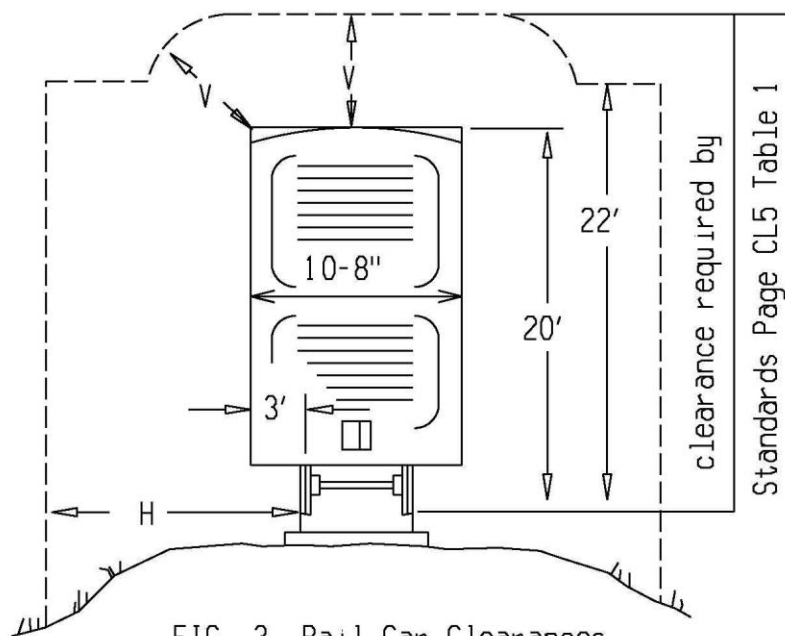
Exception 1 - A clearance of not less than 7 ft may be allowed where the supporting structure is not the controlling obstruction, provided sufficient space for a driveway is left where cars are loaded or unloaded.

Exception 2 - At industrial sidings, a clearance of not less than 7 ft shall be permitted provided sufficient space is left where cars can be loaded or unloaded. An industrial siding is generally short, serving just one customer and owned by the customer, not the railroad.

- C. Ground-mounted equipment such as transformers, pedestals, junctions, etc., shall have 12 ft. of clearance from the nearest track rail. Exceptions 1 and 2 from X B apply.

D. Underground Conduit Systems and Cables.

- 1. Conduit crossing shall be 50 inches below the top of the rail.
- 2. Conduit systems should not be located longitudinally under the tracks.
- 3. Manholes, handholes and vaults shall not be located in the roadbed.
- 4. The installation of cable longitudinally under the ballast section should be avoided.
- 5. Cable crossing under the tracks shall have 50 inches of clearance from the top of the rail.



XI. Bridges

Contact the Materials & Standards Group for the proper clearances of conductors near bridges.

XII. Sewage Systems

- A. Underground wiring shall not be closer to the edge of mound sewage systems than the following:
1. Down slope side 15 feet
  2. Top side 10 feet
  3. Lateral sides 10 feet

B. Use caution when installing underground wires between the tank and the mound as the line between these two is pressurized.

C. Construction equipment should not travel in the area within 20 feet of the mound system.

NOTE: The clearances along the sides and the top side could be less. Check with the local county for their requirements.

D. Sewer Pipe

- Gravity fed pipes - 1 foot
- Pressurized pipes - Try to avoid

Field, Alternative Field, and Septic Tank (Co. design policy).

- 5 feet if less than 480 volts
- 10 feet if 480 volts or more

XIII. Below-Ground Storage Tanks and Class I Hazardous Locations

Call the Material & Standards Group and see [Gas and Electric Service Manual](#) page 7-2.

XIV. Grain Bins

- A. Grain bins loaded by permanently installed augers, conveyors, or elevators. Building clearances apply. In addition, the following clearances shall also apply without wind displacement.

Exception in Wisconsin:

Farm silos that are loaded by a blower through a vertical metal tube permanently attached to the side of the structure are not considered grain bins. Use building clearance for these.

1. A clearance of not less than 10 feet in all directions above the grain bin shall be maintained from each "probe port" in the grain bin roof for all wires, conductors, or cables.
2. A horizontal clearance of not less than 15 feet shall be maintained between grain bins and open supply conductors, 0-22KV.

- B. Grain bins loaded by portable augers, conveyors, or elevators. See Figure 5. Horizontal clearances shall be met under wind conditions. See example in Std CL25.

EXCEPTION: On the NON-LOADING SIDE, building clearances apply to the following: support arms, grounded equipment cases, communication conductors and cables, messengers, surge protection wires, grounded guys, neutral conductors, secondary cables and service cables of 0-750 volts and unguarded cases of equipment at 0-750 volts.

- C. Any side of grain bin is considered to be non-loading side if it is so designated, or it is so closely abutting another structure or obstruction, or so close to a public road or other right-of-way that a portable auger, conveyor, or elevator is not reasonably anticipated to be used over that side or portion to fill the grain bin.
- D. Where an agreement excludes the use of portable augers, conveyors, or elevators from a designated portion of a grain bin, such portion is considered to be a non-loading side.

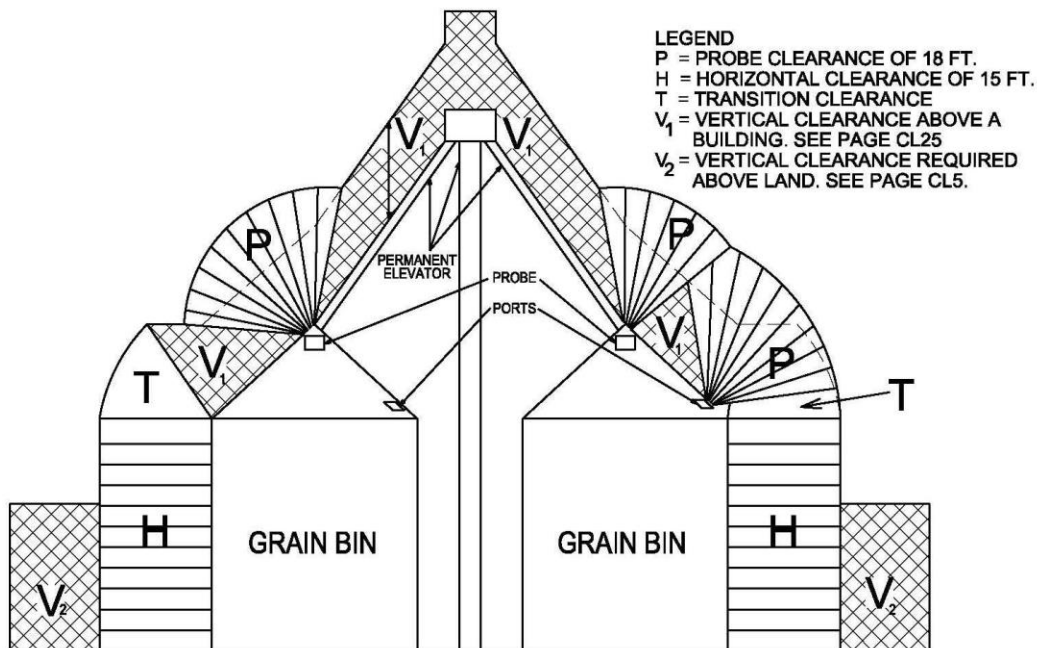


FIG. 4  
CLEARANCE ENVELOPE FOR GRAIN BINS BY  
PERMANENTLY INSTALLED AUGERS, CONVEYORS, OR ELEVATORS



XV. Clearances of Supporting Structures from Other Objects

Supporting structures, support arms, anchor guys, and equipment attached thereto, and braces shall have the following clearances from other objects. The clearance shall be measured between the nearest parts of the objects concerned.

## A. From Fire Hydrants

Not less than 4 ft.

EXCEPTION: Where conditions do not permit, a clearance of not less than 3 ft. is allowed, unless reduced by agreement with the local fire authority and pole owner.

## B. From Streets, Roads, and Highways

1. Where there are curbs: supporting structures, support arms, anchor guys, or equipment attached thereto, up to 15 ft. above the road surface shall be located a sufficient distance from the street side of the curbs to avoid contact by ordinary vehicles using and located on the traveled way. For a redirection curb, such distance shall be not less than 6 in. For paved or concrete swale-type curbs, such facilities shall be located behind the curb.
2. Where there are no curbs, supporting structures should be located a sufficient distance from the roadway to avoid contact by ordinary vehicles using and located on the traveled way.
3. Location of overhead utility installations on roads, streets, or highways with narrow rights-of-way or closely abutting improvements are special cases that must be resolved in a manner consistent with the prevailing limitations and conditions.
4. Where a governmental authority exercising jurisdiction over structure location has issued a permit for, or otherwise approved, specific locations for supporting structures, that permit or approval shall govern.



I. General

Employees aware of clearance violations involving our facilities shall follow section II below.

Note: See [Electric Operating Procedures D-1.70](#) and [D-2.10](#) for more complete information.

II. Cranes, Derricks, Scaffolds, Structures in Progress of Erection

Note: Clearances apply to all non-qualified workers for electrical work as defined by OSHA;

A Qualified Person for Electrical Work (Working on or near voltages over 50 volts) shall have:

- a. The skills and techniques necessary to distinguish exposed live parts from other electrical parts;
- b. The skills and techniques necessary to determine the nominal voltages of exposed parts;
- c. The skills to determine the minimum approach distances to live parts; and
- d. The skills to properly use the special precautionary techniques, personal protective equipment, insulating and shielding material, and insulated tools for working on or near exposed energized parts.

A. WPS employees aware of cranes, derricks or similar equipment operating or construction work being done closer to energized company overhead facilities than specified in Table I, shall warn the project foreman and/or equipment operator of the associated hazards.

B. After warning the project foreman and/or the operator, the WPS employee shall promptly notify a qualified employee of the situation. If a qualified employee is not available in the location of the occurrence, the employee shall notify another qualified employee or handle the situation personally.

NOTE: A qualified employee can readily identify the multigrounded neutral phase wires, secondaries, CATV and Telephone circuits on a pole line and determine that the neutral is properly grounded.

C. The qualified employee handling the situation shall immediately proceed to the job site and again warn the foreman and/or operator. "Look-up and Live" stickers, code #151-7796 shall be given to the operator of any involved equipment, and the operator shall be urged to install the stickers near the controls and also ask for them to be put on scaffolds with wheels on them. If the hazard is extremely serious or a code violation is present, the qualified employee shall request the foreman to halt all work near the energized facilities until the hazard is eliminated. The qualified employee handling the situation shall then proceed as indicated in Electric Operating Procedure D-1.70.

D. Except where electrical distribution and transmission lines have been de-energized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the equipment or machine, have been erected to prevent physical contact with the lines, equipment or machines shall be operated proximate to power lines only in accordance with Table I.

Note: Because of the ambiguity of this OSHA wording, Wisconsin Public Service will not erect or use any insulating barriers.

Table I

<u>Voltage of Conductors (Phase to Ground)</u>	<u>Minimum Clearances (ft) for OTHER THAN cranes, derricks and other lifting equipment</u>	<u>Minimum Clearances (ft) FOR cranes, derricks and other lifting equipment</u>
50 volts to 50 KV	10.0	*10
69, 115 and 138 KV	11.0	*15
345 KV	15.0	*20

Note: Clearances are derived from Dept. of Labor, Occupational Safety & Health Admin., Safety and Health Regulations. Subpart S, 1910.333(c)(3) and Subpart CC, 1926.1408.

Note: \* These clearances apply to cranes, derricks and other lifting equipment included by OSHA in 1926.1400 and assume that the additional OSHA requirements have been met to utilize these reduced.



Note: If we (WPS) inspect the site and determine that the neutral is properly grounded, then our multigrounded neutral is considered to be less than 50 volts and unqualified workers can work within 24" of it, but must maintain the clearances specified in Table 1 from anything not grounded or over 50 volts.

- E. The horizontal clearances in Table I are for ambient conditions at the time the work or construction is being performed, including wind blow-out.

Note: For calculating wind blow-out due to sag, see the example in Std CL25. The vertical clearances in Table I are for ambient conditions and normal conductor loading at the time the work or construction is being performed.