SECTION 640 Landscaping

640.1 Topsoil

Topsoils are those humus-bearing soils that can sustain plant life. After completing the finish grading, they are spread over the graded earth surfaces where seeds will be sown or sod will be placed, to provide a growing medium for the development of turf.

To motivate contractors to spread topsoil as early as possible, the engineer may at times want to consider allowing a contractor to spread topsoil on the side slopes before placement of "bluetop" grade stakes. This consideration assumes the rough grading is performed to reasonably close conformity with the slope stakes and reasonable care is taken to maintain an aesthetically pleasing, shoulder-to-topsoil transition at the bluetop location. Minor variations in the bluetop elevation or location will not materially affect either the function or appearance of the project for this purpose. This will allow the contractor to perform topsoiling operations to better fit the contractor's schedules and should expedite the other associated landscaping operations.

The topsoil is placed and uniformly spread over the areas to a uniform depth of 3 inches, unless otherwise specified. During spreading and shaping of the placed topsoil, all clods and lumps are to be broken down so the placed topsoil is of a fine, uniform texture. Where topsoil is placed on steep slopes, to preclude the formation of planes of slippage the surface of the underlying soil should be roughened to allow bonding with the topsoil. If slippage planes develop, sloughing of the placed topsoil may occur at any time during wet periods before sufficient root growth has developed to retain the mass in place. Also, where there is a significant difference in texture of topsoil and subsoil, such as clay over sand, it is better to blend the soils to obtain a more uniform growing medium.

Subbase areas of the inslope should be left bare unless the subbase material is highly susceptible to erosion by wind or rain. In this case, topsoil should be placed over the subbase material; however, precautions should be taken to apply no more than the designated quantity so drainage from the subbase will not be impeded or destroyed by blocking the drainage with impervious material. Materials from marsh disposal have a tendency to retain water and should not be used to cover subbase material at the inslope.

Standard spec 625.3.3 contains special requirements for urban areas where a lawn-type turf is desired. During finishing operations all loose or waste stones that will not pass a one-inch sieve must be removed. Topsoil for use over these areas must pass a one-inch sieve and at least 90% must pass a No. 10 sieve. Some topsoils containing large, hard clods may need to be pulverized or screened.

Table 640-1 defines the various soil classifications (sand, silt, clay) on the basis of particle size. Topsoil recently treated with herbicides to prevent plant growth may not allow seed germination or support plant growth. If herbicide contamination is suspected, the engineer should contact the Bureau of Highway Operations.

It may be possible to treat small amounts of topsoil to neutralize the effect of the herbicide. For large amounts, treatment may not be cost-effective, the topsoil will have to be rejected, and an alternative source of topsoil found.

Occasionally, such as where shallow (less than 6 feet) fills are being built, to ensure the stability of the fill, the contractor will have to excavate more topsoil than the amount necessary to cover the graded surfaces. This excess volume is regarded as EBS and is eligible for payment as common excavation. To minimize the amount of excess, the engineer may direct the contractor to remove the topsoil from the shallow fill sites before stripping other areas. The engineer is encouraged to discuss with the contractor early on in the project the amounts of topsoil necessary and available.

TABLE 640-1 Soil Classification Particle Sizes

Soil Class	Diameter Range (inch)
Clay	< 0.00008
Silt	0.00008 - 0.002
Very fine sand	0.002 - 0.004
Fine sand	0.004 - 0.01
Medium sand	0.01 - 0.02
Coarse sand	0.02 - 0.04
Very coarse sand	0.04 - 0.08

640.1.1 Topsoil Testing

Soil pH analysis and analysis of prior herbicide use should be performed. Topsoil and salvaged topsoil can be tested to determine if the pH range will sustain grass. In addition, soil that is suspected of prior herbicide use can also be tested.

When topsoil or salvaged topsoil is accepted from a wetland, low land, or conifer (evergreen trees) area, an analysis should be performed to find out if appropriate pH levels exist. Often the pH level is so low that the soil will not sustain plant growth without addition of lime.

An analysis for the presence of herbicides should be performed when topsoil or salvaged topsoil is accepted from areas which have been in agricultural crop production. Before performing any analysis, try to obtain field history data information from the land owner(s) about the crop production/herbicides use of the land to be used as a source for topsoil. The land owners are required to retain this information. This data should indicate which herbicides were used in the field.

If any of the herbicides listed below were used in the field's history information, it may cause problem in establishing grass. A soil analysis may have to be performed if history information is not available. This applies especially if the parcel had field corn, sweet corn, or soybeans the year before.

Table 640-2 indicates which type of crop is associated with what type of herbicide. The numbers in the table indicate the number of months the particular herbicide will have an impact on grass establishment.

The result of the soil analysis for trizine may also indicate presence of the majority of the herbicides as listed in the table.

Testing soils for the presence of herbicides is expensive, so testing requests must be limited. A complete outline of herbicide persistence (residue) in soil is available in Pest Management in Wisconsin Field Crops-1998 (A3646), Appendix Table (Page 184). It is authored by C.M. Boerboom, J.D. Doll, R.A. Flashinski, C.R. Grau, J.L. Wedberg.

This material is available from:

Wisconsin County Extension Office or Cooperative Extension Publication
Room 170
630 W. Mifflin Street, Madison, WI 53703
Phone # (608) 262-3346.

TABLE 640-2 Herbicide Effects on Grass Establishment

Herbicide	Effect on Grass Establishment (Months)		
	Field Corn	Sweet Corn	Soybean
Atrazine	24	24	
Bicep II/Bicep Lite II	24	24	
Bullet/Lariat	24	24	
Command 4EC/3ME	16		12
DoublePlay	24		
Guardsman	24	24	
Harness Xtra	24		
Lightning	12		
Marksman	24		
Princep	24	24	
Surpass 100	24		

640.1.2 Topsoil Sampling Guidelines

Topsoil may be sampled either from a stockpile, or in-place.

640.1.2.1 Sampling from a stockpile:

1. Do not obtain sample from the stockpile face. First remove the surface of the pile at the point of sample then obtain material from inside the stockpile. This will be more representative of the material in the stockpile.

2. Obtain material from at least three different locations from the stockpile. These samples will be combined into one sample that will be 3 to 4 times larger than the final sample size required.
3. Mix the large sample and remove from it enough material to be placed in one of the department's cement sample boxes. Ensure that the sample is bagged and sealed (twist tie) before placing it in the box.
4. Fill out DT1499, Sample Shipping Tag and enclose the form in the box. Make sure to write the word "Topsoil" on the outside of the box before submitting.

640.1.2.2 Sampling topsoil in-place:

1. The procedure for sampling topsoil in-place is the same as for sampling existing topsoil that is planned to be used, or sampling topsoil that has been placed.
2. Remove the surface of the topsoil so that the sample taken will not be from the surface and is representative of the material in place. For existing topsoil, ensure that the sample is as free as possible of plant material (grass, roots, etc.).
3. Obtain material from at least three different locations. These samples will be combined into one sample that will be 3 to 4 times larger than the final sample size required.
4. Mix the large sample and remove from it enough material to be placed in one of the department's cement sample boxes. Ensure that the sample is bagged and sealed (twist tie) before placing it in the box.
5. Fill out DT1499, Sample Shipping Tag and enclose the form in the box. Make sure to write the word "Topsoil" on the outside of the box before submitting.
6. Send topsoil samples to:

   Russell Frank
   3502 Kinsman Blvd.
   Madison, WI 53704
   Phone # (608) 246-7942

640.1.3 Topsoil Acceptance

The department encourages contractors to topsoil, seed, and install long-term erosion control measures as soon as practicable. Consequently, the department may entertain contractor requests for partial acceptance upon completion of significant portions of that work. If the contractor requests partial acceptance, the engineer needs to inspect the work and make sure it was completed correctly and all erosion control measures are installed properly. If partial acceptance is granted, the department assumes maintenance responsibility for the work under standard spec 105.11.1. If the topsoil is washed out or damaged due to erosion, the department pays for that restoration as specified in standard spec 625.5. The department does not reimburse the contractor for washouts or damage caused by contractor operations.

640.2 Fertilizer

640.2.1 General

Fertilizers Type A and Type B have been developed to ensure adequate fertilization of seed or sod located over most soil types in Wisconsin. Selection of Type A or Type B is made by the region design section based upon soil type and the mixture of seed to be sown. Refer to standard spec 629.

Where fertilizer is required, it should be spread upon the soil at the required rate and worked into the soil during the preparation of the seedbed, unless seeds are sown with a hydro-seeder, in which case, the fertilizer may be applied in the water along with the seed.

The rates of fertilizer application for Type A and Type B are 7 lbs. per 1,000 ft^2, as specified in standard specifications, when they are applied at the minimum percentage of components of nitrogen, phosphoric acid and soluble potash (N-P-K) required. However, the standard specifications allow the application of fertilizers containing percentages of components greater than the minimum specified. When fertilizers containing percentages of N-P-K components greater than minimum are to be paid for, the quantity to be measured can be obtained by multiplying the weight used by the ratio of the actual percentage of N-P-K components used to 32% for Type A, or to 50% for Type B.

Example 1

Type A fertilizer is supplied which contains 40% N-P-K, instead of the minimum 32% The adjusted application rate would be:

$$7 \times \frac{32}{40} = 5.6 \text{ lbs./1,000 } ft^2 \text{ applied}$$

Actual use =2,200 lbs. of a Type A fertilizer containing 40% N-P-K.

$$2{,}200 \text{ lbs.} \times \frac{40}{32} = 2{,}750 \text{ lbs.} = 27.5 \text{ CWT to be paid.}$$

Example 2

Type B fertilizer is supplied which contains 70% N-P-K, instead of the minimum 50%. The adjusted application rate would be:

$$7 \times \frac{50}{70} = 5 \text{ lbs. / } 1000 \text{ ft}^2 \text{ applied}$$

Actual use = 2,400 lbs. of a Type B fertilizer containing 70% N-P-K.

$$2{,}400 \text{ lbs. } \times \frac{70}{50} = 3{,}360 \text{ lbs. } = 33.6 \text{ CWT to be paid.}$$

In addition to the total N-P-K requirements for type A and B fertilizers, standard spec 629.2.1.2 contains specific minimum requirements for nitrogen, phosphoric acid, and potash as individual components.

640.2.2 Agricultural Limestone

Agricultural limestone treatment is applied at the rate specified in standard spec 629.3.2 for the particular index zone (neutralizing index). The index zone is a material property that varies with the material source location.

Agricultural limestone treatment is paid by the ton. To determine the quantity to be measured for payment, the base application rate of 100 lbs. per 1,000 ft^2 from Index Zone 60-69 is used. The actual weight of lime used is multiplied by 100 and divided by the application rate.

Example 3

Index Zone = 95

Application Rate = 70 lbs. per 1,000 ft2 from standard spec 629.3.2

Actual usage = 3,600 lbs.

$$\text{Payment} = 3{,}650 \text{lbs.} \times \frac{100}{70} \times \frac{1 \text{ ton}}{2{,}000 \text{ lbs.}} = 2.6 \text{ tons to be paid.}$$

640.3 Seeding

In the past, seeding and final finishing were usually delayed by the contractor until the entire project had been graded and substantially completed. The contract was accepted shortly thereafter, at which time the contractor was relieved of responsibility for maintenance. Generally, only minor amounts of reseeding were necessary, and contractors took care of the restoration at their cost.

In our continued efforts to minimize erosion and the associated negative environmental impacts, we now allow seeding to be done as shown in table 640-3.

TABLE 640-3 Seeding Guidelines

Seed Mixes	Can Be Sown	Mulch Required?[1]	Mgr. Approval Required?
10,20,30 & 40	Anytime, except midsummer and late fall	Yes	No
10,20,30 & 40	Midsummer or late fall	Yes	Yes
60	Anytime, except from 7-15 to 10-15		
60	From 7-15 to 10-15	Yes	Yes
70 & 70A	Anytime, except from 6-15 to 10-15	Yes	No
70 & 70A	From 6-15 to 10-15	Yes	Yes
Temporary seed	Anytime on temporary or permanent slopes	Yes on permanent slopes	No

[1] WisDOT guidelines recommend using mulch on all disturbed permanent slopes.

[2] WisDOT guidelines recommend using temporary seed at half the normal rate on all permanent slopes to promote quick re-vegetation. Use winter wheat or winter rye during the late fall (see No. 9 below).

The specification is broad and general in nature and subject to interpretation as to the calendar dates of midsummer. Midsummer could be regarded as falling between July 15 and August 15; however, the important point is that erosion needs to be controlled any time, mid-summer or otherwise, by the application of temporary or permanent measures.

Liberal use of temporary erosion control measures and emphasis on early completion of roadway finishing has led to substantially more reseeding either anticipated, as in the case of a temporary seeding bid item, or unanticipated, resulting from our emphasis and direction to complete early finishing. Because of our direct involvement in the prosecution of the fertilizing and seeding work, and the intermix of temporary and permanent seeding it has become very difficult to clearly distinguish the pay or no pay

status of areas of seeding or reseeding done by the contractor. Therefore, in the interest of sound erosion control practice and consistent contract administration, we will pay for all re-fertilizing and reseeding within the limits designated in the contract or ordered by the engineer, unless caused by the contractor's negligence.

640.3.1 Late Seeding

Use the following guidelines when determining how late to seed in the fall. While effective erosion control is important, it is also improper practice to jeopardize permanent seeding by placing it when it will almost surely die.

1. Seed germinates only when the soil temperature and moisture are adequate.
2. The seed plant is most vulnerable when it has just germinated. Drought or freezing can kill a newly germinated grass plant.
3. Determine when the area is prone to receive its first "killing" frost, then allow a safety factor.
4. Weigh the risk. Is it worth gambling? Are environmental or customer sensitive areas a factor?
5. "Dormant Seeding" is acceptable in some cases and is desirable with seed mixes 70 and 70A. Non-germinated seed will normally remain dormant and germinate in the spring.
6. If there is a "killing-freeze", it is likely that all new germinated seed plants will die, as they have not had enough time to establish themselves.
7. As a rule, it is risky if permanent seed is planted between September 30th and November 15th for the central part of the state. Adjust according to farther north or south project locations.
8. Late seeding can be helped by a heavier application of mulch. Instead of the normal 1/2" to 1-1/2", increase it to 2" to 2-1/2". This will allow for added protection of the grass plants during cold weather.
9. These guidelines DO NOT apply for temporary seed. WisDOT guidelines call for using temporary seed at half the normal rate on all permanent slopes, but using temporary seed as an erosion control measure, during late fall, is encouraged. Temporary seed is more likely to germinate in cold conditions and is so inexpensive that any risk is minimal.

640.3.2 Failing to Water

Perhaps as many as 90% of seeding disappointments are due to a failure to keep the seedlings moist after they germinate. Seed can lay dormant in the soil for months without water, but once germination begins the tender young seedlings will die without moisture. Best advice: water frequently and don't let the top inch of soil dry out until the grass is well established.

For this reason, the bid item of water should be considered for urban seeding where a lawn type turf is desired. Water should continue for a period of at least 30 days when rainfall is not adequate to maintain soil moisture.

640.3.3 Temporary Seeding

Temporary seeding is the establishment of a temporary vegetative cover on disturbed areas by seeding with an annual herbaceous plant, usually grass, which is quick to germinate.

Temporary seeding is used for both temporary and permanent stabilization measures to include:

1. Disturbed areas that will not be brought to final grade for more than 30 days.
2. Borrow pit and waste area sites.
3. Other disturbed areas such as sides of sediment basins, temporary road banks, intercepting embankments, etc.

Temporary seeding should be included on all projects where exposed soils are expected and re-vegetation is required. It is the least expensive of all erosion control measures, germinates quickly, and is highly effective.

Temporary seeding is an important tool to prevent erosion not only at the time of final seeding but it can also be used on sites that will stand idle over the winter months. Also remember that temporary seed may be used on sites that do not have topsoil placed yet. However, sandy soils tend to be too dry for good temporary cover to establish. When final seed-bed preparation occurs, disking or tilling may have to occur to allow for permanent vegetation growth. Past experience has indicated that annual oats and rye work best onsite with this application.

When erosion control is a crucial action item, permanent or temporary seed (or both) with mulch maybe placed in the late fall. But, WisDOT's normal application rate for mulch of 1/2" to 1-1/2" should be increased to 2" to 2-1/2". This will allow for added protection of the seed during the winter months.

640.3.4 Mixtures Containing Pure Live Seed

640.3.4.1 Background and Definitions

This is the method for determining sowing rate and method of measurement for seed mixes Nos. 60, 70, 70A, 75 and 80 containing seeds to be supplied and applied PLS (Pure Live Seed).

Purity The percentage of the specified species or variety that is contained in a given quantity of the seed.

Germination The percentage of the designated species or variety that will sprout.

Pure live seed (PLS) The percentage purity multiplied by the percentage germination equals the percentage of pure live seed.

The commonly used cool season grasses are specified as having a minimum purity and germination. Unless purity and germination of seed specified PLS are both 100%, the amount of seed required to be sown will always be greater than the amount specified and measured.

640.3.4.2 Determining the Sowing Rate for Seed Mix No. 60

Step1: Total the percentages of species or varieties in the mix with a specified minimum purity and germination. Convert to a decimal form.

Step 2: Divide the percentage of each species or variety designated PLS by the percentage PLS shown on the seed certificate for that species or variety.

Step 3: Total the numbers obtained in Step 2.

Step 4: Add the numbers from Steps 1 and 3.

Step 5: Multiply the result from Step 4 by the specified rate per thousand square feet of the mix to determine the actual pounds to sow per thousand square feet.

Step 6: Divide the total actual weight sown by the amount from Step 4. This will be the amount to be paid for as Seeding, Wetlands (mix No. 60).

Example for Seed Mix No. 60

Species	Purity	Germination	Percentage of Mix (Actual)	Percentage of Mix (PLS)
Timothy	98	90	12	
Canada Wild Rye	PLS			12.0%
Annual Ryegrass	97	90	35	
Alsike Clover	97	90	4	
Red Clover	98	90	4	--
Japanese Millet	97	85	8	
Annual Oats	98	90	25	___
TOTALS			88 %	12.0%

Step 1: Unadjusted %= 88% = 0.88

Step 2: The PLS used in this example is hypothetical. The actual PLS must be taken from the label of the seed supplied. For this example, the percentage PLS for Canada Wild Rye is 65%.

12.0 ÷ 65 = 0.185

Step 3: 0.185

Step 4: 0.88 + 0.185 = 1.065

Step 5: The application rate under standard spec 630.3.3.5 is 1.5 pounds per 1,000 square feet

1.5 x 1.065 = 1.60 pounds per 1,000 square feet actual sowing rate

Step 6: Say 113 pounds were sown

113 ÷ 1.065 = 106 pounds measured for payment.

640.3.4.3 Determining the Sowing Rate for Seed Mix No. 70 and 70A

Step 1: The actual pounds Pure Live Seed (PLS) may be listed on the seed package label. If so, proceed to Step 3.

Step 2: If, instead of the actual pounds PLS, the seed package lists gross weight and percent PLS, convert the percent PLS to decimal form and multiply the gross weight by the percent PLS to get pounds PLS in the package.

Step 3: Divide the gross weight of the package of each species by the pounds PLS in the respective

package.

Step 4: For each species, convert the percent PLS in the seed mix to decimal form and multiply the percent PLS of that species in the seed mix by the seeding rate per thousand square feet to find the PLS rate of that species.

Step 5: For each species, multiply the result from Step 3 by the result from Step 4 to find the gross weight of that species to apply per thousand square feet.

Step 6: Add the results for each species from Step 5 to determine the gross weight of the seed mix to apply per thousand square feet.

Example for Seed Mix No. 70 (The seed mix in this example is hypothetical.)

Species	Of Mix (PLS)	Gross Weight	Percent PLS
Yellow Coneflower	5	50 lb.	70
Wild Bergamot	5	50 lb.	70
Butterflyweed	5	60 lb.	60
Prairie Blazingstar	5	40 lb.	80
Little Bluestem	35	50 lb.	90
Sideoats Grama	35	50 lb.	90
Canada Wildrye	10	50 lb.	95

Step 1.
The actual pounds Pure Live Seed (PSL) may be listed on the seed package label. If so, proceed to Step 3.

Step 2	Gross Weight	X	% PLS	=	PLS Weight
Yellow Coneflower	50 lb.	X	0.7	=	35 lb.
Wild Bergamot	50 lb.	X	0.7	=	35 lb.
Butterflyweed	50 lb.	X	0.6	=	36 lb.
Prairie Blazingstar	50 lb.	X	0.8	=	32 lb.
Little Bluestem	50 lb.	X	0.9	=	45 lb.
Sideoats Grama	50 lb.	X	0.9	=	45 lb.
Canada Wildrye	50 lb.	X	0.95	=	47.5 lb.

Step 3	Gross Weight	÷	PLS Weight	=	Conversion Factor
Yellow Coneflower	50 lb.	÷	35 lb.	=	1.43
Wild Bergamot	50 lb.	÷	35 lb.	=	1.43
Butterflyweed	60 lb.	÷	36 lb.	=	1.67
Prairie Blazingstar	40 lb.	÷	32 lb.	=	1.25
Little Bluestem	50 lb.	÷	45 lb.	=	1.11
Sideoats Grama	50 lb.	÷	45 lb.	=	1.11
Canada Wildrye	50 lb.	÷	47.5 lb.	=	1.05

Step 4	% Species in Mix	X	Seeding Rate/1,000 Sq. Ft.	=	PLS Weight/1,000 Sq. Ft.
Yellow Coneflower	0.05	X	0.4	=	0.02 lb.
Wild Bergamot	0.05	X	0.4	=	0.02 lb.
Butterflyweed	0.05	X	0.4	=	0.02 lb.
Prairie Blazingstar	0.05	X	0.4	=	0.02 lb.
Little Bluestem	0.35	X	0.4	=	0.14 lb.
Sideoats Grama	0.35	X	0.4	=	0.14 lb.
Canada Wildrye	0.10	X	0.4	=	0.04 lb.

Step 5	Conversion Factor	X	PLS Weight/1,000 Sq. Ft.	=	Gross Weight/1,000 Sq. Ft.
Yellow Coneflower	1.43	X	0.02 lb	=	0.03 lb.
Wild Bergamot	1.43	X	0.02 lb	=	0.03 lb.
Butterflyweed	1.67	X	0.02 lb	=	0.03 lb.
Prairie Blazingstar	1.25	X	0.02 lb	=	0.03 lb.
Little Bluestem	1.11	X	0.14 lb	=	0.16 lb.
Sideoats Grama	1.11	X	0.14 lb	=	0.16 lb.
Canada Wildrye	1.05	X	0.04 lb	=	0.04 lb.

Step 6	Gross Weight/1,000 Sq. Ft.
Yellow Coneflower	0.03 lb.
Wild Bergamot	0.03 lb.
Butterflyweed	0.03 lb.
Prairie Blazingstar	0.03 lb.
Little Bluestem	0.16 lb.
Sideoats Grama	0.16 lb.
Canada Wildrye	0.04 lb.
TOTAL	0.48 lb.

Therefore, the actual gross weight of seed that needs to be applied per 1,000 square feet is 0.48 pounds in order to get the required PLS rate of 0.4 pounds per 1,000 square feet which will be measured for payment.

640.3.5 Testing Seed

WisDOT can test standard seed mixes for germination rates, seed type, and ratios if the engineer suspects a problem. This is an effort to continuously improve recommended seed mixes, and to determine the reason of failure on standard seeding projects. It will also provide the project manager with an opportunity to require some of the standard seed mixes to be tested. Contact Leif Hubbard at (608) 267-6884 with soil and seed related questions.

640.3.6 Seed Sampling Guidelines

Take seed samples from two locations representing seed that will be used on the specific project. Sample locations include sampling from the seed bags, or from the seeding equipment.

The seed used contains many species, and these may tend to stratify in the bag or seeding equipment. Care should be taken to ensure that the sample is representative of the seed overall. This may be accomplished by mixing the seed by hand before taking a sample, or by obtaining parts of the sample from different layers from within the bag or equipment.

Take a sample large enough to be placed in one of the department's cement sample boxes. Ensure that the sample is bagged and sealed (twist tie) before placing it in the box.

Fill out the "WisDOT Seed & Topsoil Testing Request Form" and enclose the form in the box. Include the information that is requested on the form, along with a copy of the seed ticket from the bag sampled. Also, please write "Seed" on the outside of the box before submitting.

Send seed samples to:

Russell Frank
3502 Kinsman Blvd.
Madison, WI 53704
Phone # (608) 246-7942

640.3.7 Native Seeding Mixtures

Seeding Mixtures 70 and 70A are primarily composed of native grasses and wildflowers. They are intended to be used in areas where it is desirable to re-establish native species on the project, either for aesthetic or environmental reasons. They are particularly appropriate in instances where the DNR liaison requests a native seed mix that is compatible with plant communities beyond the right-of-way. They were not, however, intended to be used primarily for erosion control or for other large-scale uses on highway rights-of-way for several reasons:

They are relatively expensive because of the wildflower component. It is not necessary that an erosion control seed mix contain wildflowers, especially when the areas are often not visible from the highway, so they cannot be enjoyed by travelers. If the seeding takes place on the inslopes, periodic mowing may preclude the wildflower plants from flowering anyway, depending on the timing of the mowing in relation to the phenology of the plant.

Wildflower seed germinates most effectively if it is dormant-seeded in the fall so that it goes through a cold stratification process over the winter to soften up the hard seed coat. This may require that temporary seed be used in the likely event that ground cover for erosion control needs to be established earlier in the season.

Diverse native grass/wildflower mixes like 70 and 70A require 2-3 years of management after seeding. These mixes should only be planted if Regional PDS staff are willing to commit the resources necessary

to do this management and SPO staff are willing to make the same commitment for any necessary follow-up management.

Seeding Mixture 75 is designed to be used for erosion control purposes and can be seeded at any time during the growing season. This mixture consists almost entirely of native grasses along with a couple of inexpensive, easy-to-grow wildflower species. It should be used in conjunction with the Seeding Nurse Crop item as described in standard spec 630.

Seeding Mixture No. 80 consists of a combination of relatively salt tolerant native and non-native species and is intended to be used on inslopes. The species in this mixture are non-invasive so it should be especially suitable for areas where the DNR liaison or others have concerns about adjacent natural areas. This mix should also be used in conjunction with the Seeding Nurse Crop item.

640.3.8 Seeding with a No-Till Rangeland Type Drill (Method C)

No-till rangeland type drills are typically equipped with 3 seed boxes: one for cool season seeds such as lawn-type grasses and nurse crop species, one for light fluffy seeds such as most native grass seeds, and one for small seeds such as most wildflower seeds. Each box is capable of being calibrated independently from the other boxes. A press wheel is mounted to the rear of each drop tube to firm the soil over the seed.

When seeding into existing vegetation or thatch, the drill should be equipped with a no-till attachment consisting of coulters which slice through the vegetation or thatch in front of the furrow openers and seed drop tubes. This no-till attachment is not necessary when seeding into bare soil.

As an alternative to using a drill with 3 separate seed boxes, each seed type (cool season, light fluffy and small) may be seeded separately with the drill being recalibrated for each seed type.

640.4 Sodding

Standard spec 631.2.1 requires that sod must be indigenous to the general locality in which it is used. In other words, the sod should grow naturally under the same general climatic and soil conditions as those at the site of the work. For example, sods grown on peaty soils would not be acceptable for use on sandy soils. Varieties of grasses that require a high degree of maintenance should not be planted either.

Sodding is the quickest method of securing a vegetative cover on graded areas of the roadway. However, due to the high cost of sodding it is generally used only on those areas where serious erosion might occur before turf could be established by seeding, or in urban areas.

The inspector will lay out the areas to be sodded and determine that the soil forming the bed upon which the sod will be placed is properly prepared. If erosion has taken place, the gullies are to be backfilled and compacted by the contractor. The finished bed should have a uniformly even surface and be shaped, especially for flumes and ditches, to the required dimensions. Before laying the sod, the soil surface should be loosened to a fine texture and to a depth of at least 1" in order to provide a condition suitable for the penetration of the grass roots. If the soil is dry, water should be applied to properly condition the bed.

During the laying of the sod, the inspector should check on the work to ensure the following:

- The sod is laid as tight as possible
- Joints are properly made
- Edges of the sod where water is apt to flow over it are properly embedded in the soil
- Laid sod is tamped or rolled to make continuous contact with the underlying soil
- The sod is properly held in place with stakes

Sod placed on slopes steeper than 1-unit vertical to 4 unit horizontal, and all sod placed on flumes, ditches, or other areas that may be subjected to a concentrated flow of water, regardless of the slope, is required to be staked. It is important that sufficient stakes are used to ensure retention of the sod in place until the grass roots have developed and entered the underlying soil, anchoring the sod in place. Only stakes made of wood can be used, and they must be driven to within 1/2" of the surface of the sod to avoid interference with subsequent mowing.

Sod may be anchored with a jute fabric (class II, Type A) of specified weight.

Refer to standard spec 631.3 for requirements for fertilizing, rolling, tamping, and watering the placed sod. Also refer to SDD 8E4 for details on sod and sod-masonry ditch checks and to SDD 8E5 for sodded flume details.

640.5 Mulching

640.5.1 Material

The purpose of mulch is to break up rainfall, prevent compaction of the soil surface, lessen the erosive effects of water and wind, moderate soil temperatures, supply shade for germinating seedlings, and prevent excessive evaporation of water from the soil.

Standard spec 627.2 allows straw, hay, wood chips, wood excelsior fiber, or other material that is suitable. All mulch must be substantially free of noxious weed seeds and objectionable foreign material. Rotten or partially decayed straw or hay is not acceptable. Short-stemmed straw is not acceptable for crimping purposes but should work well for tacking.

Standard spec 627.2 further provides that straw or hay used for mulch must be air-dry. As a guide, any straw or hay having 10% or less of moisture will be considered air-dry. It is important that the straw or hay be air-dry when weighed for payment by the ton. Generally, baled hay or straw coming from sheds, barns, under tarps, or even interiors of stacks will be air-dry unless exposed to rain before weighing. Should the engineer believe the straw or hay contains moisture greater than 10%, the moisture can be determined by randomly obtaining handfuls of hay or straw from bales and stuffing them into a soil sample bag. The sample should be weighed to obtain the net mass and then heated at moderate heat in an oven or suitable container to drive off the moisture. Moisture content is then determined by the following formula:

$$\text{Moisture Content (\%)} = \frac{\text{Wet Mass of Sample - Air Dry Mass of Sample}}{\text{Air - Dry Mass of Sample}} \text{ X } 100$$

640.5.2 Equipment

Equipment used in mulching operations should be specifically designed for applying, tacking, or crimping mulch. Equipment that is of inadequate capacity, jerrybuilt, poorly designed, badly worn, or malfunctioning is not acceptable.

640.5.3 Application

Mulch must be applied to seeded areas within two days after completion of the seeding in order to conserve the moisture necessary for germination of the seed within the soil.

The contractor has the option to use one of the following three methods, unless restricted to a specific method by the contract. Contracts with counties should specify the mulching method to be used if their standard county practices differ from ours. When mulching areas of slopes that are too steep for tilling or otherwise inaccessible to a tiller, the contractor must anchor the mulch, using method A or B.

640.5.3.1 Method A: Netting

This method allows spreading mulch in place to a loose, uniform depth of 1/2 to 1 1/2 inches, and then anchoring by means of approved netting or twine secured by pegs or staples. When using this method, begin mulching at the top of the slopes, and proceed downward. Usually, the contractor selects a lightweight plastic netting rather than twine. This lightweight netting ultimately degrades under action of sunlight.

The contractor may use department-approved erosion control mats, listed in the PAL, instead of separately applying mulch and netting.

640.5.3.2 Method B: Tackifier

With this method, mulch is blown by machine to a uniform depth of 1/2 to 1 inch, using 1/2 to 3 tons of mulch per acre. The mulch covering should be loose enough to allow some sunlight to penetrate and air to circulate, but thick enough to shade the ground, conserve soil moisture, and prevent or reduce erosion. Mulch material from compacted bales should be loosened or fluffed before or during the placing so that no matted lumps of the material are placed on a seeded area. A spray of non-asphaltic tack sufficient to hold the mulch in place achieves anchoring.

Straw or hay mulch is usually applied with a mulch blower. The mulch blower is equipped with one or more nozzles, a storage tank, and a pump. It allows for combined application of a non-asphaltic binder with the mulch. Experience indicates that the blower must be equipped with at least three operating nozzles when combined application of binder is allowed.

Hydro-seeders are used for spraying a non-asphaltic tackifier over mulch that has been previously placed. Positive agitation must be provided in the tanks during application to assure a homogeneous mixture of water, tackifier, dye, and mulch when applied simultaneously.

Tackifiers, if used, must be from the PAL.

Specifications, application rates, and general information on tackifiers are contained within the PAL.

The inspector must verify that the correct proportions of binder and water are mixed uniformly. Likewise, the rate of application of binder and tackifier must be checked and verified. Increased rates of application may be required based on inspection of the mulch after placing and tacking.

640.5.3.3 Method C: Crimping

This method involves spreading the mulch uniformly to a loose depth of 1/2 to 1 1/2 inches by blowing from a machine or other means. Anchoring will be by a mulch tiller specially designed for crimping mulch into the soil. Experience to date indicates that anchoring mulch by tilling is a superior method for most soils. For desirable results, especially in heavier soils such as clays, the mulch should be applied and tilled into the soil while the topsoil and seedbed are still in a loose and friable condition. Tiller ballast should be added or discarded to achieve the required penetration.

One pass of the tiller is usually sufficient, but short-strand straw or hay may require several passes. Several passes may also be needed to anchor the mulch next to shoulders, in medians or in areas exposed to frequent or high-velocity winds.

When wood excelsior fiber is used for mulch, the fiber need not be anchored as required for other mulch types. The wood fiber tends to swell and expand, and the many tiny fibers and barbs interact to secure the mulch in place.

Plastic nettings designed for use over mulches to secure the mulch in place can be used in areas where crimping is not feasible or where tacking agents cannot be applied or are ineffective.

A mulch tiller is used for crimping mulch. An agricultural disc is not a mulch tiller. A mulch tiller has flat, notched disks, whereas a farm disk has curved smooth disks and is designed to turn over soil. An agricultural disk should not be used for crimping mulch because it will bury the mulch rather than pressing it into the soil.

Random checks should subsequently be made as necessary to assure continued conformance. Areas that have been crimped may need additional passes of the tiller to secure the mulch depending on soil conditions and exposure to wind. Inspection of mulched areas must be made to assure that areas that have not been crimped have been secured by another method.

640.5.4 End Results

Mulch should remain on the seedbed until the grass has grown through the mulch. Mulch lost before acceptance is assumed to have been improperly placed and must be replaced by the contractor at the contractor's expense. Mulch properly placed and anchored but lost from exceptional or severe rain or wind must be replaced by the contractor and paid for by the department to encourage early landscaping and erosion control. Mulch replaced by the contractor must undergo inspection to assure the mulch is properly secured.

640.5.5 Mulch Inspection

An inspector must be present during initial applications to inspect straw and hay for moisture content, deterioration, and length of straw as well as to check equipment for suitability and operational capability.

640.5.6 Diary Entries

Appropriate information relating to mulching should be entered into the grading or erosion control diary. Entries relating to the following are suggested:

- Kind of mulch
- Condition of mulch, including air-dry context or moisture percent if 10% or more, average length and state of deterioration if any
- Kind and condition of equipment, number of nozzles, etc.
- Method of application
- Binding or tacking agent used, if any
- Actual rate of application of tacking agent
- Dates of initial and random inspections
- Condition of mulch after anchoring or tacking.
- Amounts lost to wind and replaced by contractor at the contractor's expense
- Items of interest, special problems, recommendations, etc.

640.6 Trees, Shrubs and Vines

WisDOT Bureau of Highway Operations has a staff of landscape architects who have expertise in all areas of vegetation management. They should be invited to participate in the preconstruction conference for projects that have a significant amount of planting involved. They are also available to answer

questions and assist with field checking of staking, inspections of plants and planting operations, advising on care requirements during the plant establishment period, determining plant survival, etc.

640.6.1 Materials

Planting of trees, shrubs, and vines under the contract will be made with plant stock grown by and furnished from nurseries, unless the contract provides for using collected or plantation-grown stock.

The plant material to be used in the planting project is perishable and therefore requires special care and handling. Acceptable plant material as described in standard spec 632 has been grown, dug, stored, packaged, and transported in a manner designed to keep it alive and in good condition. The intent of the specifications is that all reasonable means should be used during the term of the contract to keep the plant material in good condition.

Engineers should have the American Standards for Nursery Stock; a Plant Hardiness Zones map, published by the U. S. Department of Agriculture, and the latest AASHTO Inspection Guide for Landscape Planting. The AASHTO guide is not a contract document but provides helpful information. These standards, maps, and guides are available in the region and from the Bureau of Highway Operations landscape architects.

The contractor is to furnish a list of sources for all plant material at least 15 days before the delivery of the material. The addresses on this list should be checked against the Plant Hardiness Zone map to make sure that all plants come from within the specified acceptable area.

Nursery-grown, plantation-grown, or "collected" stock, are three levels of plant culture. Nursery-grown stock has generally been better managed, grown under more controlled conditions, and received more care than plantation or collected stock. Plantation-grown stock has been systematically planted in friable soils free of stones but has received only a minimum of aftercare. The most common examples of plantation-grown stock are evergreens grown for Christmas trees. Collected stock has been taken from wild or native stands and generally is subject to greater shock when transplanted than the same kind when nursery-grown.

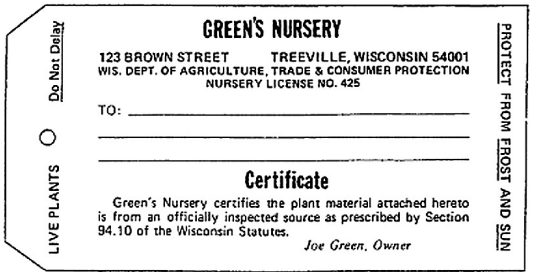
640.6.2 Certification for Nursery Stock

A certificate of compliance should accompany each shipment of nursery-grown planting material received on the project and is filed with the engineer.

Wisconsin Statutes Section 94.10(5) sets out the requirements for labeling nursery stock. Shipments of nursery stock must be labeled with the name and address of the person selling or distributing the shipment. Nursery stock sold at retail must bear a tag or label giving the common or botanical name of the plants.

Each nursery or dealer is responsible for obtaining their own tags.

FIGURE 640-1 Example Certification for Nursery Stock



640.6.3 Inspection

Usually, a general inspection of the plant stock is made at the nursery or source of supply or a central collection area by a plant specialist. If the specialist has not inspected the project plant stock, the engineer or inspector may use the checklist shown in figure 640-2 as a guide to acceptance or rejection. When inspection is made at the source, approved stock is usually tagged. An approval tag may be attached to each large size tree. Small size trees and shrubs may have only representative samples of each species and size tagged.

Regardless of any prior approval, the inspector will examine each shipment of plant stock upon its arrival at the job site, noting the condition of plants and compliance with contract requirements, and obtaining accompanying certificates of inspection relative to injurious insects and diseases. Plants that are not acceptable upon arrival should be rejected.

FIGURE 640-2 Checklist for Inspection of Trees, Shrubs and Vines

If a plant specialist has not inspected the stock before its delivery to the project site, the engineer or inspector should check each plant at the time of delivery for the following desirable characteristics:

___1. Size and quantity meet contract requirements for the species

___2. Natural, uniform leaf or needle color.

___3. Well-developed, firm, moist buds uniformly spaced out to the end of branches on dormant stock. The cambium layer just under the bark should be green and moist.

___4. No visible decay in the roots, trunk, or branches.

___5. No sun scald, as shown by lighter-colored areas of bark. The cambium layer just under the light-colored bark will be dry and brown if the plant has been sun scalded.

___6. A good root system. Roots should not be on or close to the surface, crowded, twisted, or encircling the plant.

___7. No frost cracks. These are long, vertical splits in the bark that will allow insects and fungi to enter the plant.

___8. No signs of injury; such as abrasions, cuts, or breaks.

___9. Correct pruning, with no protruding stubs, cutting of the bark, or decay at the cut.

___10. No diseases. These may appear as discharges of sap; discolored leaves, needles, or bark; abnormal growth of branches, etc.

___11. No insects. Evidence of insects may be clusters of eggs, feeding patterns on bark and leaves, and holes drilled into the bark.

___12. Proper habit of growth.

a. Shade trees and flowering trees should be balanced, symmetrical, with a single leader. Side branches should be well developed.

b. Evergreens should have full foliage with uniform density.

c. Shrubs should have at least the minimum number of branches for the species and be uniformly branched.

___13. Trees with wrapped trunks should be unwrapped at time of delivery and immediately checked for defects under the wrap. If unwrapping is not allowed, the trees should be rejected.

___14. A firm, intact ball on balled and burlapped stock. The trunk should not be free to move inside the ball.

___15. Necessary certificates should accompany the shipment.

Failure of plant stock to pass this checklist is cause for rejection. Rejected plant stock should be immediately reloaded onto the delivery vehicle and not allowed to remain on the project.

The following items and procedures should be considered or employed when accepting plant material on arrival:

- A nursery inspection tag should accompany each shipment.
- The stock should be protected from the wind, sun, and other detrimental climatic effects during transit. According to standard spec 632.2.2.9, all stock must be dug, handled, packed, transported, and planted in the appropriate manner as applicable to BR, B&B, B&P, CG, or MT stock. These acronyms are defined below:

BR Bare root stock
B&B Balled and burlapped stock
B&P Balled and potted stock
CG Container grown stock
MT Machine transplanted stock

- The earth ball of B&B material should be firm and unbroken. Remove burlap from a random plant. If cut ends of several large fleshy roots appear on the surface of the earth ball, break the ball and examine the root system. If there are very few fibrous roots, chances of plant survival are reduced, especially in evergreens.
- B&B plant material should always be handled by the ball with no exceptions.
- Dormant deciduous plant material should have green tissue just under bark on all parts of the plant top. Check by cutting a small secondary branch and laying back a small piece of bark.
- Roots of bare root material should be of an average minimum spread as described in the American Standards for Nursery Stock.
- Permission to substitute plants should be extended only after consultation with the landscape architect to ensure the substituted plants are suitable for the purpose intended.

640.6.4 Measurement

The information in table 640-4 is derived from the American Standard for Nursery Stock.

TABLE 640-4 Method of Measurement for Various Tree Types

Tree Type	Method of Measurement
Shade and flowering trees (caliper measurement)	Take caliper measurement of trunk at 6 in above ground level [1] if diameter is 4 in or less. If greater than 4 in, take trunk caliper measurement at 12 in above ground level.
Shade and flowering trees (height measurement)	Measure height vertically from ground level to top of tallest trunk.
Deciduous shrubs	Measure height vertically from ground level to top of tallest branch.
Coniferous evergreens (upright growth)	Measure height vertically from top of ball to top middle of leader.
Coniferous evergreens (creeping or low spreading growth)	Measure horizontally the widest spread of the branches from one side to the other, measure the least spread, and average the results.
Vines	Measure from top of root to end of stem.

[1] Ground level refers to the top of the ball for B&B plants or the plant root collar for bare root and containerized plants.

640.6.5 Storage

All plant stock not planted on the day of delivery to the job site is required to be properly stored and protected from the sun and wind in the manner specified for temporary storage in standard spec 632.3.2. Special care should be taken so that roots of bare root plants are covered at all times except at planting time when brief exposure is necessary. Do not allow several bare-root plants to be distributed to their individual planting locations and left with their roots unprotected before they are planted. The fine hair roots will dry out very quickly when exposed to sun and wind.

Earth balls of B&B stock should be completely covered with approved moist mulch material. Evergreens being stored for more than a week should be spaced and have tops untied to prevent yellowing which occurs when they are stored too close together. Potted plants should be spaced to provide air circulation, have the top spread, be protected from the wind if possible, and watered when necessary. It is important that stored plants receive proper care until all are planted.

640.6.6 Location Staking

The location of trees and shrubs shown on the plans will be staked or otherwise indicated in the field by the engineer, and the contractor's planting will be inspected for compliance. The plan location should be accurately staked in the field using a base line or other methods for large areas.

Trees should not be planted at locations that would be hazardous to occupants of vehicles leaving the roadway. Generally, newly planted trees with an ultimate trunk diameter of more than 4 in should have a minimum setback of 36 ft from the edge of the traffic lane - 50 to 60 ft is desirable. If the trees are located behind walls, abutments, or other obstructions that separate the roadway from the trees, they may be planted closer.

The staking of plant locations should be done early so that staking is completed or nearly so before planting operations begin. The plant locations should be scaled off the plan. A full-size plan rather than a "D" size plan will work better for this. If plant locations conflict with some existing feature such as power lines or if the plant would be in an undesirable location, for example, in a ditch that did not appear on the plan, or would be located within the minimum setback, the necessary adjustment in location should be made. These adjustments should be noted on the plan and brought to the attention of the engineer before planting begins.

640.6.7 Planting

During planting operations, the inspector should determine that the performance of the work complies with the specified requirements. Specific attention should be paid to the following:

- Proper size of excavated plant holes
- Correct placing of plants
- Backfill of plant holes with specified materials
- Correct manner of placing backfill material around plants
- Proper application of fertilizer
- Adequate watering
- Any required pruning, mulching, wrapping, staking, or guying of plants

As a general rule, planting should be done in a manner that storage time is reduced to a minimum. Where many plants are involved, and the planting time is drawn out, it is usually best to concentrate on getting the material planted, leaving guying, wrapping, and mulching for later. An exception to this may be evergreens, which offer much wind resistance, and which should be braced or guyed as required at or soon after planting time. Constant wind action usually breaks small roots, keeping the tree from becoming established, defeating the purpose of the earth ball.

Usually, machine transplanting should be done as early in the spring as possible.

Evergreens desirably should be planted either in the spring before the buds open, or in September. Deciduous trees desirably should be planted before the buds have opened in the spring or after the leaves have dropped naturally in the fall. Project conditions may require adjustments to these ideal planting times.

Potted plants are usually planted last because an adequate root system is contained in the pot, and with proper care they can be held for some time without ill effect. In some cases, potted shrubs have been potted by the contractor and should be held for a specified period to ensure a live, healthy plant at the time of planting.

Care should be taken to set the plant at its proper elevation. This should be as close as possible to that at which it was previously growing. If the hole is too deep, backfill it until the plant will rest at its proper height. The depth of the hole should be carefully measured for large B&B stock to eliminate unnecessary handling that loosens the roots from the ball. It is better for a plant, especially a tree, to be planted slightly too high than for it to be planted too low. Soil under large balled and burlapped trees should be firm; otherwise, loose soil will turn to mud after watering and the tree will settle into the hole.

Backfilling of bare root plants should be done carefully so that the soil fills in between small roots. The plant should be worked around slightly to cause soil to filter down between the roots. Firming by stamping with a boot should be avoided because this breaks many small roots. The required watering will also compact the soil and assist in eliminating air pockets.

Standard spec 632.3.7 requires that backfill material for plant holes must be a combination of six parts native topsoil and one part compost. Holes for MT plants must be filled half-full with a slurry of one part water and one part compost just before placing the tree.

In planting potted plants, the elevation should be based on the plant root crown rather than the pot. Plantable fiber pots should be planted intact, with several gashes made in the pot to speed up deterioration. If the top of the pot will not be covered by the mulch material, the top portion should be cut off after planting, but before mulching. If plastic or metal pots, which do not readily decompose, are used, the pot should be removed from each plant as it is planted.

The contractor, upon completion of the planting, must remove and dispose of all excess excavation, waste materials, or other debris resulting from the planting.

640.6.8 Pruning

The philosophy for pruning at planting time has changed dramatically in recent years. It is now not acceptable to prune up to half of the growth from a plant to compensate for root loss incurred during the digging operation at the nursery. Research has shown that leaving as much leaf surface as possible on the newly planted plant increases its photosynthesis capability that allows it to overcome the shock of transplanting much more quickly. The only recommended pruning operation at planting time is the removal of broken, dead or rubbing branches.

Pruning to improve the structure of the plant should wait at least one growing season or to the end of the final year of a multi-year plant establishment period. Plants should be pruned so that after pruning the plant still retains the character and appearance typical of the species. The thinning of small branches of some species of low growing trees may be warranted at this time. For instance, lower branches of crab apple trees may need to be removed to accommodate rodent control material, and the interior branches of hawthorns may need to be thinned to allow air and light to penetrate.

The following procedures should be employed when pruning:

- Evergreens normally should not be pruned; however, all dead or broken branches and all leaders, except one, should be removed.
- All broken, dead, or rubbing limbs of deciduous trees should be removed.
- Cuts should be made as close as possible to the branch collar at the base of the limb without injuring the collar.
- Painting of pruning cuts is no longer required, except on oaks to prevent oak wilt.
- Pruning tools should be suitable for the purpose and sharp enough to make a clean, smooth cut.

640.6.9 Anti-Desiccant

If specified, an emulsion formulated to reduce water loss by transpiration should be sprayed on the needles of evergreens at or before the time of planting, on the roots of BR stock before shipment, and on MT stock before transplanting unless deciduous trees are dormant. When dry, the anti-desiccant will leave an odorless, colorless, thin film of wax on the roots, needles, and branches. Comparison with unsprayed plants and experience with the process are the best ways the inspector has to detect if anti-desiccant has been applied.

640.6.10 Landscape Planting Surveillance and Care

The contractor is obligated to care for plantings and must be made aware of the responsibilities as described in standard spec 632, especially standard spec 632.3.19. This subsection pertains to watering, weeding, spraying, etc., after the initial planting. This work is an important part of the planting project that ensures the survival of the plants and protects the taxpayer's investment.

Mulching, watering, wrapping, guying, bracing, and application of rodent protection and anti-desiccant materials, when required, are a definite part of the bid item for which the contractor is remunerated. The contractor's obligation to perform this work is as clear cut and binding as that of furnishing and planting the plant material.

Ties used to secure wrappings should not be of nylon, plastic, or other materials that do not degrade rapidly.

Payment for the care of the plant material after planting is not included in the bid price for the plants. It is paid for under a separate bid item entitled Landscape Planting Surveillance and Care (see standard spec 632.3.19). The care cycles described should occur every 10 to 14 days. For estimating purposes, the number of cycles is typically figured on the basis of 1 cycle in late May, 2 cycles each month from June through September and 1 cycle in early October. The actual number of cycles may vary depending on whether adequate rainfall or drought occurs.

If the contractor fails to adequately perform landscape surveillance and care as described in standard spec 632.3.19, the engineer should assess daily damages using the administrative item 806.0632 Failing to Perform Landscape Surveillance. The daily damages are intended to offset the cost of hiring an outside source to perform the work. The dollar value to be used is provided in the contract special provisions. Daily damages specified in the special provision should be dependent upon the value of planting items in the contract, as shown in FDM 27-25-10.

Replacement of dead plants during the appropriate planting season is still incidental to the bid item for furnishing and planting that species and size.

640.6.11 Establishment Period and Payment

The contractor will be responsible for care of plants and necessary replacements for a 2-year establishment period, unless a 1-year period is specified in the contract.

The 2-year establishment period must extend until October 15 of the second full growing season. The 1-year establishment period must extend until October 15 of the first growing season, if planting is done in the spring; the period must extend until October 15 of the succeeding year, if the planting is done in the fall.

When a 2-year plant establishment period has been specified, care and general condition of plantings should be monitored at least every month from the time the plants leaf out in the spring, until they lose their leaves in the fall. A comprehensive inspection should be conducted in late August or early September following the first growing season. Any dead plants should be tagged or marked. These are to be replaced by the contractor during that fall planting season. Another inspection should be conducted the following spring in case any plants die during the winter, with replacements again being made at that time.

The contractor must complete all replacements by June 1 of the year the final inspection is made so that all plants are top quality and in prime condition as of the inspection date. The final inspection is normally conducted late in August or early in September of the final year of the plant establishment period using the criteria specified in standard spec 632.3.20 for determining plant acceptability and qualification for payment. Partial and final payments will be in accord with standard spec 632.5.

A diagrammatic flow chart in figure 640-3 shows the payment schedule for plants installed under a two-year growing season establishment period. Future payments made under the plant payment schedule in the standard specifications for a two-growing season establishment period should follow this chart.

FIGURE 640-3 Plant Payment Schedule