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Successful project road design and construction requires keen attention to geographic and environmental variables.

WITH THE EXCEPTION of a handful of southeastern states, virtually every state in the country has a wind farm. Often overshadowed by the electrical and turbine-related construction items, proper road construction is critical to the success of every wind project. Contractors must build quality roads, crane pads, and crane paths to allow the delivery and movement of project material and equipment—turbine components in particular—or risk missing key project deadlines.

Soil conditions, construction methods, and road materials vary widely by region. Contractors therefore must have an in-depth understanding of exactly how to design and build roads in each region.

Wind project access roads must be designed to handle all major project loads (concrete trucks, turbine component delivery vehicles, and million-pound main erection cranes) during the intense and short-lived construction phase. After construction, traffic is predominantly for O&M purposes and has a relatively low impact on the roads. Project road design must strike a balance between the needs of these two periods..

The following are some of the critical items for wind project road design and construction:

DESIGN CRITERIA

Roads must be designed to the requirements of the wind turbine delivery vehicles and the main erection crane.

- Horizontal design—Turbine components are delivered using extremely long vehicles (often exceeding 170 feet), with specific requirements for turning radii, road width, turnouts (to allow for traffic to pass), and turnarounds (to allow the delivery vehicles to turn and travel in the opposite direction). In addition, the roads must be wide enough (typically 34 feet wide) to allow the main erection crane to travel, where necessary.
- Vertical design—The main erection crane and the heavy construction vehicles cannot travel up (or down) grades exceeding a certain slope (typically 10 percent), or travel over surfaces with excessive vertical curves. The wind turbine manufacturer and erection contractor will require specific vertical curve and slope limits for their equipment.
- Cross-section strength—Project roads must be designed economically for the specific loading and site/strength characteristics. The road cross-section typically consists of a subgrade and base material of varying depths that will permit the travel of all construction traffic with acceptable rutting and deformation limits.

SUBGRADE

Road strength begins with the subgrade. Generally consisting of scarified and compacted native soil, a strong subgrade is required to provide the strength necessary to withstand the heavy wind project loads. Contractors must carefully examine the geotechnical report to determine the proper moisture content for maximum subgrade compaction, and the proper compaction criteria to result in minimum deformation and rutting.

BASE MATERIAL

Once the subgrade is properly constructed, contractors will place and compact the base material atop the subgrade. The base material, typically an aggregate of some type, provides a smooth and uniform driving surface, reinforces the road strength and improves road drainage properties. Base materials vary from region to region (e.g. caliche in the Southwest, limestone, sand and gravel). The road design must match the depth of the base material with the strength of the subgrade to establish a road that meets the needs of the project loads. In areas with low-strength soils (resulting in a low-strength subgrade), or areas where a great deal of rain is expected, it is common for the road design to include reinforcement with synthetic materials (geogrids and geofabrics). These materials can bridge low strength subgrades and allow, in some instances, a decreased base thickness and a higher tolerance for precipitation.

DRAINAGE

Proper drainage is a key to road longevity. Standing water creates weak areas that will eventually result in road failures and roads may become impassable. Additionally, improperly channeled water allows erosion to occur and leads to the breakdown of road surfaces. Drainage structures carry water away from the roadbed and are designed based upon the topography of the road as well as the amount of surface water that is anticipated to flow onto the road.

Proper road design and construction is an absolute necessity for the success of a wind project. No project can support the cost of a true "all-weather" road-concrete or asphalt. However, the wind contractor's mission is to design project roads that will support the delivery of project material in anticipated weather conditions, and have contingency plans ready in the event that weather conditions make construction travel difficult.

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