Description of Typical Transmission Project Activities

General Overview

The following table represents Eversource's good faith effort to develop for the Connecticut Department of Energy & Environmental Protection a list of typical activities Eversource routinely performs to maintain compliance with the various electric regulatory requirements (e.g., NERC, FERC, ISONE, NESC, etc.) and to construct, maintain, operate and restore the transmission system to a state of full rated operation. This list is intended for educational purposes only. The general categories of required work activities (or combination of activities) and equipment changes are on a project specific basis and, therefore, these descriptions should not be relied upon as indicators of potential permitting or environmental impact thresholds. Such determinations are developed by a project specific analysis of the resources present. All work is conducted in accordance with Eversource's Best Management Practices Manual to avoid or minimize potential impacts to sensitive environmental resources.

Project Activities*:	Brief Description of Activity	Construction Methodology
- Fiber Optic Groundwire (OPGW) Installation	• Replacement of (existing) overhead shield wire with a fiber optic communication cable	• Use of ground based equipment (i.e., bucket truck, crane, etc.) and helicopter (when feasible), or use of only ground based equipment • Access along project route, via existing access roads where possible (with improvements as needed) • Trimming/mowing of trees and brush within right-of-way to provide safe and necessary access for construction equipment and crews • Establishment of work pads** • Establishment of pull pads*** • Restoration of project route to restore the area to pre-construction condition
- Reconductor	• Replacement of (existing) wire ("conductor") with new wire	• Use of ground based equipment • Access along project route, via existing access roads where possible (with improvements as needed) • Trimming/mowing of trees and brush within right-of-way to provide safe and necessary access for construction equipment and crews • Establishment of work pads** • Establishment of pull pads*** • Restoration of project route to restore the area to pre-construction condition
- Structure Modifications/Repairs	• Modification/reconfiguration and/or Repairs of (existing) parts of the structure, including but not limited to: o Crossarm o X-brace o Insulators o Guys and Anchors o Other components	• Use of ground based equipment • Access along project route, via existing access roads where possible (with improvements as needed) • Trimming/mowing of trees and brush within right-of-way to provide safe and necessary access for construction equipment and crews • Establishment of work pads** (may not always be required for this type of activity) • Restoration of project route to restore the area to pre-construction condition
- Structure Replacement	• Replacement of (existing) complete structure	• Use of ground based equipment • Access along project route, via existing access roads where possible (with improvements as needed) • Trimming/mowing of trees and brush within right-of-way to provide safe and necessary access for construction equipment and crews • Establishment of work pads** • Restoration of project route to restore the area to pre-construction condition
- New Line Build (Overhead Line Portion)	• Installation of new structures (including poles, hardware, bracing, etc.), new overhead shield wire and new conductor	• Use of ground based equipment and helicopter (when feasible) or use of only ground based equipment • Access along project route, via existing access roads where possible (with improvements as needed) or new access roads • Trimming/mowing of trees and brush within right-of-way to provide safe and necessary access for construction equipment and crews • Establishment of work pads** • Establishment of pull pads*** • Restoration of project route to restore the area to pre-construction condition
- Structure Separation	• Installation of a new structure(s) to separate a Transmission structure that carries more than one line ("circuit") • Lines are moved onto separated structures, allowing for a single line on each structure	• Use of ground based equipment and helicopter (when feasible) or use of only ground based equipment • Access along project route, via existing access roads where possible (with improvements as needed) or new access roads • Trimming/mowing of trees and brush within right-of-way to provide safe and necessary access for construction equipment and crews • Establishment of work pads** • Establishment of pull pads*** • Restoration of project route to restore the area to pre-construction condition
- Substation Work (Replacement)	• Removal and installation of like-for-like equipment (i.e., breakers and transformers) • Work may include above and/or below grade construction within area of existing substation	• Use of ground based equipment • Access to replacement equipment location and to setup of ground based equipment for construction • Restoration of project area to restore the area to pre-construction condition
- Substation Work (New Construction)	• Installation of new equipment, either within existing fence line, with a substation expansion, or around the substation	• Use of ground based equipment • Access to new equipment location and to setup of ground based equipment for construction • Trimming/mowing of trees and brush within project area to provide safe and necessary access for construction equipment and crews • Restoration of project area to restore the area to pre-construction condition
- Vegetation Management	• Refer to separate description provided	

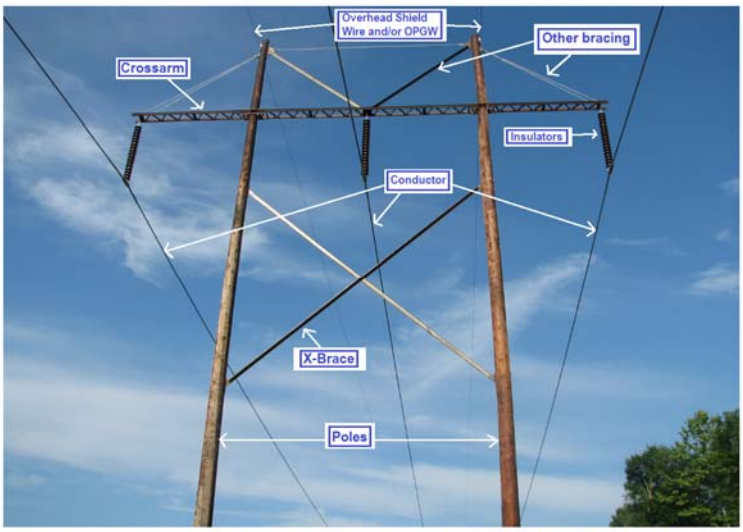
* Project activities identified are typical. Other activities may occur on a project by project basis

** Refer to pages 3 and 4 of this document for description of work pads and access roads from Eversource presentation to CT DEEP, December 8, 2016

*** Pull pads are locations along the project route at which equipment will be set up to safely install and pull wire, and are similar in appearance to large work pads. Pull pads may consist of timber mats or may be an improvement to existing conditions where feasible.

Examples of Typical Transmission Structures

Typical H-Frame Structure Configuration*

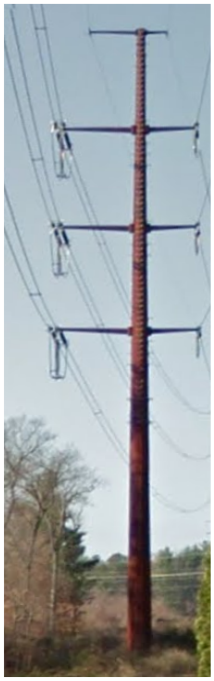


*Structure shown is a 345-kV structure. Variations exist among structures for different voltage classes, terrain conditions, conductor type, number of circuits, right-of-way characteristics, and other design criteria.

Typical Lattice Tower Configuration*

*Variations exist among lattice towers for different voltage classes, terrain conditions, conductor type, number of circuits, right-of-way characteristics and other design criteria.

Typical Monopole Configurations*



*Variations exist among monopoles for different voltage classes, terrain conditions, conductor type, number of circuits, right-of-way characteristics and other design criteria.

Typical Sizing and Configuration of Work Pads and Access Roads

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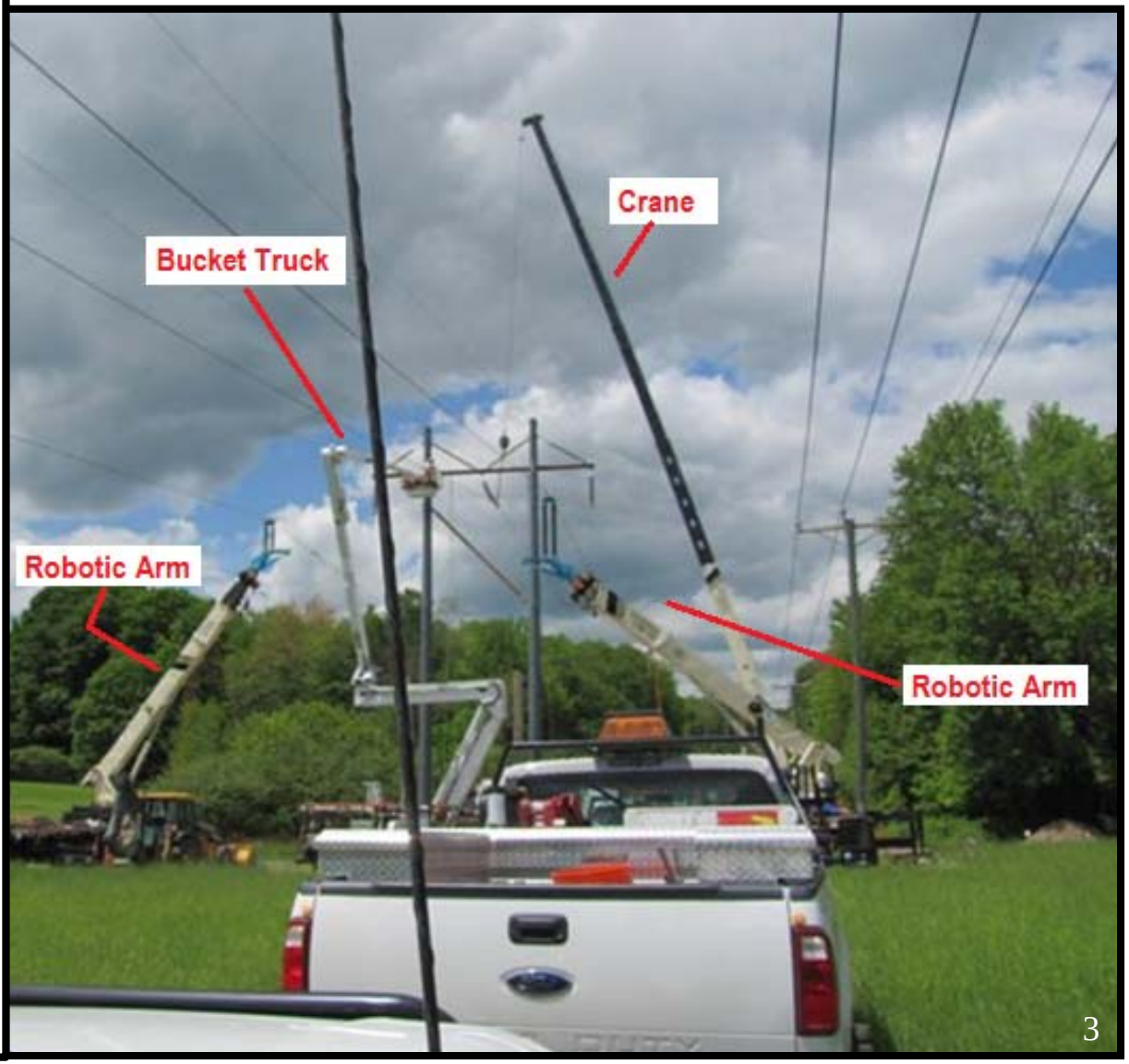
Adequate sizing of work pads and/or access roads involves a number of considerations, including at a minimum:

- Type of work: Live line work vs. de-energized work
- Type/configuration of structure (both existing and proposed)
- Type of work required (e.g., structure replacement, insulator change out, cross arm replacement, etc.)
- Line Voltage
- Safely fitting typical equipment: bucket truck(s), crane(s), robotic arms, digger derrick, backhoe, excavator, etc.
- Spacing between conductors
- Minimum approach distances (MAD) to energized conductors
- Setup of equipment to maintain MAD from energized conductors
- Height of structure – this dictates the height and footprint of the crane
- Terrain – side slopes, rock, vegetation, etc.
- Location of adjacent circuits and/or structures



Typical Sizing and Configuration of Work Pads and Access Roads (cont.)

EVERSOURCE ENERGY

- Work pads typically need to be constructed to provide an area for setup on both sides of structure to allow for necessary equipment positioning and provide a safe working environment.
- Typical work pads are 100’ x 100’ for 115-kV work. The work pad size may need to be increased for taller structures and/or structure configuration, line voltage, and type of work (live line vs. de-energized).
- Access roads are typically built with 6-8” of clean angular stone, top dressed with 4-6” of gravel.
- Road width in upland areas is typically 16’. (Access road width may vary pending location or other factors, e.g., turn radius.)
- Where roads are proposed in wetland or culverts, and bridges are proposed, a minimum of 12’ wide (preferably 16’ wide) usable road is needed to accommodate vehicles of at least 140,000 lbs.
- Construction matting may be used for temporary crossings when stone roads can’t be built.

Where site conditions allow and safety is not compromised, we work to minimize work pad and access road sizes to mitigate impacts.