Statutory Authorization: 24 V.S.A., §4412(4)
Type: REGULATORY
Related Topic Areas: Design Review; Land Use & Development Regulations; Zoning Regulations

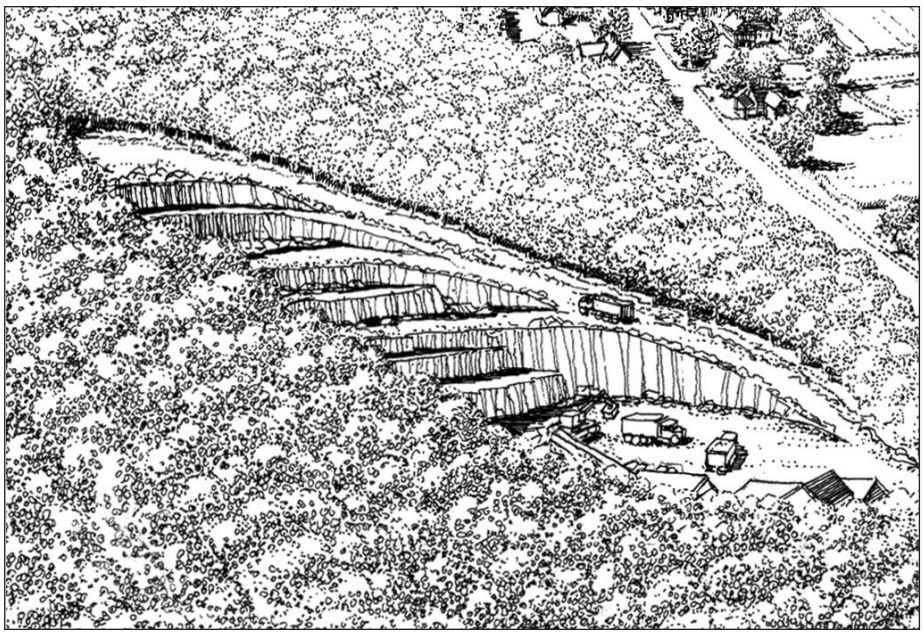
Performance Standards 21

Overview

One of the primary purposes of zoning regulation is to prevent one land use from adversely affecting adjacent or nearby uses. Zoning has traditionally done this by controlling the location, density, and intensity of land use. Some types of nuisances, hazards, or pollutants, however—such as noise and odor—are more ubiquitous and not necessarily unique to a specific use. Instead of precluding uses that may result in objectionable or dangerous emissions, or requiring unrealistically large lots to isolate impacts and buffer adjoining properties, it's often more effective to control potential problems at the source. This can be done by regulating the operation or "performance" of a use through performance standards applied under zoning, or under separately adopted nuisance ordinances.

Chapter 117 authorizes Vermont municipalities to include performance standards in their zoning regulations (§4414[5]). It also specifies that adopted standards describe acceptable levels of performance or operation that will prevent adverse effects from the emission of a variety of "dangerous or objectionable elements." Performance standards are optional—communities may choose to address one or more of the listed nuisances or hazards, or others as appropriate, in relation to allowed uses. The important thing is that the standards be clear, realistic, and measurable or otherwise enforceable.

Chapter 117 also enables "performance-based zoning," which, rather than specifying the types of development that are allowed by district, sets forth performance-based criteria that any development within a district must meet. This is considered a more flexible type of zoning that focuses on the regulation of impacts rather than use. To date, many Vermont municipalities have incorporated performance standards under their regulations, but no communities have adopted performance-based zoning.



As towns evolve to support new residents and new economic activities, traditional industrial- and resource-based industries, such as sand and gravel extraction operations, can come into conflict with residential and commercial uses. Performance standards can help mitigate noise, dust, glare, and other dangerous or objectionable elements and promote peaceful coexistence.

Objectionable Elements

24 V.S.A. §4414(5)

Chapter 117 authorizes the adoption of performance standards under zoning to address such objectionable elements as:

- noise and vibration,
- smoke and dust,
- odor or other forms of air pollution,
- heat, cold, and dampness,
- electromagnetic or other disturbance,
- glare,
- liquid or solid refuse or wastes, and
- dangerous, injurious, noxious, fire, explosive, or other hazards.

Application

Most Vermont municipalities have chosen to include some type of performance standards in their zoning regulations. Performance standards often reference the list of elements identified in Chapter 117, with a basic standard that such nuisances must not be discernible as measured at the property line. Over the years, more detailed standards have evolved for common areas of concern, including noise, smoke, and outdoor lighting.

Vibration. A vibration standard is often included in performance standards but is rarely called upon for enforcement. In most cases, the

standard prohibits any vibration that is transmitted through the ground and that is discernible at the property line of the parcel from which the vibration is emanating without the use of instruments. The city of St. Albans goes further and establishes a standard expressed in terms of maximum acceleration (measured in g's or forces of gravity) at a specified number of oscillations per second (ops). St. Albans' basic standard states that vibrations shall not exceed an acceleration of 0.002 g at frequencies up to 60 ops.

Noise. A growing number of communities limit excessive noise through performance standards in their zoning bylaws, or under separately adopted noise ordinances. The standard imposed is almost always specified in terms of a maximum allowable noise or decibel level (dBA) measured at the property line of the parcel from which the noise is emanating. Decibels can easily be measured in the field using a sound-level meter.

Decibel Scale

Decibels (dB) are a measure of sound pressure, weighted (A-scale) to compensate for the sensitivity of the human ear to different pitches:

- 0 = softest sound a person can hear
- 10 = normal breathing
- 20 = whispering at 5 feet
- 30 = soft whisper
- 40 = quiet residential area, office, library
- 50 = rainfall, refrigerator
- 60 = normal conversation
- 70 = TV audio, human voice at 10 feet
- 80 = doorbell, machine tools, car at 10 feet
- 90 = lawn mower, tractor, blender
- 100 = snow mobile, factory machinery
- 110 = leaf blower, power saw, nightclub band
- 120 = chain saw, rock concert, pain threshold
- 130 = stock car race, jackhammer, power drill
- 150 = jet engine taking off

The decibel (dB) is a measure of sound pressure or intensity. The most frequently used decibel scale (A-weighted) is based on the lowest limit of sound audible to the human ear, which is given a value of 0. With each increase of 10 decibels, the loudness doubles. A noise level of 120 dBA is considered the threshold for pain. Noise levels over 85 dBA will harm hearing over extended periods, and noise levels above 140 dBA can cause damage from just one exposure.

A maximum decibel level of 65 or 70 dBA, as measured at the property line, is a common standard, but regulations may also:

- Vary the maximum level by zoning district. For example, specify lower maximum levels (such as 55 dBA) in rural or residential districts and higher levels (such as 65 or 70 dBA) in industrial and commercial districts.
- Differentiate between maximum daytime and nighttime sound levels, and set a lower nighttime maximum. For example, Shelburne specifies that noise levels shall not exceed 60 dBA between 7 p.m. and 7 a.m., and 70 dBA the rest of the time.
- Vary maximum allowed levels by duration of operation. For example, Swanton includes "decibel correction factors" that specify increases or decreases in acceptable noise levels based on the type and duration of noise.
- Limit allowed increases in decibel levels over background levels. For example, set a maximum increase of 3 dBA over background levels.
- Allow for limited exceptions to accommodate incidental and customary activities. For example, allow the use of lawn mowers (65–95 dBA) and snowblowers (100 dBA) in residential neighborhoods.

Odor. Odors, which are complex mixtures of volatile chemical compounds, are especially difficult to regulate. Many local standards simply prohibit the emission of "noxious gases" or "objectionable odors" that are discernible at the property line or that endanger public health or safety, cause injury, or damage property. Since odors are hard to quantify without expensive lab testing, local "sniffer laws" are notoriously hard to administer and enforce. Odors and other air pollutants—especially those associated with manufacturing and industrial uses—are typically regulated based on the types of materials and compounds used or emitted in processing, under accepted state or federal emissions standards.

Smoke and Particulates. Most standards prohibit emission of smoke

Sound Level Standards (*Example: Williston Noise Ordinance*)

Time Period	Receiving Property	One Hour Average dBA	Instantaneous Maximum dBA
7 a.m. to 10 p.m.	Industrial A	75	90
7 a.m. to 10 p.m.	Residential	55 to 65	80
10 p.m. to 7 a.m.	Industrial A	60	70
10 p.m. to 7 a.m.	Residential	45	60
7 a.m. to 10 p.m.	Other	65	50
10 p.m. to 7 a.m.	Other	60	60

Ringelmann Smoke Chart

The Ringelmann Smoke Chart is actually a series of cards published by the U.S. Bureau of Mines which simulate various smoke densities as percentages of black. A Ringelmann No. 1 is equivalent to 20 percent black; a Ringelmann No. 5 is 100 percent black. These are used to measure the opacity of smoke rising from stacks and other sources, usually over a defined period of time, by matching the actual emission with the various numbers or densities indicated on the charts.

that inhibits vision at the property line of the parcel on which the smoke is being generated. Some, such as the regulations for Bennington, St. Albans City, and Swanton, go a step further and refer to smoke of an intensity measured using the Ringelmann Smoke Chart, which measures the opacity of stack emissions. Standards, such as those found in Swanton's regulations, often reference Ringelmann No. 2 (a maximum opacity of 40 percent).

Heat, Cold, and Dampness. Many municipalities choose not to regulate these types of nuisances because they don't generally apply or are difficult to quantify. Standards, where included, generally prohibit anything that causes adverse health impacts, damage to adjoining property, or a perceptible change (say in temperature) beyond the property line of the parcel from which the emission is coming.

Glare. Glare is one of several problems created by poorly designed or improperly installed outdoor light fixtures. Technically, glare refers to the impact on visual acuity caused by exposure to high levels of direct light. Many Vermont communities address this by limiting the mounting height of outdoor fixtures and requiring that lighting fixtures be directed downward and shielded to avoid or minimize glare. Some municipalities also address "light trespass" problems by limiting the amount of illumination that can be measured on adjacent properties to a maximum level of illumination of 0.03 foot-candles and an average of 0.01 foot-candles.

Smoke Emissions Language

Example: ***Swanton***

No emission shall be permitted at any point, from any chimney or otherwise, of visible gray smoke of a shade equal to or darker than No. 2 on a standard Ringelmann Chart issued by the U.S. Bureau of Mines (or direct facsimile thereof), except that visible gray smoke equaling No. 2 may be emitted for not more than 4 minutes in any 30-minute period. These provisions also shall apply to visible smoke of any color having an apparently equivalent opacity.

What Is a Foot-Candle?

A foot-candle (fc) is a measure of illumination (light level) equal to the light of one candle over a distance of one square foot.

In recent years, the technology of outdoor illumination has greatly improved, and most fixture manufacturers now offer a variety of designs that effectively shield the light source from view and direct the light to where it is needed. In addition, the ability to design outdoor lighting installations has improved to the point where there is no excuse for offensive installations.

Communities interested in more extensive lighting standards can draw from the *Outdoor Lighting Manual for Vermont Municipalities* (see side bar). Several municipalities, such as Williston, have chosen to establish separate outdoor lighting regulations within their zoning bylaws. These regulations set forth lighting objectives and limitations for various parts of town, zoning districts, or particular areas or uses (for example, parking lots) and address lighting design, light levels, and lighting color.

Outdoor Lighting Standards

The *Outdoor Lighting Manual for Vermont Municipalities* (Chittenden County Regional Planning Commission 1996), though now somewhat out of date, provides a comprehensive discussion of outdoor lighting problems and useful guidance for the development of local standards.

More recent industry exterior lighting standards are available through Illuminating Engineering Society of North America (IESNA). IESNA is also working in collaboration with the International Dark-Sky Association (IDA) to develop a model lighting ordinance and design guidelines for publication in 2006.

In 2006, the Vermont State Legislature approved legislation that establishes a task force to consider a broad array of outdoor lighting issues and recommend voluntary lighting guidelines for both state and local use.

Liquid and Solid Waste. Liquid waste refers primarily to wastewater—most municipal performance standards reference applicable wastewater treatment and disposal standards. Communities with municipal wastewater systems typically specify that properties within wastewater system service areas must connect to municipal systems.

Solid waste is a somewhat different story. Some communities prohibit the accumulation of solid waste to the degree that it attracts insects or rodents (often under separately adopted health regulations). Others specifically prohibit burning solid wastes, in accordance with state regulations. Most Vermont municipalities are members of a regional solid waste district and often require solid waste disposal in accordance with district requirements, at certified disposal facilities.

Electromagnetic Disturbance. The intent of this standard is largely to prevent disruption to television

Electromagnetic Disturbance Language

Example: ***Bennington***

No use, under normal operating conditions, shall: …

(8) cause electromagnetic disturbances, electronic transmissions or signals which repeatedly interfere with the reception of radio, television or other electronic signals, or which are otherwise detrimental to public health, except as specifically licensed and regulated through the Federal Communications Commission.

and/or radio reception. With the advent of modern cable and wireless technologies, this has become less of a concern. It's also important to note that the 1996 Federal Telecommunications Act severely limits the ability of municipalities to regulate wireless emissions regulated through the Federal Communications Commission (FCC), as acknowledged in Bennington's performance standards.

Fire, Explosives, and other Hazardous Materials. The intent here is obvious—to prevent hazards to people and property. Bylaws that simply prohibit the storage of hazardous materials on-site may inadvertently exclude commonly used household and commercial substances, including heating oil, propane, and kerosene, gasoline for small engines, paint solvents, and cleaners. Local regulations often exempt the storage of small quantities of materials that are customary and incidental to general residential and commercial use (for example, Shelburne specifically exempts residential propane tanks) and refer to applicable state regulations for the proper storage, use, and disposal of larger quantities of materials that are subject to state reporting requirements and local fire department notification. Where explosives may be used (for example, in mining and quarrying operations), communities often regulate the hours in which blasting can occur and sometimes require advance notice to adjoining property owners.

Considerations

Vermont's planning statute describes performance standards in terms of protection from specific hazards. Performance-based zoning that focuses on the regulation of impacts rather than specific uses, as noted above, may include a much broader array of performance measures that are used in lieu of, or as supplement to, traditional use-based zoning, such as standards that address open space protection, traffic generation, parking, building height and massing, and screening. In some cases, aesthetic concerns may also be addressed under a concept known as "form-based zoning," which emphasizes form over function. (See topic papers, Design Review and Zoning Regulations.)

Most municipalities use a combination of traditional use-based and performance-based zoning approaches. Performance standards can be applied during the permitting process or serve as the basis for corrective action if a problem develops that results in complaints or hazardous conditions.

While performance standards may be fairly simple or highly technical and complex, they must be designed to address real community concerns. Most important, the standards must be enforceable by local staff. If a community establishes a quantitative standard, it should be prepared to go out and measure conditions to ensure compliance, which may involve the purchase of special equipment or budgeting for laboratory tests. Some assistance is also available from the state with regard to applicable state regulations and industry standards.

Vibrations and Hazards Language

Example: ***Middlebury***

Blasting activities are regulated in relation to the frequency of vibrations produced:

Blasting and other activities causing substantial vibration shall not exceed a particle velocity of 0.5 inches per second below 40 Hz, nor 2.0 inches per second for frequencies above 40 Hz measured at the property line.

The town also prohibits hazards that place an unreasonable burden on the local fire department, thereby allowing for fire department review:

Fire, explosive and similar safety hazards which would substantially increase the risk to an abutting property, or which would place an unreasonable burden on the Fire Department, shall be prohibited.