

Transmission in Highway ROW: Construction Considerations

There are a variety of considerations for transmission developers and departments of transportation to enable the safe and efficient deployment of transmission infrastructure into highway rights-of-way (ROWs).

This document provides information regarding transmission line construction considerations for transmission lines in a highway or interstate ROW without causing undue burden or risk to the ongoing activities of the DOT.

Through discussions with state DOTs, the NextGen Highways team has identified that safety of employees and vehicles passengers, timing and magnitude of traffic impacts, ROW access, and impacts on future highway construction needs as the primary concerns for state DOTs.

In 2003, Wisconsin passed Act 89, prioritizing the siting of transmission lines within existing transmission and highway corridors across the state. Since the passage of this bill, a portion of 26 transmission projects have been sited in highway ROW, including eight projects sited within interstate ROW. In total, over 200 miles of highway and interstate ROW have been used to:

- Conserve forests and other undeveloped habitats
- Minimize the need for private land
- Minimize the environmental and viewshed impacts for the public • Utilize corridors that have already been disturbed

The NextGen Highways team has conducted a thorough review of the planning and design of the [Badger Coulee](#) transmission project, which is a 345 KV transmission project developed by American Transmission Company and Xcel Energy. The project runs approximately 180 miles from La Crosse County, WI to Dane County, WI, predominantly along and within the interstate highway right-of-way.

Prior to construction, a number of routes were considered and a detailed examination of highway ROW impacts for each route option were captured in a [constructability report](#).

Please note, this document does not provide a detailed discussion of highway design, construction, and maintenance. This report only touches on these needs as they directly relate to transmission infrastructure in the highway ROW.

Transmission Construction Considerations

Once a route and design has been decided upon in close coordination with the state DOT, and state energy regulators approve the investment, construction work can begin. Throughout the construction process, traffic impacts, safety risk, and highway ROW access are important considerations upon which the utility and DOT must coordinate and take appropriate risk mitigation measures.

Transmission Construction Process Summary			
Step	Description	Potential Highway ROW Impacts	Solutions
1. Site Preparation	Crews place matting, fencing and other preparations at each pole site to enable access for large equipment	Crews accessing pole sites via highway may impact traffic Crews may need to create new temporary ROW access points	Design phase - Maximize use of private land for ROW access & pole placement distance from the roadway
2. Pole Construction	Footings are dug and poured, pole sections are connected, raised, and secured to footings	Collision risk for vehicles and construction crews	Additional collision protection may be required Design phase - Maximize use of private land for ROW access
3. Wire Stringing	Either via ground crew or helicopter, conductor cable is strung from tower to tower, connected to protective equipment at either end	Traffic slowdowns and stops for wire stringing at highway crossings	Design phase – Develop a detailed construction plan for any segments within close proximity to the roadway Conduct stringing work at night, when possible Traffic management rolling stops, temporary lane or highway closures
4. Site Restoration	Crews remove all equipment and preparation measures	Crews permanently restore all ROW access control	

	Crews restore sites to pre-construction condition to the extent practical		
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Traffic Impacts

A primary concern of the DOT throughout the construction process is impacts on traffic flowing through the highway corridor. The DOT and utility must work together to develop a plan to assess and manage traffic impacts from construction.

As summarized in the table above, traffic impacts may arise from a number of aspects of transmission construction, including:

- Direct access by crews to construction sites from within the ROW
- Shoulder and lane closures
- Access to interchanges and interchange infields for pole construction and line stringing
- Entrance and exit ramp closures during conductor stringing
- Rolling stops, typically no more than 15 minutes, to allow conductor stringing across the highway

With early and consistent coordination between the transmission developer and state DOT, particularly during the transmission design process, the potential impacts of each of these can be mitigated. For example, construction site access may be provided through arrangements with private landowners so crews do not need to use the highway ROW to access the construction sites. The project team can also place structures closer to the ROW boundary than the roadway.

Clear Zone

Clear zones along the route will have been established during the design process. In most cases these will provide ample space to mitigate collision risk for both construction crews and passenger vehicles during construction. However, there may be some instances where other developments or the landscape itself prohibit sufficiently wide setbacks from the roadway to mitigate safety risks. In these cases, shielding such as concrete barriers or crash cushions will need to be placed as a protective barrier between the roadway and the construction zone.

Site Impacts and Restoration

At each pole construction site, extensive preparation is done before construction begins. Soil testing is done and tree clearing may need to take place. Matting, erosion control, fencing, and temporary clear span bridges across drainage ditches may be needed to allow construction crews and equipment to access the site and safely construct each pole.

Temporary fencing would be added as needed to control access to the highway ROW for pedestrians and animals.

Once the line is strung, materials and equipment are removed from each pole structure location and all construction site access points. The structure sites are restored to their previous state to the extent practicable and permanent fencing to control highway ROW access is replaced or reinstalled.



(Photo courtesy of the Wisconsin Department of Transportation Transmission Playbook: Accommodation on Interstate and Freeway Right-of-Way)

Pole Construction

For overhead transmission lines, poles or towers are typically placed every 1000 feet, depending on voltage level and route-specific requirements. The Badger Coulee line design used tubular metal pole structures to hang the lines, each of which required an installation site approximately 30 ft wide and 150 ft long. Once pole sites are identified, soil investigations are done to determine viable access points to each construction site, which can include access from private property (preferred) or the highway ROW, including travel lanes or shoulders. Once access is established, vegetation is cleared within and between pole construction sites to allow construction to begin.

Each pole requires a concrete foundation that is approximately 30-40 cubic yards in size (about 6ft in diameter and 30ft deep). The size of required foundations changes significantly with transmission line design and voltage level and can range from five to over one hundred cubic yards.

First, crews excavate the site and frame the concrete mold. Steel rebar is added for strength and concrete is poured into the frame mold. This process typically requires one long working day per foundation. Crews must have site access for excavators, concrete trucks, equipment delivery trucks, and personnel vehicles.



0/94, ATC Badger-Coulee (photo courtesy of the Wisconsin Department of Transportation Transmission Playbook: Accommodation on Interstate and Freeway Right-of-Way)

Wire Stringing

Once poles are in place, the conductor cable can be strung along the route from pole to pole. This is done by either pulling the cable from the ground or by helicopter. During this process, traffic impacts are likely where road crossings occur and will require rolling traffic stops to allow conductors to be strung across the roadway. Traffic impacts like this can create a safety hazard for vehicles rapidly slowing down. Wires may need to be strung at night and/or law enforcement may need to assist with traffic management. Through the Badger Coulee process, WisDOT developed a set of guidelines for utilities:

1. The utility must include a detailed line-pulling plan in its permit application that must contain:
 - a. A method, or methods, of catching the line and preventing the line from falling onto our highway
 - b. A contingency plan in case the line falls onto the highway
 - c. The amount of time needed to pull lines over the highway
 - d. The amount of installation time needed for temporary goalposts or other devices used to catch a falling line
 - e. A proposed design for any temporary barrier protection needed to protect the items in (d)
 - f. The minimum height for any items in (d) cannot be lower than the lowest conductor elevation
 - g. A work zone traffic control plan
2. The region must evaluate the risk associated with a daytime versus a nighttime pull:
 - a. Time needed versus AADT, crash rates, evaluation of the detailed pulling plan, ease of operation, past successes/failures, etc.
3. The plan may be submitted to the Bureau of Highway Maintenance for additional evaluation/ comments if needed

Where road crossings or other overheard crossings such as distribution wires or telecommunications wires do occur, guard structures must be installed to eliminate the possibility of wires dropping into the roadway and remain in place until the transmission conductors have been secured.



Photo courtesy of the Wisconsin Department of Transportation Transmission Playbook: Accommodation on Interstate and Freeway Right-of-Way)



Using boom trucks with bat wings for freeway crossing (photo courtesy of the Wisconsin Department of Transportation Transmission Playbook: Accommodation on Interstate and Freeway Right-of-Way)