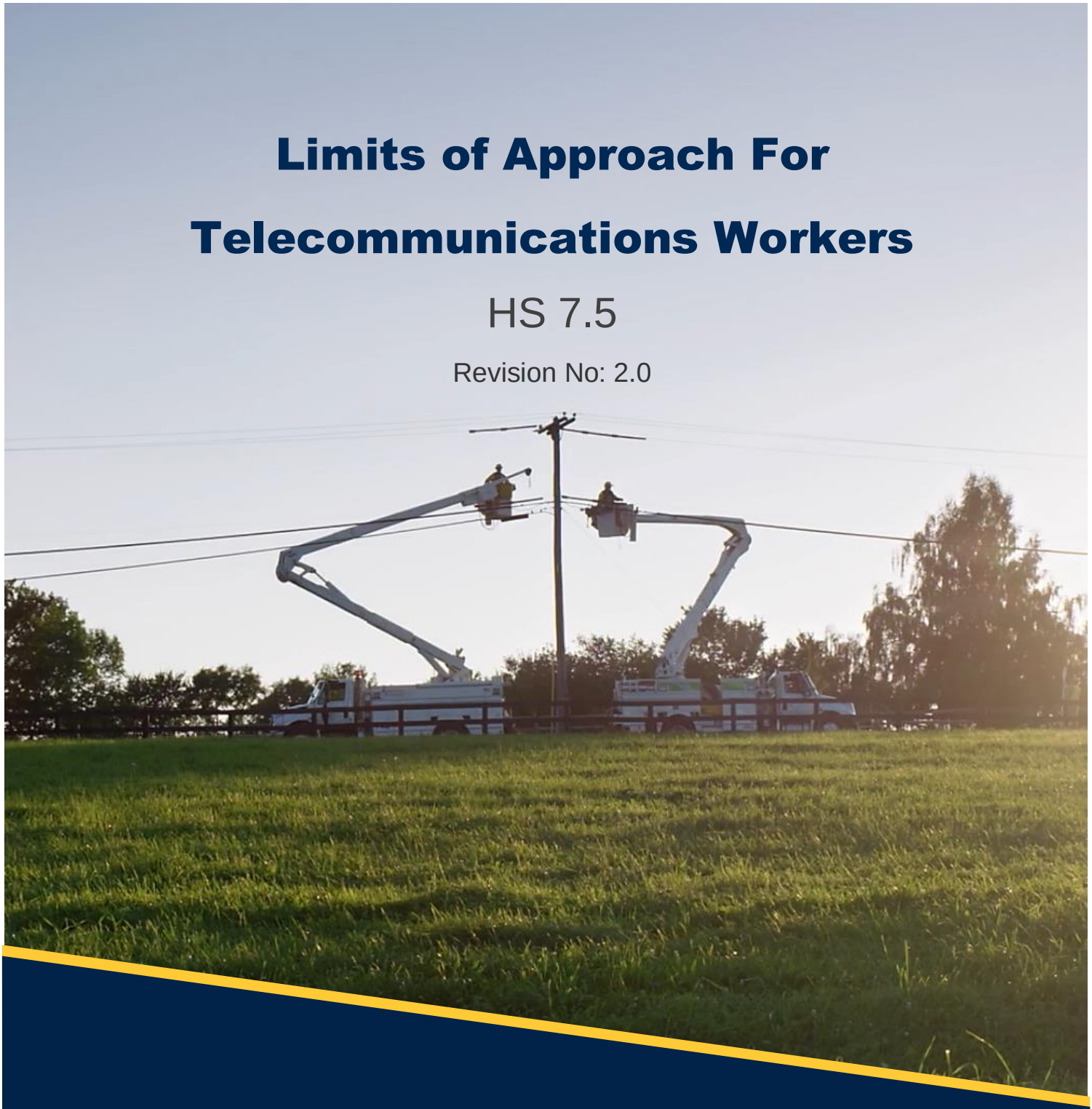
Limits of Approach For Telecommunications Workers

HS 7.5

Revision No: 2.0



Owner	Approver	Revision #	Revision Date	Date of Last Review
Safety & Work Methods	Manager Safety & Work Methods	2.0	September 7, 2023	September 7, 2023

FORTIS ALBERTA

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1. Scope

1.1. This document sets out how FortisAlberta implements and applies the safe limits of approach distances articulated in the Alberta Occupational Health and Safety Code and Alberta Electric Utility Code to its electric distribution equipment and powerlines.

2. Purpose

2.1. This document is a source of supplemental information that users may choose to incorporate in their own training programs on the safe limits of approach for electrical equipment. This document is neither a comprehensive nor a stand-alone source of information on the safe limits of approach for electrical equipment and any user should consult the appropriate legislation, codes, and regulations to ensure they are compliant.

2.2. Disclaimer of Liability

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3. Normative References

3.1. Workers shall be competent in the following standards:

- FortisAlberta HS 39.01 Minimum Approach Distances [B1]
- Alberta Electric Utility Code [B2]
- Alberta Occupational Health and Safety Code (OH&S) Parts 17 and 40 [B3]

4. Glossary

AEUC – Alberta Electrical Utility Code

Apparatus – all equipment pertaining to the generation, transmission distribution and use of electricity.

Energized – the state of electrical systems, lines and equipment connected to a source of electric energy at a potential significantly different from that of ground (earth) at the work site and which presents an electrical hazard.

Limits of Approach – the minimum distance in air to be maintained between any part of the body of a worker including any object (except tools appropriate for live working) being handled directly, and part(s) at different potentials.

Minimum Approach Distance – same definition as Limits of Approach

PLT – Powerline Technician

Non-qualified Personnel - any person not employed by an electrical utility company.

Operator-in-charge – a designated employee assigned by an employer to coordinate the control of the electrical operation of an electrical utility system in accordance with the requirements of the safely rules and the operating procedures established by the employer.

Qualified Utility Employee – a power line or station utility employee trained and experienced to work safely on energized electrical equipment or lines.

Utility Employee – an employee trained to recognize hazards associated with energized electrical equipment or lines and trained and experienced to work safely near energized electrical equipment or lines. An employee trained and experienced to work safely on energized electrical equipment or lines operating at voltages below 750 V between conductors.

5. Regulatory Requirements

5.1. Specific to limits of approach, FortisAlberta is governed by the Alberta Occupational Health and Safety Code (OH&S) Parts 17 and 40 [B3]. In 2023 the AEUC removed rules and tables outlining the limits of approach and referred instead to the method of calculating these distances outlined in CAN/ULC-S801-14-Rev1, Standard on Electric Utility Workplace Electrical Safety for Generation, Transmission, and Distribution [B4]. The updated tables that apply for workers including Power Line Technicians and Utility Tree Trimmers can be found in FortisAlberta's HS39.01 Minimum Approach Distances [B1].

5.2. Alberta Occupational Health and Safety Code Part 17 (OH&S).

225(1) Before work is done or equipment is operated within 7.0 meters of an energized power line, an employer must

a) determine the voltage of the power line, and
b) establish the appropriate safe limit of approach distance listed in schedule 4.

225(2) Except as provided for in subsection (3), an employer must ensure that the safe limit of approach distance, as established in subsection (1), is maintained and that no work is done and no equipment is operated at a distance less than the established safe limit of approach distance.

225(3) Before work is done or equipment is operated in the vicinity of an overhead power line at a distance less than the established safe limit of approach distance listed in Schedule 4, an employer must notify the operator of the electric utility, the rural electrification association or the industrial power producer who operates the overhead power line and obtain the operator's assistance in protecting workers involved.

225(4) An employer must ensure that earth or other materials are not placed under or beside an overhead power line if doing so reduces the safe clearance to less than the established safe limit of approach distance listed in Schedule 4.

225(5) A worker must maintain safe clearance of not less than the established safe limit of approach distance listed in Schedule 4 when working in the vicinity of an overhead power line.

5.3. FortisAlberta, after notification, will contact the employer; identify the power line voltage, establish the limits of approach for the employers' workers or equipment and communicate that limit to the worker.

6. Limits of Approach

6.1. The nominal supply voltages of FortisAlberta powerlines range from $120V_{LG}$ to $25kV_{LL}$ (14.4kV Line-to-Ground) and are classified as distribution powerlines. This includes power lines that are owned by Rural Electrical Associations but operated by FortisAlberta. Limits of approach are voltage dependent. The higher the voltage, the greater the limits of approach for workers and their tools and equipment.

6.2. Telecommunication workers shall identify the owner or operator of the powerlines on the structure they are planning to work on, as only the owner or operator can establish the voltage on the power line. Once it is determined that the structure you are planning to work on is owned by FortisAlberta, and FortisAlberta has informed you of the voltage in the relevant equipment or line, you should reference the table in Alberta OH&S Schedule 4, shown in Table 1 below, which sets out the approach distances. The limit of approach for high voltage powerlines is 3 meters. High voltage is defined as 750 volts – 40 kV, meaning:

- No worker may approach within 3 meters of the powerline at any time.
- No tool or equipment can be positioned within 3 meters of the powerline at any time.
- These distances are established for worker protection; at any time, if you think that you might encroach on this 3 meter distance then you must stop the work and contact FortisAlberta who will help determine a safe method to complete the work.
- Note that the approach distance is always measured from the lowest point on the structure where the high voltage is located and could be inadvertently contacted. If you do not know where the 3 meters limits of approach apply, then you must contact FortisAlberta at 310-Wire for an orientation.
- Measurements must never be taken with a tape measure and must be made by a visual assessment only. This is because tape measures may be conductive. If they contact a high voltage powerline or piece of equipment the potential resulting shock could cause injury or death.

6.3. Throughout this document the focus is on high voltage power lines with a 3.0 meter limit of approach. Apply the same logic for secondary supply voltages (0 – 750 Volts) but use the appropriate limits of approach from Table 1. Secondary supply conductors are assumed to be bare, uninsulated by default (1.0 meter limits of approach).

6.4. The safest method may include FortisAlberta taking steps to:

- Isolate the overhead power line
- Install temporary protective rubber cover-up
- Assign a FortisAlberta power line technician to be on site to observe the work

Table 1 – Safe Limit of Approach Distances

Operating voltage of overhead power line between line conductors unless otherwise specified	Safe limit of approach distance for persons and equipment
0 - 750 V insulated or polyethylene covered conductors (1)	0.3 m
0 - 750 V bare, uninsulated	1.0 m
Above 750 V insulated conductors (1), (2)	1.0 m
0.75 kV - 40 kV	3.0 m
69 kV, 72 kV	3.5 m
138 kV, 144 kV	4.0 m
230 kV, 260 kV	5.0 m
500 kV	7.0 m
500 kV DC Pole-Ground	7.0 m
(1) Conductors must be insulated or covered throughout their entire length to comply with these groups. (2) Conductors must be manufactured to rated and tested insulation levels.	

Taken from Table 1 in Schedule 4 of Alberta Occupational Health and Safety Code (Also found in AEUC as Table 1 Safe limits of Approach distances from Overhead Power Lines for Persons and Equipment)

7. Identifying High Voltage Power Lines on FortisAlberta Structures

7.1. Telecommunication companies may have facilities attached to many different types of FortisAlberta structures. These structures may be single phase or three phase structures, and these structures could include all types of different electrical equipment including transformers, switch gear or underground risers. This section identifies the 3 meter measuring points on the different types of structures.

7.1.1. The structures throughout the remainder of this document are not an all-inclusive list of FortisAlberta structures but a representation of the different types that exist.

7.2. Single Phase Structures

Single phase structures do not normally have crossarms attached to the poles. The high voltage conductor is located at the top of the pole.

Contacting any of the supply conductors can result in serious injury or death.

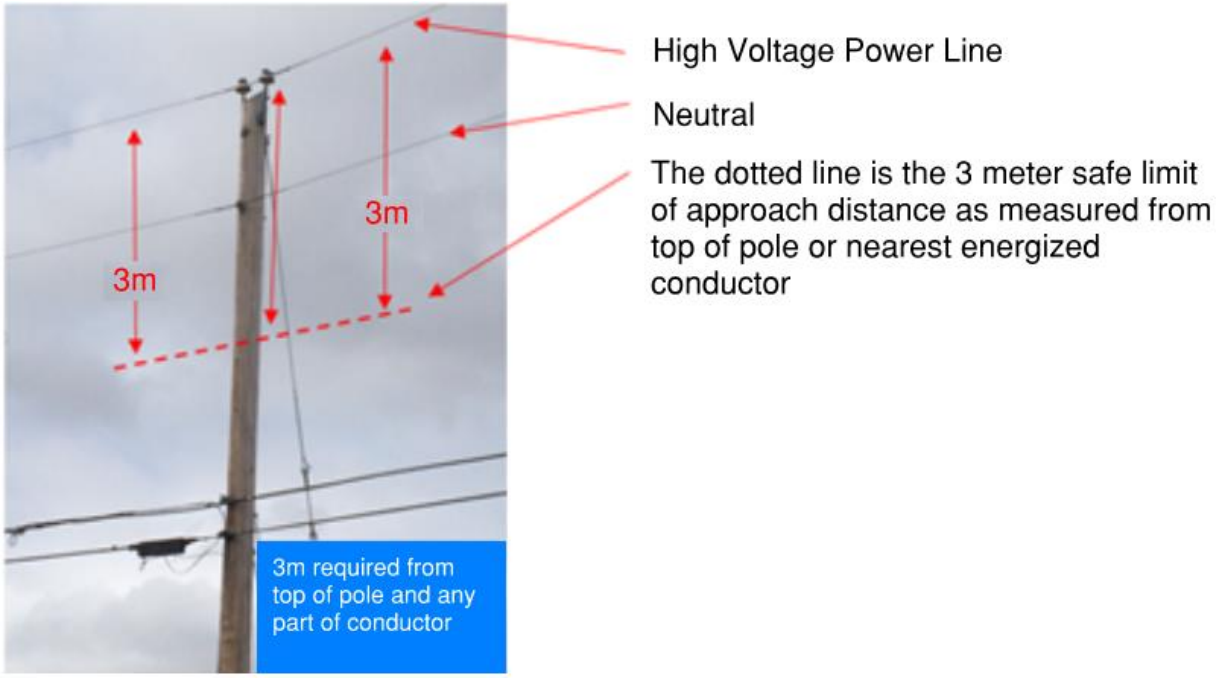

Figure 1 - Single Phase Power Line with Neutral

7.2.1. Figure 1 is a typical single phase high voltage power line with a neutral. The high voltage conductor is located at the top of the structure and the neutral below it. The distance that the neutral is located below the high voltage conductor will vary based on the year of construction and site-specific conditions.

The 3 meter limit of approach distance is visually measured down from the top of the pole and results in the imaginary dotted line.

Note: There have been incidents in the past where a communication worker was lashing his cable to a steel support cable and the lash was flipped up and contacted the energized high voltage power line. At no time can this lashing be long enough that it will encroach on the 3 meters when tying a cable in.

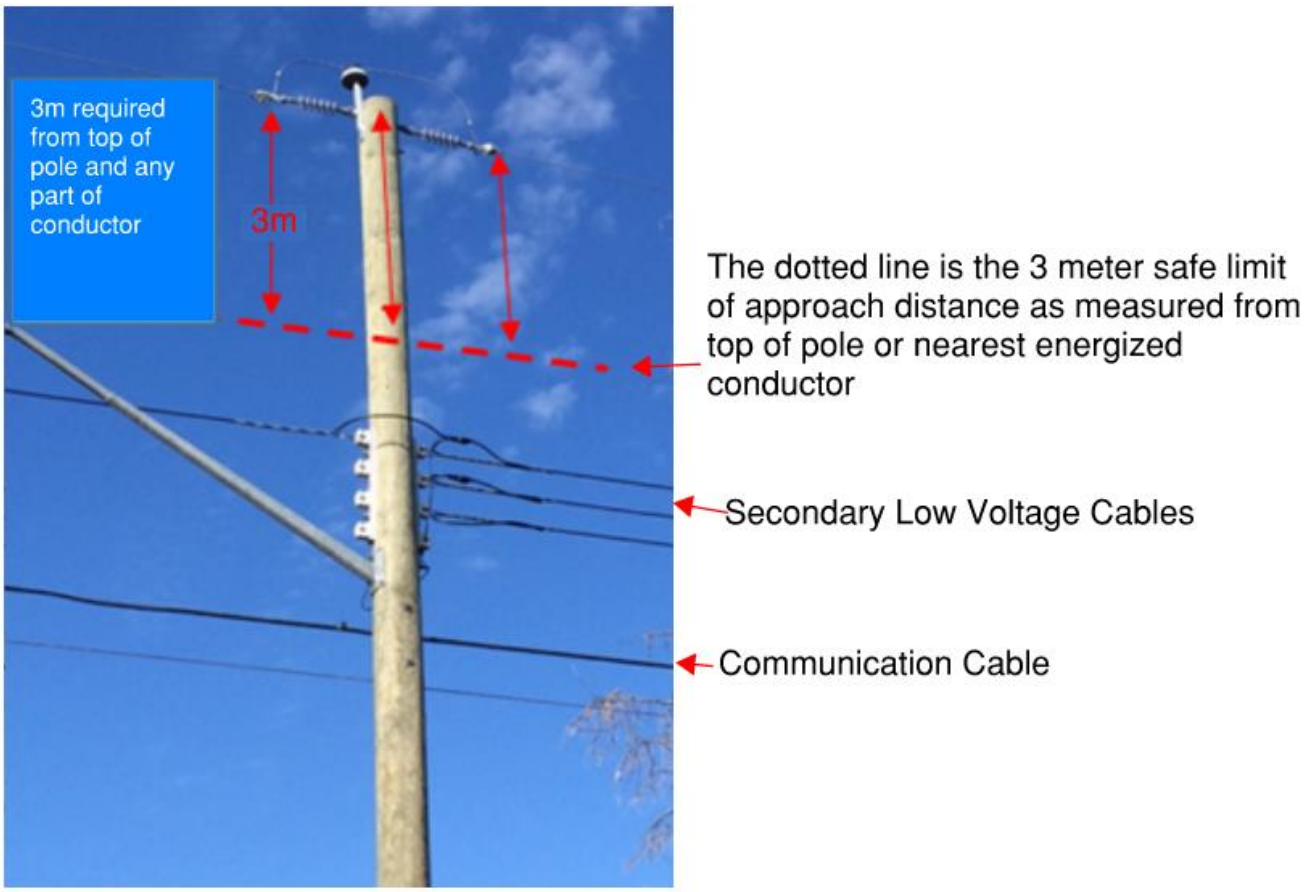

Figure 2 - Single Phase Power Line without Neutral

7.2.2. In Figure 2, the high voltage power line is again located at the top of the pole. Unlike Figure 1, this structure has no neutral and has the addition of 3 secondary cables (voltage below 750V). Below the dotted line are the 3 secondary cables and below those cables is the communication cable. These secondary cables are normally energized at 120 V each but could be as high as 480 V. Communication workers are to stay 1 meter away from these secondary cables.

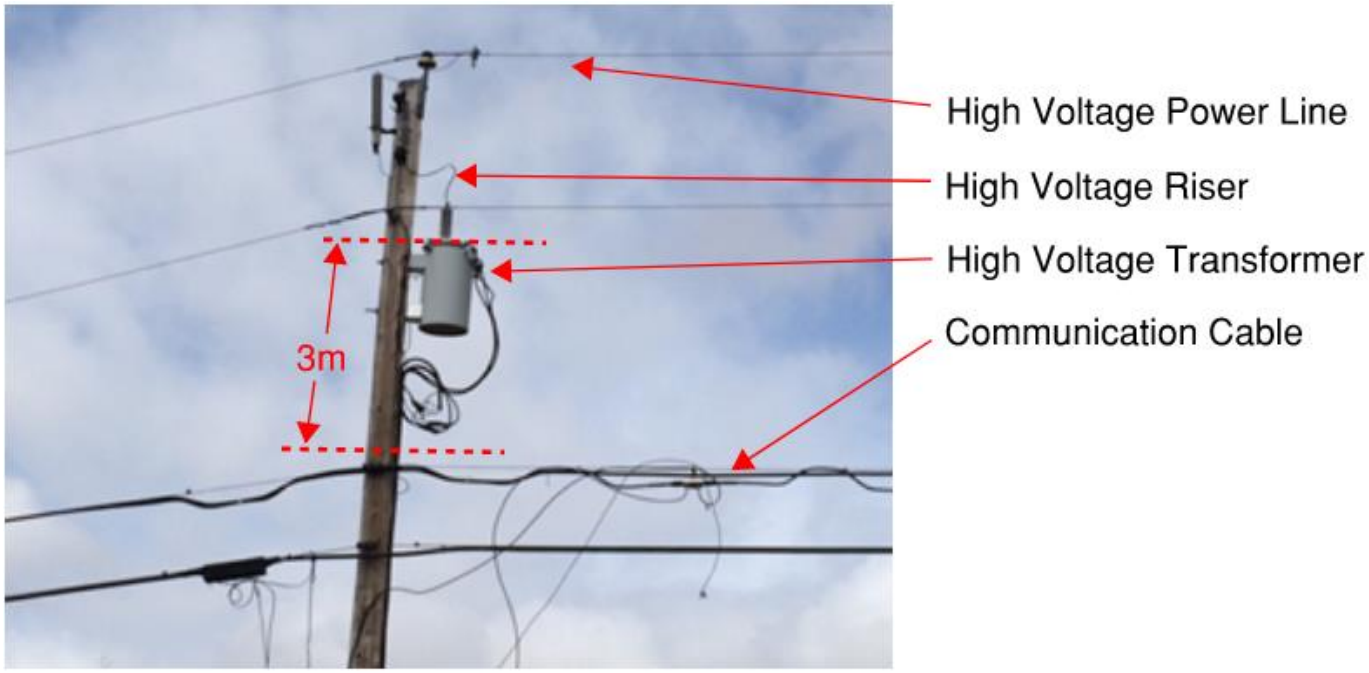

Figure 3 - Single Phase Power Line with Transformer

7.2.3. Figure 3 shows the addition of a high voltage transformer. The top of the transformer is energized at the same voltage as the conductor at the top of the pole. The 3 meter limit of approach distance is always taken from the lowest point on the structure that the high voltage can be contacted.

The lowest point in Figure 3 is the top of the transformer since it has a high voltage jumper attached to it from the high voltage power line above. The red dotted line again delineates the imaginary 3 meter limit of approach distance as measured from the top of the transformer. The telecommunication cable is very close to the 3 meter limits of approach distance.

Extreme caution must be taken, and the worker should consider contacting FortisAlberta for additional direction when working on this structure.

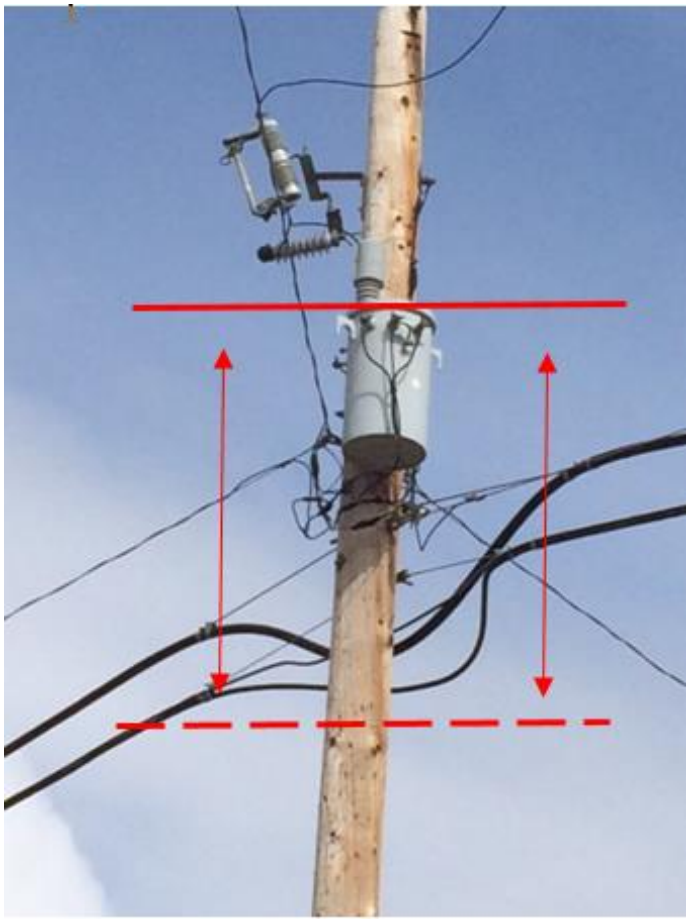

Figure 4 - Single Phase Power Line with Transformer

7.2.4. Figure 4 is another example of a structure with a high voltage transformer attached to it. The 3 meter limit of approach distance is measured down from the top of the transformer. The telecommunication cable is clearly located within the 3 meter distance (indicated by the red dotted line).

The telecommunication worker must contact FortisAlberta at 310-WIRE prior to working on this structure. A FortisAlberta employee will come to site and establish a procedure with the communication worker to safely complete the work.

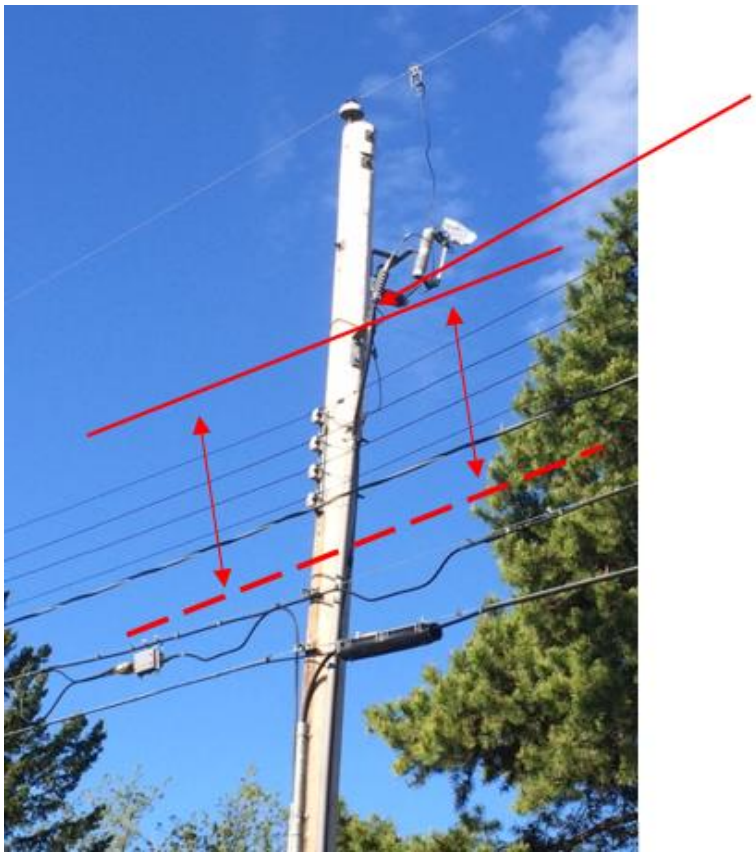

Figure 5 - Single Phase Power Line with High Voltage Underground

7.2.5. Figure 5 is a single phase structure with a high voltage underground cable attached to it. These high voltage underground cables will be attached to the pole either on a cross arm (See 3 phase structures) or on a single bracket as in the picture above.

The 3 meter limits of approach distance on structures with an underground high voltage cable attached is measured down from the bracket if the underground cable is attached to a bracket on the pole or down from the crossarm if the cables are attached to a crossarm on the pole. The solid red line in Figure 6 is the top of the bracket and the dotted red line delineates the 3 meter limit of approach distance as measured down from the bracket.

7.3. Three Phase Structures

Three phase structures normally have crossarms attached to them that support the 3 individual high voltage conductors. The 3 meter limit of approach distance on the structure shown in Figure 6 is measured from the crossarm down.

Contacting any of the supply conductors can result in serious injury or death.

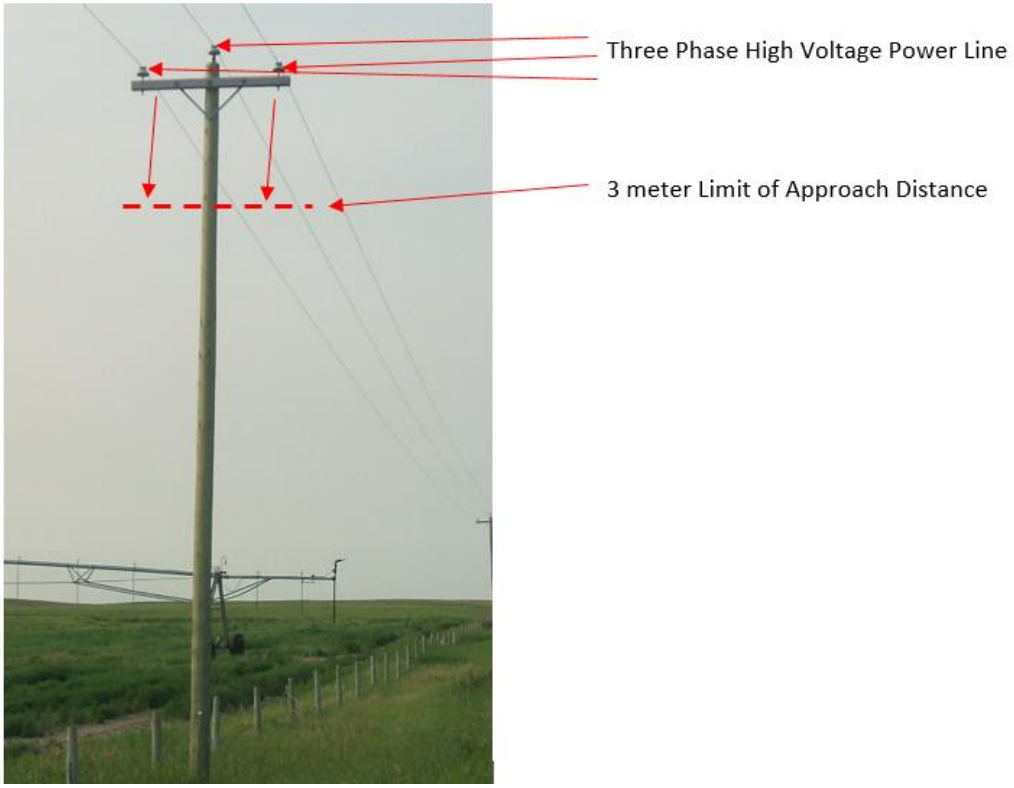

Figure 6- Three Phase Power Line Tangent Structure

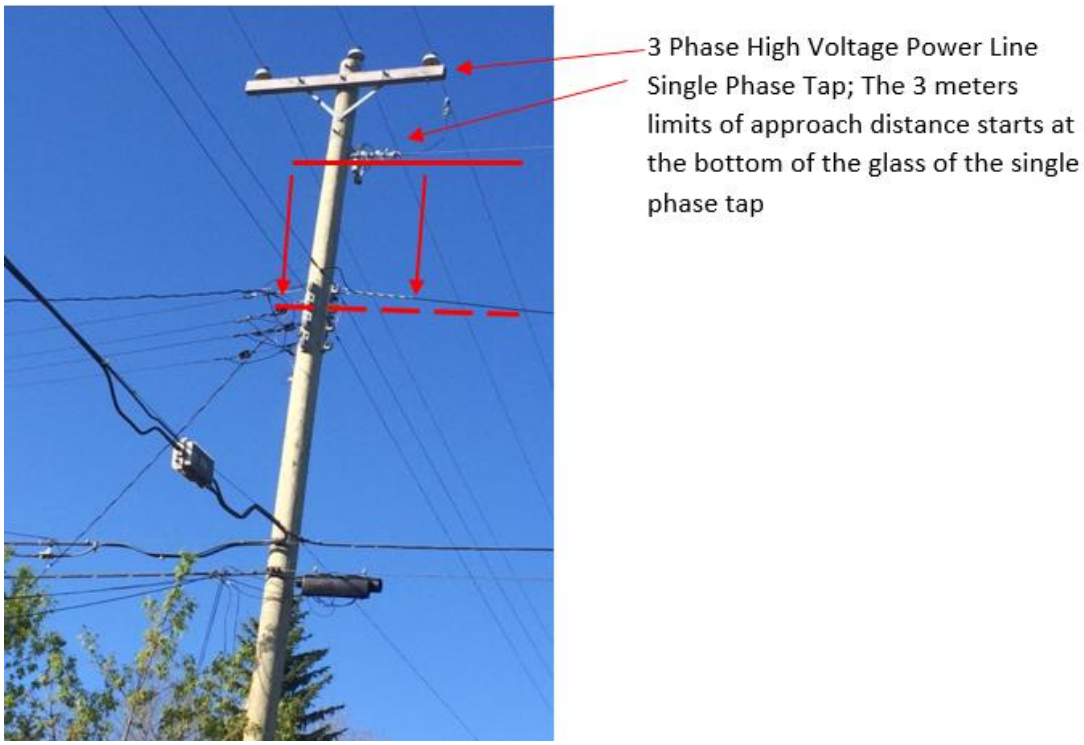

Figure 7 - Three Phase Power Line with a Single Phase “Tap”

7.3.1. Figure 7 is a three phase structure with a single phase high voltage power line “tapping off”. The tap off is attached to one of the top conductors by a jumper so is energized at the same high voltage as the 3 top conductors.

The limits of approach distance are always measured from the lowest point on the structure that the high voltage can be contacted. In this example, the lowest point would be the single phase “tap off” location, so the 3 meter limit of approach distance would be measured down from that point.

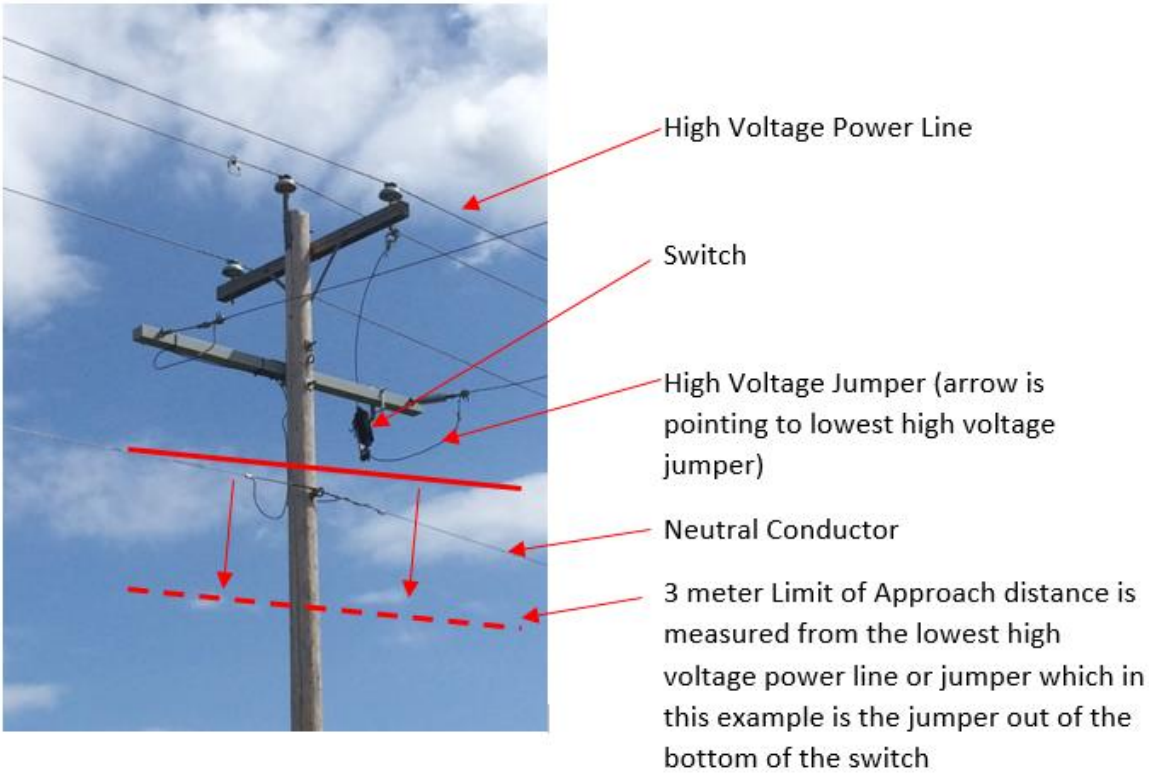

Figure 8 -Three Phase Power Line with Single Phase “Tap” on Crossarm

7.3.2. Figure 8 is another example of a 3 phase power line with a single phase tap off of it. The difference is that this time the tap is located on a crossarm and not attached directly to the pole. A switch is also attached to the crossarm with high voltage jumpers connected to both the top and bottom of the switch.

The lowest point on the structure that the high voltage could be contacted would therefore be the high voltage jumper coming out of the bottom of the switch. The 3 meter limit of approach distance (represented by the dotted line) would be measured from that location, indicated by the solid line.

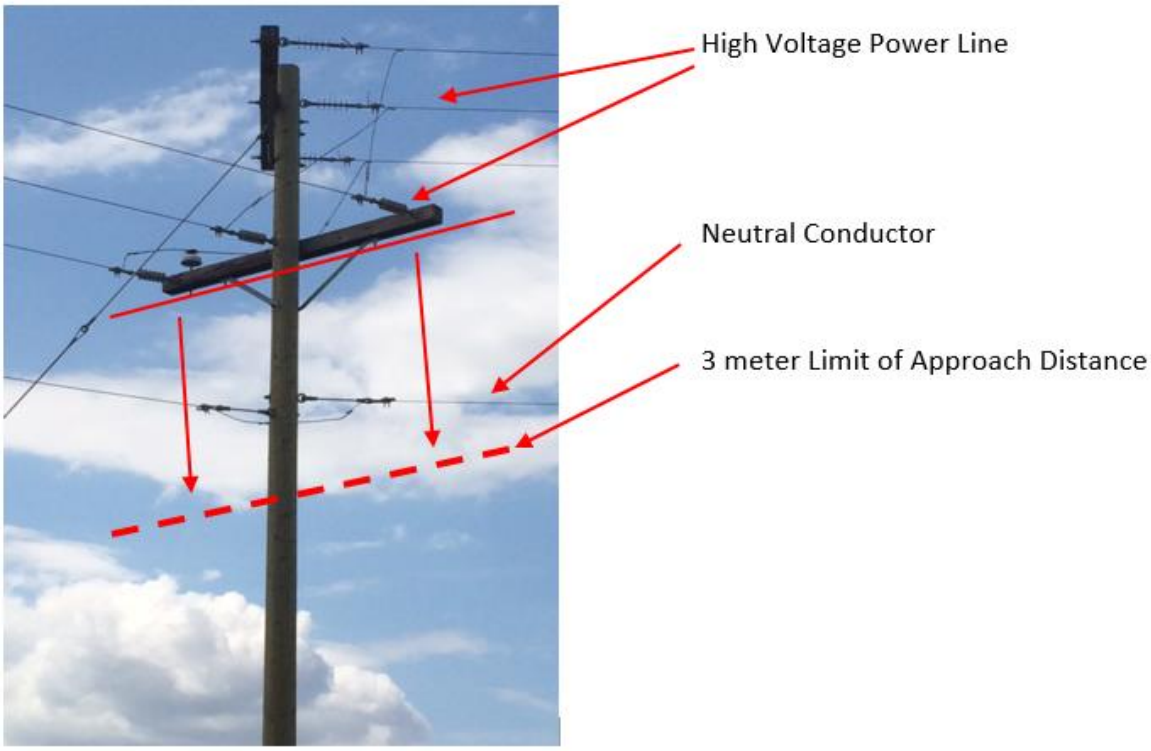

Figure 9 - Three Phase Power Line with a “Three Phase Tap”

7.3.3. Figure 9 is another three phase structure with a 3 phase tap located on the bottom crossarm. The conductors on the bottom crossarm are connected to the conductors on the top crossarm and so contain the same high voltage as the top high voltage power line.

The 3 meter limit of approach distance (represented by the dotted line) is therefore measured down from the lower crossarm on the structure, indicated by the solid line.

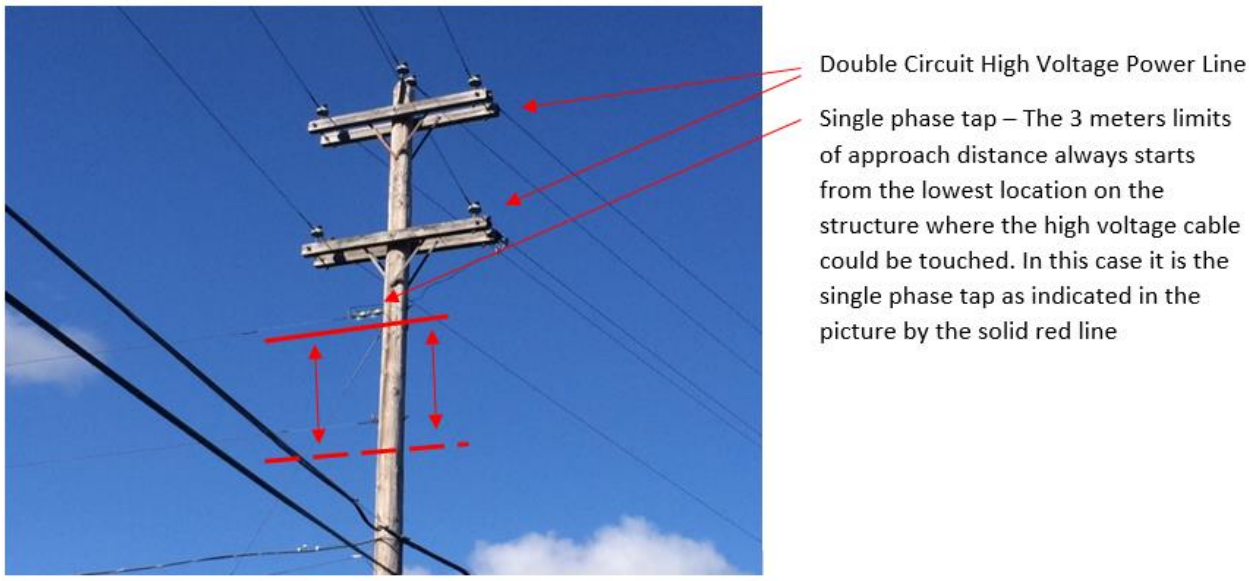

Figure 10 - Three Phase Double Circuit Structure with Single Phase “Tap”

7.3.4. FortisAlberta has locations where two different circuits are located on the same structure. Either circuit may consist of 2 or 3 high voltage conductors. If conductors are attached to a crossarm, then they are always assumed to be high voltage conductors. In the example above a single phase “tap” is also attached to the structure located below the bottom crossarm. “Taps” are energized at the same high voltage as the top conductors and so are the lowest location on the structure where the high voltage could be contacted.

Therefore, the 3 meter limit of approach distance is measured down from the “tap off” location (indicated by the solid red line) as shown in Figure 10.

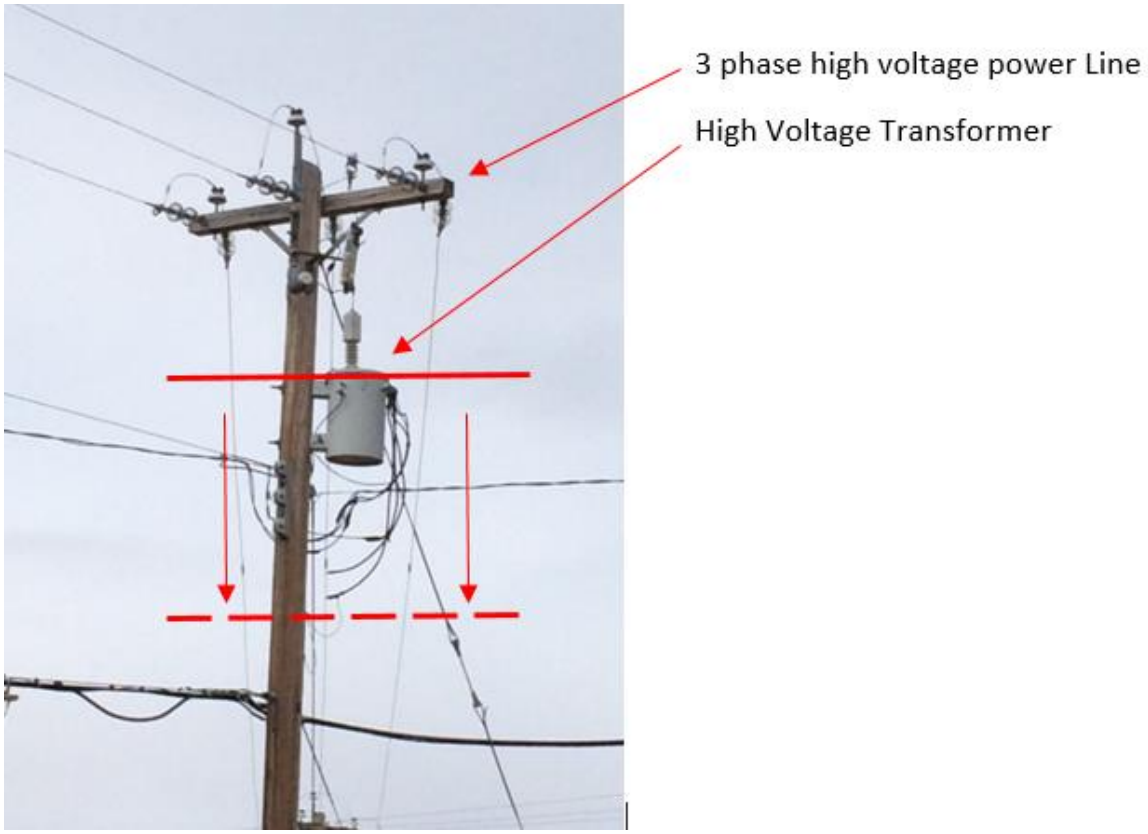

Figure 11 - Three Phase Power Line with Single Phase Transformer

7.3.5. Figure 11 is an example of a three phase power line with a single phase high voltage transformer attached to it. The top of the transformer is energized at the same voltage as the conductor at the top of the pole. The 3 meter limit of approach distance is measured down from the top of the transformer as indicated above.

In Figure 11 the telecommunication cables are close to the 3 meter limit indicated by the dotted line. **The telecommunication worker should identify where this imaginary line is and be careful not cross to it at any time.**

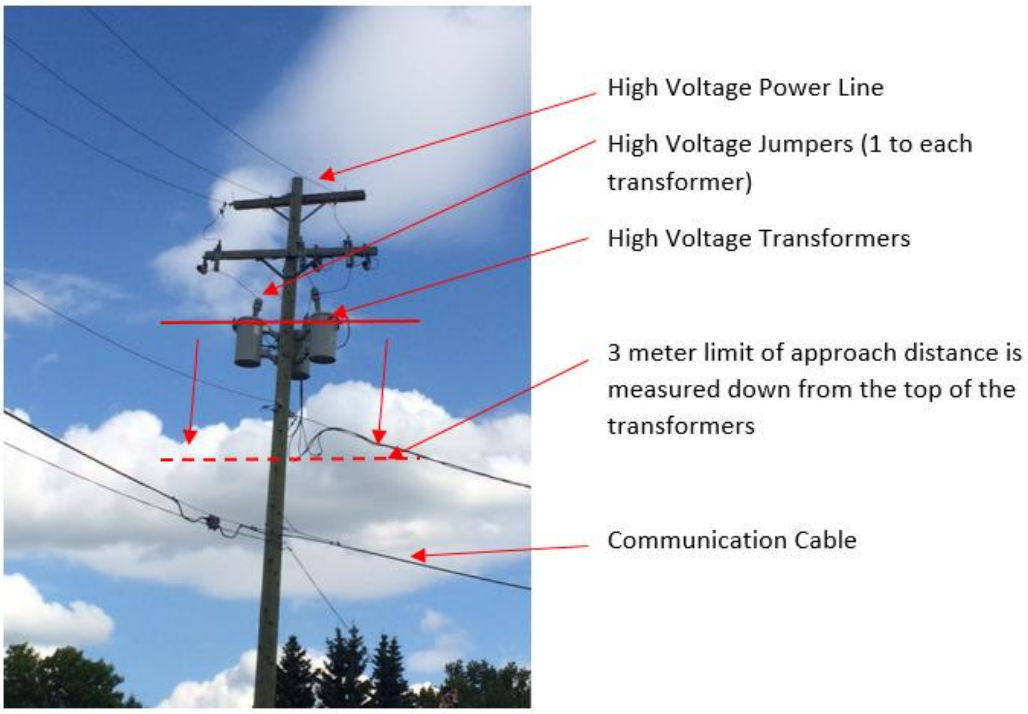

Figure 12 - Three Phase Power Line with 3 Individual Transformers

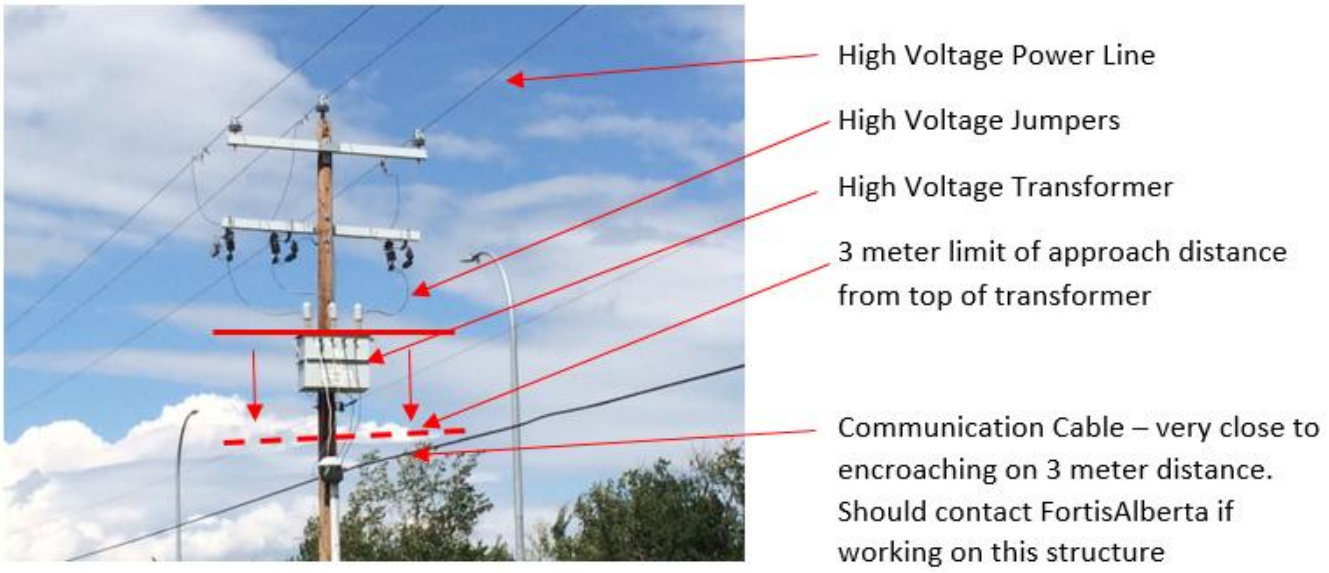

Figure 13-Three Phase Power Line with 3 Phase Transformer (one tank)

7.3.6. Figures 12 and 13 are examples of two different types of 3 phase transformers that are common on Fortis structures. Figure 12 consists of 3 individual transformers while Figure 13 is one individual 3 phase transformer housed in one tank.

In Figures 12 and 13 the tops of the transformers are energized at the same high voltage at the overhead powerline. As this is the lowest point on the structure that the high voltage could be contacted, the 3 meter limit of approach is measured down from the top of the transformer as indicated by the solid line down to the dotted line.

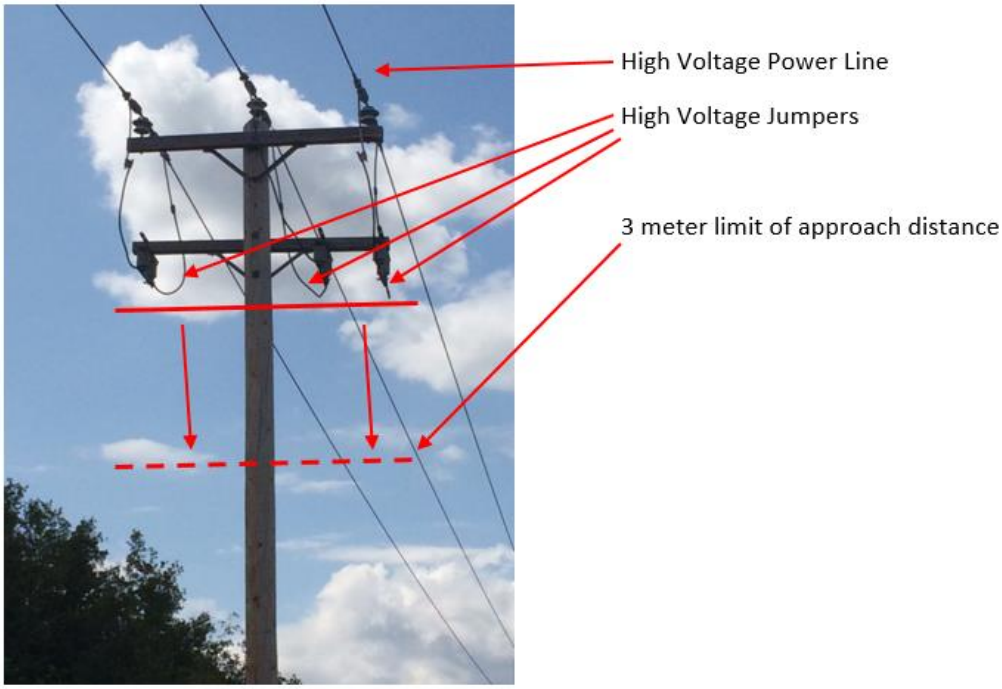

Figure 14 - Three Phase Power Line with Switch Arm

7.3.7. Figure 14 is a three phase structure with a switch arm. There are high voltage jumpers attached to the switches that are also connected to the high voltage conductors above. The switches and the jumpers are therefore energized at the same high voltage as the powerline. The switches underneath the crossarm and would be considered the lowest point on the structure where the high voltage could be contacted.

Because the 3 meter limits of approach distance are always measured from the lowest point on the structure where the high voltage can be contacted then in this case that would be to the switches themselves and not the crossarm as in previous examples.

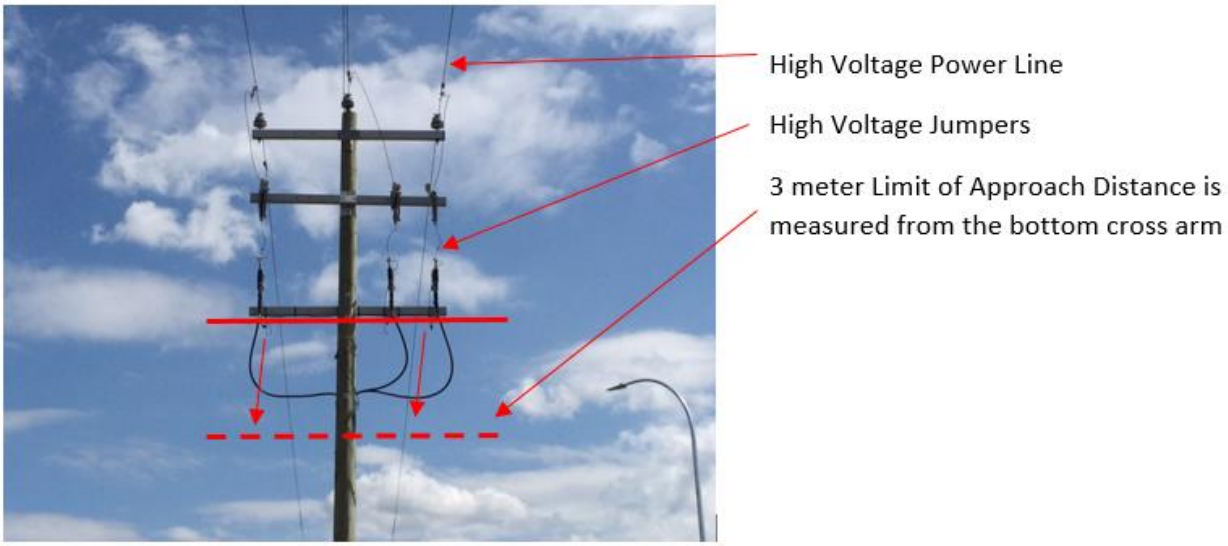

Figure 15 - Three Phase Power Line with 3 High Voltage Underground Cables

7.3.8. Figure 15 is an example of a 3 phase high voltage power line with 3 high voltage underground cables attached to it. These underground cables are attached to a crossarm on brackets and the brackets are considered to be the lowest location on the pole where the high voltage could be contacted. Therefore, the 3 meter limit of approach distance is measured down from the crossarm as indicated in the picture above.

8. Mid-span Clearance

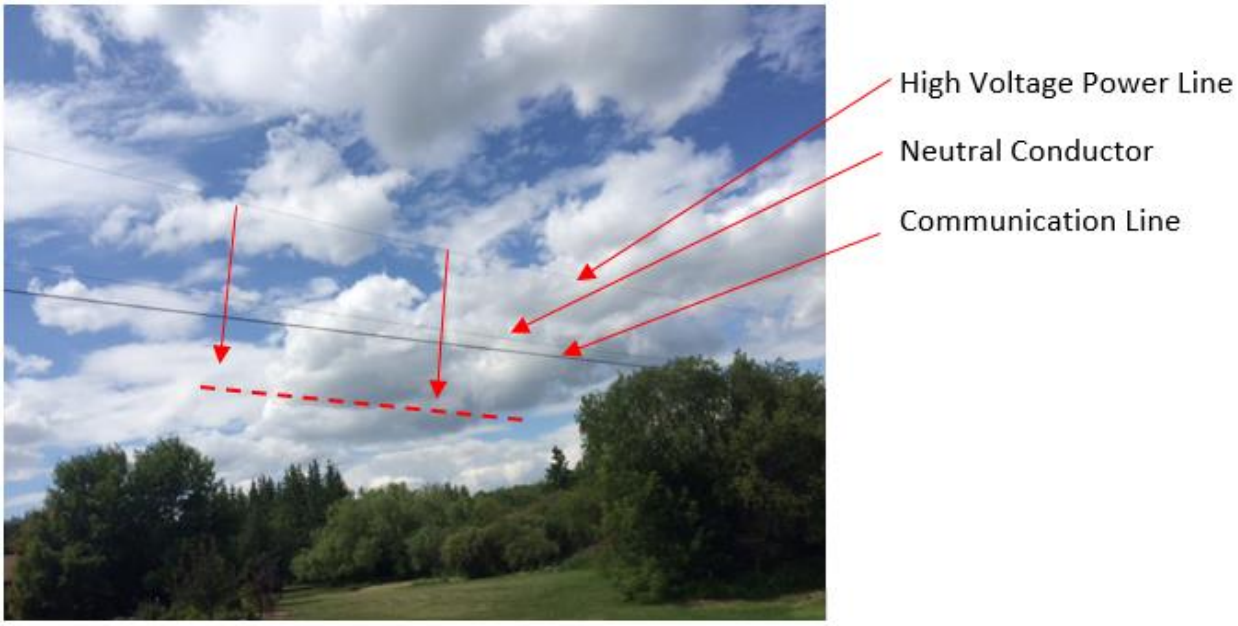

Figure 16 - Mid-span Clearance

8.1. The limits of approach must also be considered if a telecommunication worker is required to work between two structures.

The distances between the telecommunication owned line and the FortisAlberta owned / operated power line may be different than at the structures due to the different sags in the conductors. The communication worker must always maintain the 3 meters distance to the high voltage equipment or power line, it is no different than working on a structure.

If you cannot determine exactly where the 3 meters applies when working mid-span, then you must contact FortisAlberta at 310-Wire. In Figure 16 the communication cable is within the 3 meter safe limit of approach distance and cannot be worked on without first contacting FortisAlberta.

Annex A Bibliography (Informative)

[B1] FortisAlberta HS 39.01 Minimum Approach Distances

[B2] Alberta Electric Utility Code

[B3] Alberta Occupational Health and Safety Act, Regulations and Code

[B4] CAN/ULC-S801-14-Rev1, Standard on Electric Utility Workplace Electrical Safety for Generation, Transmission, and Distribution

FortisAlberta Standards can be found from The Wire by choosing ‘Our Company’, ‘Safety’, then ‘Standards Database’, or by selecting ‘Applications’, then ‘Standards Database’. The search function can be used to find Standards Documents. Select ‘Standards Documents’ on the left menu to view all available Standards Documents. Standards made available to contractors can be found using FortisAlberta’s Contractor Portal at https://workingwith.fortisalberta.com/.

Revision Tracking Table

Rev	Date	Summary of Changes
2.0	September 2023	Updated Figures and limits of approach references