



Town of Barrington
333 Calef Highway
Barrington, NH 03825

**Re: Varsity Wireless Telecommunications site
VW2-NH-0032A Barrington 1
Bumford Road
Barrington, NH 03825**

May 31, 2017

Dear Members of the Planning Board,

Varsity Wireless proposes to seek required approvals, procure, and build a 150' tall galvanized steel monopole at the property located off Bumford Road. The pole shall be designed to support five telecommunication carrier antenna arrays & equipment utilized in the region.

Minimum structural loading requirements on the tower are dictated by the current applicable codes based upon IBC 2009 with amendments that reference ANSI/TIA-222 Revision G "Structural Standard for Antenna Supporting Structures and Antennas". According to these codes, the design wind speed for the tower shall be at least a 100 mph (3 sec gust) with minimum 40 mph and 1" radial ice that escalates with height corresponding to statistical wind and icing conditions from a 50-year return period for this geographic location, or as may be dictated by the engineer-of-record and/or the local jurisdiction.

The monopole antenna support structure proposed by Varsity Wireless will likely be a polygonal tapered galvanized steel pole. Each section will be about 30-50 feet in length and assembled in the field in multiple sections with a slip-joint. This type of pole is used industry-wide across the United States and provides for the service life and strength to accommodate a variety of collocation and antenna design configurations established by various wireless carriers. The proposed foundation for the pole will be a reinforced concrete pad with pier or caisson and will be custom engineered to work with the existing soil conditions. The monopole is custom fabricated by a specialty manufacturer whose exact dimensions and details vary slightly between brands. The foundation and pole will be designed by a New Hampshire's Registered Professional Engineer or Structural Engineer as may be applicable in conjunction with the selected tower manufacturer for the intended code prescribed loading.

Under an extreme higher than code wind gust, the monopole might become overstressed in the upper sections where wind speed is at its maximum. The probable structural failure mechanism is a bending or buckling of the monopole near its mid-point immediately above the construction slip-joint. A bent monopole reduces surface areas exposed to wind loading at the top thereby causing a redistribution of stress to lower monopole sections. Under a catastrophic failure scenario where the upper half completely separates, it is my opinion that a conservative estimate of the monopole "fall zone" would be approximately ½ the overall structure height.

The complete toppling of a monopole, like a tree, in a high-speed wind condition is prevented by the base foundation. The detailed foundation design for the monopole will be determined from geotechnical soil data obtained from field investigations and submitted under the applicable code at the time of a building permit application. By code requirements, the foundation is designed to resist overturning or toppling of the monopole with a safety factor of two (2). This means that the monopole foundation can resist two (2) times the maximum stresses generated by wind loading before overturning would occur. Since design codes require the monopole foundation to resist 2.0 times the failure load, then the steel monopole structure will fail before the foundation. This design approach assures that the monopole "fall zone" is limited to a distance less than the monopole height.

In our experience, monopole failures from wind & ice events are extremely rare when they are designed and constructed in accordance with the current Code and telecommunications' industry standards. The design of the telecommunication structures incorporate the same or similar principles and loading requirements as used in tall buildings, utility poles, and billboard signs which often do not require "fall zone" protections.

If required by the approving authority, additional design criteria will be specified to the tower manufacturer and it shall be the responsibility of the tower design engineer, selected tower manufacturer and Varsity Wireless to ensure compliance as necessary with the final conditions of any issued permits or approvals.

Sincerely,

A circular professional engineer seal for the State of New Hampshire. The outer ring contains the text "STATE OF NEW HAMPSHIRE" at the top and "PROFESSIONAL ENGINEER" at the bottom, separated by dashes. The inner circle contains the text "DEREK J. CREASER" and "No. 13536" below it, with the word "LICENSED" at the bottom.

Derek J. Creaser, P.E.
Sr. Project Manager
Hudson Design Group LLC