SITING AND PERMITTING

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Common terms

Study Area – an area to be evaluated for possible transmission line routes.

Route – a specific alignment of the transmission line within a study area.

Suitable area – a favorable location for siting a transmission line due to compatible land uses and lack of sensitive resources. While suitable areas are preferred for siting, they rarely extend the entire length of a route.

Constraint – a sensitive area typically related to environmental resources or land use. Because of the complex nature of siting, constrained areas are often crossed by portions of a proposed route

Siting considerations

Xcel Energy uses an open and comprehensive process when evaluating and siting substations and transmission lines that considers electric system planning, project costs, the environment, public involvement, regulatory issues, existing and planned land use, land rights and engineering considerations.

Preliminary corridors identification phase

Step 1. Define the project Study Area based on the required transmission line and its substation end points.

Step 2. Collect data with the Study Area and Conduct an opportunity and constraint analysis.

Step 3. Identify preliminary alternative routes based on analysis.

Step 4. Seek public and government agency input on alternate routes.

Route refinement phase

Step 1. Refine alternative routes based on public input.

Step 2. Conduct a comparative analysis of the alternative routes.

Step 3. Present the comparative analysis and alternative routes at public workshops.

Identification of preferred and alternative routes

Step 1. Make final adjustments to the alternative routes based on public input.

Step 2. Update the comparative analysis to reflect the refined routes.

Step 3. Identify a preferred route and a select feasible alternatives based on the comparative analysis.

Step 4. Present the preferred and alternative routes to government agencies to obtain permitting approvals.

Data collection and evaluation

Resource data are studied and mapped using a Geographic Information System (GIS). Data are analyzed in the following categories:

- Land use and land cover
- Jurisdiction, designated and protected areas
- Cultural and historic resources
- Air and ground transportation
- Utility corridors and facilities, communications
- Recreation
- Geology, soils, topography
- Recreation
- Biological resources
- Water resources

JURISDICTION	PERMIT / DECISION / ACTION
Federal	
Federal Aviation Administration	Title 14 CFR Part 77, Objects Affecting Navigable Airspace
U.S. Army Corps of Engineers	Clean Water Act, Section 404/Nationwide Permit 57, Jurisdictional Water of the U.S.
U.S. Fish and Wildlife Service	Endangered Species Act, Section 7 Consultation
State	
Colorado Public Utilities Commission	Certificate of Public Convenience and Necessity (CPCN)
Colorado Department of Public Health and Environment	Construction General Stormwater Permit and Stormwater Pollution Prevention Plan (SWPPP) Section 401 Water Quality Certification
Colorado Department of Transportation	Access Permits if necessary
Colorado State Historic Preservation Office	Determination of Compliance with NHPA Section 106
Local	
Municipalities and counties	Land use, construction and crossing permits

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TRANSMISSION LINE CONSTRUCTION PROCESS

INFORMATION SHEET
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There are several steps needed prior to transmission line poles being installed. The process can vary depending on the size of the line, soil conditions, terrain and other variables.

1. Soil surveys and property staking:
Before acquisition begins, field survey and soil information must be obtained to finalize design. A soil boring is drilled at structure locations to determine the mechanical properties of the soil. Soil borings typically take place about a year before the start of construction. Right-of-way (ROW) agents request access to the property and coordinate between the soil boring contractor and the property owner. The soil boring locations are staked and existing underground utilities are located prior to borings. Once final pole locations are determined, they are staked in the field with tree clearing limits, right-of-way boundaries and other property features mapped as needed. Typically, a 150-foot wide easement will be required for 345 kV lines.

2. Construction access and tree clearing:
Construction access routes to the ROW are identified and obtained during the ROW acquisition process. The access is typically 25 to 30 feet wide and is needed so large equipment including a drill rig, concrete trucks and a crane can be delivered to the site. Tree clearing and other vegetation removal will take place on the identified access route and the area within the easement. Matting is sometimes put down in wet or soft areas to prevent compaction, minimize soil disturbance and improve site safety.

3. Mobilizing equipment and delivering material:
A crane, drill rig, concrete truck, boom trucks, trailers, structures, steel casing and rebar cages are some of the equipment and materials that will be moved into the site for construction.

4. Foundation construction:
Construction crews will begin drilling for structure foundations. Two types of foundations are typically used for transmission line projects, either drilled pier foundations or direct embed foundations. Reinforced concrete drilled pier foundations typically range from 6 to 9 feet in diameter and are drilled 20 to 40 feet deep. Once drilling is complete, reinforcing steel and anchor bolts are placed in the hole and concrete is poured. Drilled pier foundations typically take one to two days to complete unless rock is encountered. Direct embed foundations typically range from 3 to 5 feet in diameter and are 15 to 30 feet deep. Once the hole is drilled, the pole base section is placed in the hole and then backfilled with rock, soil or concrete. Direct embedded foundations typically take 2 to 4 hours to complete.

5. Installing the structure:
High voltage transmission structures are usually steel poles. The poles are assembled at the foundation site and set in place with the use of cranes and other heavy equipment. A pole can be assembled and set in place in one day.

TRANSMISSION LINE CONSTRUCTION PROCESS

6. Stringing conductor:

After all structures are erected in an area, the next step is to install conductor (wire). Conductor is pulled from one structure to the next through a pulley system temporarily placed on the structures. After a section of conductor is pulled through a series of structures, the conductor is attached to insulators, which are attached to the structure and the pulleys are removed. Trucks, heavy equipment and sometimes helicopters are used in this process. Other equipment including bird diverters, spacers and galloping devices are also installed.

7. Land restoration:

Following construction, the ROW is cleaned up and restored. This work may include tile and fence repair, rut removal, decompaction, tilling, seeding and possible wetland restoration. If damage occurred to crops or other non-restorable property during construction, Xcel Energy will fairly reimburse the landowner for those damages.

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POWER LINES AND ELECTRIC AND MAGNETIC FIELDS

INFORMATION SHEET

WHAT YOU NEED TO KNOW

Electric and magnetic fields, commonly known as EMF, exist wherever electricity is produced or used, including around any electric appliance or wire that conducts electricity. Whenever you turn on a lamp, use a microwave or use your computer, these frequencies are around.

The electric power we use in America is a 60 Hertz (Hz) alternating current, meaning the electric charges move back and forth 60 times per second, creating an 'extremely low frequency' field. These are different from the much higher frequency fields associated with radio and TV waves and cell phone signals.

What are electric and magnetic fields?

Electric fields are created by voltage—the higher the voltage, the stronger the field. Anytime an electric appliance is plugged in, even if it isn't on, an electric field is created in its vicinity. But these fields are easily blocked by walls, trees and even clothes and skin—and the farther away you move from the source of the electric field, the weaker it becomes. Moving even a few feet away from an appliance makes a big difference in the strength of the field that you're exposed to.

Magnetic fields, measured in milliGauss (mG), are produced by electric current and only exist when electricity is flowing through a wire or an appliance is turned on—the higher the current, the greater the magnetic field. As with electric fields, the strength of a magnetic field dissipates rapidly as you move away from its source.

Why are you calling them electric and magnetic fields instead of electromagnetic fields? Is there a difference?

These terms are often used interchangeably, and both electric and magnetic fields from power lines and electromagnetic fields may be abbreviated as EMF. However, there are differences between low frequency power line EMF and higher frequency radio waves.

The frequency (i.e., the rate of time variation) of fields produced by the generation, transmission and use of electricity – typical of most household and office appliances and power lines – are low, and electric and magnetic fields exist separately. At higher frequencies, such as with radio or TV signals, the fields are interrelated and are more accurately described by the term "electromagnetic." Radio and TV electromagnetic waves are meant to transmit away from the antenna and carry radio frequency energy to the receiver. The EMF from power lines is too low in frequency to carry any significant energy away, and the electric power stays on the utility lines.

It is important to recognize that power line EMF and radio frequency electromagnetic waves should not be confused with ionizing radiation such as X-rays. Because of its dramatically higher frequency, ionizing radiation (like X-rays) has enough energy to alter chemical bonds and damage biological molecules, something that lower frequencies in the electromagnetic spectrum (power lines, radio, TV and infrared) cannot do.

POWER LINES AND ELECTRIC AND MAGNETIC FIELDS

What about EMF and power lines?

The World Health Organization (WHO), and research organizations, have studied the potential for EMF to affect human health and have never found correlation between exposure to EMF and negative health issues.

According to the WHO

Electromagnetic fields and cancer

Despite many studies, the evidence for any effect remains highly controversial. However, it is clear that if electromagnetic fields do have an effect on cancer, then any increase in risk will be extremely small. The results to date contain many inconsistencies, but no large increases in risk have been found for any cancer in children or adults.

A number of epidemiological studies suggest small increases in risk of childhood leukemia with exposure to low frequency magnetic fields in the home. However, scientists have not generally concluded that these results indicate a cause-effect relation between exposure to the fields and disease (as opposed to artifacts in the study or effects unrelated to field exposure). In part, this conclusion has been reached because animal and laboratory studies fail to demonstrate any reproducible effects that are consistent with the hypothesis that fields cause or promote cancer. Large-scale studies are currently underway in several countries and may help resolve these issues.

Sources and useful links

The following are links to more information and studies on EMF:

- World Health Organization "Electromagnetic fields and public health," World Health Organization fact sheet, **www.who.int/mediacentre/factsheets/fs322/en/index.html**
- Environmental Health Criteria 238, Extremely Low Frequency Fields, **http://www.who.int/peh-emf/publications/ elf_ehc/en/**
- American Cancer Society: Power Lines, Electrical Devices and Extremely Low Frequency Radiation **https://www.cancer.org/cancer/cancer-causes/radiation- exposure/extremely-low-frequency-radiation.html**
- U.S. National Cancer Institute: Electromagnetic Fields and Cancer, **https://www.cancer.gov/about-cancer/causes- prevention/risk/radiation/electromagneticfields-fact-sheet**
- Health Canada: Electric and Magnetic Fields from Power Lines and Electrical Appliances, **https://www.canada.ca/ en/health-canada/services/home-garden-safety/electric- magneticfields- power-lines-electrical-appliances.html**

BIRDS AND POWER LINES

INFORMATION SHEET

As part of its commitment to the environment, Xcel Energy uses several strategies to protect birds from being injured or killed from contact with power lines or electrical equipment. The strategies include:

- Preventive – conducting risk assessments and installing avian safe standards where possible. When appropriate, Avian Protection Plans will be developed and equipment will be installed to divert birds away from power lines.
- Reactive – documenting mortalities, notifying resource agencies and applying remedial measures where appropriate
- Proactive – educating employees and being involved in organizations that conduct avian interaction research

For additional information regarding birds and power lines, visit the Avian Power Line Interaction Committee website at www.aplic.org.

Nest management

Transmission line structures and equipment can be attractive to birds for building nests. Utilities try to minimize the risk of electrocution or injury to birds, of damage to electrical equipment, and outages to customers that may result when birds come in contact with power lines and structures. Nest management programs include installing nest boxes or platforms in safe areas on or near structures, where warranted. Additionally, utility personnel are educated on nest reporting, nest removal and platform construction.

Electrocution

Electrocution of birds is rarely associated with transmission lines greater than 138 kilovolts (kV) because generally the electrical components are separated enough that a bird can avoid contact with two lines, which would complete the circuit, potentially causing electrocution. Problems can arise with smaller lines, which can be corrected in two primary ways:

- Isolation – moving the components farther apart to achieve the necessary clearance
- Insulation – using covers on various electrical components to prevent contact with the component that would cause the electrocution

Minimizing bird collisions

Pre-construction efforts

- Use vegetation, topography or man-made structures to shield lines
- Locate lines together
- Site lines away from obvious flyways, if possible

Post-construction efforts

- Retroactively mark lines to make wires more visible to birds

BIRDS AND POWER LINES

Marking lines

Marking lines with various types of markers can decrease but not eliminate bird collisions. The different types of markers vary in effectiveness. Devices include bird and swan flight diverters and clamp-on markers. Examples of these devices are shown in the photo. Xcel Energy has used a variety of these markers on its lines. The decision to use them can be based on:

- Line voltage rating
- Weight of markers
- Wind/ice load factors during winter
- Durability
- Ease of installation
- Effect on the viewshed
- Susceptibility to vandalism

EASEMENT ACQUISITION AND RIGHT OF WAY PROCESS

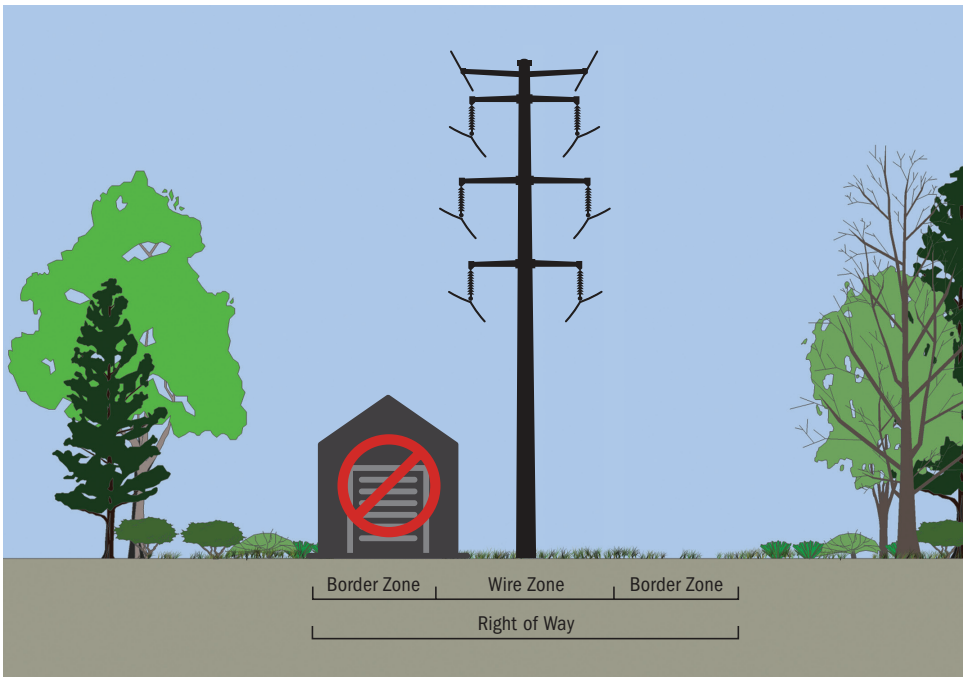
INFORMATION SHEET

Easement Acquisition and Survey Permission

- An easement is an interest in real estate authorizing a utility to use the land within the defined easement area known as the Right-of-Way (ROW) to construct, operate and maintain a transmission line and related transmission facilities.
- We may need permission for temporary access to perform engineering, environmental, cultural and land survey studies.
- We will use market data from recent sales of similar properties to determine fair and appropriate compensation for the easement.
- We will make every effort to reach a negotiated settlement for the purchase of the easement.

Working in the Right-of-Way

- Typically, the landowner retains the right to conduct activities within the easement (such as agricultural operations) provided the landowner's use does not interfere with the construction, operation or maintenance of the transmission facilities.
- Activities not permitted within the easement are those that jeopardize the integrity of the transmission facilities or reduce the ground-to-line clearance, such as the existence of tall growing trees or the existence of buildings in the ROW.
- Landowners need to exercise caution when operating tall equipment, moving irrigation pipes, fueling vehicles or conducting other activities within the easement area.



Structures or large trees are not allowed within the easement area as they can interfere with transmission line operation and cause safety issues.

Easements and Agriculture

Irrigation

- To the extent possible, transmission structures will be placed to avoid conflicts with existing irrigation equipment and its operation.
- ROW agents meet with landowners to learn about site specific circumstances which may need to be addressed.

Planting and Harvesting

- ROW agents will work with individual landowners to understand planting and harvesting seasons so those timeframes can be considered when planning construction activities.
- If crops are damaged during construction or maintenance activities. we will work with landowners to provide compensation

Livestock

- In coordination with the landowner, segments of fences may be removed, or access gates may be installed in the ROW during construction.
- The ROW agents and the construction crews would work with landowners to minimize impacts to livestock.
- Gates within the ROW would be left in place to facilitate future maintenance of the transmission facilities.

WORKING WITH LANDOWNERS

INFORMATION SHEET
COLORADO

Easement Acquisition and Survey Permission

- An easement is a permanent right authorizing a utility to use the Right-of-Way (ROW) to build and maintain a transmission line.
- Access may be needed for construction and long-term maintenance of the transmission line.
- To assist with transmission line engineering and design, temporary access or permission from landowners would be acquired.
- Engineering, environmental, cultural, and land survey studies would be conducted to develop the final transmission line route.
- Market data from recent sales of similar properties is used to determine fair and appropriate landowner compensation.
- Every effort will be made to reach a fair and reasonable settlement. When negotiations are unsuccessful, which is rare, we may have to exercise our eminent domain authority may be required.

Working in the Right-of-Way

- Normally, access by the landowner within the transmission line easement is not restricted, and agricultural activities can still occur.
- Activities not permitted within the easement are those that jeopardize the integrity of the structures or reduce the ground-to-line clearance, such as construction of buildings.
- Landowners should exercise caution when operating tall equipment, moving irrigation pipes, fueling vehicles, or conducting other activities within the easement to prevent electrical shock or contact with the line.

Easements and Agriculture

Irrigation

- Structures will be placed to avoid conflicts with irrigation equipment and its operation to the extent possible.
- Site specific circumstances can be addressed with landowners.

Planting and Harvesting

- ROW agents would work with individual landowners to determine when to avoid construction during the planting and harvesting seasons.
- If damage to crops cannot be avoided, compensation for crop loss will be offered.

Livestock

- In coordination with the landowner, segments of fences may be removed or access gates may be installed during line construction.
- Crews would construct temporary fences and work with landowners to minimize impacts to and protect livestock.
- If the landowner is in agreement, gates would be left in place to facilitate future maintenance activities.

Recreation Guidelines

Q. Can I play with a kite or a model plane near a power line?
A. No. Here are some rules to follow:

- Do not fly kites or model planes near any power line.
- Always fly kites and model planes so the wind carries them away from power lines, and television or radio antennas.
- Call your electric utility if a kite or plane becomes snagged in a power line. DO NOT pull the string or climb a tower, pole or ladder to get it down.
- If a plane is caught in the line, let go of the control line immediately and call your electric utility for assistance.
- DO NOT attempt to retrieve it yourself.

Q. Can I hunt in areas where there is a power line?
A. Hunting is allowed on land where there is a power line, if you are the land owner. Intentionally shooting at power lines is illegal. Shooting insulators or conductors can break a wire or cause hazards such as an electrical discharge or arc through the air.

Q. Can I build a bonfire, burn leaves or build another type of fire under a power line?
A. No. Fires should not be started under a power line. Smoke and hot gases from fires can create a conductive path for electricity.

- A fire could damage the poles or wires and result in an outage.
- It is possible that the power line could flash to the ground through hot air and smoke, which is a serious safety hazard.

When the weather is nice, we want to get outside. You can enjoy many recreational activities near power lines but some activities require caution. Be careful when flying kites, hunting or building fires near power lines. Additionally, never climb towers, fences, or any other structure near a power line or an electrical substation.

Safe construction and maintenance practices

Q. How do I know the lines are safe?
A. Transmission lines are built and maintained to meet or exceed safety standards, such as those specified by the National Electrical Safety Code and the North American Electric Reliability Corporation. Every effort is made to ensure safety in construction, operation and maintenance of transmission lines. For information on safe distances for specific activities near the power line, contact the utility operating the line directly. Transmission lines and line infrastructure are designed to withstand extreme weather conditions. Protective devices at line terminals stop the electricity flow under abnormal operating circumstances.

Q.How do you monitor the safety of the line?
A. Xcel Energy follows strict transmission line maintenance standards. We regularly inspect lines by ground (usually during fall or winter months) and by air to look for:

- Non-compatible vegetation within the right of way
- Equipment needing repair or replacement
- Right-of-way encroachments, which can be hazardous to safety and reliable operation
- Anything that might jeopardize safe, reliable operation of the line

Utilities must visit the right of way for these inspections but visits will be minimal and landowners will be contacted prior to inspections or maintenance. However, in cases of emergency, advance contact may not be possible.

SAFETY AROUND POWER LINES

FREQUENTLY ASKED QUESTIONS ABOUT POWER LINES ON OR NEAR YOUR PROPERTY

The following safety guidelines apply to any power line, including the Xcel Energy transmission lines. If you see a power line that is down or broken, DO NOT touch it. STAY AWAY from it and call 911 immediately. There is no way to tell if a power line is energized just by looking at it. Always assume it is energized and carries currents strong enough to kill.

Machinery and vehicle guidelines

One of the most important rules to follow when working around power lines with tall equipment is simple: LOOK UP. Know where the power lines are and stay away from them.

Q. How can farm equipment and other machinery be safely operated near power lines?
A. If you are considering operating a vehicle with a height greater than 14 feet, please contact your local electric utility. Call first even if it appears the line has clearance exceeding 14 feet.

And always remember:

- Physical contact with power line wires is extremely hazardous and can cause a lethal shock. Equipment SHOULD NOT be operated under a power line in a manner that causes contact or near-contact with the wires.
- DO NOT lift, elevate, build or pass under a power line any object, tool or vehicle that could make contact or near-contact with the wires.
- To help prevent arc flashing, or an electrical explosion, it is recommended that equipment, antennas and people stay at least 14 feet away from any energized power line.

Q. Can I put fuel in my machinery safely near a power line?
A. Fueling vehicles under transmission lines is not recommended. If you must fuel a vehicle under a transmission line, use a non-metallic or plastic container. The vehicle should also be grounded to eliminate any source of sparks.

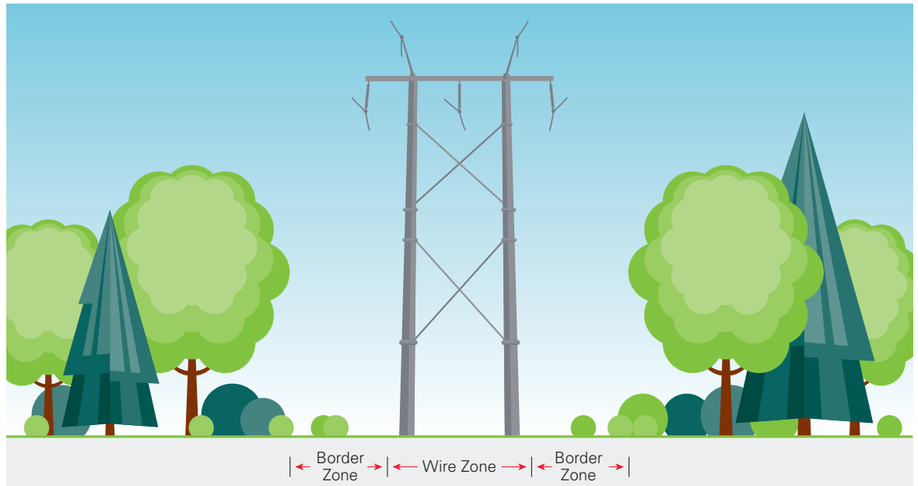
LOOK UP! Equipment that can be extended, such as a grain elevator or stack mower, requires the utmost care when within the easement right of way.

transmission.xcelenergy.com

Building or planting guidelines

The North American Electric Reliability Corporation (NERC) requires electric utilities to meet stringent requirements designed to keep our electrical system safe and reliable, including standards for maintaining proper clearances. It is our responsibility to keep a certain amount of distance around power lines clear of anything that may make contact or near-contact with a power line. This includes buildings and incompatible vegetation.

You must call your utility provider before planting any trees, shrubs or building any structures in transmission line rights of way areas to help avoid problems in the future.



Do not plant non-compatible vegetation in the border zone or wire zone of a transmission right of way as they will likely require removal.

Q. Can I plant anything in the right of way area?
A. For your benefit, DO NOT plant any trees or shrubs in the right of way area before talking to your utility first. As a landowner, even with an easement granted, most property rights do remain with you, but a utility doesn't want to be forced to remove your new tree. Activities in the easement area that do not interfere with the safe construction, operation and maintenance of the line are permitted, i.e. using the land for pastureland, farming or gardening.

Q. Can I construct a building or other structure beneath a power line?
A. Not without prior written approval from the electric utility. Buildings and other structures are generally not permitted on rights of way. It is important that you discuss projects with the utility in order to avoid creating situations that could become unsafe to the landowner and/or utility workers.

Right of way (ROW) is the area where the transmission facilities are placed. It is generally clear of tall vegetation and buildings. Certain rights are acquired by the utility in an easement, but the landowner remains the owner of the property.

Fence Guidelines

Fence wires mounted on wood posts can build up an electrical charge near power lines. Important factors are:

- Length of fence paralleling the line
- Distance between the line and the fence
- Amount of moisture in the fence posts and the ground
- Presence of grounding devices such as metal fence posts or weeds growing next to the fence

Q. What do I need to know about non-electric fences?
A. Non-electric fences made of barbed wire or similar material directly attached to steel posts are adequately grounded and will not collect an electric charge. If you are planning to install a wire fence parallel to and near a power line, use at least one steel post every 150 to 200 feet to ground the fence.

Q. Can electric fences build up an electrical charge?
A. Electric fences, being specially insulated from the ground, can pick up a charge from transmission lines. Usually, the charge will drain off when the charger unit is connected to the fence; however, when the charger is disconnected either for maintenance or when the fence is being built, a small shock may be produced. Contact Xcel Energy for assistance.

Typically such a shock can be prevented by:

- Shorting out one or more of the fence insulators to the ground with a wire when the charger is disconnected, or
- Installing an electric filter which will ground charges induced from a power line while still allowing the charger to be effective. Again, contact Xcel Energy for assistance if you have questions; every situation is unique.

Electric fences are specially insulated from the ground and can pick up an induced charge from transmission lines.

Irrigation and watering guidelines

The potential for water and metal to conduct electricity makes it important to take safety precautions when irrigating near power lines. Additionally, fertilizers and pesticides tend to increase the conductivity of water, making extra precautions necessary. Watering the lawn at your home or business is not problematic; however, you still must prevent a direct, solid stream of water from contacting a transmission line.

Q. Can I irrigate near transmission lines?
A. Yes, as long as you take these precautions:

- **Prevent a solid stream of water from hitting the wires.** Equipment with nozzles that are small in diameter or spray a fine mist is typically not problematic because the solid part of the water stream will not reach the power line wires. Also, an intermittent spray of water will not conduct significant amounts of electricity. Even large diameter nozzles operating at their normal spray angle typically will not reach the wires with a solid stream. However, at no time should the solid part of a water stream touch power line wires. Should that happen, turn the water off by switching the pump off before trying to correct the problem.
- **Make sure the irrigation system is well grounded.** If you have questions as to whether or not your irrigation system is adequately grounded, contact your local electric utility.
- **Check with utility before installing a new irrigation system.** Each system should be reviewed on a case-by-case basis; questions about the installation and operation of an irrigation system adjacent to or under a power line should be directed to your electric utility.
- **DO NOT install long lengths of pipe parallel and adjacent to transmission lines.** They should be laid out at right angles to power lines, if possible, to reduce risk of the pipes building up an induced charge.
- **Be careful when moving the pipes.** When unloading irrigation pipes, stay at least 50 feet from power lines to avoid any chance of raising them too close to the wires.

You should never allow a solid stream of water to hit a transmis-sion line wire. Be sure to note the guidelines in this section.