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DIVISION 2100
MATERIALS FOR ROADSIDE IMPROVEMENTS

SECTION 2101

TOPSOIL

2101.1 DESCRIPTION

This specification covers the material requirements for topsoil.

2101.2 REQUIREMENTS

Topsoil is the top six inches of field or pasture loam and has a good supply of humus along with a high degree of fertility. Good topsoil has a loose crumbly structure.

- Topsoil handled too wet or soggy are not acceptable.
- Soils from ditch bottoms, drained ponds or eroded areas are not acceptable.
- Soils supporting growth of noxious weeds, as defined by The Kansas Seed Law, or undesirable weeds, are not acceptable.

2101.3 TEST METHODS

None Specified.

2101.4 PREQUALIFICATION

None Specified.

2101.5 BASIS OF ACCEPTANCE

Visual inspection by the Engineer for compliance with this specification.

SECTION 2102

PLANTS

2102.1 DESCRIPTION

Material requirements for Plants.

2102.2 REQUIREMENTS

a. General.

(1) Referenced Specifications and Standards:

(a) DataScape Guide to Commercial Nomenclature, latest edition, American Nurseryman Publishing Co.

(b) American Standard for Nursery Stock, latest edition, American National Standards Institute, Inc.: ANSI Z60.1

(2) Quality and Size. Provide plants that comply with all applicable portions of ANSI Z60.1. Only plants free of noxious weeds, insect infestations, mechanical injury, diseases, or defects are acceptable for use under this specification. Plant growth is to be vigorous, symmetrical and typical for the species.

Provide the minimum acceptable size specified in the Contract Documents, measured before pruning and with branches in normal position. Larger plants may be substituted, at no change in the Contract unit price, if approved by the Engineer.

(3) Container Plants. Container grown nursery plants may be substituted for balled and burlapped plants if approved by the Engineer.

(4) Inspection of Plants. Plants must comply with any permits, certifications or inspections required by State, Federal or other authorities. Inspection by the Engineer of all plants may be done at any time before final planting. Immediately remove rejected plants from the project site.

Identify the plant's genus, species, cultivar and common name with a tag attached to each plant or attached randomly in groups of smaller plants.

Plants held in storage will be rejected if they show signs of shriveled and dry tops or roots, or if the plant has new growth that developed while in storage. Move deciduous plants from the nursery field before leaf buds have opened. Deciduous plants moved after leaf buds have opened will be rejected, unless written approval is provided by the Engineer.

b. Balled and Burlapped Plants (B & B). Balls must be firm, natural and completely wrapped with jute, flax or hemp burlap. Do not wrap using plastic or polyethylene fabric wrapping. Secure the burlap with rope, twine or wire to hold the ball in a firm, rigid condition. Balls that are crushed, deformed or broken will be rejected. Only nursery stock that has been harvested during the current planting season is acceptable.

The Engineer may accept plants with root balls smaller than specified if the plants were grown in "root control, in-ground containers." Remove the fabric bag for root controlled plants and secure the earth ball with burlap before planting.

c. Container Plants. Provide only plants grown in the container for a minimum of 4 months. When the plant is removed from the container for planting, the soil mixture must remain intact with the root system reaching the sides of the container. Do not use plants with a heavy, twisted root mass circling the bottom of the container.

d. Bare Root Plants. Provide nursery grown plants with well branched root systems which are characteristic of the species presented. Saturate the root system with an anti-transpirant gel or treat with acrylates and protect from moisture loss with a suitable covering.

e. Transplanting Established Materials. All established trees, shrubs, and other plants on a project that are to be transplanted are indicated in the Contract Documents. The method of moving will be shown, such as B & B. Use the ball and burlap method when transplanting out of season or when the plants are leafed out. B & B is always used when transplanting evergreen plants.

During the planting season, small plants and trees, 2 inch caliper or less, may be transplanted "bare-root." Exceptions to "bare root" planting are shown in the Contract Documents. When transplanting "bare root," dig the plant with a root spread ⅓ greater than that required for nursery grown plants of the same type, kind and size.

f. Native or Collected Plants. When collected plants are to be supplied, notify the Engineer not less than 5 days before beginning to dig. Dig only inspected and approved plants. The "bare root" requirements of **subsection 2102.2 e**. will apply.

g. Anti-Desiccant (Anti-Transpirant). Treat all evergreens or plants in partial or total leaf with an anti-desiccant at the nursery before digging or in the case of potted plants, before delivery. A certification of treatment by the nursery or the treating agency is to accompany the treated plants. Treat all deciduous plants that break dormancy after delivery but before planting. Apply the polyvinyl chloride complex liquid by dipping or spraying according to the manufacturer's recommendation.

2102.3 TEST METHODS

None Specified.

2102.4 PREQUALIFICATION

None Required.

2102.5 BASIS OF ACCEPTANCE

a. Initial Acceptance. Visual inspection and measurement of plants by the Engineer and compliance with all applicable provisions of this Section. Additionally, provide the Engineer with the certificate of treatment for plants treated with an anti-desiccant.

b. Final Acceptance. Compliance with the "plant establishment" provisions of **DIVISION 900.**

SECTION 2103

SEEDS

2103.1 DESCRIPTION

This specification covers the material requirements for seeds.

2103.2 REQUIREMENTS

a. General. Provide seeds which comply with the seed and noxious weed laws of the State of Kansas and applicable Kansas Department of Agriculture Rules and Regulations except as specifically noted in this Section**.**

Do not provide Sericea Lespedeza and Multiflora Rose with any seed.

b. Seed Quality and Definitions. Conduct all seed analyses in accordance with rules and regulations as prescribed by the Association of Official Seed Analysts (AOSA) and Kansas Seed Law. The Kansas Seed Law specifies the kind and amount of weed seed permitted; the requirement for a current analysis report; and labeling of all seed to show its purity, germination, date of last germination test, and weed seed content.

Cleaning and conditioning of seed must result in a product that meets or exceeds minimum standards. The product must also be clean enough to plant using existing drilling equipment without further processing.

(1) Kansas Seed Law. The germination test is valid for 9 months after the end of the month the test was made, so long as the seed remains in Kansas.

(2) Federal Seed Law. For seed shipped across state lines, the germination test is valid for 5 months after the end of the month the test was made.

(3) Interpretation of Current Analysis Report. For seed purchased during the valid period of the germination test, the analysis report may be considered current for the full seeding period in effect at the time of purchase. (If seed is purchased March 1, and the valid date expires March 31, the analysis report may be considered current if the seed is planted by April 30, which is the end of the spring seeding period. If the seed is to be planted during a later seeding season, a new germination test is required.) This interpretation may be amended by the Engineer for those projects in which KDOT delayed seeding to a later seeding season. In these situations the seed need not be retested only for the next season.

c. Pure Live Seed (PLS) Requirements and Determination. Compute percent pure live seed (%PLS) by adding percent germination to percent firm or hard seed. Divide the sum by 100. Multiply this product by the percent purity.

$$\% \text{ PLS} = \frac{(\% \text{ Germ.} + \% \text{ Firm or Hard Seed}) \times \%\text{Purity}}{100}$$

Minimum PLS requirements are shown in **TABLES 2103-1** and **2103-2.** The Engineer may grant permission to use seeds that fail to comply with the required PLS provided the following conditions are met.

(1) The Contractor can provide suitable evidence to the Engineer that seeds comply with **TABLE 2103-1** or **2103-2** are not readily available.

(2) The Contractor is willing to increase the quantity of seeds, at no additional cost to KDOT, to provide the minimum quantity of PLS required.

d. Origin of Seed. Where named or numbered strains are not available, use of seed from native stands is permitted if the seed is harvested within range of its planting location not to exceed:

(1) 300 miles south, 150 miles north or west and 1500 feet in higher elevation.

(2) Native seed sources must be identified as to state and county where seed was harvested in order to certify location and elevation.

e. Buffalo Grass Seed (Buchloe dactyloides). Buffalo grass seed may be an improved strain, hybrid or named variety as specified on the Contract Documents. Stain with a dye. Treat all buffalo grass seed to enhance germination.

f. Bulk Seed Determination. Determine the amount of bulk seed needed for each bid item based on PLS requirements and the following formula:

$$\text{Total Bulk Mass} = \frac{\text{Bid Item PLS Plan Quantity}}{\%\ \text{PLS}}$$

2103.3 TEST METHODS

As prescribed by the AOSA and The Kansas Seed Law.

2103.4 PREQUALIFICATION

None Required. Seed supplier must follow all registration and licensing requirements stated in The Kansas Seed Law.

2103.5 BASIS OF ACCEPTANCE

The Engineer will accept each seed shipment to a project work site based on the following:

a. Receipt of a copy of the seed supplier's "Kansas Seed Law Business Registration" certificate.

b. Receipt and approval of a certification from the seed supplier stating the compliance of the supplied seed with this specification and The Kansas Seed Law.

c. Verification that each seed container is labeled as required by The Kansas Seed Law.

d. Verification of compliance with the minimum required % PLS as stated in **TABLE 2103-1** and **2103-2.**

TABLE 2103-1: GRASS SEED

Bid Item	Minimum % PLS
Bluegrass, Kentucky	64.0
Bluestem, Big (Kaw)	35.0
Bluestem, Little (Aldous)	28.0
Bluestem, Sand (Garden)	35.0
Bromegrass, Smooth	72.0
Buffalograss (Sharp's Improved)	72.0
Canarygrass,(Reed)	63.0
Dropseed, Sand	57.0
Fescue, Tall, (K-31), (Rebel II)	80.0
Foxtail, Creeping (Garrison)	60.0
Grama, Blue (Lovington)	21.0
Grama, Sideoats (El Reno)	35.0
Indiangrass (Osage)	42.0
Lovegrass, Sand (Bend)	58.0
Millet, Foxtail	77.0
Ryegrass, Perennial	83.0
Sacaton, Alkali (Salado)	57.0
Sandreed, Big	15.0
Sandreed, Prairie	28.0
Sudangrass	76.0
Switchgrass (Blackwell)(Kanlow)	81.0
Timothy	76.0
Wheatgrass, Intermediate	72.0
Wheatgrass, Streambank (Sodar)	63.0

TABLE 2103-1: GRASS SEED	
Bid Item	**Minimum % PLS**
Wheatgrass, Western (Barton)	60.0
Wheat x Wheatgrass Hybrid (Regreen)(TM)	85.0
Wild-rye, Canada	**
Ryegrass, Common	83.0
Ryegrass, Italian	83.0

** No Industry Standard

TABLE 2103-2: WILDFLOWER SEED		
Common Name	**Bid Item**	**Minimum % PLS**
Golden yarrow	Achillea filipendulina	**
Yarrow	Achillea millefolium	68.0
Red yarrow	Achillea millefolium f. rubra	**
Lead-plant	Amorpha canescens*	**
False-indigo	Amorpha fruticosa*	**
Swamp milkweed	Asclepias incarnata	**
Common milkweed	Asclepias syriaca	**
Butterfly milkweed	Asclepias tuberosa	**
Drummond's aster	Aster drummondii	**
Fendler's aster	Aster fendleri	**
New England aster	Aster novae-angliae	**
Aromatic aster	Aster oblongifolius	**
Azure aster	Aster oolentangiensis	**
Single-stemmed bog aster	Aster paludosus subsp. hemisphericus	**
	Aster patens var. patentissimus	**
Willowleaf aster	Aster praealtus var. praealtus	**
Silky aster	Aster sericeus	**
Blue false-indigo	Baptisia australis var. minor*	**
Plains wild-indigo	Baptisia bracteata var. glabrescens	**
Purple poppy-mallow	Callirhoe involucrata	**
Showy partridge-pea	Cassia chamaecrista*	**
Indian paintbrush	Castilleja coccinea	**
Citron paintbrush	Castilleja purpurea var. citrina	**
Downy paintbrush	Castilleja sessiliflora	**
Cornflower	Centaurea cyanus	80.0
Ox-eye daisy	Chrysanthemum leucanthemum	78.0
Chicory	Cichorium intybus	83.0
Bigflower coreopsis	Coreopsis grandiflora	**
Lance-leaved coreopsis	Coreopsis lanceolata	71.0
Plains coreopsis	Coreopsis tinctoria	83.0
Rough-leaf dogwood	Cornus drummondii	**
Gray dogwood	Cornus foemina	**
Crownvetch	Coronilla varia*	**
Cosmos	Cosmos bipinnatus	76.0
Golden prairie-clover	Dalea aurea*	**
White prairie-clover	Dalea candida*	**
Nine-anther prairie-clover	Dalea enneandra*	**
Round-head prairie-clover	Dalea multiflora*	**
Kaneb purple prairie-clover	Dalea purpurea 'Kaneb'*	58.0
Silky prairie-clover	Dalea villosa*	**
Illinois bundleflower	Desmanthus illinoensis*	**
Shooting star	Dodecatheon meadia	**

TABLE 2103-2: WILDFLOWER SEED		
Common Name	**Bid Item**	**Minimum % PLS**
Purple coneflower	Echinacea angustifolia	**
Pale coneflower	Echinacea pallida	**
Englemann's daisy	Engelmannia pinnatifida	**
Button snakeroot	Eryngium yuccifolium	**
Tall joe-pye weed	Eupatorium altissimum	**
Joe-pye weed	Eupatorium maculatum var. bruneri	**
Boneset	Eupatorium perfoliatum	**
Sweet joe-pye weed	Eupatorium purpureum	**
Indian blanket flower	Gaillardia pulchella	63.0
Prairie gentian	Gentiana puberulenta	**
Snakeweed	Gutierrezia sarothrae	**
Maximilian sunflower	Helianthus maximilianii	**
Dame's rocket	Hesperis matronalis	83.0
Bush morning-glory	Ipomoea leptophylla	**
Perennial Sweetpea	Lathyrus latifolius*	**
Round-head lespedeza	Lespedeza capitata*	**
Rough gayfeather	Liatris aspera	**
Dotted gayfeather	Liatris punctata	**
Eureka thickspike gayfeather	Liatris pycnostachya 'Eureka'	**
Cardinal flower	Lobelia cardinalis	**
Indian-tobacco	Lobelia inflata	**
Blue cardinal flower	Lobelia siphilitica	**
Palespike lobelia	Lobelia spicata	**
Bird's foot trefoil	Lotus corniculatus*	80.0
Tahoka daisy	Machaeranthera tanacetifolia	**
Black-foot daisy	Melampodium leucanthum	**
Wild bergamot	Monarda fistulosa var. fistulosa	**
Missouri eveningprimrose	Oenothera macrocarpa	73.0
White eveningprimrose	Oenothera speciosa	58.0
White beardtongue	Penstemon albidus	**
Buckley's penstemon	Penstemon buckleyi	**
Cobaea penstemon	Penstemon cobaea	**
Large beardtongue	Penstemon grandiflorus	**
Tube penstemon	Penstemon tubaeflorus	**
Blue phlox	Phlox divaricata subsp. laphamii	**
Prairie phlox	Phlox pilosa subsp. fulgida	**
Prairie phlox	Phlox pilosa subsp. pilosa	**
White milkwort	Polygala alba	**
Blood polygala	Polygala sanguinea	**
Sand cherry	Prunus pumila var. besseyi	**
Upright prairieconeflower	Ratibida columnifera	76.0
Mexican hat prairieconeflower	Ratibida columnifera f. pulcherrima	76.0
Grayhead prairieconeflower	Ratibida pinnata	76.0
Sunglow prairieconeflower	Ratibida pinnata 'Sunglow'	**
Black-eyed susan	Rudbeckia hirta	78.0
Brown-eyed susan	Rudbeckia triloba var. triloba	**
Nekan blue sage	Salvia azurea 'Nekan'	**
Lance-leaved sage	Salvia reflexa	**
Catclaw sensitive brier	Schrankia nuttallii	**
Compass plant	Silphium laciniatum	**
Cup plant	Silphium perfoliatum	**

TABLE 2103-2: WILDFLOWER SEED		
Common Name	**Bid Item**	**Minimum % PLS**
Prairie goldenrod	Solidago missouriensis var. fasciculata	**
Rigid goldenrod	Solidago rigida var. rigida	**
Red false-mallow	Sphaeralcea coccinea	**
Prince's plume	Stanleya pinnata var. pinnata	**
Rockpink flameflower	Talinum calycinum	**
Prairie flameflower	Talinum parviflorum	**
Bracted spiderwort	Tradescantia bracteata	**
Prairie spiderwort	Tradescantia occidentalis	**
Ohio spiderwort	Tradescantia ohiensis	**
Shortstem spiderwort	Tradescantia tharpii	**
White clover	Trifolium repens*	**
Venus'looking glass	Triodanis perfoliata	**
Moth mullein	Verbascum blattaria	**
Dakota vervain	Verbena bipinnatifida	**
Rose vervain	Verbena canadensis	**
Hoary vervain	Verbena stricta	**
Arkansas ironweed	Vernonia arkansana	**
Western ironweed	Vernonia baldwinii subsp. interior	**
Western ironweed	Vernonia fasciculata subsp. fasciculate	**
Rocky Mountain zinnia	Zinnia grandiflora	**

*Inoculate legume seeds with their specific nitrogen fixing bacteria listed in **TABLE 2103-3** and in accordance with **SECTION 2106.**

** No Industry Standard

TABLE 2103-3: NITROGEN FIXING BACTERIA			
Genus	**Inoculant**	**Genus**	**Inoculant**
Amorpha	Amorpha Spec 1	Desmanthus	Desmanthus Spec 1
Baptisia	Baptisia Spec 1	Lathyrus	Type C
Cassia	Type EL	Lespedeza	Type EL
Dalea	UMR6815		

SECTION 2104

SODS

2104.1 DESCRIPTION

This specification covers the material requirements for various types of sod.

2104.2 REQUIREMENTS

a. General. Cut the sod uniformly and according to the industry standard for the kind of sod being supplied. Torn, broken, or dry sod is not acceptable. The sod must be strong enough to hold together when rolled and unrolled 3 times; reinforcement netting may be added to sod.

Sods containing noxious weeds or quantities of foreign grass will not be accepted. Do not furnish sod containing orchard grass, crabgrass, wiregrass (barnyard Bermuda), giant foxtail, bindweed or yellow nut sedge.

b. Kentucky Bluegrass Sod. Cut sod strips approximately 1 inch thick, 24 inches wide, and 54 inches long, or in similar dimensions that will produce 1 sq yd. Other dimensions may be approved by the DME.

c. Bermuda Grass or Zoysia Grass Sod, Plugs or Strips. Cut this sod approximately 3 inches thick and 12 to 14inches wide. Further division into plugs is to be done at the planting site.

d. Turf Type Tall Fescue Sod. Cut the sod strips 1¼ in. thick (±¼ in.), approximately 18 inches wide and 72 inches long, or in similar dimensions that will produce 1 sq yd. Sod content equal to approximately 60% of one or more hybrid varieties of turf type tall fescue and 40% Kentucky bluegrass is required.

e. Perennial Wildflower Sod. Cut wildflower sod in pads 20 inches wide and 36 inches long, or some similar measurements that will produce 5 square feet and weighing approximately 15 lbs. Provide sod pads composed of densely packed, 3 inches tall perennial wild flower plants with well developed root systems. Provide plants mature enough to bloom within 6 to 8 weeks after planting. Sod containing a minimum of 11 varieties of hardy perennial plants, including: Black-Eyed Susan, Purple Coneflower, Dame's Rocket, Gaillardia, Johnny Jump-Up, Shasta Daisy, Rockcress, and Wallflower is required. Do not allow any grasses in the sod. Use a net-like fabric to allow handling of the sod pads.

f. Buffalograss Sod. Cut the sod strips 1 ¼ inches thick, 18 inches wide and 72 inches long, or in similar dimensions that will produce 1square yard. Provide sod containing a minimum of 95% buffalograss.

2104.3 TEST METHODS

None Specified.

2104.4 PREQUALIFICATION

None Required.

2104.5 BASIS OF ACCEPTANCE

Visual inspection by the Engineer.

SECTION 2105

SOIL COMPOST

2105.1 DESCRIPTION

This specification covers the material requirements of soil compost for use in planting trees, shrubs and other plant materials.

2105.2 REQUIREMENTS

Provide compost suitable for general gardening, soil incorporation and plant backfill.

The Kansas Department of Health and Environment, Bureau of Waste Management, Topeka, Kansas maintains a current list of Kansas Permitted Composting Facilities. Provide compost from a Kansas Permitted Composting Facility that complies with **TABLE 2105-1**.

TABLE 2105-1: SOIL COMPOST REQUIREMENTS

Parameters	Range
#1 PH	6.0 - 7.5
#2 Soluble Salts	5 ds (mmhos/cm) or below
#3 Nutrient Content (dry weight basis)	N .8% or above, P 1% or above
#4 Bulk Density	28 to 35 lbs/cu ft (450 to 560 kg/m³)
#5 Moisture Content	30 - 40%
#6 Organic Matter Content	>35% of dry weight
#7 Particle Size	pass through a ½ inch or smaller screen
#8 Stability (Maturity)	#6 or #7 (Solvita Compost Maturity Test)

Cover compost after processing at the composting site, during transport and at the project site.

Conduct the tests a maximum of 4 weeks before the compost is delivered to the project.

Provide testing results for Parameters #1 through #7 from testing conducted by Servi-Tech, Inc., Dodge City, Kansas. The Environmental Scientist will consider other testing facilities, at the Contractor's request.

Conduct the testing for Parameter #8 using a Solvita Compost Maturity Test kit. The Solvita Compost Maturity Test kit may be obtained from Woods End Research Laboratory, Inc.

Submit the results of tests conducted on the compost for Parameters #1 through #8 and a sample of the compost (one 5 pound sealed plastic bag) to the Bureau of Right of Way, Environmental Services Section before the compost is incorporated into the project.

The Environmental Scientist will visually inspect the compost sample to determine the absence of man-made materials, such as glass and plastic.

2105.3 TEST METHODS

None Specified.

2105.4 PREQUALIFICATION

None Required.

2105.5 BASIS OF ACCEPTANCE

Approval of the required tests results by the KDOT Environmental Scientist and visual inspection of the container label to verify compliance with this Section.

SECTION 2106

NITROGEN FIXING BACTERIA

2106.1 DESCRIPTION

This specification covers the requirements for nitrogen fixing bacteria.

2106.2 REQUIREMENTS

a. General. Inoculation media containing live nitrogen fixing bacteria of the correct "culture" is be supplied with all legume seeds. Each kind of legume seed has a "culture" of bacteria that is adapted to it. Plant the leguminous seeds as soon as possible after inoculation.

b. Packaging. Supply nitrogen fixing bacteria in containers of a size sufficient to treat the amount of seed to be planted. Treat the seed according to the directions on the container. Use only dated media and only within the date period listed.

2106.3 TEST METHODS

None Specified.

2106.4 PREQUALIFICATION

None Required.

2106.5 BASIS OF ACCEPTANCE

Visual inspection of the container label to verify that the bacteria is of the proper culture, supplied in the proper quantity and properly dated.

SECTION 2107

AGRICULTURAL LIMESTONE

2107.1 DESCRIPTION

This specification covers material requirements for agricultural limestone.

2107.2 REQUIREMENTS

Use ground limestone, ground dolomite or a mixture of the two having an effective calcium carbonate (E.C.C.) value of at least 50%. The E.C.C. value is calculated as follows:

E.C.C = (AB) X Calcium Carbonate Equivalent
A = (%passing a No. 8 sieve - %passing a No. 60 sieve) x 0.50
B = %passing No.60 sieve

Calcium Carbonate Equivalent is calculated from the Neutralization Value as determined according to the Official Methods of Analysis of the Association of Official Analytical Chemists.

2107.3 METHODS OF TEST

None Specified.

2107.4 PREQUALIFICATION

Registration of each manufacturing/distribution facility with the Kansas Department of Agriculture.

2107.5 BASIS OF ACCEPTANCE

Provide a copy of the agricultural limestone distributor's registration with the State Department of Agriculture as required by the Kansas Agricultural Liming Materials Act. Bulk shipments must be accompanied by a certified delivery slip showing the minimum percentage of Effective Calcium Carbonate as defined by the Kansas Agricultural Liming Materials Act.

SECTION 2108

FERTILIZERS

2108.1 DESCRIPTION

This specification covers the material requirements for fertilizers.

2108.2 REQUIREMENTS

a. Fertilizers used on KDOT projects must comply with the applicable sections of the "Kansas Commercial Fertilizer Law" as administered by the Kansas State Board of Agriculture.

b. Fertilizer Grade. The grade for each commercial fertilizer will be shown in the Contract Documents. The fertilizer grade shown in the Contract Documents shall be read as follows:

- the first number represents the percentage of nitrogen required (expressed as available N),
- the second number represents the percentage of phosphorous required (expressed as the percent of available P_2O_5),
- the third number represents the percentage of potassium required (expressed as the percent of available K_2O).

A mixed fertilizer such as 12-24-12 would contain 12% N, 24% P_2O_5 and 12% K_2O.

A tolerance of -0.5% will be permitted for each of the designated ingredients in commercial fertilizers.

c. Sources of Fertilizer. Use one of the following types of commercial fertilizers on KDOT work:

(1) Package fertilizers in granulated or tablet form, manufactured by firms registered by the Kansas State Board of Agriculture annually on July 1st.

Fertilizer tablets are commercially prepared, tightly compressed material used when planting trees and plants. They are formulated to be long-lasting (2 year minimum) with a slow-release analysis of 20-10-5 derived from urea-formaldehyde, calcium phosphates, potassium sulfate, calcium sulfate, ferrous sulfate and comply with the following minimum guaranteed analysis.

Total Nitrogen (N)*	20.0%
7% Water Soluble Organic Nitrogen	
13% Water Insoluble Nitrogen	
Available Phosphoric Acid (P_2O_5)	10.0%
Soluble Potash (K_2O)	5.0%
Calcium (Ca)	2.6%
Sulfur (S)	1.6%
Iron (Fe)	0.35%

*17% slowly available nitrogen from urea-formaldehyde

(2) Bulk fertilizers blended by custom blenders licensed by the Kansas State Board of Agriculture annually on January 1st. Liquid fertilizers are considered to be bulk fertilizers.

2108.3 TEST METHODS

None specified.

2108.4 PREQUALIFICATION

Comply with registration and licensing requirements of the Kansas State Board of Agriculture as specified in **subsection 2108.2c.(2)**.

2108.5 BASIS OF ACCEPTANCE

a. Package Fertilizers.

(1) Receipt of the current certificate of registration issued by the Kansas State Board of Agriculture for annual registration of the product.

(2) The grade of commercial package fertilizers will be determined and accepted on the basis of the label analysis, which must appear on each package. Show on the label analysis the following information as required by the applicable provisions of the "Kansas Commercial Fertilizer Law":

(a) the name and address of the person registering the commercial fertilizer;

(b) the brand and grade of the commercial fertilizer;

(c) the net mass in the package or container;

(d) the registered guaranteed analysis. The guaranteed analysis includes the minimum percentages of plant foods in the following order and form:

Nitrogen, minimum ___ percent
Available phosphoric acid, minimum___ percent
Soluble potash, minimum___ percent,
except as follows:

- unacidulated mineral phosphatic materials and basic slag show the guaranteed analysis in the following order and form:

  Total phosphoric acid, minimum___ percent
  Available phosphoric acid, minimum___ percent
  Fineness of grind:___ percent through mesh screen, and
- bone, tankage, and other natural organic phosphate materials shall show the guaranteed analysis in the following form:

  Total phosphoric acid, minimum___ percent;

(e) Commercial fertilizers containing any ingredient which is injurious to plants must be labeled to show:

- the name and percentage of each such active ingredient;
- adequate directions for use, and
- adequate warnings against misuse;

(f) the minimum percentage of any and all other plant food elements or compounds contributing to the value of the commercial fertilizer, and

(g) any other information as may be prescribed by rules and regulations.

(3) Small quantities of package fertilizers may be accepted on brand name. Only high quality fertilizer of a recognized brand, and of the proper grade and type for the intended use, will be accepted in this manner.

b. Bulk.

(1) Receipt of a copy of custom blender's current license issued by the Kansas State Board of Agriculture.

(2) Receipt of a certified label or a certified delivery slip covering each shipment, and showing the information required in **subsection 2108.05(a)(2)**.

c. Verification Tests. Verification tests may be conducted by KDOT on samples obtained at frequencies and locations designated by the Engineer to determine the reliability of bag label analysis and custom blender certified labels or a certified delivery slip.

If a product of any supplier is found to consistently deviate from the bag level analysis or the custom blenders certified analysis, the acceptance of that product will be discontinued. Copies of the failing test reports will be furnished to the Kansas State Board of Agriculture for appropriate action under the "Kansas Commercial Fertilizer Law".

SECTION 2109

PEAT MOSS

2109.1 DESCRIPTION

This specification covers the materials requirements for peat moss.

2109.2 REQUIREMENTS

The peat moss is to be dark in color, finely divided or granular, with a pH value between 5.0 and 7.0, and substantially free of mineral and woody matter. Provide peat moss that is free of weed seeds, nematodes, soil borne diseases, and concentrations of any substances in sufficient amount to be harmful to plant growth.

2109.3 TEST METHODS

None Specified.

2109.4 PREQUALIFICATION

None Required.

2109.5 BASIS OF ACCEPTANCE

Visual inspection by the Engineer for compliance with **subsection 2109.2.**

SECTION 2110

MULCH

2110.1 DESCRIPTION

This specification covers material suitable for use as mulch.

2110.2 REQUIREMENTS

a. General Mulch Materials. Prairie hay is the preferred mulch material. Use prairie hay containing primarily Bluestem grasses, switchgrass, indiangrass and other desirable perennial grasses, normally found in Bluestem pastures. Additional materials acceptable for mulching include sudan grass hay or excelsior mulch.

Provide written evidence to the Engineer if none of the preferred/additional mulching materials are available. The Engineer may permit the use of wheat straw, oat straw, sawdust, shredded wood, peat moss or pulverized corn cobs.

Do not provide mulching material containing Sericea Lespedeza, Multiflora Rose or any noxious weed identified by the Kansas Department of Agriculture.

b. Excelsior Mulch.

(1) General. Excelsior mulch is composed of fibers cut from green wood. The cut is to be made to provide maximum fiber strength, but at an angle to the natural grain of the wood so the fiber will splinter as weathering progresses. Provide excelsior mulch free of seeds or other viable plant material that are not desirable in the mulch. Deliver excelsior mulch to the project in bales.

(2) Dimensions. The approximate dimensions of the majority of the fibers are as follows:

Length .....4 to 6 inch
Thickness .....0.020 to 0.040 inch
Width .....0.030 to 0.050 inch

(3) Smolder Resistance. The excelsior mulch material is not to flame or smolder for a distance of more than 12 inches from point of ignition. See **subsection 2110.3** for test method.

(4) Toxicity. Vegetation growth and/or seed germination are not to be inhibited by any toxicity in the mulch. Excelsior mulch material is to be non-toxic to the personnel engaged in handling and installation.

c. Shredded or Chipped Wood Mulch. Provide shredded or chipped hardwood, cypress or cedar wood mulch for use around trees, shrubs and other plants as designated in the Contract Documents. Chipped wood mulch is to be substantially free of mineral, organic or vegetative matter other than wood. The mulch is to have no more than one calendar year between the time of cutting and shredding or chipping and the time of application to the current project. Do not use this chipped wood mulch around small perennials and vines.

d. Composted Mulch. Use only composted wood mulch around small perennials and vines.

e. Wood Cellulose Fiber. Provide wood cellulose fiber composed of a blend of virgin wood and paper fibers that contains no growth or germination inhibiting factors and complies with **TABLE 2110-1**:

TABLE 2110-1: WOOD CELLULOSE FIBER

Property	Requirement
Wood	70%
paper	30%
Moisture Content	9-15%
Organic matter	80% minimum
pH	6.5 average
water holding capacity	1.6 gal/lb
Guar Tackifier	2% minimum

f. Hydro-Mulch. Provide a bonded fiber matrix (BFM) product made from non-toxic, biodegradable, thermally processed, virgin, wood fibers that contains no growth or germination inhibiting factors and complies with **TABLE 2110-2**:

TABLE 2110-2: HYDRO-MULCH

Property	Requirement
Virgin wood fibers	90% minimum
Organic matter	99% minimum
Hydrocolloid-based binder	10% minimum
"Dry" Moisture Content	9 - 15%
pH	5.5 – 7.5
Water holding capacity	13 times own weight
Dye agent color	Green or Yellow

2110.3 METHOD OF TESTS

Test for smolder resistance of excelsior mulch as follows: Obtain a representative sample of the excelsior large enough to form a mat approximately 30 x 30 x 1 ½ inches. Leach the sample with seven one-hour immersions in separate portions of water maintained at 80°F during the leaching period. Drain for about 15 minutes after each immersion. After the last immersion and draining period, spread the sample out on a flat surface to form a mat approx. 30 x 30 x 1 ½ inches and air dried for 72 hours at room temperature. At the completion of the air drying period, place a lit cigarette on the surface of the mat. Measure and record the distance that a flame or smolder spreads from the cigarette.

2110.4 PREQUALIFICATION

None Required.

2110.5 BASIS OF ACCEPTANCE

a. Excelsior mulch is accepted on the basis of satisfactory test results from the Materials and Research Center. Perform tests on samples supplied from the project delivered material.

b. The Engineer will accept straw or hay bales based on the following:

- North American Weed Management Association (NAWMA) Standards.
- Receipt of a statement that this material "meets the North American Weed Free Forage Standards" on a Transit certificate with the vehicle tag number, the type and number of bales being transported or a Forage tag on each bale.

Contact the Kansas Department of Agriculture to request inspection or for certifications. For a Certified Weed-Free Forage/Mulch Growers Listing contact the Kansas Department of Agricultures.

c. The wood cellulose fiber will be accepted based on visual inspection of the container label to verify compliance with this specification. Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

d. All other mulch materials are accepted based on a visual inspection by the Engineer.

SECTION 2111

MULCH TACKING SLURRY

2111.1 DESCRIPTION

This specification covers the materials to be used as tacking slurry applied to mulch.

2111.2 REQUIREMENTS

a. Tacking Material. Provide tacking material that complies with the following:

- A blend of fibers of recycled slick paper, produced from printers' slick paper containing wood cellulose, and kaolin clay.
- Free of synthetic or plastic materials or other foreign material
- Biodegradable
- Disperses in water and forms a homogeneous slurry, and remains in suspension when agitated by the hydraulic slurry equipment.
- When sprayed uniformly over the mulch, forms an absorbent cover allowing percolation of water to the underlying soil.
- Packaged in moisture resistant bags with the net weight (mass) of the packaged material plainly shown on each bag.
- Non-water soluble fibers.

Complies with the following minimum requirements for wood cellulose mulch:

Applied Color	Green
Organic Matter, percent by weight	Min. 80
Tacking Agents, percent by weight	>4
Moisture Content, percent by weight	12 ± 3
Water Holding Capacity	>1200 (grams of H_2O per 100 grams of fiber
pH Range	5.5 ± 3

b. Tacking Agent. Add a Guar Gum based tacking agent to the tacking material in the hydraulic slurry at a rate and manner recommended by the manufacturer. The tacking agent must be biodegradable and comply with the following:

Density	30 grams per cc
Hazardous Components	None
Percent Volatile	0 at 70°F
Appearance	Cream Colored Powder
Water Miscibility	Thickener
Odor	Mild

c. Water. Use water for mulch tacking slurry that complies with the **DIVISION 2400**.

d. Toxicity. Do not use tacking materials and/or tacking agents that are toxic to vegetation, hazardous to the germination of seed or may be injurious to personnel handling and applying the materials.

2111.3 TEST METHODS

None Specified.

2111.4 PREQUALIFICATION

None Required.

2111.5 BASIS OF ACCEPTANCE

Receipt and approval of a Type D certification as specified in **DIVISION 2600.**

SECTION 2112

WEED CONTROL FABRIC

2112.1 DESCRIPTION

This specification covers the material requirements for weed control fabric.

2112.2 REQUIREMENTS

Weed control fabric can be an opaque woven or non-woven material, manufactured specifically for use as a weed barrier. Use fabric that can maintain its integrity for a minimum of 2 years in direct sunlight and has the following minimum physical properties:

Weight	96 g/sq. yd.
Grab tensile strength	100 lbf.
Puncture strength	60 lbf.
Tear strength	45 lbf.

2112.3 TEST METHODS

Grab tensile strength	ASTM D 4632
Puncture strength	ASTM D 4786
Tear strength	ASTM D 4533

2112.4 PREQUALIFICATION

None Required.

2112.5 BASIS OF ACCEPTANCE

Visual inspection of the label to verify compliance with this Section.

SECTION 2113

EROSION CONTROL MATERIALS

2113.1 DESCRIPTION

This specification covers erosion control products manufactured from wood, straw or coconut fiber mat, synthetic mat, paper mat, jute mesh or other material that is placed on slopes or ditches for short-term or long-term protection of seeded areas.

2113.2 REQUIREMENTS

a. Provide prequalified erosion control materials of the class and type specified in the Contract Documents.

b. Erosion control products are categorized in **TABLE 2113-1 and 2113-2**:

TABLE 2113-1: CLASS 1. "SLOPE PROTECTION		
Type	**Uses**	**Soil Type**
Type C	Slopes > 3:1	Clay soils
Type D	Slopes > 3:1	Sandy soils

TABLE 2113-2: CLASS 2 FLEXIBLE CHANNEL LINER		
Type	**Duration**	**Shear Stress t_d**
Type E	Short-term (≤ 5 years)	up to 2 lbs/sq ft
Type F	Short-term (≤ 5 years)	up to 4 lbs/sq ft
Type G	Long-term (> 5 years)	up to 6 lbs/sq ft
Type H*	Long-term (> 5 years)	up to 8 lbs/sq ft

*Use Only 100% synthetic products

c. Anchors. Provide and use anchors as recommended by the erosion control product manufacturer. In the absence of any recommendations by the manufacturer, provide material in **TABLE 2113-3**:

TABLE 2113-3: WIRE, STAPLE AND ANCHORS	
Property	**minimum size**
Slope Protection	
Wire Diameter	11 gauge
Leg Length (Heavy Soil)	6 inch
Leg Length (Light Soil)	8 inch
Crown Width	1 inch
Flexible Channel Liner - Wire Staple Anchors	
Wire Diameter	8 gauge
Leg Length (Heavy Soil)	10 inch
Leg Length (Light Soil)	14 inch
Crown Width	2 inch
Flexible Channel Liner - Metal Stake Pin Anchors	
Pin Diameter	3/16 inch
Pin Length (Heavy Soil)	10 inch
Pin Length (Light Soil)	14 inch
Steel Washer Diameter	1½ inch, nominal
Flexible Channel Liner - Hardwood Stake Anchors	
Light Soil	1 x 3 x 12 inch
Heavy Soil	1 x 3 x 18 inch

2113.3 TEST METHODS

Erosion Control products will be tested and evaluated by the Texas Department of Transportation and the Texas Transportation Institute following procedures outlined in the Texas DOT Erosion Control Report. Anchors are evaluated on the basis of their performance in the field.

2113.4 PREQUALIFICATION

Prequalification procedures may be obtained by writing to the Texas Department of Transportation, Director of Construction and Maintenance, 125 East 11th Street, Austin, TX 78701-2483. A list of prequalified materials based on the annual Texas DOT Erosion Control Report and field performance within Kansas will be maintained by the KDOT Bureau of Construction and Materials. The KDOT prequalified list establishes the acceptable materials to be incorporated into KDOT projects. Products will remain on the KDOT list provided field performance is satisfactory or the manufacturer requests the removal of their own product.

2113.5 BASIS OF ACCEPTANCE

a. Erosion Control Materials.

(1) Prequalification as required by **subsection 2113.4**.

(2) Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

(3) Field observation before or during material installation.

b. Anchors. Field observation before or during installation.

SECTION 2114

TEMPORARY SEDIMENT BARRIERS

2114.1 DESCRIPTION

This specification is applicable to materials used as ditch checks or barriers designed to reduce water velocity and temporarily contain sediment.

2114.2 REQUIREMENTS

a. Geotextile Fabric for Temporary Silt Fence. Provide material that complies with AASHTO M 288 for unsupported silt fence, with 4 ft. maximum post spacing. Actual post spacing is as shown in the Contract Documents.

b. Posts. Provide wood, steel, or synthetic posts of sufficient strength to resist damage during installation and to support the applied loads. Length is to be as shown in the Contract Documents. Hardwood posts having dimensions of at least 1 3/16 x 1 3/16 inch, No. 2 Southern Pine at least 2 ⅝ x 2 ⅝ inch or steel posts of U, T, L, or C shape, weighing 0.95 lbs per foot minimum are satisfactory.

c. Prefabricated Silt Fence. Prefabricated silt fence systems that comply with geotextile fabric and posts in **subsection 2114.2a.** and **2114.2b**.

d. **Biodegradable Logs.** Provide commercially available biodegradable logs manufactured from straw, excelsior wood fiber, coconut fiber, jute or other biodegradable material bound with an open mesh fabric of jute or light-weight plastic.

Do not use biodegradable logs manufactured from straw for ditch checks or inlet sediment barriers.

e. Synthetic Sediment Barriers. Provide synthetic sediment barrier materials such as Geo-Ridge Permeable Berm™, Triangular Silt Dike™ or equivalent. The Stormwater Compliance Engineer will consider an equivalent of the brand names specified. Provide the Engineer with a complete description, literature, test reports, etc. on the proposed equivalent prior to installation.

f. Filter Sock. Provide burlap or synthetic mesh bags, coarse aggregate, wood chips, compost or other permeable filler material to slow and filter stormwater runoff. Use only coarse aggregate filler for curb inlet protection.

2114.3 TEST METHODS

a. Silt Fence. As specified in AASHTO M 288.

b. Biodegradable Logs, Synthetic Sediment Barriers, and Filter Sock. None Required.

2114.4 PREQUALIFICATION

None Required.

2114.5 BASIS OF ACCEPTANCE

a. Geotextile for silt fence. Receipt and approval of a Type D certification as specified in **DIVISION 2600**, and visual inspection at the point of usage.

b. Posts. Visual inspection for condition and dimensional requirements at the point of usage.

c. Biodegradable Logs. Dimensional and other requirements shown in the Contract Documents, and visual inspection of the installed material.

d. Synthetic Sediment Barriers. Brand name and visual inspection of the installed material.

e. Filter Sock. Visual inspection and compliance with requirements in the Contract Documents.