

3861

3861

Plant Stock

3861.1 SCOPE

This Specification covers trees, shrubs, vines, and perennials of various species and varieties suitable for roadside landscape planting. The term "plant" shall mean any or all trees, shrubs, vines or perennials specified.

3861.2 REQUIREMENTS

Unless otherwise specified as collected stock (wild or grown in other than nursery conditions) or Department-furnished transplants, all plants furnished shall be from nursery grown stock and shall bear evidence of proper nursery care during growth. Plants will not be considered to be nursery grown unless they have been growing in a nursery for at least 2 years.

The Contractor shall comply with the current edition of "Inspection and Contract Administration Guidelines for Mn/DOT Landscape Projects," published by the Mn/DOT Landscape Unit, as the minimum and maximum criteria and standard for grading and accepting plant stock.

A Classification of Plants

Trees, shrubs, vines and perennials commonly used for landscaping purposes will be classified by species, variety, and size or age as indicated in the Contract.

When a dimensional size is specified in the Contract, it shall indicate the minimum range of height, stem caliper (diameter), or spread acceptable, as measured in accordance with standards in the current edition of "Inspection and Contract Administration Guidelines for Mn/DOT Landscape Projects."

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C Plant Names

All botanical and common names of plant materials specified shall be based on descriptions by Bailey in the latest edition of "Hortus Third." **D Plant Hardiness**

All plant stock shall be deemed acceptable for hardiness if it is hardy to the Minnesota zone where the project site is located and:

- 1) Plant stock can be documented as continuously grown for at least the last two years within the acceptable limits shown on the Acceptable Plant Stock Growing Range Limits map in the Plan or
- 2) Plant stock, if grown outside the acceptable growing range limits, can be documented as having the seed source or root and graft stock originating from within the acceptable growing range limits.

Any questions regarding plant stock hardiness or botanical identification will be resolved by the Engineer.

E Previous Transplanting

All plants with the exception of seedlings, perennials, machine-transplants, and collected stock if specified, must bear evidence of previous transplanting or root pruning at least once during growth at the nursery. Trees from forest plantations are not acceptable, unless proper transplanting and root pruning has been practiced to develop compact and fibrous root systems suitable for transplanting success.

F Quality and Condition

A Certificate of Nursery Inspection by the Department of Agriculture of the State or origin, or valid copy thereof, shall be supplied as specified in 2571.2A2 (Plant Stock Documentation).

All plants shall be first-class representatives of their normal species or variety, and shall be free of disease, disfiguring knots, sun scald, insect infestations, dead or broken branches, bark abrasions, and other objectionable conditions.

All trees shall have reasonably straight trunks and shall be fully branched and symmetrical on all sides as characterized by natural habits of growth and proper nursery care. Shrubs shall be of strong bushy stock with well developed and formed stems, canes, or branches. Vines and perennials shall be strong healthy plants of the size or age specified.

All plants shall have strongly developed fibrous root systems of sufficient size to permit successful establishment and good growth, typical of the species or variety specified. The root systems of container grown plants shall be sufficiently developed to hold the soil intact upon removal from the container. Large root stubs and/or large circling or girdling roots shall be considered evidence of lack of proper care and root pruning, and shall be sufficient cause for rejection of nursery grown plants.

G Digging and Handling

All plants shall be dug and handled with reasonable care and skill as necessary to prevent damage to stems, roots, branches, and trunk.

Plants that are balled and burlapped (B & B) shall be dug in a manner that preserves a firm ball of undisturbed soil around the root system. Plants shall conform to the recommended balling and burlapping specifications set forth in the current edition of "Inspection and Contract Administration Guidelines for Mn/DOT Landscape Projects."

Balled and burlapped plants shall be wrapped and bound so that the soil ball will remain intact and solid while being handled, shipped, and planted. Handling shall always be by the soil ball and not by the plant's branches or trunk. The use of wire baskets in conjunction with furnishing, loading, or planting balled and burlapped

3861.2

plants will be permitted; however, restrictions of 2571.3F (Installation of Plants) shall apply.

H Packing and Shipping

All plant material shipments shall comply with the nursery inspection and plant quarantine regulations of the States of origin and destination as well as with Federal regulations governing interstate movement of nursery stock.

All plants shall be true to name, and each bundle, bale or individual plant shall be legibly and securely labeled with the names and sizes of each species or variety and with the quantity contained in the individual bundles, boxes or bales.

All plants shall be packed and shipped as necessary to ensure arrival at the planting site in good condition. From the time plants are dug and until delivered to the planting site, the roots shall be protected at all times against drying-out, by covering the root systems with a suitable moisture-holding material. They shall also be adequately protected against other damaging climatic conditions such as sun, wind, and freezing temperatures. When transported in closed vehicles, the plants shall have adequate ventilation to prevent unwanted sweating.

3861.3 SAMPLING AND INSPECTION

The plants shall be subject to inspection by the Engineer prior to planting, but such inspection shall not be considered as final acceptance. Final inspection and acceptance or rejection of plant stock shall be at the Project planting site.

All plants shall be in good condition upon delivery. Plants delivered with broken or bruised branches, stems, or canes will be rejected unless the damaged growth can be removed through pruning and without losing their symmetry or being trimmed to an unacceptable size. Balled and burlapped plants delivered with broken or disturbed balls, indicating the soil has been so loosened as to cause stripping of the small and fine feeding roots, will be rejected. Bare root plants shall be delivered in a dormant condition and should be installed while in a dormant condition. The Engineer may authorize installing plants that have broken dormancy, however, if authorized, the installation will be at the Contractor's own risk, and the initial planting operations payment for these plants will be withheld until they are determined to be initially acceptable after the first year of plant establishment.

The Engineer may inspect up to three balled and burlapped or container plants, of each variety delivered to the planting site, at random and inspect for condition and size of the root system. This may include pulling back the burlap and wire basket or removing containers. Any plants that become unsuitable for planting due to inspection shall be replaced by the contractor without any compensation.

During the spring planting season, coniferous plants that have candled out (put out new growth) while being stored in a holding bin

3876.2

may be planted, however, coniferous plants that are dug after candling out will be rejected. Coniferous trees not fully branched from bottom to top and those that have been heavily sheared or pruned will be rejected. Only unsheared or lightly sheared conifers (those that have not been sheared within the last growing season and display buds or growth at the terminal ends of branches) shall be accepted. Pine trees shall have a terminal leader bud and terminal leaders shorter than 500 mm (**18 inches**) in length. A new central leader must be trained in conifers delivered with multiple or missing leaders.

Plants not conforming to dimensional requirements will be rejected. In measuring the height of coniferous trees of the pine, spruce and fir species, the upper limits shall be the midpoint of the terminal leader.

All rejected plants shall be removed from the Project by the Contractor and shall be replaced with acceptable plants of the required species and variety, unless otherwise directed by the Engineer.

3876

Seed

3876.1 SCOPE

This Specification covers introduced grass/legume and native grass & forb seeds used for planting to provide vegetative cover.

Pure live seed (PLS) is the percent of seed germination plus dormant and/or hard seed times the percent of seed purity of each species.

3876.2 REQUIREMENTS

A General Requirements

All seed shall conform to the latest seed law of the State, including those governing labeling and weed seed tolerances.

Tolerances for Germination and Purity, as determined by the Department of Agriculture, shall only apply to seed that has been previously tested and approved by the Department as a seed lot. Test for germination and viability shall have been made within 9 months of the date of installation.

All legume seed, including native legumes, shall have been pre-inoculated with the proper bacterial culture for the species being inoculated and with the bacteria culture designed for this purpose (pre-inoculation), in the manner and within the time specified by the manufacturer.

All native grass and forb seed shall be of current production seed or harvested from the previous two growing seasons.

All sedge, rush and forb seed that requires special pregermination treatment such as cold moist stratification shall be so treated prior to installation.

3876.2

All wild-type native grass and forb seed shall have a source of origin within Minnesota, eastern North Dakota, eastern South Dakota, northern Iowa, or western Wisconsin.

Unless otherwise specified, origin certified seed shall have originated within the regions specified above and shall be accompanied by the appropriate Quality Mark documentation from the Minnesota Crop Improvement Association to verify this.

Wild-type is defined as seed that is derived directly from native, wild stock; including seed that was collected in the wild and placed into production or that which has been harvested directly from native stands. Wild-type varieties are regional or local ecotypes that have not undergone a selection process. Wild-type refers to all native seed referred to as "common" in the industry. Origin certified seed that is "yellow tag" is by definition wild type that has originated within a specified geographic region.

Native species requiring certification for origin shall have their origin documented by the Minnesota Crop Improvement Association (MCIA). This level of certification is at the "yellow tag" (YT) level according to the MCIA Quality Control program. Documentation for origin certification of native seeds shall accompany all shipments and shall be identified on the tags as well.

Origin shall be clearly identified on the seed label for all seed, including native forbs.

Use of varieties not listed herein will be considered unacceptable and will be subject to 1503.

B Requirements for Native Grasses, Sedges, Rushes.....Table 3876-1

The Contractor shall supply and plant native grass as pure live seed (PLS). If the listed varieties are not available from the Approved Vendor or Source list on file with the Mn/DOT Turf Establishment & Erosion Control unit, other varieties may be substituted only by obtaining approval of the Engineer and the Turf Establishment & Erosion Control unit. The Contractor shall provide documentation of substitutions prior to acceptance. Germination values shall include not more than 20 percent dormant seed, except for wetland sedges, rushes and grasses for which up to 80% dormancy shall be allowed.

All native grass seeds that contain awns or excessive hairs shall be cleaned and de-bearded prior to their inclusion into mixtures.

TABLE 3876-1
NATIVE GRASS REQUIREMENTS
GERMINATION, PURITY, AND ACCEPTABLE VARIETIES

Trade Name	Scientific Name	Acceptable Origin & Varieties	Purity	Germ.
			Min. %	Min.%
Bluestem, big	<i>Andropogon gerardi</i>	MN Certified (YT), Bison	85	70
Gramma, sideoats	<i>Bouteloua curtipendula</i>	MN Certified (YT)	85	70
Gramma, blue	<i>Bouteloua gracilis</i>	MN Certified (YT), SD, ND wild-type	80	70
Brome, fringed	<i>Bromus ciliata</i>	MN Certified (YT), MN, MT, Canada wild-type	85	70
Brome, Kalm's	<i>Bromus kalmii</i>	MN Certified (YT), MN wild-type	85	70
Hairy wood chess	<i>Bromus purgans</i>	MN Certified (YT)	85	70
Buffalo grass	<i>Buchloe dactyloides</i>	MN Certified (YT), MN, ND, SD, NE wild-type	85	70
Blue-joint grass	<i>Calamagrostis canadensis</i>	MN Certified (YT), MN wild-type	85	70
Sedge, bottle-brush	<i>Carex comosa</i>	MN wild-type	85	60
Sedge, tussock	<i>Carex stricta</i>	MN wild-type	85	60
Sedge, fox	<i>Carex vulpinoidea</i>	MN wild-type	85	60
Wild rye, Canadian	<i>Elymus canadensis</i>	MN Certified (YT)	85	70
Bottle brush grass	<i>Elymus hystrix</i>	MN wild-type	85	70
Wheat grass, slender	<i>Elymus trachycaulus</i>	MN Certified (YT), MN, ND, SD, Canada wild-type, Revenue	85	70
Wild rye, Virginia	<i>Elymus virginicus</i>	MN Certified (YT), MN, WI, IA wild-type	85	70
Wheat grass, western	<i>Elytrigia smithii</i>	MN Certified (YT), MN, ND, SD wild-type	85	70
Manna grass, reed	<i>Glyceria grandis</i>	MN Certified (YT), MN wild-type	85	70
Manna grass, fowl	<i>Glyceria striata</i>	MN Certified (YT), MN wild-type	85	70
Common rush	<i>Juncus effusus</i>	MN Certified (YT), MN wild-type	85	60
June grass	<i>Koeleria macrantha</i>	MN Certified (YT), MN, ND, SD wild-type	85	70
Switch grass	<i>Panicum virgatum</i>	MN Certified (YT), Dakota	95	70
Bluegrass, fowl	<i>Poa palustris</i>	MN Certified (YT), MN, ND, Canada wild-type	90	70
Bluestem, little	<i>Schizachyrium scoparium</i>	MN Certified (YT)	85	70
Bulrush, green	<i>Scirpus atrovirens</i>	MN Certified (YT), MN wild-type	85	60
Wool grass	<i>Scirpus cyperinus</i>	MN Certified (YT), MN wild-type	85	60
Bulrush, soft-stem	<i>Scirpus validus</i>	MN Certified (YT), MN wild-type	85	60
Indian grass	<i>Sorghastrum nutans</i>	MN Certified (YT)	85	70
Cordgrass, prairie	<i>Spartina pectinata</i>	MN Certified (YT), MN wild-type	85	70
Dropseed, rough	<i>Sporobolus asper</i>	MN Certified (YT), MN wild-type	90	70
Dropseed, sand	<i>Sporobolus cryptandrus</i>	MN Certified (YT), MN, ND, SD wild-type	95	70
Dropseed, prairie	<i>Sporobolus heterolepis</i>	MN Certified (YT)	90	70
Needle grass, green	<i>Stipa viridula</i>	MN Certified (YT), MN, ND, SD wild-type	90	80

Note: MN wild-type and YT shall include seed of eastern North Dakota and South Dakota, western Wisconsin and northern Iowa. YT denotes Yellow tag certification by the MCIA.

C Requirements for Introduced Grasses....Table 3876-2

TABLE 3876-2
INTRODUCED GRASS REQUIREMENTS
GERMINATION, PURITY, AND ACCEPTABLE VARIETIES

Trade Name	Scientific Name	Acceptable Varieties	Purity Minimum %	Germination Minimum %
Bentgrass, seaside	<i>Agrostis palustris</i>	--	98	90
Redtop	<i>Agrostis stolonifera</i>	--	92	85
Oats	<i>Avena sativa</i>	--	99	85
Brome, smooth	<i>Bromus inermis</i>	--	90	85
ReGreen ^{1M}	<i>Elymus trachycaulus x Triticum aestivum</i>	--	95	90
Fescue, hard	<i>Festuca ovina var. duriuscula</i>	Durar, Scaldis	95	85
Fescue, red	<i>Festuca rubra</i>	Wintergreen, Dawson, Pen Lawn, Cindy	97	85
Fescue, sheep's	<i>Festuca sp.</i>	--	95	85
Ryegrass, perennial	<i>Lolium perene</i>	--	99	90
Ryegrass, annual	<i>Lolium italicum</i>	--	99	90
Timothy	<i>Phleum pratense</i>	--	99	85
Bluegrass, Canada	<i>Poa compressa</i>	Common, Reubens, Talon	95	82
Bluegrass, Kentucky-Elite	<i>Poa pratensis</i>	Adelphi, Aspen, Baron, Glade, Columbia, Estate, Eclipse, Midnight, Touchdown, Merit, Parade, Rugby, Fylking, Victa, Monopoly	95	85
Bluegrass, Kentucky-LM	<i>Poa pratensis</i>	America, Aquila, Park, Nassau, Newport, Ram I, Nugget, Sydsport	95	85
Bluegrass, Kentucky-Park	<i>Poa pratensis</i>	Certified Park only	95	82
Bluegrass SD Common	<i>Poa pratensis</i>	98/85	98	85
Alkali grass	<i>Puccinella distans</i>	Fult's, Salty	95	85
Wheat, winter	<i>Triticum aestivum</i>	--	99	85

3876.2

D Requirements for Introduced Legumes....Table 3876-3
Germination values determined by test shall include dormant seed for legumes.

**TABLE 3876-3
INTRODUCED LEGUMES REQUIREMENTS
GERMINATION, PURITY, AND ACCEPTABLE VARIETIES**

Trade Name	Scientific Name	Acceptable Varieties	Purity Minimum %	Germination Minimum %
Alfalfa, creeping	<i>Medicago sativa</i>	Rambler, Victoria, Teton, Travois, Spredor 2	99	85
Alfalfa, perennial	<i>Medicago sativa</i>	Vernal	99	85
Alfalfa, annual	<i>Medicago sativa</i>	Nitro, Condor, El Grande, Maricopa, Mesa, Prestige, Tulane, Westar, Beacon, Coronado, Mecca, Sundor	99	85
Clover, alslike	<i>Trifolium hybridum</i>	--	99	85
Clover, red	<i>Trifolium pratense</i>	Lakeland, Arlington	99	85
Clover, white	<i>Trifolium repens</i>	----	99	85

E Requirements for Native Forbs (Wildflowers) Table 3876-4
All forb seed shall be of wild-type as defined in 3876.2A.
The Contractor shall supply and plant native forb seed as pure live seed (PLS). Native forb seed shall be tested for viability with a standard germination test performed according to 3876.3. If the test meets or exceeds the minimum percent germination requirement for each respective species, the Engineer will accept the seed for viability. If a species is called for that is not listed in Table 3876-4, its purity shall be no less than 50 percent and its viability no less than 20 percent.

3876.2

**TABLE 3876-4
NATIVE FORB SPECIES (WILDFLOWERS)
GERMINATION, PURITY, AND ACCEPTABLE VARIETIES**

Trade Name	Scientific Name	Acceptable Origin and Varieties	Purity Min. %	Germ. Min. %
Hyssop, fragrant-giant	<i>Agastache foeniculum</i>	MN Certified (YT), MN wild-type	80	50
Onion, prairie	<i>Allium stellatum</i>	MN Certified (YT), MN, ND, SD wild-type	80	40
Anemone, Canada	<i>Anemone canadensis</i>	MN Certified (YT), MN wild-type	80	40
Milkweed, marsh	<i>Asclepias incarnata</i>	MN Certified (YT), MN wild-type	80	60
Milkweed, butterfly	<i>Asclepias tuberosa</i>	MN Certified (YT), MN wild-type	80	60
Aster, sky-blue	<i>Aster azureus</i>	MN Certified (YT), MN wild-type	80	50
Aster, heath	<i>Aster ericoides</i>	MN Certified (YT), MN wild-type	80	50
Aster, smooth-blue	<i>Aster laevis</i>	MN Certified (YT), MN wild-type	80	50
Aster, large-leaved	<i>Aster macrophyllus</i>	MN Certified (YT), MN wild-type	60	40
Aster, New England	<i>Aster novae-angliae</i>	MN Certified (YT), MN wild-type	80	50
Aster, upland-white	<i>Aster ptarmicoides</i>	MN Certified (YT), MN wild-type	80	50
Aster, swamp	<i>Aster puniceus</i>	MN Certified (YT), MN wild-type	60	40
Aster, silky	<i>Aster sericeus</i>	MN Certified (YT), MN wild-type	80	50
Milkvetch, Canada	<i>Astragalus canadensis</i>	MN Certified (YT), MN wild-type	90	70
Partridge pea	<i>Chamaecrista fasciculata</i>	MN Certified (YT), MN wild-type	90	70
Tick-seed, stiff	<i>Coreopsis palmata</i>	MN Certified (YT), MN wild-type	80	40
Prairie clover, white	<i>Dalea candidum</i>	MN Certified (YT), MN wild-type	90	70
Prairie clover, purple	<i>Dalea purpureum</i>	MN Certified (YT), MN wild-type	90	70
Tick-trefoil, showy	<i>Desmodium canadense</i>	MN Certified (YT), MN wild-type	90	70
Coneflower, narrow-leaved	<i>Echinacea angustifolia</i>	MN Certified (YT), MN, ND, SD wild-type	80	50
Joe-pye weed	<i>Eupatorium maculatum</i>	MN Certified (YT), MN wild-type	60	50
Boneset	<i>Eupatorium perfoliatum</i>	MN Certified (YT), MN wild-type	60	50
Ox-eye, common	<i>Heliopsis helianthoides</i>	MN Certified (YT), MN wild-type	80	60
Iris, blue-flag	<i>Iris virginica-shrevei</i>	MN Certified (YT), MN wild-type	80	60
Bushclover, round-headed	<i>Lespedeza capitata</i>	MN Certified (YT), MN, ND, SD wild-type	80	50
Blazingstar, rough	<i>Liatis aspera</i>	MN Certified (YT), MN wild-type	80	50
Blazingstar, dotted	<i>Liatis punctata</i>	MN Certified (YT), MN, ND, SD wild-type	80	50
Blazingstar, tall	<i>Liatis pycnostachya</i>	MN Certified (YT), MN wild-type	80	50
Lobelia, great-blue	<i>Lobelia siphilitica</i>	MN Certified (YT), MN wild-type	80	40
Monkey flower	<i>Mimulus ringens</i>	MN Certified (YT), MN wild-type	80	40
Bergamot, wild	<i>Monarda fistulosa</i>	MN Certified (YT), MN wild-type	80	40
Bee balm, spotted	<i>Monarda punctata</i>	MN Certified (YT), MN wild-type	70	40
Beardtongue, foxglove	<i>Penstemon digitalis</i>	MN Certified (YT), MN wild-type	80	40
Penstemon showy	<i>Penstemon grandiflorum</i>	MN Certified (YT), MN wild-type	80	40
Coneflower columnar	<i>Ratibida columnifera</i>	MN Certified (YT), MN, ND, SD wild-type	80	50
Coneflower, grey-headed	<i>Ratibida pinnata</i>	MN Certified (YT), MN wild-type	80	50
Black-eyed Susan's	<i>Rudbeckia hirta</i>	MN Certified (YT), MN wild-type	80	60
Golden-glow, wild	<i>Rudbeckia laciniata</i>	MN Certified (YT), MN wild-type	80	40
Brown-eyed Susan	<i>Rudbeckia triloba</i>	MN Certified (YT), MN wild-type	80	40

**TABLE 3876-4 CONT'D
NATIVE FORB SPECIES (WILDFLOWERS)
GERMINATION, PURITY, AND ACCEPTABLE VARIETIES**

Trade Name	Scientific Name	Acceptable Origin and Varieties	Purity Min. %	Germ. Min. %
Spiderwort, prairie	<i>Tradescantia bracteata</i>	MN Certified (YT), MN wild-type	80	50
Spiderwort, Ohio	<i>Tradescantia ohioensis</i>	MN Certified (YT), MN, WI, IA wild-type	80	50
Vervain, blue	<i>Verbena hastata</i>	MN Certified (YT), MN wild-type	80	50
Vervain, hoary	<i>Verbena stricta</i>	MN Certified (YT), MN wild-type	80	50
Ironweed	<i>Veronia fasciculata</i>	MN Certified (YT), MN wild-type	80	50
Culver's root	<i>Veronicastrum virginianum</i>	MN Certified (YT), MN wild-type	80	40
Vetch, American	<i>Vicia americana</i>	MN Certified (YT), MN, Canada wild-type	80	60
Alexander's, heart-leaved	<i>Zizia aptera</i>	MN Certified (YT), MN wild-type	80	50
Alexander's, golden	<i>Zizia aurea</i>	MN Certified (YT), MN wild-type	80	50

F Seed Mixture Designations

The seed mixture or species to be furnished and used shall be as indicated in the Contract. The mixtures shall be a uniform blend of the designated seeds, proportioned as specified in Table 3876-5.

Mixtures 5B through 38B shall be blended according to size and texture so that they can be installed from the appropriate seed box. The fine seed shall be installed from the fine seed box and the fluffy seed from the fluffy seed box. Forbs are added to mixtures by blending fine and fluffy seeds with the corresponding grass seed components using the mixtures provided in Table 3876-6. The inclusion of forbs is indicated in Table 3876-5.

F1 Native Harvest

Unless otherwise specified, native harvest shall consist of seed that has been harvested directly from wild stands within 80 km (25 miles) of the Project. Seed originating from outside the specified area will not be acceptable. Approximately 70 percent of the mixture shall consist of big bluestem and Indian grass, each with a minimum germination percent of 70 percent. The minimum percent PLS of the big bluestem and Indian grass portion of the native harvest mix shall be no less than 50 percent. In addition, the native harvest shall contain a minimum of five species of native grasses and shall also consist of no less than 3 percent (by mass) of native forbs. All species contained in the native harvest mix shall be listed with their relative percentages on the packing slip. Components comprising less than 1 percent of the mix may be listed as "trace". Germination results for the species tested shall be contained on the label. In addition, the native harvest mix shall contain no more than 25 percent non-viable matter. Non-viable matter includes but is not limited to chaff, non-viable seed, hulls, trash, and straw.

3876.2

TABLE 3876-5
SEED MIXTURE DESIGNATIONS

Mixture 5B		
Common Name	Botanical Name	% of Mix
Hyssop, fragrant-giant	<i>Agastache foeniculum</i>	0.25
Bluestem, big	<i>Andropogon gerardi</i>	5.0
Anemone, Canada	<i>Anemone canadensis</i>	0.25
Milkweed, marsh	<i>Asclepias incarnata</i>	0.25
Milkweed, butterfly	<i>Asclepias tuberosa</i>	0.25
Aster, smooth-blue	<i>Aster laevis</i>	0.25
Aster, large-leaved	<i>Aster macrophyllus</i>	0.25
Milkvetch, Canada	<i>Astragalus canadensis</i>	0.25
Gramma, sideoats	<i>Bouteloua curtipendula</i>	4.0
Wood chess, hairy	<i>Bromus purgans</i>	4.0
Tic-trefoil, showy	<i>Desmodium canadense</i>	0.25
Wild rye, Canada	<i>Elymus canadensis</i>	6.0
Bottle brush grass	<i>Elymus hystrix</i>	2.0
Wheat grass, slender	<i>Elymus trachycaulus</i>	10.0
Wild rye, Virginia	<i>Elymus virginicus</i>	6.0
Sunflower, early	<i>Heliopsis helianthoides</i>	0.25
Lobelia, great-blue	<i>Lobelia siphilitica</i>	0.25
Rye grass, annual	<i>Lolium italicum</i>	10.0
Monkey flower	<i>Mimulus ringens</i>	0.25
Bergamot, wild	<i>Monarda fistulosa</i>	0.25
ReGreen	NA	36.0
Switch grass	<i>Panicum virgatum</i>	2.0
Black-eyed Susan	<i>Rudbeckia hirta</i>	0.25
Golden-glow, wild	<i>Rudbeckia laciniata</i>	0.25
Brown-eyed Susan	<i>Rudbeckia triloba</i>	0.25
Bluestem, little	<i>Schizachyrium scoparium</i>	5.0
Aster, upland-white	<i>Solidago ptarmicoides</i>	0.25
Goldenrod, stiff	<i>Solidago rigida</i>	0.25
Indian grass	<i>Sorghastrum nutans</i>	5.0
Spiderwort, prairie	<i>Tradescantia bracteata</i>	0.25
Vervain, blue	<i>Verbena hastata</i>	0.25
Alexander's, golden	<i>Zizia aurea</i>	0.25
Total:		100.0

Mixture 10B		
Common Name	Botanical Name	% of Mix
Bluestem, big	<i>Andropogon gerardi</i>	6.0
Gramma, sideoats	<i>Bouteloua curtipendula</i>	8.0
Wild rye, Canadian	<i>Elymus canadensis</i>	6.0
Wheat grass, slender	<i>Elymus trachycaulus</i>	4.0
Wheat grass, western	<i>Elytrigia smithii</i>	2.0
Rye grass, annual	<i>Lolium italicum</i>	10.0
ReGreen	NA	34.0
Forbs (Table F-1 or F-2)	NA	5.0
Switch grass	<i>Panicum virgatum</i>	1.0
Bluestem, little	<i>Schizachyrium scoparium</i>	10.0
Indian grass	<i>Sorghastrum nutans</i>	10.0
Needle grass, green	<i>Stipa viridula</i>	4.0
Total:		100.0

Mixture 15B		
Common Name	Botanical Name	% of Mix
Bluestem, big	<i>Andropogon gerardi</i>	5.0
Gramma, sideoats	<i>Bouteloua curtipendula</i>	10.0
Wild rye, Canadian	<i>Elymus canadensis</i>	5.0
Wheat grass, slender	<i>Elymus trachycaulus</i>	5.0
Rye grass, annual	<i>Lolium italicum</i>	10.0
ReGreen	NA	34.0
Forbs (Table F-1, F-2, or NA F-3)		5.0
Switch grass	<i>Panicum virgatum</i>	2.0
Bluestem, little	<i>Schizachyrium scoparium</i>	12.0
Indian grass	<i>Sorghastrum nutans</i>	12.0
Total:		100.0

3876.2

Mixture 20B		
Common Name	Botanical Name	% of Mix
Bluestem, big	<i>Andropogon gerardi</i>	5.0
Gramma, sideoats	<i>Bouteloua curtipendula</i>	10.0
Wild rye, Canadian	<i>Elymus canadensis</i>	6.0
Wheat grass, slender	<i>Elymus trachycaulus</i>	4.0
June grass	<i>Koeleria macrantha</i>	3.0
Rye grass, annual	<i>Lolium italicum</i>	10.0
ReGreen	NA	34.0
Forbs (Table F-1, F-2, or F-3)	NA	5.0
Switch grass	<i>Panicum virgatum</i>	1.0
Bluestem, little	<i>Schizachyrium scoparium</i>	13.0
Indian grass	<i>Sorghastrum nutans</i>	8.0
Dropseed, sand	<i>Sporobolus cryptandrus</i>	1.0
Total:		100.0

Mixture 25B		
Common Name	Botanical Name	% of Mix
Bluestem, big	<i>Andropogon gerardi</i>	5.0
Canada anemone	<i>Anemone canadensis</i>	0.1
Marsh milkweed	<i>Asclepias incarnata</i>	0.5
New England aster	<i>Aster novae-angliae</i>	0.6
Swamp aster	<i>Aster puniceus</i>	0.6
Fringed brome	<i>Bromus ciliata</i>	5.0
Blue-joint grass	<i>Calamagrostis canadensis</i>	0.1
Bottlebrush sedge	<i>Carex comosa</i>	1.0
Tussock sedge	<i>Carex stricta</i>	0.5
Fox sedge	<i>Carex vulpinoidea</i>	0.4
Showy tic-trefoil	<i>Desmodium canadense</i>	0.4
Wheat grass, slender	<i>Elymus trachycaulus</i>	6.0
Virginia wild-rye	<i>Elymus virginicus</i>	6.0
Joe-pye weed	<i>Eupatorium maculatum</i>	0.4
Boneset	<i>Eupatorium perfoliatum</i>	0.3
Reed manna grass	<i>Glyceria grandis</i>	0.3
Fowl manna grass	<i>Glyceria striata</i>	0.2
Early sunflower	<i>Heliopsis helianthoides</i>	0.7
Blue-flag iris	<i>Iris virginica-shrevii</i>	0.5
Common rush	<i>Juncus effusus</i>	0.2
Meadow blazingstar	<i>Liatris ligulistylis</i>	0.4
Tall blazingstar	<i>Liatris pycnostachya</i>	0.4
Great blue lobelia	<i>Lobelia siphilitica</i>	0.1
Rye grass, annual	<i>Lolium italicum</i>	10.0
Monkey flower	<i>Mimulus ringens</i>	0.1
Wild Bergamot	<i>Monarda fistulosa</i>	0.6
ReGreen	NA	42.0
Switch grass	<i>Panicum virgatum</i>	1.0
Fowl bluegrass	<i>Poa palustris</i>	5.0
Black-eyed Susan's	<i>Rudbeckia hirta</i>	0.6
Green bulrush	<i>Scirpus atrovirens</i>	0.3
Wool grass	<i>Scirpus cyperinus</i>	0.3
Soft-stem bulrush	<i>Scirpus vallisus</i>	1.0
Grass-leaved goldenrod	<i>Solidago graminifolia</i>	0.2
Indian grass	<i>Sorghastrum nutans</i>	6.0
Prairie cord grass	<i>Spartina pectinata</i>	2.0
Blue vervain	<i>Verbena hastata</i>	0.5
Ironweed	<i>Veronica fasciculata</i>	0.2
Culver's root	<i>Veronicastrum virginianum</i>	0.1
Golden Alexander's	<i>Zizea aurea</i>	0.4
Total:		100.0

3876.2

Mixture 26B		
Common Name	Botanical Name	% of Mix
Bluestem, big	<i>Andropogon gerardi</i>	5.0
Canada anemone	<i>Anemone canadensis</i>	0.1
Marsh milkweed	<i>Asclepias incarnata</i>	0.5
New England aster	<i>Aster novae-angliae</i>	0.6
Swamp aster	<i>Aster puniceus</i>	0.6
Brome, fringed	<i>Bromus ciliata</i>	8.0
Bluejoint grass	<i>Calamagrostis canadensis</i>	0.2
Showy tic-trefoil	<i>Desmodium canadense</i>	0.4
Wheat grass, slender	<i>Elymus trachycaulus</i>	8.0
Wild rye, Virginia	<i>Elymus virginicus</i>	6.0
Joe-pye weed	<i>Eupatorium maculatum</i>	0.4
Boneset	<i>Eupatorium perfoliatum</i>	0.3
Manna grass, reed	<i>Glyceria grandis</i>	0.2
Manna grass, fowl	<i>Glyceria striata</i>	0.3
Early sunflower	<i>Heliopsis helianthoides</i>	0.7
Blue-flag iris	<i>Iris virginica-shrevii</i>	0.5
Meadow blazingstar	<i>Liatris ligulistylis</i>	0.4
Tall blazingstar	<i>Liatris pycnostachya</i>	0.4
Great blue lobelia	<i>Lobelia siphilitica</i>	0.1
Rye grass, annual	<i>Lolium italicum</i>	10.0
Monkey flower	<i>Mimulus ringens</i>	0.1
Wild Bergamot	<i>Monarda fistulosa</i>	0.6
ReGreen	NA	35.0
Switch grass	<i>Panicum virgatum</i>	1.0
Bluegrass, fowl	<i>Poa palustris</i>	10.0
Black-eyed Susan's	<i>Rudbeckia hirta</i>	0.6
Green bulrush	<i>Scirpus atrovirens</i>	0.3
Wool grass	<i>Scirpus cyperinus</i>	0.3
Grass-leaved goldenrod	<i>Solidago graminifolia</i>	0.2
Indian grass	<i>Sorghastrum nutans</i>	5.0
Cordgrass, prairie	<i>Spartina pectinata</i>	3.0
Blue vervain	<i>Verbena hastata</i>	0.5
Ironweed	<i>Veronia fasciculata</i>	0.2
Culver's root	<i>Veronicastrum virginianum</i>	0.1
Golden Alexander's	<i>Zizea aurea</i>	0.4
Total:		100.0

Mixture 28B		
Common Name	Botanical Name	% of Mix
Bluestem, big	<i>Andropogon gerardi</i>	6.0
Milkweed, marsh	<i>Asclepias incarnata</i>	0.17
Brome, fringed	<i>Bromus ciliata</i>	4.0
Prairie clover, purple	<i>Dalea purpureum</i>	0.17
Tic-trefoil, showy	<i>Desmodium canadense</i>	0.17
Wheatgrass, slender	<i>Elymus trachycaulus</i>	10.0
Wild-rye, Virginia	<i>Elymus virginicus</i>	10.0
Sunflower, early	<i>Heliopsis helianthoides</i>	0.17
Rye-grass, annual	<i>Lolium italicum</i>	8.0
ReGreen	NA	40.0
Switchgrass	<i>Panicum virgatum</i>	3.0
Bluegrass, fowl	<i>Poa palustris</i>	12.0
Black-eyed Susan	<i>Rudbeckia hirta</i>	0.15
Indian grass	<i>Sorghastrum nutans</i>	6.0
Vervain, blue	<i>Verbena hastata</i>	0.17
Total:		100.00

Mixture 30B		
Common Name	Botanical Name	% of Mix
Gramma, sideoats	<i>Bouteloua curtipendula</i>	8.0
Gramma, blue	<i>Bouteloua gracilis</i>	6.0
Prairie clover, purple	<i>Dalea purpureum</i>	2.0
Wild rye, Canada	<i>Elymus canadensis</i>	4.0
Wheat grass, slender	<i>Elymus trachycaulus</i>	6.0
Rye grass, annual	<i>Lolium italicum</i>	8.0
ReGreen	NA	26.0
Blue grass, Canada	<i>Poa compressa</i>	12.0
Alkali grass	<i>Puccinella distans</i>	16.0
Bluestem, little	<i>Schizachyrium scoparium</i>	10.0
Dropseed, sand	<i>Sporobolus cryptandrus</i>	2.0
Total:		100.0

3876.2

Mixture 30B-WF		
Common Name	Botanical Name	% of Mix
Grama, sideoats	<i>Bouteloua curtipendula</i>	8.0
Grama, blue	<i>Bouteloua gracilis</i>	6.0
Wild rye, Canada	<i>Elymus canadensis</i>	4.0
Wheat grass, slender	<i>Elymus trachycaulus</i>	8.0
Rye grass, annual	<i>Lolium italicum</i>	8.0
Forbs (Table F1, F2 or F3)	NA	8.0
ReGreen	NA	26.0
Blue grass, Canada	<i>Poa compressa</i>	10.0
Alkali grass	<i>Puccinella distans</i>	10.0
Bluestem, little	<i>Schizachyrium scoparium</i>	10.0
Dropseed, sand	<i>Sporobolus cryptandrus</i>	2.0
Total:		100.0

Mixture 33B		
Common Name	Botanical Name	% of Mix
Grama, sideoats	<i>Bouteloua curtipendula</i>	8.0
Grama, blue	<i>Bouteloua gracilis</i>	6.0
Buffalo grass	<i>Buchloe dactyloides</i>	6.0
Wild rye, Canada	<i>Elymus canadensis</i>	4.0
Wheat grass, slender	<i>Elymus trachycaulus</i>	6.0
June grass	<i>Koeleria macrantha</i>	4.0
Rye grass, annual	<i>Lolium italicum</i>	8.0
Forbs (Table F1 or F2)	NA	7.0
ReGreen	NA	35.0
Bluestem, little	<i>Schizachyrium scoparium</i>	10.0
Dropseed, sand	<i>Sporobolus cryptandrus</i>	2.0
Needle-grass, green	<i>Stipa viridula</i>	4.0
Total:		100.0

Mixture 38B		
Common Name	Botanical Name	% of Mix
Milkweed, butterfly	<i>Asclepias tuberosa</i>	0.4
Aster, sky-blue	<i>Aster azureus</i>	0.2
Aster, silky	<i>Aster sericeus</i>	0.2
Grama, sideoats	<i>Bouteloua curtipendula</i>	8.0
Grama, blue	<i>Bouteloua gracilis</i>	6.0
Brome, Kalm's	<i>Bromus kalmii</i>	4.0
Coreopsis, prairie	<i>Coreopsis palmata</i>	0.3
Prairie clover, white	<i>Dalea candidum</i>	0.4
Prairie clover, purple	<i>Dalea purpureum</i>	1.0
Wild-rye, Canada	<i>Elymus canadensis</i>	6.0
Wheat grass, slender	<i>Elymus trachycaulus</i>	6.0
Ox-eye, common	<i>Heliopsis heliantoides</i>	0.4
June grass	<i>Koeleria macrantha</i>	4.0
Bush clover, round-headed	<i>Lespedeza capitata</i>	0.2
Blazingstar, rough	<i>Liatris aspera</i>	0.3
Blazingstar, dotted	<i>Liatris punctata</i>	0.3
Rye grass, annual	<i>Lolium italicum</i>	7.0
Bergamot, wild	<i>Mondarda fistulosa</i>	0.2
Bee balm, spotted	<i>Mondarda punctata</i>	0.2
ReGreen	NA	38.0
Beardtongue, foxglove	<i>Penstemon digitalis</i>	0.2
Penstemon, showy	<i>Penstemon grandiflorum</i>	0.3
Coneflower, columnar	<i>Ratibida columnifera</i>	0.4
Black-eyed Susan	<i>Rudbeckia hirta</i>	0.3
Bluestem, little	<i>Schizachyrium scoparium</i>	10.0
Goldenrod, stiff	<i>Solidago rigida</i>	0.2
Dropseed, sand	<i>Sporobolus cryptandrus</i>	2.0
Dropseed, prairie	<i>Sporobolus heterolepis</i>	3.0
Spiderwort, prairie	<i>Tradescantia bracteata</i>	0.3
Alexander's, heart-leaved	<i>Zizia aptera</i>	0.2
Total:		100.0

3876.2

Mixture 50B		
Common Name	Botanical Name	% of Mix
Wheat-grass, slender "Revenue"	<i>Elymus trachycaulus</i>	8.0
Bluestem, big "Bison"	<i>Andropogon gerardi</i>	7.0
Brome grass, smooth	<i>Bromus inermis</i>	15.0
Rye-grass, perennial	<i>Lolium perene</i>	20.0
Alfalfa, creeping	<i>Medicago sativa</i>	4.0
Legume, native (see below)	NA	1.0
Switch grass "Dakota"	<i>Panicum virgatum</i>	8.0
Timothy	<i>Phleum pratense</i>	7.0
Bluegrass, Kentucky "Park"	<i>Poa pratensis</i>	30.0
Total:		100.0
Acceptable Native Legumes		
Milkvetch, Canada	<i>Astragalus canadensis</i>	
Prairie clover, purple	<i>Dalea purpureum</i>	
Tic-trefoil, showy	<i>Desmodium canadense</i>	
Bush-clover, round-headed	<i>Lespedeza capitata</i>	
Vetch, American	<i>Vicia americana</i>	

Mixture 60B		
Common Name	Botanical Name	% of Mix
Fescue, creeping-red "Cindy"	<i>Festuca rubra</i>	10.0
Rye-grass, perennial "Elf"	<i>Lolium perene</i>	14.0
Bluegrass, Canada	<i>Poa compressa</i>	12.0
Bluegrass, fowl	<i>Poa palustris</i>	10.0
Bluegrass, common "98/85"	<i>Poa pratensis</i>	12.0
Bluegrass, Kentucky "Park"	<i>Poa pratensis</i>	12.0
Bluegrass, Kentucky "Caliber"	<i>Poa pratensis</i>	10.0
Alkali grass	<i>Puccinella distans</i>	19.0
White clover	<i>Trifolium repens</i>	1.0
Total:		100.0

Mixture 80B		
Common Name	Botanical Name	% of Mix
Bromegrass, smooth	<i>Bromus inermis</i>	20.0
Rye-grass, perennial	<i>Lolium perene</i>	25.0
Alfalfa, creeping	<i>Medicago sativa</i>	25.0
Switch grass "Dakota"	<i>Panicum virgatum</i>	10.0
Timothy	<i>Phleum pratense</i>	10.0
Bluegrass, fowl	<i>Poa palustris</i>	10.0
Total:		100.0

Mixture 90B		
Common Name	Botanical Name	% of Mix
ReGreen	NA	20.0
Partridge pea	<i>Chamaecrista fasciculata</i>	9.0
Wheat-grass, slender "Revenue"	<i>Elymus trachycaulus</i>	9.0
Rye-grass, perennial	<i>Lolium perene</i>	20.0
Alfalfa, creeping	<i>Medicago sativa</i>	7.0
Timothy	<i>Phleum pratense</i>	10.0
Dropseed, sand	<i>Sporobolus cryptandrus</i>	7.0
Clover, alsike	<i>Trifolium hybridum</i>	7.0
Clover, red	<i>Trifolium pratense</i>	11.0
Total:		100.0

Temporary Mixes		
Mixture	Plant Species	% of Total
100B	Winter wheat	100.0
110B	Oats	100.0
120B	ReGreen	100.0
125B	Regreen	92.0
	Partridge pea	8.0
	Total:	100.0
130B	Oats	40.0
	Winter wheat	40.0
	Rye grass	10.0
	Alfalfa, annual	10.0
	Total:	100.0

3876.2

**TABLE 3876-6
FORBS BY AREA OF MINNESOTA**

Table F1 (NW Forbs)	
Common Name	Botanical Name
Aster, smooth-blue	<i>Aster laevis</i>
Milkvetch, Canada	<i>Astragalus canadensis</i>
Prairie clover, white	<i>Dalea candidum</i>
Prairie clover, purple	<i>Dalea purpureum</i>
Tick-trefoil, showy	<i>Desmodium canadense</i>
Coneflower, narrow-leaved	<i>Echinacea angustifolia</i>
Ox-eye, common	<i>Heliopsis helianthoides</i>
Bushclover, round-headed	<i>Lespedeza capitata</i>
Blazingstar, rough	<i>Liatris aspera</i>
Blazingstar, tall	<i>Liatris pycnostachya</i>
Bergamot, wild	<i>Monarda fistulosa</i>
Penstemon, showy	<i>Penstemon grandiflorum</i>
Mint, mountain	<i>Pycnathemum virginianum</i>
Coneflower, columnar	<i>Ratibida columnifera</i>
Black-eyed Susan	<i>Rudbeckia hirta</i>
Goldenrod, stiff	<i>Solidago rigida</i>
Vervain, blue	<i>Verbena hastata</i>
Vervain, hoary	<i>Verbena stricta</i>
Alexanders, heart-leaved	<i>Zizea aptera</i>
Alexanders, golden	<i>Zizia aurea</i>

Rate: As specified in the seed mix tabulation. All species shall be provided in equal weights. Substitutions shall not be allowed.

Description: Native forbs to be added to native grass mixtures in Northwestern Minnesota.

Table F-2 (SW Forbs)	
Common Name	Botanical Name
Milkweed, butterfly	<i>Asclepias tuberosa</i>
Aster, smooth-blue	<i>Aster laevis</i>
Milkvetch, Canada	<i>Astragalus canadensis</i>
Partridge pea	<i>Chamaecrista fasciculata</i>
Prairie clover, white	<i>Dalea candidum</i>
Prairie clover, purple	<i>Dalea purpureum</i>
Tick-trefoil, showy	<i>Desmodium canadense</i>
Coneflower, narrow-leaved	<i>Echinacea angustifolia</i>
Ox-eye, common	<i>Heliopsis helianthoides</i>
Blazingstar, rough	<i>Liatris aspera</i>
Blazingstar, tall	<i>Liatris pycnostachya</i>
Bergamot, wild	<i>Monarda fistulosa</i>
Penstemon, showy	<i>Penstemon grandiflorum</i>
Coneflower, columnar	<i>Ratibida columnifera</i>
Coneflower, grey-headed	<i>Ratibida pinnata</i>
Black-eyed Susan	<i>Rudbeckia hirta</i>
Goldenrod, stiff	<i>Solidago rigida</i>
Vervain, blue	<i>Verbena hastata</i>
Vervain, hoary	<i>Verbena stricta</i>
Alexanders, golden	<i>Zizia aurea</i>

Rate: As specified in the seed mix tabulation. All species shall be provided in equal weights. Substitutions should not be allowed.

3876.2

Table F-3 (SE Forbs)	
Common Name	Botanical Name
Milkweed, butterfly	<i>Asclepias tuberosa</i>
Aster, smooth-blue	<i>Aster laevis</i>
Milkvetch, Canada	<i>Astragalus canadensis</i>
Partridge pea	<i>Chamaecrista fasciculata</i>
Prairie clover, white	<i>Dalea candidum</i>
Prairie clover, purple	<i>Dalea purpureum</i>
Tick-trefoil, showy	<i>Desmodium canadense</i>
Ox-eye, common	<i>Heliopsis helianthoides</i>
Blazingstar, rough	<i>Liatris aspera</i>
Blazingstar, tall	<i>Liatris pycnostachya</i>
Bergamot, wild	<i>Monarda fistulosa</i>
Mint, mountain	<i>Pycnathemum virginianum</i>
Coneflower, grey-headed	<i>Ratibida pinnata</i>
Black-eyed Susan	<i>Rudbeckia hirta</i>
Goldenrod, stiff	<i>Solidago rigida</i>
Spiderwort, Ohio	<i>Tradescantia ohiensis</i>
Vervain, blue	<i>Verbena hastata</i>
Vervain, hoary	<i>Verbena stricta</i>
Alexanders, heart-leaved	<i>Zizia aptera</i>
Alexanders, golden	<i>Zizia aurea</i>

Rate: As specified in the seed mix tabulation. All species shall be provided in equal weights. Substitutions should not be allowed.

Description: Native forbs to be added to native grass mixtures in SE Minnesota.

3876.3 INSPECTION AND ACCEPTANCE

Certified Source - Sources with established quality control and so approved by the Turf Establishment & Erosion Control unit may supply seed in accordance with the Guaranteed Analysis method on file with the Mn/DOT Turf Establishment & Erosion Control unit. Seed guaranteed as meeting the pertinent requirements of this Specification shall be identified by official guaranteed analysis labels affixed to each container of seed in addition to the customary seed tag. For each lot of each type of seed, test reports from the Minnesota Department of Agriculture Seed Laboratory or a certified commercial seed analyst shall be submitted to the Department's Materials Laboratory prior to mixing. Seed shipped without certified test reports on file in the Department's Materials Laboratory shall not be accepted and no payment will be made.

Noncertified source - All seed shall be sampled and tested prior to use. The Contractor shall submit to the Engineer the proposed source at least 6 weeks prior to time of use to allow adequate time for testing and approving the material. Current test results as conducted by a certified seed analyst or by a state Seed Laboratory may be accepted in lieu of Department testing.

As an alternate to the above testing or the Guaranteed Analysis method, Certified Seed bearing the Quality Mark of the Minnesota Crop Improvement Association will be acceptable. Certified Seed bearing the Quality Mark of agencies so authorized in other states will be acceptable providing that their germination and purity requirements equal or exceed those established by the Minnesota Crop Improvement Association.

The Department reserves the right to conduct its own inspection of seed either at the supplier's warehouse or at the Project site. Should the results of the Department's inspection disagree with those obtained at the origin, the Department's findings shall be conclusive and binding.

All Seed not planted within 9 months after it has been tested for germination shall be sampled and retested before use, at no cost to the Department. Seed testing shall be in accordance with the methods on file with the Mn/DOT Turf Establishment & Erosion Control unit.

The Contractor shall obtain all native grass and forb seeds from an Approved Vendor or Source for native seeds as listed with the Mn/DOT Turf Establishment & Erosion Control unit or listed in the Contract. Bags of seed shall be labelled with the mixture number and the vendor from which it was obtained.

3877

3877

Topsoil Borrow

3877.1 SCOPE

This Specification covers topsoil material used as a medium for establishing and sustaining healthy plant growth.

3877.2 REQUIREMENTS

Topsoil material furnished under this Specification shall be obtained from the soil horizons normally designated as "A" or "B" as defined by the Soil Science Society of America, or shall be obtained from alluvial deposits. The material shall meet the requirements given herein for the several classifications defined.

A Topsoil Borrow

Topsoil borrow for general use as a turf growing medium shall meet the requirements of Table 3877-1:

**TABLE 3877-1
TOPSOIL BORROW REQUIREMENTS**

	Minimum	Maximum
Material Passing 2.00-mm Sieve	85%	--
Clay	5%	30%
Silt	10%	70%
Sand & Gravel	10%	70%
Organic Matter	3%	20%
pH	6.1	7.8

B Select Topsoil Borrow

Select topsoil borrow for use as a plant growing medium in designated areas, such as landscape beds, shall meet the requirements of Table 3877-2:

**TABLE 3877-2
SELECT TOPSOIL BORROW REQUIREMENTS**

	Minimum	Maximum
Material Passing 2.00-mm (#10) Sieve	90%	--
Clay	5%	30%
Silt	10%	70%
Sand & Gravel	20%	70%
Organic Matter	3%	20%
pH	6.1	7.5
Extractible Phosphorous	30 kg per hectare (pounds/acre)	--
Exchangeable Potassium	150 kg per hectare (pounds/acre)	--
Soluble Salts	--	0.15 siemens per meter (1.5 mmhos/cm)

3877.2

C Premium Topsoil Borrow

Premium topsoil borrow for use as a plant growing medium in critical areas and top dressing turf reinforcement mats shall be screened and pulverized and meet the requirements of Table:

**TABLE 3877-3
PREMIUM TOPSOIL BORROW REQUIREMENT**

	Maximum	Minimum
Material Passing 2.0-mm		
(#10) Sieve	95%	--
Clay	10%	25%
Silt	25%	60%
Sand & Gravel	25%	60%
Organic Matter	5%	15%
pH	6.0	7.1
Soluble Salts	--	0.15 siemens/m (1.5 mmhos/cm)

3877.3 SAMPLING AND TESTING

The Contractor shall submit to the Engineer a list of prospective sources for topsoil borrow at least 1 month prior to time of use to allow adequate time for inspecting, testing, and approving the sources.

Texture of the topsoil shall be classified according to the Engineering definition of particle size. Texture shall be determined by the method described in AASHTO T 88.

The current standard testing procedure of the University of Minnesota, Soil Science Department, Soils Testing Laboratory shall be used for determining pH, percent of organic matter, extractible phosphorous, exchangeable potassium, and soluble salts.

3878

Sod

3878.1 SCOPE

This Specification covers sod used for landscaping and erosion control.

3878.2 REQUIREMENTS

Sod shall consist of densely-rooted bluegrass or other permanent turf grasses as approved by the Engineer.

The sod shall be cut in uniform strips of not less than 300 mm

(12 inches) in width and to a uniform thickness of 20 mm **(.75 inch)** or more as necessary so that practically all of the dense root system will be retained and be exposed in the bottom side of the sod.

When the sod is cut, it shall be sufficiently moist to withstand exposure and handling during the transplant operations. The sod shall have been raked free of debris and the top growth trimmed to a height of 25 to 75 mm **(1-3 inches)**.

All sod furnished shall be in acceptable condition upon delivery to the work site. The sod strips shall not have dry or dead edges upon delivery. Between June 1 and September 15, sod shall not be cut more than 24 hours in advance of delivery.

A Lawn Sod

Lawn sod shall have a lush appearance, be dense, have a uniform texture, and bright in color throughout. The sod shall not contain grass with blade widths of 5 mm **(.2 inch)** or greater. The sod shall be weed-free and shall contain no more than 5 mm **(.2 inch)** of thatch over the base soil. The sod shall consist of a blend of 4 or 5 fine leaved turf grasses. At least two-thirds of the grasses, as determined by initial seeding proportions, shall be of improved and elite type Kentucky bluegrass varieties as defined in 3876.2C.

B Erosion Control Sod

Sod used for general road side purposes and for erosion control shall be a low maintenance type, dense, and of uniform texture. The sod shall be free of noxious weeds and shall contain less than 3 percent grassy weeds, sedges, broadleaf weeds, or coarse grasses. The sod shall consist of a blend of 4 or 5 fine leaved turf grasses. At least two-thirds of the grasses, as determined by initial seeding proportions shall be of acceptable low maintenance Kentucky bluegrass varieties as defined in 3876.2C.

B1 Netting

The netting required in ditch bottoms in accordance with 2575.3J, at a minimum, will meet the erosion control netting 3883 specifications with respect to material type, mesh openings, weight, and tensile strength.

B2 Staples

The staples used to anchor the sod shall be U shaped 3 mm **(0.12 inch)** diameter or heavier steel wire having a span width of 25 mm **(1 inch)** and a length of 200 mm **(8 inches)** from top to bottom after bending.

Alternatives to staples in ditch bottoms include laying snow fence, chainlink fence, jute, or a biodegradable netting with a minimum life span of 3 months over the top of the sod and securing it to the sod. The method of securing includes using wood stakes, rebar, and metal

3878.2

staples, or as directed by the Engineer. The wood stakes and rebar must be removed after the 30 day maintenance period.

C Salt Resistant Sod

Salt resistant sod for use along boulevards or in potential salt environment shall be a low maintenance type, fine leafed, and of uniform texture. The sod shall be free of noxious, broadleafed, and grassy weeds and shall contain less than 3 percent coarse grasses. The sod shall have originated from the blend of grass seed shown in Table 3878-1.

**TABLE 3878-1
SALT RESISTANT SOD**

Grass Type	Acceptable Varieties	Minimum Percent by Mass	Maximum Percent by Mass
Alkali grass	Fults, Salty	15	20
Red fescue	Dawson, Cindy	15	20
Park Kentucky bluegrass	Park	10	15
Improved Kentucky bluegrass	(A)	20	30
Low Maintenance Kentucky bluegrass	(B)	20	30

(A) Listed in 3876.2C

(B) Listed in 3876.2C excluding Park Kentucky bluegrass

D Mineral Sod

Mineral sod shall be commercially produced on or harvested from mineral based soils. The soil upon which mineral sod is produced or harvested from shall consist of less than 10 percent organic matter by mass. The sod shall be dense, fine leafed, and of uniform texture. The sod shall be free of noxious, broadleafed, or grassy weeds and shall contain less than 3 percent coarse grasses. The sod shall consist of a blend of 4 or 5 fine leafed turf grasses. At least 35 percent of the grasses, as determined by initial seeding proportions, shall consist of improved type Kentucky bluegrass varieties defined in 3876.2C.

3878.3 SAMPLING AND TESTING

Prior to delivery to the Project, the Contractor shall furnish the Engineer a certification from the grower stating the grass varieties contained in the sod. No sod shall be placed until the certification of varieties contained in the sod has been reviewed and accepted by the Engineer.

3878.3

Test samples for determination of soil organic matter content of mineral sod will be obtained from the soil exposed in the bottom side of the sod rolls. Testing for organic matter content will be in accordance with ASTM D 2974.

The Department reserves the right to conduct its own inspection at any time of sod in the production fields or at the Project site. Representative samples of the sod shall be furnished upon request, in which case no sod shall be delivered until the samples have been approved.

3879

3879
Agricultural Lime

3879.1 SCOPE

This Specification covers ground limestone and dolostone capable of neutralizing soil acidity.

3879.2 REQUIREMENTS

Agricultural ground limestone and dolostone shall contain at least 80 percent calcium carbonate equivalent (CCE). It shall be ground sufficiently fine so that 90 percent, including all the fine particles obtained in the grinding process, will pass through a 2.36 mm (# 8) sieve; and at least 35 percent will pass through a 250 µm (# 60) mesh sieve.

3879.3 SAMPLING AND TESTING

Test samples, when required, shall be obtained in accordance with Mn/DOT's Schedule of Materials Control. Sieve analysis testing will be in accordance with ASTM D 422. Chemical analysis will be in accordance with the methods established by ASTM C 602.

3880
Peat Moss

3880.1 SCOPE

This Specification covers peat moss used as a soil amendment for landscape plantings.

3880.2 REQUIREMENTS

Peat moss shall be of the hypnum, sphagnum, or reed sedge types as defined in ASTM D 2607. Other peaty soils will not be acceptable. The peat moss shall be a processed product reasonably free of wood and other extraneous matter and shall contain no weed seed or bacterium that may affect plant growth. The peat moss shall be uniform throughout meeting the requirements of Table 3880-1:

TABLE 3880-1
PEAT MOSS REQUIREMENTS

	Minimum	Maximum
Moisture Content, % by mass	25	70
Ash Content, % by mass	--	25
pH	3.0	7.5
Fiber Content, %	33	--

3881.3

At the time of delivery the peat moss shall be in an air-dried condition.

Quantity shall be expressed as loose volume. Package contents shall be determined by measuring loose material in a 0.03 m³ (**1 cubic foot**) measure.

3880.3 SAMPLING AND TESTING

Test samples shall be provided upon request and at a rate designated by the Engineer. Testing will be in accordance with the methods prescribed in ASTM D 2974. Testing for fiber content shall be as described in ASTM D 2607.

When delivered in package form, the material may be accepted on the basis of the manufacturer's guaranteed analysis.

3881

Commercial Fertilizer

3881.1 SCOPE

This Specification covers fertilizer used for establishing vegetative cover and landscape plantings.

3881.2 REQUIREMENTS

Fertilizer furnished under this Specification shall be a commercial grade of the inorganic or organic type, produced in pelletized, granular or slurry form. The fertilizer shall contain at least the minimum analysis specified, and shall be furnished as a blend or mixture containing the specified percentages of total nitrogen, available phosphoric acid (or phosphorous), and water soluble potash (or potassium), in that order.

When the fertilizer is furnished in closed containers, they shall be clearly marked with the mass, type of nutrients, and the manufacturer's guaranteed analysis, all in accordance with State and Federal regulations.

When the fertilizer is furnished in bulk, each shipment shall be accompanied by a suitable bill-of-lading giving the mass, type of nutrients and a certificate of the manufacturer's guaranteed analysis.

3881.3 SAMPLING AND TESTING

Fertilizer may be accepted on the basis of the manufacturer's guaranteed analysis, but the Department reserves the right to sample and test the material at any time. Chemical analysis will be in accordance with methods established by the Association of Official Agricultural Chemists.

3882

3882

Mulch Material

3882.1 SCOPE

This Specification covers mulch material for controlling erosion and establishing vegetative cover.

3882.2 REQUIREMENTS

Mulch material shall conform to the requirements for one of the following types, as specified in the Contract.

TYPE 1

Type 1 mulch shall consist of grain straw, hay, cuttings of agricultural grasses and legumes. When Type 1 is used in conjunction with native grasses (Mixes 5B-38B), it shall consist of grain straw only.

The material shall be free of seed bearing stalks of noxious grasses or weeds as defined by the rules and regulations of the Minnesota Department of Agriculture.

Mulch containing Canada thistle or leafy spurge fragments or seeds shall be rejected. In addition, Type 1 mulch shall not contain the following species: cattail (*Typha sp*), reed canary grass (*Phalaris arundinacea*), birds-foot trefoil (*Lotus corniculatus*) or crown vetch (*Coronilla varia*). At the time of delivery the mulch shall be in an air dried condition. Bales used for bale checks shall be densely packed rectangular shaped 350 x 450 x 850 mm (**14 x 18 x 36 inches**) minimum nominal size. Bales shall be tightly wrapped with two strands of twine or wire.

TYPE 3

Type 3 mulch shall consist of clean grain straw (i.e. oats, wheat) that is certified by the Minnesota Crop Improvement Association (MCIA) to be weed free. All mulch bales shall be in an air dried condition at the time of delivery and shall have an MCIA inspection tag attached indicating that the mulch has passed inspection.

TYPE 4

Type 4 mulch shall consist of a combination of Type 1 mulch and Type 5 Hydraulic Soil Stabilizer. The combination shall consist of 3.4 metric tons (**1 -1/2 tons/acre**) of Type 1 mulch and 840 kg/ha (**750 pounds/acre**) Of Type 5 Hydraulic Soil Stabilizer.

TYPE 6

Type 6 mulch shall consist of raw wood material from either hard or soft timber and shall be a product of a mechanical chipper, hammermill, or tub grinder. The material shall be substantially free of mold, dirt, sawdust, and foreign material and shall not be in an advanced state of decomposition. The material shall not contain chipped up manufactured boards or chemically treated wood, including but not limited to wafer board, particle board, and chromated copper arsenate (CCA) or penta treated wood. The material, when air dried, shall all pass a 100 mm (**4 inch**) screen and

3882.3

not more than 20 percent by mass of the material shall pass a 2.36 mm (0.1 inch) sieve. Unattached bark or green leaf composition, either singly or combined, shall not exceed 20 percent each by mass. Maximum length of individual pieces shall not exceed 500 mm (20 inches).

TYPE 7 (Prairie Mulch)

Prairie mulch shall be of a type that has been thrashed to remove seeds so that it consists of clippings, chaff, or residue from harvesting or cleaning operations. This material may be harvested from native stands or from native grass production fields. Prairie mulch shall be free of noxious weed seeds, and shall be from the Approved Sources list for native seeds on file on the Mn/DOT web pages under the Materials Engineering Section. Two types of prairie mulch may be specified:

Type 7A - Derived from short to mid-height native grasses and consisting of one or more of the native grasses listed in Mixtures 30B through 38B.

Type 7B - Derived from mid-height to tall native grasses and consisting of one or more of the native grasses listed in Mixtures 10B through 25B.

TYPE 8 (Prairie Hay)

Prairie hay shall be of a type that has not been thrashed to remove seeds so that it consists of material that has been bailed directly. This material may be harvested from native stands or from native grass fields. Prairie hay shall be free of noxious weed seeds, and shall be from the Approved Sources list for native seeds on file on the Mn/DOT web pages under the Materials Engineering Section. Two types of prairie hay may be specified:

Type 8A - Derived from short to mid-height native grasses and consisting of one or more of the native grasses listed in Mixtures 30B through 38B.

Type 8B - Derived from mid-height to tall native grasses and consisting of one or more of the native grasses listed in Mixtures 10B through 25B.

TYPE 9

Aggregate mulch will be 9.5 to 50 mm (3/8 to 2 inch), with 5 percent by mass allowable passing the 9.50 mm (3/8 inch) sieve. Crushing is allowable, but not required.

3882.3 SAMPLING AND TESTING

Test samples, when required, shall be obtained at a rate determined by the Engineer. Testing for moisture content will be in accordance with ASTM D 4444 and sieve analysis in accordance

3882.3

with ASTM D 422. Type 5 mulch will be accepted on the basis of the manufacturer's certified results in accordance with 1603.

3883

Erosion Control Netting

3883.1 SCOPE

This Specification covers biodegradable mesh placed over Type 1 mulch, on the bottom of freshly placed sod, or on top of hydraulic soil stabilizer, or alone to reinforce the materials while vegetation is forming.

3884.2

3883.2 REQUIREMENTS

A Netting material shall conform to the following requirements for one of the following types, as specified in the Contract.

Type 1

Polypropylene netting shall consist of polypropylene plastic net with bonded joints. Mesh openings shall be a minimum of 15 mm (**0.5 inch**) to a maximum of 25 mm (**1 inch**) measured in either direction. The net shall have a minimum mass of 12.2 g/m² (**2.5 pounds/1,000 square feet**). The minimum tensile force shall be 90 N per 4 strands (**20 pounds/4 strands**) in the length direction and 70 N (**16 pounds**) per 4-strands in the width direction. Tensile force shall be the average of three tests.

Type 2

Jute netting shall consist of jute yarn woven into an open mesh with approximate 25 mm (**1 inch**) openings. The net shall have a minimum mass of 0.40 kg per (.**92 pounds/square yard**). Each strand shall be no less than 0.35 mm (**0.14 inch**) in diameter with a minimum yarn count of no less than 50 per meter.

Type 3

Coir netting shall be 100% coconut, woven material. The yarns shall be of machine spun coir twine uniformly twisted, with average thickness 4mm-7.5mm (**0.16-.3inch**). With 37-40 curls per .3 (**1 foot**). The percent opening area shall be 48-68%.

Wire staples used to secure the netting shall be 3 mm (**11 gauge**) or heavier, steel wire, "U" shaped, and have a length of not less than 150 mm (**6 inches**), unless otherwise specified in the Contract.

3883.3 SAMPLING AND TESTING

Samples for testing shall be of such size and numbers as requested by the Engineer.

3884
Hydraulic Soil Stabilizer

3884.1 SCOPE

This specification covers soil-stabilizing materials, which are applied by hydro spreading and used for controlling erosion and establishing vegetative cover.

3884.2 REQUIREMENTS

Hydraulic soil stabilizers shall easily mix with water and shall be noncorrosive to hydraulic application equipment. They shall be nonfoaming and contain mixture enhancers to prevent foaming and mixing problems during agitation in the application equipment. Application equipment shall have both mechanical agitation and also slurry bypass.

Hydraulic soil stabilizers shall be considered safe when properly applied according to Environmental Protection Agency (EPA) and other regulatory agencies to the applicator, adjacent workers and the environment. Material Safety Data Sheets (MSDS) shall be submitted annually to the Departments Turf Establishment Unit. The materials shall be nontoxic to plants, fish and other wildlife and shall be 100% biodegradable.

Hydraulic soil stabilizers shall conform to the requirements for one of the following types, as specified in the Contract.

Type 1 Natural Tackifier

Type 1 shall consist of water soluble natural proteins, vegetable gums, or guar gums blended with gelling and hardening agents, or a water soluble blend of hydrophilic polymers, viscosifiers, sticking aids and other gums.

Guar gum based tackifiers shall consist of a minimum of 95% guar gum, by weight. The remaining 5% shall consist of dispersing and cross-link additives.

Type 2 BLANK

Type 3 BLANK

Type 4 BLANK

Type 5 Hydromulch

Type 5 shall consist of wood cellulose fibers that shall contain no germination or growth inhibiting factors. It shall not contain nor be processed from sawdust or pulverized newspaper. It shall be dyed an appropriate color to allow visual metering of its application, and shall have the property of becoming dispersed and suspended when agitated in water. It shall contain 2.5 to 5.0 percent tackifier (Type 1) by weight.

The tackifier shall be incidental to the Type 5 hydromulch material. When sprayed uniformly on the surface of the soil, the fibers shall form

3884.2

a blotter-like ground cover that readily absorbs water and allows infiltration to the underlying soil. Moisture content shall not exceed 15 percent at the time of delivery. When washed on an 850-um sieve at least 50 percent shall be retained on the sieve.

Type 6 Hydromulch blend

Type 6 shall meet the requirements of Type 5 above except that it shall be a blend of 40 to 60% recycled paper and 40 to 60% wood cellulose fibers by weight.

Type 7 BLANK

Type 8 Bonded Fiber Matrix

Type 8 shall be composed of 100% wood or wood by products. A minimum of 25% of the fibers shall average 10.16mm (**0.4 inches**) in length and 50% or more shall be retained on a Clark Fiber Classifier 24-mesh screen. Fibers shall be colored with water soluble, non-toxic dye, to aid in uniform application over the site. The material shall contain a hydrocolloid based (guar gum) binder equaling 10% or greater by volume. The crosslinker shall contain slow-release and agricultural based fertilizers or other proprietary chemicals equaling less than 2 % by volume. These binder and crosslinkers shall not dissolve or disperse upon rewetting. The moisture content of the matrix shall be 12%+/-3% by weight. The mix ratio shall be 378-473 L (**100 to 125 gallons**) water to 24 kg (**50 poundss**) material.

3884.3 SAMPLING AND TESTING

Samples for laboratory testing shall be of numbers and size requested by the Engineer. Testing for moisture content will be in accordance with ASTM D4444 and particle sieve analysis in accordance with ASTM D422. For Type 8 hydraulic soil stabilizer a field "slump-test" or equivalent shall be performed to measure product specific free water movement in one time unit. This must be demonstrated to the MnDOT inspector prior to placement.

3884.4 CERTIFICATION AND TRAINING

Certification of Applicator will consist of Manufacture/Vendor Training program, consisting of a minimum of 4 hours of Classroom and Field Experience. Topics to be covered include reading the plan sheets and project specifications, mix ratios, field measurements, verification processes (i.e., slump tests) installation details, problem solving, machine inspections and maintenance issues. Successful completion of the certification program shall be good for 2 years from the training date. Contractors wishing to use this specification shall provide written proof from the Manufacture/Vendor of a list of the individuals passing the Certification within the company. This will be supplied annually and preferably by February to the Office of Environmental Services, Turf Establishment and Erosion Prevention

3885.1

Unit. The burden of proof shall rest with the Contractor. The Training program shall be subject to approval by MnDOT.

3885
Erosion Control Blankets

3885.1 SCOPE

This Specification covers biodegradable open weave blankets used for establishing and reinforcing vegetation on slopes, ditch bottoms and shorelines during disturbance events and construction. These blankets are not designed to provide permanent long-term protection of soils from stormwater events. Several categories are provided with different service application and specific uses as follows:

	<u>Category</u>	<u>Service Application</u>	<u>Use</u>
1		Very Temporary	Flat areas, shoulder drain outlets, roadway shoulders, lawns, and mowed areas.
2		One Season	Slopes 1 vertical :3 horizontal to 1v:2h less than 15m (50 feet) long, ditches with gradients 2 percent or less, flow velocities less than 1.5m/second (5.0 feet/sec.).
3		One Season	Slopes 1 vertical :3 horizontal to 1v:2h more than 15m (50 feet) long, ditches with gradients 3 percent or less, flow velocities less than 2.0m/second(6.5 feet/sec.).
4		Semi-permanent	Slopes 1 vertical to :2 horizontal and steeper, ditches with gradients 4 percent or less, flow velocities less than 2.1m/second (7.0 feet/sec.), flow depth (8 inches) or less.
5		Semi-permanent	Ditch bottoms with gradients 8 percent and less, flow velocities less than 2.7 m/second (9 feet/sec.), and under 200mm (8 inches) flow depth, water course banks within the normal flow elevation.

3885.2

3885.2 REQUIREMENTS

A Acceptable Types

Acceptable types of blankets allowed in the various categories shall be as follows:

<u>Category</u>	<u>Acceptable Types</u>
1	Straw RD 1S, Wood Fiber RD 1S
2	Straw 1S, Wood Fiber 1S
3	Straw 2S, Wood Fiber 2S
4	Straw/Coconut 2S, Wood Fiber HV 2S
5	Coconut 2S

The lettering designation shall be defined as follows:

- 1S - Netting on one side
- RD - Rapidly degradable
- 2S - Netting on two sides
- HV - High velocity

B Physical Requirements

Erosion control blankets shall conform to Table 3885-1 and the following requirements.

B-1 Material Fiber

Each erosion control blanket shall consist of a uniform web of interlocking fibers with net backing. The blanket shall be of uniform thickness with the material fibers being evenly distributed over the entire area of the blanket. The blankets shall have sufficient porosity to shield the underlying soil surface from erosion and promote plant growth. All material shall have been properly cured to achieve curled and barbed fibers. All blankets shall be smolder resistant.

B-2 Net Backing

The net backing on each blanket shall consist of polypropylene mesh. For Category 1 blankets, the net backing shall start to break down after 1 month with 80 percent breakdown occurring within 3 months. For Category 2 and 3 blankets, the netting shall contain sufficient UV stabilization for breakdown to occur within a normal growing season. For Category 4 and 5 blankets, the netting shall be UV stabilized to provide a service life of 2 to 3 years. For blankets designated as 2S, the fiber material shall be sandwiched between an attached top and a bottom layer of net backing.

B-3 Stitching

The material fiber in each blanket shall be securely attached to the net backing to prevent movement of the fiber in relation to the netting. For blankets consisting of 75mm (**3-inch**) material fibers, the blanket

3885.3

shall be fastened together at a spacing not to exceed 50mm (**2 inches**). For blankets consisting of 150mm (**6-inch**) material fibers, the blanket shall be fastened together at a spacing not to exceed 100mm (**4 inches**).

B-4 Staples

The staples used to anchor Category 1 and 2 blankets shall be U shaped, 11 gauge or heavier steel wire having a span width of 25mm (**1 inch**) and a length of 150mm (**6 inches**) or more from top to bottom after bending. Staples used to anchor Category 3, 4 and 5 blankets shall have a minimum length of 200mm (**8 inches**).

3885.3 SAMPLING AND TESTING

Samples shall be sent in for testing when the amount to be installed is 61mm (**200 feet**) or greater. Samples for testing must be submitted 21 days prior installation for testing. Approved products for this specification are on file on the Mn/DOT web page under the Materials Engineering Section.

3886
Silt Fence

3886.1 SCOPE

This Specification covers silt fence for use in retaining sediment and preventing off-site sheet flow sedimentation. The following types are provided for specific uses:

Standard Machine Sliced	General use during site grading, to protect critical areas. Can be used in ditch check applications.
Heavy Duty	Locations where extra strength is required are: near water bodies, unstable wetland soils, steep slopes, highly erodible areas, areas inaccessible to equipment, and high runoff areas.
Preassembled	Light duty applications are to protect temporary construction or to supplement the other types of silt fence.

3886.2 REQUIREMENTS

Silt fence shall conform to Table 3886-1 and the following requirements.

A Geotextile

Geotextile shall be uniform in texture and appearance and shall have no defects, flaws, or tears that would affect its physical properties. It shall contain sufficient ultraviolet rays (U.V.) inhibitor and stabilizers to provide a minimum 2 -year service life from outdoor exposure.

B Fastening and Sewing

B1 Heavy Duty

When wire mesh is used, wire fasteners (hog rings) shall fasten the geotextile over the top of the mesh along the upper edge at a maximum spacing of 305mm (**12 inches**). A minimum of 3 metal U-shaped clips or wire shall fasten the wire mesh and two layers of geotextile to the metal posts.

When plastic mesh is used, the mesh backing shall be joined to the geotextile at the top with two rows of stitching. Geotextile shall protrude below the bottom edge of the plastic mesh to allow embedment. A minimum of 3 metal U-shaped clips or wire shall fasten the plastic mesh and geotextile to the metal posts.

B2 Machine Sliced

Each post of the machine sliced silt fence shall be tied in three locations with 22kg (**50 pound**) plastic zip ties. Position the post with the nipples facing away from the silt fence fabric. All three ties shall be placed within the top 203mm (**8 inch**) of fabric, puncturing holes

3886.2

vertically a minimum of 25 mm (**1 inch**) apart. Ditch Checks shall be held in the slit by a 16 mm (**5/8 inch**) Polyethylene rope.

B3 Preassembled

A polyester or nylon cord shall be sewn into a seam continuously along the top of the geotextile. Minimum cord diameter shall be 3 mm (**1/8 inch**). Each post shall be securely fastened to the geotextile by a minimum of five gun staples 25 mm (**1 inch**) long that are also suitable for such a purpose. Stapling should be done at a diagonal angle to the threads of the geotextile fabric.

C Posts

Each post shall be securely fastened to the geotextile by zip ties, clips or staples suitable for each purpose. Standard T metal posts with a welded plate shall be used on the machine sliced and heavy duty installations. Wooden posts used on the preassembled silt fence shall have a sharpened end and shall protrude below the bottom of the geotextile to allow for a minimum of 457 mm (**18 inch**) embedment.

Maximum post spacing shall be 2.4 m (**8 foot**) for heavy duty; 1.8 m (**6 foot**) for machine sliced and 1.8 (**6 foot**) for preassembled. When machine sliced is used for ditch check installations the maximum post spacing shall be 1.2 m (**4 foot**).

D Field Assembly

The geotextile of the heavy duty silt fence shall be attached to the upstream side of the net backing. The bottom edge of the geotextile shall be buried at least 152 mm (**6 inch**) deep in a vertical trench with the soil pressed firmly against the embedded geotextile.

The geotextile of the machine sliced silt fence shall be inserted by machine in a slit in the soil 0.2-0.3 m (**8-12 inch**) deep. The slit shall be created such that a horizontal chisel point at the base of a soil slicing blade slightly disrupts soil upward as the blade slices through the soil. The geotextile shall be mechanically inserted directly behind the soil slicing blade in a simultaneous operation, achieving consistent placement and depth. No turning over (plowing) of soil is allowed for the slicing method. Compact the soil immediately next to the silt fence fabric by operating the wheels of a tractor or skid steer on each side of the silt fence a minimum of 2 times.

The bottom edge of the geotextile on the preassembled silt fence shall be buried at least 152 mm (**6 inches**) deep in a vertical trench and the soil pressed firmly against the embedded geotextile.

3886.3 SAMPLING AND TESTING

Samples shall be sent in for testing when the amount to be installed is 61 m (**200 foot**) or greater. Samples for testing must be submitted 21 days prior installation for testing. Equipment used for the machine sliced silt fence installation shall be approved by the Department's Agricultural Engineer.

Table 3886-1
Silt Fence

	Heavy Duty		Machine Sliced	Preassembled
Description	Composite of mesh backing, posts, geotextile, and fasteners, assembled on-site.		Machine installed geotextile fastened to posts on-site	Ready to install unit of geotextile attached to driveable posts
Geotextile				
Type	Woven		Woven monofilament*	Woven
Width	122cm (48 inches)		90cm (36 inches)	90cm (36 inches)
Grab Tensile ASTM D 4632 (machine direction)	45kg (100 lb) min.		59kg (130 lb) min.	45kg (100 lb) min.
Apparent Opening Size ASTM D 4751	.85-.212mm (# 20-70 Sieve)		.60-.425mm (# 30-40 Sieve)	(.85-.212mm (# 20-70 Sieve)
U.V. Stability ASTM D 4355, 500 hrs.	70% min.		70% min.	70% min.
Flow Rate ASTM D4491 l/min/sq.m (gal./min./sq.foot)	-- --		4074 (100)	-- --
Top Fastening Component	15cm (6 inch) overlap top of mesh backing		Salvaged Edge	Sewn-in Cord
Net Backing				
Material	Woven Wire Mesh	Plastic Mesh		
Steel Wire Gauge	14 ½ min.	-		
Max. Mesh Opening	15cm (6 inches)	50mm (2 inch)		
Min. Width	76cm (30 inches)	76cm (30 inches)		
Rope for Ditch Check				
Type			Polyethylene	
Diameter			16mm (5/8 inch) min.	
Posts				
Material	Steel T-Post		Steel T-Post with welded plate	Wood
Min. Size	1.8 kg / m (1.26 lbs./ in. feet)		1.8 kg / m (1.26 lbs./In./ ft)	50mm x 50mm (2 x 2 inch)
Min. Length	1.5m (5 feet)		1.5m (5 feet)	1.5m (5 feet)
Min. Embedment	610mm (24 inches)		610mm (24 inches)	46cm (18 inches)
Max. Spacing	2.4m (8 feet)		1.8m (6 feet), 1.2m (4 feet) for ditch checks	1.8m (6 feet)
Post Fastener	"U" shaped Clips	"U" shaped Clips	Plastic Zip Ties-22kg (50 lb.) Tensile	Gun Staples 25mm (1 inch) long
Min. Fasteners per post	3	3	3	5

* No substitutions allowed, monofilament in both directions.

3887

3887

Flotation Silt Curtain

3887.1 SCOPE

This specification covers flotation silt curtain used for containing siltation in an area of open water. The following types are provided for specified uses:

Still Water	Lakes or large bodies of water with no current
Moving Water	Streams and rivers with a current less than 2.1 m/s (7.0 foot/second)
Work Area	Moving or still water, used to confine a work area.

3887.2 REQUIREMENTS

Flotation silt curtain shall be constructed of fabric fastened to a flotation carrier and weighted along the bottom edge. Depth of curtain shall be as indicated in the Plans. Depth of curtain shall refer to the dimension of the curtain fabric extending below the flotation, i.e. hanging in the water. The flotation silt curtain shall conform to Table 3887-1. Upon completion of the work the curtain shall be removed in a manner that will prevent siltation of the water.

A Field Assembly

A1 Still Water

The curtain shall be anchored along its length with enough weight to hold it in place. The depth of the curtain shall be a minimum of 0.6 m **(2 foot)** to a maximum of 3.0 m **(10 feet)**. Installation shall be approximately 0.3 m **(1 foot)** above the bottom of the water body.

A2 Moving Water

In moving water, each anchor shall be accompanied by a buoy. The curtain shall be constructed with connecting devices at each end so that sections can be joined together. Connecting devices shall be designed to prevent silt from permeating through the connection, and at the specified strength to prevent ripping out. The curtain shall be anchored with a minimum of 136 kg **(300 pounds)** out in the waterway, a minimum of 762 m **(25 feet)** from the temporary fill.

A3 Work Area Type

The curtain shall conform to the moving water curtain found in Table 3887-1. In a moving waterway the angle out from the shore shall be 45° on both ends of the curtain. The work area being contained should extend only 1/4 of the stream width. The curtain should be extended out from the shore less than 1/3 of the stream width. The curtain shall be anchored with a minimum of 18 kg **(40 pounds)** at the maximum of 30 m **(100 feet)** intervals to secure it out from the work area.

**TABLE 3887-1
FLOTATION SILT CURTAIN REQUIREMENTS**

	TYPE	
	Still Water	Moving Water
Curtain Fabric Material Type	Impermeable vinyl-nylon laminate	Impermeable vinyl- coated nylon
Mass per square meter (yard)	0.6 kg (18 oz)	0.75 kg (22 oz)
Grab Tensile Strength ASTM D 4632 (B)	1.3 kN (300 lbs)	2.2 kN (500 lbs)
Depth of Curtain (A)	From 0.6 to 3 m (2-10 feet)	From 0.6 to 3 m (2-10 feet)
Flotation	150 mm (6 inch) diameter Marine quality expanded polystyrene	200 mm (8 inch) diameter Marine quality expanded polystyrene
Net Buoyancy, per meter (foot)	200 N (13 lbs)	300 N (20 lbs)
Top Load Carrying Components	Fabric Only	Fabric plus 8-mm (5/16 inch) galvanized steel cable 40.0 kN (9800 lb) min. break strength
Ballast, mass per meter (pound/ feet), min.	1.0 kg (0.7 lb/foot) enclosed 6-mm (1/4 inch) galvanized chain	1.6 kg (1.1 lb/foot) enclosed 8-mm (5/16) galvanized chain
Connection Between Sections	Laced grommets	Aluminum collar reinforced quick disconnects

(A) As specified in the Contract

(B) Minimum average roll value.

In moving water, each anchor shall be accompanied by a buoy. The curtain shall be constructed with connecting devices at each end so that sections can be joined together. Connecting devices shall be designed to prevent silt from permeating through the connection.

3887.3 SAMPLING AND TESTING

Material furnished under this Specification may be accepted on the basis of the manufacturer's guaranteed analysis. However, the Department reserves the right to sample, test, inspect, and accept or reject the materials based on its own tests.

3888

3888

Erosion Stabilization Mats

3888.1 SCOPE

This Specification covers permanent, long lived turf reinforcement mats to provide soil reinforcement for vegetation establishment in ditch bottoms, waterways, steep slopes, and shorelines where shear stresses are high or highly erodible soils that have frequent runoff. Various classes with different applications, varying in severity of shear stresses are as follows:

ESM Class	Application	Minimum Sustained (A) Permissible Shear Stress on Bare soil channel-1/2hr. Pa (pounds/square foot)	General Description (B)
1	Not soil filled	95 Pa (2.0 pounds/square foot)	Composite of grids & wood fiber
2	Either filled/not filled	170 Pa (3.5 pounds/square foot)	Composite of grids and coconut
3	Either filled/not filled	240 Pa (5.0 pounds/square foot)	synthetic
4	Soil filled	287 Pa (6.0 pounds/square foot)	synthetic

(A) Sustained shear for minimum 1/2 hour.

(B) Soil containment cells are required for Class 2, 3 and 4.

REQUIREMENTS

A General

Erosion stabilization mats are made of a three dimensional matrix of synthetic material and can consist partially of organic materials. Soil-filled mats should be continuously bonded at filament intersections. Filaments which are discontinuous or loosely held together by woven, unstitched or glued netting will not be permitted in this class. The soil-filled mats should have cells at least 10-19mm (3/8 -3/4 inch) in depth.

B Materials and Dimensions

Material and dimension requirements will be as indicated in the Plans.

C Staples, Pins

The staples used to anchor the Erosion Stabilization Mats shall be metal U -shaped, 11 gauge, 20cm (8 inches) in length. Metal Pins should be at least 4.7mm (3/16 inch) diameter steel with a 38mm (1.5inch) steel washer at the head of the pin, 20cm (8 inches) in length.

3888.3 APPROVED MATERIALS..... 3891

3888.4 SAMPLING AND TESTING 3886.3

3889**TEMPORARY DITCH CHECKS****3889.1 SCOPE**

This Specification covers temporary ditch checks used for slowing water velocity and temporarily containing sediment in ditch bottoms and waterways.

3889.2 REQUIREMENTS

Temporary ditch checks shall conform to the requirements for one of the following types, as specified in the contract.

Type 1 Sliced in Silt Fence

Type 1 ditch check shall meet the requirements of 3886-silt fence-machine sliced with a maximum 1.2m (**4 feet**) post spacing and a 16mm (**5/8-inch**) polyethylene rope inserted into the embedded geotextile cuff.

Type 2 BLANK**Type 3 Bioroll Blanket System**

Type 3 Ditch check shall consist of two components; straw or wood excelsior filled roll, placed on top of a category 3, specification 3885 erosion control blanket. The erosion control blanket shall be rolled out across the ditch and trenched in/on the upgrade side. The blanket shall be stapled with 200 mm (**8 inch**) staples at a spacing of 300mm (**1 foot**) on center. The Bioroll shall consist of straw or wood excelsior that has been compressed and stuffed into a polyester or plastic netting. Dimensions of each roll shall be approximately 300 mm (**12 inches**) in diameter by (**10 feet**) long.

The bioroll shall be anchored with wooden stakes. The stakes shall be nominal 50mmx 50mm (**2 x 2 inch**) cross section, at least 460 mm (**18 inches**) long and with a pointed end. Maximum spacing between the stakes shall be 600mm (**2 feet**).

Type 4 BLANK**Type 5 BLANK****Type 6 Geotextile triangular dike**

Type 6-ditch check shall be triangular shaped having a height of at least 0.20 -0.25 m (**8-10 inch**) in the center with equal sides and a 0.41-0.51 m (**16-20 inch**) base. The triangular shaped inner material shall be urethane foam. The outer cover shall be a woven geotextile fabric placed around the inner material and allowed to extend beyond both sides of the triangle 0.61-0.91 m (**2-3 feet**). Length of each section shall be 0.91-2.1 m (**3-7 feet**). Standard length shall be 2.1 m (**7 feet**) unless otherwise indicated in the plans. The geotextile of tightly abutted sections shall overlap and be stapled. The geotextile dike shall be attached to the ground with wire staples at a spacing not to exceed 300mm (**1 foot**) on center. The staples shall be No. 11 gauge wire and be 0.15-0.20 m (**6-8 inches**) in length.

3889.2

Type 7 Rock check

Type 7 ditch check shall meet the requirements of specification 3601 Class I-IV. Rock shall be placed across the ditch or waterway in a berm approximately 610mm (2 feet) high over a geotextile liner, Type IV (Spec 3733).

3889.3 Sampling and Testing

Samples for testing shall be of such size and numbers as requested by the Engineer.

3890

Compost

3890.1 SCOPE

This Specification covers compost material used as a soil amendment for landscape planting or turf establishment purposes.

3890.2 REQUIREMENTS

Compost material furnished under this Specification shall consist of a natural humus product derived from the aerobic decomposition of organic wastes. The compost shall be considered mature and usable by Mn/DOT when 60 percent decomposition has been achieved as determined by an ignition-loss analysis and any one additional test method including the Solvita test of 5 or above. This shall mean that the compost product has no offensive smell, no identifiable organic materials, and will not reheat more than 20F degrees above ambient temperature. Compost must be produced by a process to further reduce pathogens (PFRP) and weed seeds, and process verified by fecal coliform or *Salmonella* sp. Tests, where applicable. Compost foreign particle restrictions up to 3% at 4mm (0.16 inch) will apply to the shredded pieces from the plastic bags used to transport feedstocks to the composting facility, but will be considered acceptable if visible in the finished product. Biosolids as a compost additive or co-compost material shall be acceptable if product description and source is on file with MnDOT and meets all specifications for Grade 1 Compost.

Compost shall be registered for sale with the State of Minnesota. Additionally, the material shall meet the Minnesota Pollution Control Agency requirements for allowable levels of any inherent contaminants (7035.2836 Subp. 6 Sec. A), or the Code of Federal Regulations, Title 40, section 503.13(b)(3), amended for mercury. Compost must meet minimal chemical contaminant standards in order to be used in a Mn/DOT project. No material may be mixed into a compost that does not comply with Minnesota Rules Chapter 7045 (Hazardous Waste). Compost used in Mn/DOT transportation systems is not allowed to exceed 10% of the Minnesota Pollution Control Agency's Superfund residential soil cleanup guidelines, termed Soil Reference Values or SRVs (i.e. 10% of individual chemical or chemical mixture Hazard Index, Hazard Quotient, or acceptable cancer

3890.2

risk level). No chemical contaminant, including pesticides, can be present in concentrations that would result in toxic effects to soil organisms, plants, or animals which reside in or on the composted soil areas or use the treated area for food or shelter. At the time of delivery to the Project, the compost shall be in a condition considered safe for exposure to dusts during handling.

A Grade 1 Compost

Grade 1 compost for use in turf establishment shall be a nutrient rich type derived from the decomposition of animal derived material with a texture similar to a highly organic soil and meeting the following requirements:

	Min	Max
Organic Matter Content	30%	----
C/N Ratio	6:1	20:1
NPK ratios ^a	2:2:1	4:4:2
pH	5.5	8.0
Moisture Content	35%	55%
Bulk Density (lbs/yd³)	700	1600
Inert Material	----	3% @ 4mm (0.15 inch)
Soluble salts (mmhos/cm)	----	10
Germination Test ^b	80%	100%
Screened Particle Size	----	10mm (0.375 inch)
Contaminants	----	US EPA 503 ^c

^a To obtain the nitrogen, phosphorus or potassium levels specified, the compost may be fortified with commercial fertilizer.

^b Germination test must list the species of Cress or lettuce seed used.

^c or MPCA 7035.2836 Subp. 6 Sec. A.

B Grade 2 Compost

Grade 2 compost for use of as a landscape planting medium, shall be a humus rich type derived from the decomposition of leaves and yard wastes. Animal or poultry manure, at any stage of decomposition, shall not be acceptable. Texture shall be similar to a shredded peat and shall meet the following requirements:

	Min	Max
Organic Matter Content	30%	----
C/N Ratio	6:1	20:1
pH	5.5	8.5
Moisture Content	35%	55%
Bulk Density (lbs/yd³)	700	1500
Inert Material ^d	----	3% @ 4mm (0.15 inch)
Soluble salts (mmhos/cm)	----	10
Germination Test ^b	80%	100%
Screened Particle Size	----	19mm (0.75 inch)
Contaminants	----	US EPA 503 ^c

^a includes plastic bag shreds

^b Germination test must list the species of Cress or lettuce seed used.

^c or MPCA 7035.2836 Subp. 6 Sec. A.

3890.2

C Grade 3 Compost

Grade 3 compost derived from a composite of up to 10 percent of animal derived material feedstock added to leaf and yard waste feedstock by weight, meeting all requirements of Grade 1 Compost.

3890.3 APPROVED MATERIALS

Vendors approved by the Department's Turf Establishment and Erosion Prevention Unit and on file on the web under the Materials Engineering Section meet this specification requirement.

3890.32 SAMPLING AND TESTING

Compost shall be tested and approved by the Engineer prior to delivery to the Project. Prior to the Engineer sampling the product, compost vendors must furnish certification that their compost has been chemically and biologically tested and found to meet the specification standards described above. When any federal or state chemical specific requirements are conflicting, the vendor shall meet the most stringent requirement. The Department also reserves the right to conduct bioassay testing of any material.

Prospective sources shall be indicated to the Engineer at least 1 month prior to delivery to the Project in order to allow adequate time for testing and approval of the material. Material from sources approved by the Agricultural Engineer may be accepted on the basis of a certificate of compliance according to 1603. In this case, certified test reports shall be furnished prior to delivery and acceptance to the Engineer and also to the Agricultural Engineer.

All testing shall be in accordance to current standard testing procedures of the University of Minnesota Soils Testing Laboratory, Soil Science Department, or equivalent.

3891

Inlet Protection

3891.1 SCOPE

This specification covers inlet protection for controlling sedimentation into and through inlet pipes.

Inlet protection will be classified by type according to use. Type will be as indicated herein:

Type A: Inlet protection to be utilized around field inlets until permanent stabilization methods have been established. Inlet protection Type A may also be utilized on pavement inlets prior to installation of curb and gutter or pavement.

Type B: Inlet protection will be utilized on street inlets without curb heads.

3893.1

Type C: Inlet protection will be utilized on street inlets with curb heads.

Type D: Inlet protection to be utilized at culvert inlets until permanent stabilization methods have been established.

3891.2 REQUIREMENTS

Materials and dimension requirements will be as indicated in the Plans.

3891.3 APPROVED MATERIALS

Devices approved by the Departments Turf Establishment and Erosion Prevention Unit and on file on the web under the Materials Engineering Section can be furnished as meeting this specification requirement.

3891.4 SAMPLING AND TESTING

Sampling and testing samples shall be furnished in the size and number directed by the Engineer.

3892

Temporary Down drain

3892.1 SCOPE

This Specification covers material used as a temporary Down drain to convey drainage down a slope while turf is establishing.

3892.2 REQUIREMENTS

Temporary Down drain shall consist of a 250 mm (**10 inch**) minimum diameter corrugated polyethylene tubing (PE). The corrugated polyethylene tubing shall be nonperforated and shall comply with AASHTO M 252.

The Down drain shall be anchored with stakes. The stakes shall be nominal 50 x 50 mm (**2 x 2 inch**) cross-section, at least 1 m (**3feet**) long, and with a pointed end. Maximum spacing between the stake installations shall be 2.5 m (**8 feet**).

3892.3 SAMPLING AND TESTING

Samples for testing shall be of such size and numbers as requested by the Engineer.

3893

Sandbags

3893.1 SCOPE

This Specification covers material used for sandbags to dike off construction areas or to serve as temporary erosion control installations.

3893.2

3893.2 REQUIREMENTS

Sandbags shall consist of a woven polypropylene fabric sewn together with double stitching. The polypropylene fabric shall meet or exceed the following:

Grab Tensile Strength

ASTM D 4632 420 N, min.

UV Stability

ASTM D 4355 70% min.

Overall size of the sandbag shall be at least 350 x 650 mm(**14 x 26 inch**).

3893.3 SAMPLING AND TESTING

Samples for testing shall be of such size and numbers as requested by the Engineer.

3894

Sediment Mat

3894.1 SCOPE

This Specification covers a sediment absorbing biodegradable mat temporarily placed in a stream bed to intercept and retain sediment caused by in-stream construction activities.

3894.2 REQUIREMENTS

The sediment mat shall consist of a flat pad that can be laid out singly or grouped together. The pad shall be composed of a bottom layer of burlap, a center core of wood excelsior fiber blanket and an upper layer of jute netting. The burlap shall be a construction grade 280 g (**10oz.**) mass fabric. The wood excelsior fiber center core shall be approximately 25 mm (**1inch**) thick and shall have a mass of at least 0.50 kg (**1 lb.**) per square meter(**yd.**). The jute netting shall be a construction grade having a mass of at least 0.50 kg(**1 lb.**) per square meter (**yd.**) with approximately 25 mm(**1 inch**) openings. The pad shall be stitched together along the edges and through the center to prevent movement of the layers in relation to each other. Overall size of each pad shall be approximately 1.2 x 3.0 m (**4 x 10 feet**) with an overall mass of approximately 11 kg (**24 lbs.**).

3894.3 SAMPLING AND TESTING

Samples for testing shall be of such size and numbers as requested by the Engineer.

3895

Fiber Log

3895.1 SCOPE

This Specification covers fiber logs used to stabilize shorelines and to facilitate the establishment of vegetation.

3896.2

3895.2 REQUIREMENTS

The fiber log shall consist of natural coconut fibers (coir) that have been compressed and stuffed into a netting. Dimensions of the log shall be approximately 300 mm (**12 inch**) in diameter. Mass of the log shall be no less than 11 kg/meter (**7.4lbs./foot**). The outer netting shall consist of coir yarn. Service life shall be a minimum of 5 years.

3895.3 SAMPLING AND TESTING

Samples for testing shall be of such size and numbers as requested by the Engineer.

3896

Soil and Root Additives

3896.1 SCOPE

This specification covers additives for improving soil or root stock to ease transplanting, stimulate growth and improve the health of plant stock or seed.

3896.2 REQUIREMENTS

Additives shall conform to the requirements for one or more of the following, as specified in the Contract:

A Plant Hormones

Rooting hormone powder or liquid, used to stimulate rooting of plant cuttings, bare root stock and perennial plant material, shall contain known root hormones including any of the following: indole-3-butyric acid (IBA) indole acetic acid (IAA) or cytokinins. The inert ingredients shall not be harmful to the environment. Pre-mixed liquid forms must be handled and mixed according to the manufacturer's recommendations. This material may be tank mixed or pre-blended with hydrophilic polymers and endomycorrhizal inoculum.

B Hydrophilic Polymers

Super-absorbent polymer or hydrophilic compound, used to modify physical characteristics of soils to manage soil air and water, shall be an organic and fully biodegradable cross-linked polymer or other hydroscopic compound with water-binding groups and shall consist of potassium polyacrylate/polyacrylamide copolymer, sugar alcohols, polysaccharides, humates, alpha-hydroxypropionic acid or other documented hydrophilic compound. The product shall have a

3896.2

minimum life span of 60 days in the soil. Application rate shall be in accordance to manufacturer's recommendations for new plantings. This material may be mixed or pre-blended with rooting hormones and mycorrhizal treatments.

C Mycorrhizal Inoculum

C1 Endomycorrhizal Inoculum

Endomycorrhizal inoculum, microorganisms symbiotic with, and beneficial to plant roots, shall contain several species of *Glomus* that can be applied to the soil or base of a plant as a liquid, powder, or pellet. Minnesota origin of inocula is preferred. Additional endomycorrhizal species of *Gigaspora*, *Scutellospora*, *Entrophospora*, *Acaulospora*, or *Sclerocystis* may also be present. The Inoculum will not be rejected if ectomycorrhizal species of *Pisolithus* or *Rhizopogon* are present. The inoculum shall have a defined live spore count and shall be applied according to the manufacturer's recommendations for new plantings. Antagonistic pathogens shall not be present above trace levels. This material may be mixed or pre-blended with hydrophilic polymers and rooting hormones.

C2 Ectomycorrhizal Inoculum

Ectomycorrhizal inoculum, microorganisms symbiotic with, and beneficial to plant roots, shall contain *Rhizopogon* and or other cold tolerant species that can be applied to the soil or base of a plant as a liquid, powder, or pellet. Minnesota origin of inocula is preferred. The inoculum shall have a defined live spore count and shall be applied according to the manufacturer's recommendations for new plantings. Antagonistic pathogens shall not be present above trace levels. This material may be mixed or pre-blended with hydrophilic polymers and rooting hormones.

3896.3 SAMPLING AND TESTING

Product data sheet, research tests and Material Safety Data Sheet shall be submitted to the Project Engineer for approval prior to delivery and use on the project.

3902**Form Coating Material****3902.1 SCOPE**

This Specification covers coating material that will prevent bonding between a form, dowel, or other object and concrete.

3902.2 REQUIREMENTS

The form coating material shall meet the following requirements and also be approved by the Concrete Engineer. The form coating material shall be a chemical release agent containing no ordinary lubrication oil, conventional form oil, fuel oil, or kerosene. The form coating material shall prevent bonding to concrete; shall not penetrate, stain, or leave a residual film on the concrete surface; and shall not attract dirt or other deleterious matter.

The form coating material shall be applied at a rate recommended by the manufacturer that will provide a smooth surface free of dusting action caused by reactions of the chemical release agent.

The flash point of the chemical release agent shall be not less than 65°C (149°F).

3902.3 SAMPLING AND TESTING**A Sampling**

Samples for testing shall be of such size and numbers as requested by the Engineer.

B Testing

Flash Point ASTM D 92

3906**Water for Concrete and Mortar****3906.1 SCOPE**

This Specification covers water for use in Portland cement concrete and mortar.

3906.2 REQUIREMENTS

Water for use in mortar or concrete shall be subject to the approval of the Engineer. It shall not be salty or brackish and shall be reasonably clear and free from oil, acid, injurious alkali or vegetable matter.

When comparative tests are made with a water of known satisfactory quality, any indication of unsoundness, marked change in time of setting, or a reduction of more than 10 percent in mortar strength shall be sufficient cause for rejection of the water under test.

3906.3 SAMPLING AND TESTING

When required by the Engineer, the quality of the water shall be determined in accordance with AASHTO T 26.

3906.3

In sampling water for testing, care shall be taken that the containers are clean and that samples are representative.

3910

Salt (Sodium Chloride)

3910.1 SCOPE

This Specification covers salt (sodium chloride) to be used for road purposes.

3910.2 REQUIREMENTS

The quality and grading of the salt shall conform to ASTM D 632 for Type 1, Grade 1 material. At the time of delivery to the Department, the salt shall not contain more than 1.5 percent moisture, and it shall be free flowing and free of lumps, aggregations and foreign matter.

3910.3 SAMPLING AND TESTING

A Sampling

The Department reserves the right to sample and inspect the salt at the Contractor's unloading and storage facilities or at the point of delivery to the Department.

B Testing

The chemical analysis for determination of sodium chloride content shall be made in accordance with the Rapid Method of Test for Sodium Chloride, as published in the Appendix to ASTM D 632.

3911

Calcium Chloride

3911.1 SCOPE

This Specification covers liquid and solid calcium chloride for use in dust control, ice control, accelerating the hardening of concrete and other purposes.

3911.2 GENERAL REQUIREMENTS

Calcium chloride shall be in liquid or solid form, as specified in the Contract, and shall conform to AASHTO M 144 for the type and grade specified. Unless otherwise authorized, liquid calcium chloride shall contain a minimum of 38 percent, by mass (weight), anhydrous CaCl₂. The solution shall be clear and free of solid matter.

3911.3 SAMPLING AND TESTING

Sampling shall be according to AASHTO T 143. Calcium chloride shall be sampled at the rate of one 1 kg (**2 pounds**) sample of solid material and 0.5 L (**1 pint**) of liquid material for each shipment or lot. Sample containers shall be well sealed plastic jars.

3917.1

Calcium chloride shall be tested using the appropriate procedures of AASHTO T 143 or ASTM E 449.

3912

Magnesium Chloride Solution

3912.1 SCOPE

This Specification covers magnesium chloride solution used for dust control.

3912.2 REQUIREMENTS

A General

The magnesium chloride solution shall be water clear, thoroughly mixed, free from any solid matter or deleterious substances. The solution solids shall consist primarily of magnesium chloride.

B Chemical Composition

Magnesium chloride, anhydrous, percent minimum	28.0
Sulfate, as SO ₄ , percent maximum	3.5
Alkali chlorides, as NaCl, percent maximum	5.0

3912.3 SAMPLING AND TESTING

A Sampling..... AASHTO T 143

Magnesium chloride shall be sampled at the rate of 0.5 L (**1 pint**) sample per load. Sampling procedure shall be according to ASTM D 345. Sampling containers shall be well sealed plastic jars.

B Testing

Magnesium chloride, MgCl ₂	ASTM E 449 Modified (A)
Sulfate SO ₄	Gravimetric precipitation with BaCl ₂
Alkali chlorides	ASTM E 449 (or flame emission)

(A) Procedure for EDTA titration of calcium modified to determine magnesium using alpha-hydroxynaphthol blue.

ASTM E 449 Section 12.3 - add approximately 10 g ammonium chloride to final titrating solution and make basic by adding 40 ml concentrated NH₄OH in place of NaOH. Standardize EDTA and calculate results for MgCl₂.

3917

Concrete Treating Oil

3917.1 SCOPE

This Specification covers two types of mixtures to be applied as a protective coating on concrete. Unless otherwise specified, the type used shall be optional with the Contractor.

3917.2

3917.2 REQUIREMENTS

A Type I

Type I concrete treating oil shall consist of a mixture of equal parts, by volume, of:

- (a) Mineral spirits conforming to ASTM D 235.
- (b) Neutral petroleum oil (plain) having a viscosity of 75-100 SUS at 38°C (100°F).

B Type II

Type II concrete treating oil shall consist of a mixture of boiled linseed oil and petroleum spirits conforming to AASHTO M 233.

3917.3 SAMPLING AND TESTING

- A Sampling and testing boiled linseed oil.....ASTM D 260**
- B Tests for mineral spiritsASTM D 235**
- C Sampling petroleum products.....ASTM D 4057**
- D Viscosity.....ASTM D 445**

- 3902 Form Coating Material 1**
- 3906 Water for Concrete and Mortar..... 1**
- 3911 Calcium Chloride..... 2**

3973
Buried Cable Signs

3973.1 SCOPE

This Specification covers the buried cable signs used to mark the route of underground fiberoptic cables.

3973.2 REQUIREMENTS

Install the ground mounted signs to 3.8 kg/m (**2.6 pounds per foot**) galvanized steel fence posts that comply with 3401. Use stainless steel bands and fittings when installing the signal mounted signs to the RCS.

The aluminum signs shall comply with 3352, 2564, the Contract detail and with the Mn/DOT Standard Signs Manual. The sign is 150 mm wide x 300 mm high (**6 x 12 inches**), with black legend on a non-reflective yellow face and complies with Department standards. The Engineer must approve the sign design before they are procured by the contractor.

A Buried Cable Sign

The sign is aluminum, 200 mm wide x 300 mm high (**8 x 12 inches**), with black legend silk screened on a yellow face, complying with the Mn/DOT Standard Signs Manuals.

The sign legend is:

CAUTION	(line 1)
BURIED FIBER	(line 2)
OPTIC CABLE	(line 3)
BEFORE DIGGING CALL	(line 4)
GOPHER STATE ONE CALL	(line 5)
612.454.0002	(line 6)
Mn/DOT LOGO	(line 7)

B Legend Size

The legend size is: The first line has 40 mm (**1.575 inch**) yellow characters centered on a black 50 mm x 180 mm (**2 x 7 inch**) background. The second has 30 mm (**1.18 inch**) black characters, third and fourth 20 mm (**0.75 inch**), fifth 15 mm (**0.59 inch**), and the sixth 25 mm (**1.0 inch**).

The logo is a 40 mm (**1.575 inch**) diameter circle with a white background. The blue letters "MINNESOTA DEPARTMENT OF TRANSPORTATION" are in margin of the circle. The left half of the logo inside the margin has a silhouette of the left one half of a coniferous tree on a green foreground. The right half of the logo inside the margin has a five point star silhouette inside a blue foreground.

3973.2

C Sign Placement

Place the signs less than 220 m (**722 feet**) apart, and at each change of direction, along the route of direct buried fiberoptic cable.

3973.3 TESTING 2550

END