NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE GENERAL SPECIFICATION

WINDBREAK/SHELTERBELT ESTABLISHMENT

(Ac.)

CODE 380

GENERAL SPECIFICATIONS

Procedures, technical detail, and other information listed below provide additional guidance for carrying out selected components of the named practice. This material is referenced from the conservation practice standard for the named practice and supplements the requirements and considerations listed therein.

GENERAL DESIGN INFORMATION

Each windbreak design is unique depending on objectives of the landowner and local site conditions. Consideration must be given to five key windbreak structural components: height, continuity, density, orientation, and length. By manipulating these components, an effective windbreak can be designed to meet the landowner's objectives.

Height of the windbreak, often referred to as H, is an important factor determining how far downwind the protected zone will reach. This value increases as the windbreak matures. The greatest wind speed reduction occurs in the area from two times (2H) to ten times (10H) the height of the windbreak on the leeward or downwind side. Measureable reductions can also occur as far away as thirty times the height. For example, for a windbreak where the tallest trees are 50 feet, the greatest wind speed reductions will occur from 100 to 500 feet leeward of the windbreak. On the upwind side of a windbreak, wind speed reductions are measureable for a distance of two to five times the height of the windbreak.

Continuity of the windbreak is essential to achieve full effectiveness. Windbreaks should not have any large gaps. Gaps create a funnel effect that concentrates wind flow, increasing wind speed in excess of those in the open field often causing damage downwind from the gap. Replacing trees that die and locating access lanes around the ends of the windbreak can prevent gaps. If roads, lanes, or a large ditch must cross a windbreak, try to make the crossing at an angle to the prevailing wind direction. The goal is for the trees and shrubs to grow together to form a continuous barrier within ten years.

Density is the amount of leaves, branches and trunks in the windbreak. Wind blows over and around a windbreak but a portion also flows through the windbreak. The number of rows, the spacing between plants, and species composition are factors that control windbreak density. The more solid or dense a windbreak, the greater the wind speed reduction. However, less dense plantings allows for protection to a greater distance. The density can be managed by the choice of species, conifer versus deciduous, the spacing of the trees, and the number or rows in the windbreak. For additional clarification about windbreak density see Agroforestry Note #36, Windbreak Density: Rules of Thumb for Design: http://www.unl.edu/nac/agroforestrynotes.htm

Orientation is the direction the windbreak faces. Windbreaks are most effective when oriented at right angles to the troublesome winds. To allow for changes in wind direction, windbreaks are often

planted in multiple directions such as an L, U, or E shape. When orienting the windbreak, avoid placement that may cause future management problems such as interference with utilities or road visibility. A windbreak may consist of one or more legs, depending upon the number of directions from which troublesome winds occur and the landowner's objectives. Adding additional legs may not be economically feasible if it disrupts the use of large farm equipment. Design the windbreak so that at least one leg is close as possible to a right angle to the prevailing problem wind.

Length of the windbreak determines the amount of total area receiving protection. For best protection, the uninterrupted length of a windbreak should exceed the height by at least 10:1. For example, if the height of the windbreak is 50 feet, the windbreak needs to be at least 500 feet long to minimize the impact of air turbulence around the end of the windbreak.

The overall effectiveness of a windbreak for a given purpose is dependent upon blending these five components. Two key guidelines apply:

- Orient the windbreak as close to perpendicular to the troublesome wind direction.
- Select tree and shrub species that are adapted to the soils and climate.

SPECIES SELECTION

Species must be adapted to the soils, climate and site conditions. To determine which trees will grow satisfactorily on which soils and to determine the expected heights after 20 years, refer to Windbreak and Environmental Planting Interpretations, or Table 1 in the Oklahoma NRCS Tree/Shrub Establishment (612) specification.

SPACING

Growth characteristics of individual tree/shrub species (e.g. height, crown spread) will be used to determine the appropriate spacing.

The plant spacing within each row shall be as shown below:

Shrubs	4 - 8 feet
Trees	10 - 20 feet

The spacing between rows shall be 10 to 20 feet. This spacing shall be 4 feet wider than the width of maintenance equipment. Large hardwood trees with an overtopping crown spread shall not be planted within 16 feet of an evergreen species.

LOCATION

Primary windbreaks for winter wind protection and snow control are usually located to the north and west of the area needing protection. Windbreaks established to control soil erosion or protect plants from wind related damage are typically installed south and west of the area needing protection. The minimum number of rows for a primary windbreak will vary depending on the purpose of the planting.

State and local county regulations must be followed in locating plantings adjacent to highways. Windbreaks will be positioned to avoid causing visibility problems at road intersections, curves, and driveway entrances. Trees or shrubs at maturity should not spread into the rights-of-way of roads. Avoid creating blind corners at road intersections.

On the windward side of a road, the nearest tree row should be no closer than 50 feet from the edge of the right-of-way. On the windward side of a road in areas having heavy snow accumulation annually, tree rows should not be planted closer than 200 feet from the centerline of the road to provide adequate snow storage off the road. Where space allows, plantings on the south side of roadways should be 100 feet from the center line of the road to avoid ice buildup from winter shading and snow drifting.

Avoid planting trees or shrubs under, over, or immediately adjacent to power, telephone, and similar above or below ground facilities, or use species that will not interfere with the facility. For plantings adjacent to over head lines, position shrubs or trees so that crowns (projected crown height and diameter at 20 years of age) are at least 20 feet from the nearest line or structure. If space is limited, species with a mature height less than the height of the facility may be used beneath above ground utilities.

Avoid planting trees and shrubs within 20 feet of underground septic lines where possible.

PREPARATION OF PLANTING SITES

Proper site preparation prior to planting trees and shrubs is critical to their survival and growth. Properly prepared sites shall be free of competitive vegetation and plow pans. Mechanical, manual, or chemical methods may be used for site preparation.

Site preparation on medium or heavy cropland soils should include summer fallowing. When planting trees in perennial vegetation or alfalfa, prepare the ground by subsoiling with a ripper or paraplow in the late summer or fall, leaving the surface rough over the winter and disking or harrowing in the spring to provide a clean, firm seedbed for tree planting.

Sandy soils which are subject to wind erosion should not be summer fallowed. A cover crop of Sudan or haygrazer should be established the summer before planting the trees. The area may require chemical treatment if annual winter weeds or grasses present a problem, before tree planting. If chemicals are used, follow the label recommendations.

If weed barrier is to be used on sandy soils, disk and clean only the row area which the material will cover.

No tree planting shall be made in bermudagrass unless steps to destroy or control bermudagrass are applied prior to planting of trees and shrubs, or afterward through herbaceous release herbicides.

Avoid cropland sites that have had recent heavy applications of herbicides that may be harmful to seedlings.

PLANTING STOCK

Only viable, high quality and adapted planting stock will be used. Packaged seedlings can be stored for 2 weeks in a cool, dry, shady, or protected location and should be checked every few days for moisture needs. DO NOT store packages where they will freeze or where the temperature will exceed 70° F. Ideal storage is at 35 to 40 degrees. Stored packages shall not be stacked more than 2 deep, without spacers, to allow air flow around the bags (packaged seedlings can build heat within the bags).

For large tree plantings, coordinate with the nursery and accept delivery of only enough trees for a one or two week supply at a time. Although not ideal, seedlings can be heeled in when it is necessary to store them longer than 2 weeks. Because of the increased handling and root exposure this entails, it should only be used as a last resort, when no other alternatives are available. To heel in, remove seedlings from the bundle, spread them out in a trench (plow furrow) with a 30 to 40 degree slope from the vertical, and cover the roots with soil. The trees shall be placed in the trench so that the roots and 1-2” of root collar are below ground line. Pack soil firmly around the roots to eliminate air pockets. The trench should be located in a cool, shady place, and the soil around the roots shall be kept moist.

PLANTING

Plant bare root seedlings after December 1 and prior to bud break of native tree and shrub vegetation (usually March 15 to April 1). Potted or containerized seedlings shall be planted from October 1 to April 20 as long as adequate moisture is present at the time of planting.

Plant when there is good soil moisture but not when the ground is saturated with water.

Avoid planting under dry, windy or very warm conditions.

Exercise extreme caution while planting bare root seedlings, to keep the roots from being exposed to open air.

Do not plant when the ground is frozen or during periods of freezing weather.

When taking the seedings to the field; transport and store the seedling bags in cool, shady locations and protect them from temperature extremes.

Only open one bag at a time and close it immediately after taking only one handful of seedlings or what will be used in a short period of time. Transfer trees from shipping bags to planting bags quickly. Do not tap tree roots to remove excess peat moss or dirt.

Keep seedling roots covered with moist burlap, moss or in buckets with water. Expose only the single tree being planted, at the time, to the elements when planting.

Seedlings must be planted at the same level or no more than one inch deeper than they grew in the nursery or with the root collar at or less than 1/2 inch below the ground level, this is especially important with conifers. Seedlings with exposed root collars survive poorly. Soil around the roots must be gently but firmly packed to remove air pockets. Watering after planting helps in removing air pockets as well.

Roots must extend down and out naturally and not be crimped in the hole or furrow. Do not force roots into too shallow a hole or furrow. Avoid “J” or “L” rooting.

With hand planting, use your shoe to pack the soil firmly around the roots. If planting with a machine, make sure the packer wheels have the proper tension and are in the proper alignment in relation to the tree.

Planting holes or furrows must be deep enough so that the roots are not curled or crowded (planting into a narrow trench will accumulate extra moisture for establishment). When planting in holes that have been augured, the edges of the hole should be gouged to roughen or break up the compacted layer caused by the auger along the edge of the hole.

Check to see if the roots are packed tightly by gently pulling the top. The seedling should not be loose.

Refer to Job Sheet 612 02 (Checking Soil Moisture Available to Trees) to determine the proper soil moisture.

MOISTURE

Available water in the soil must be maximized at the time of planting. This can be accomplished by cultivation and fallowing one year prior to planting. Unless soil moisture conditions are favorable, watering the seedlings at the time of planting will be necessary.

Moisture conservation or supplemental watering shall be provided for plant establishment and growth where natural precipitation is too low for the selected species. Seedlings with a drip irrigation system need the equivalent of at least 1 gallon of water per day, per plant, during the dry months. One time watering applications shall provide at least 15 gallons per week. This is recommended for the first 3 years of establishment. Use Job Sheet WOOD-OK-09 (Operating Your Drip Watering System) for design.

Mulch materials such as wood chips or fabricated plastic mulches (polypropylene geotextile) may be used for moisture conservation. The most common dimensions of fabricated mulch rolls are 6 ft. by 300 ft. and 6 ft. by 500 ft. The six-foot-wide rolls are mechanically installed over the top of seedlings immediately after planting. A slit or X is cut at each tree location no larger than necessary to pull seedlings through. When fabricated mulches are used in conjunction with irrigation systems or in areas of 20 inches or greater annual precipitation, 4 ft. wide fabricated mulch rolls are sufficient. Supplemental watering may be provided by hand watering, flood irrigation, or drip systems.

Superabsorbent polymers (Polyacrylamide or hydrogels) are widely used in tree planting applications as a means of conserving water. When mixed with water the polymers swell like sponges to several

times their original size. After planting, the water is then slowly released to the surrounding soil, reducing the need for irrigation. Mix the hydrogel product with water according to manufacturer's instructions. Let the mixture stand until it forms a slurry the consistency of gravy (30 minutes to 1 hour). Adjust the slurry to the thickness that permits the maximum amount of gel to adhere to the roots. Dip the roots of the seedlings immediately prior to field planting, and do not shake.

ADDITIONAL GUIDANCE

To provide adequate protection from wind and drifting snow around buildings, feedlots, etc., a dense windbreak (greater than 65% density) is needed. A minimum of two rows will generally be required, of which the windward row should consist of a shrub or short, dense tree species. Optimum effect will be achieved by planting 3 or more rows.

The windbreak must have sufficient length to place the majority of buildings, feedlots and other areas needing protection within the 2-5H wind shadow zone. Due to the shifting nature of the wind, extend the ends a minimum of 150' past the edge of the area needing protection where property boundaries allow.

Multiple-row windbreaks should have shrubs and small trees in the outer rows and not planted between taller growing species. For most situations a shrub or conifer will be used in the most windward row of a multiple-row planting to provide additional snow (moisture) for the growing plants within the planting and to "park" the snowdrift in an area that is out of the way.

Shrubs and evergreen species shall be planted in the outside rows that have more sunlight.

Thin or prune windbreaks as needed to maintain proper density and plant health to continue its function.

Livestock shall be excluded from all windbreak/shelterbelt plantings.