

SECTION 02100
SUBGRADE AND SUBBASE PREPARATION

PART 1 GENERAL

1.01 - Section Includes

- A. Subgrade Preparation.
- B. Subgrade Stabilization.
- C. Subgrade Treatment.
- D. Granular Subbase.
- E. Special Backfill.
- F. Granular and Earth Shoulder Preparation.

1.02 - Description Of Work

- A. Subgrade Preparation – includes the shaping and consolidation of a prescribed portion of a roadbed in preparation for the placement of granular subbase.
- B. Subgrade Stabilization – includes the removal and disposal of unsuitable or unstable material that is not appropriate to place subbase on and backfill with suitable backfill or macadam stone base material. Geotextile fabrics, as required per the Contract Drawings, are also included in this section.
- C. Subgrade Treatment – includes the incorporation of lime or fly ash into the natural subgrade.
- D. Granular Subbase - includes the furnishing, placing, shaping and compaction of granular subbase in preparation for PCC or ACC pavement.
- E. Special Backfill – includes furnishing, placing, shaping and compaction of special backfill in preparation for pavement base course.
- F. Granular and Earth Shoulder Preparation – consists of blading over the foreslope both the soil excavated from the trench and any material of the shoulder lying above the proposed, finished shoulder line, and hauling offsite, as required. Work shall also include the placement of granular shoulder material, as required.

1.03 - Submittals

- A. Submit certification of compliance and/or samples indicating the materials incorporated into the Work comply with the Contract Documents.
- B. The substitution of materials is allowed as set forth in the General Conditions.

1.04 - Scheduling And Conflicts

- A. Schedule Work to minimize disruption of public streets and facilities.

1.05 - Special Requirements

- A. All Work and materials incorporated into this Project shall conform to all applicable local, state, and federal requirements.

PART 2 PRODUCTS

2.01 - Subgrade Stabilization

- A. All backfill materials utilized for the backfill of excavation of unsuitable or unstable soil shall meet one of the following requirements:
 - 1. Suitable soil as set forth in Section 02000.
 - 2. Macadam stone base material as set forth in the Iowa Department of Transportation (DOT) Standard Specification 4122, Gradation No. 13.

3. **Clean crushed stone or crushed concrete with the following gradation:**

Sieve	Percent Passing
2-1/2"	100
2"	90-100
1-1/2"	35-70
1"	0-20
1/2"	0-5

4. **The engineer may authorize a change in gradation, subject to materials available locally at time of construction.**

B. Geogrid and Geotextile Stabilization Fabrics:

1. All engineering fabric (geogrid) incorporated into this item shall have properties as set forth in the Iowa DOT Standard Specification 4196.01E.
2. If engineering fabric (geotextile) incorporated into this item shall have properties as indicated in the table at the end of this section. Engineering fabric shall be a permeable, synthetic textile material suitable for use with soil, rock or other geotechnical engineering related materials in a roadway construction application. Said material shall be mildew, rot, insect and rodent resistant and shall be inert to commonly encountered chemicals found in soil.
3. Geotextiles shall have the following properties:

Property	Value	Test Method
Grab strength, dry, minimum (average value in either principal direction)	125 lbs.	Iowa 913
Elongation, dry, minimum (average value in either principal direction)	20%	Iowa 913
Water permeability, K	0.02-0.30	Iowa 911
Apparent opening size, minimum	40	Corps of Engineers W-02215

2.02 - Subgrade Treatment

- A. The lime used in subgrade treatment shall meet the requirements of ASTM C207, Type N.
- B. The fly ash used in subgrade treatment shall meet the requirements of ASTM C618. It shall be either Class C or F. The pozzolanic activity test with lime will not be required for Class C material.

2.03 - Granular Subbase

- A. The granular subbase material shall meet the requirements of the following Iowa DOT Standard or Supplemental Specifications:
 1. Iowa DOT Gradation No. 12, or
 2. Iowa DOT Standard or Supplemental Specifications for modified subbase.
 3. Exception: Reclaimed asphalt shall not be allowed.
- B. The granular subbase material for use with geogrid applications shall meet the requirements of Iowa DOT Gradation No. 12.

2.04 - Granular Shoulders

- A. Crushed Stone
 1. Crushed stone shall consist of a uniform mixture of coarse and fine particles produced by crushing limestone, dolomite, or quartzite. The percentage of wear, when tested according to AASHTO T 96, Grading B, shall not exceed 45 percent.
 2. The material shall meet the requirements for Gradation No. 11 of the Aggregate Gradation Table in the current Iowa DOT General Supplemental Specifications for Construction Projects.

3. Additional requirements:

	Percent
Max. percent mud balls	4
When compaction of material is a specification requirement, the minimum percent passing No. 200 sieve	6

4. For shoulders only, crushed stone with a freeze-and-thaw loss not exceeding 10 percent (Iowa DOT Materials Laboratory Test Method 211, Method A.), and an abrasion loss not exceeding 55 percent (AASHTO T 96, Grading B) may be provided.

B. Gravel/Limestone Aggregate Mixture

1. A gravel/limestone aggregate mixture may be allowed as an option for granular shoulders when noted in the Contract Documents. When the material is furnished according to this option, the aggregate shall be a combination of gravel and limestone screenings.

2. Except for the minimum percentage passing the No. 200 sieve, the gravel shall meet the following:

a. Gravel shall consist of a natural gravel or mixture of sand with gravel or crushed stone or both meeting Gradation No. 10 of the current Iowa DOT General Supplemental Specification for Construction projects. Additional requirements:

	Percent
Max. percent shale particles in fraction retained on No. 4 sieve	10
Max. percent mud balls and particles passing No. 200 sieve	15
Max. percent of combination of foregoing two items	20
When compaction of material is a specification requirement, the minimum percent passing No. 200 sieve	6

b. Limestone screenings shall be produced from ledges meeting freezing and thawing and a maximum percentage of wear, when tested according to AASHTO T 96, Method B, equal to 45 percent.

c. The combination shall have 30 percent to 50 percent limestone screenings. The proportions shall be adjusted between these limits so that the combined aggregate percentage passing the no. 200 sieve is between 8 and 16 percent.

2.05 - Earth Shoulders

A. Earth shall be free of roots, granular material, rocks with dimensions greater than 2 inches in the top 3 inches, or other materials which will not form a good seedbed.

2.06 - Special Backfill

A. Special backfill material shall meet the requirements of Iowa DOT Standard Specifications 4132, Gradation 30 or 31. The mixture shall have a plasticity index not exceeding 10. The fraction passing the No. 40 sieve shall not contain more than 1 percent carbon.

B. No salvaged asphaltic materials shall be used, unless noted in the Contract Documents.

PART 3 EXECUTION

3.01 - General

A. Remove all deleterious materials such as topsoil, vegetation, or loose, soft, frozen, or otherwise unsuitable materials. The actual stripping depth shall be evaluated by qualified geotechnical personnel.

B. The Contractor shall keep Project Site free from drainage ponding due to construction operations.

C. High Ground Water Conditions (when present)

1. Prior to site grading and any excavation, an effective means of controlling groundwater shall be established to "predrain" the site and minimize disturbance of the bearing soils.

2. Use a series of ditches, french drains, and/or drain lines to lower the groundwater level to at least 2 feet below the excavation depth. This system can be incorporated into the pavement underdrain system.
 3. Heavy equipment traffic directly on soft saturated soils should be avoided. Consideration should be given to performing earthwork with track-mounted construction equipment which helps minimize subgrade disturbance.
- D. Subgrade compaction shall be Type A per Iowa DOT Standard Specification 2107.05 unless otherwise specified. Type A compaction refers to compaction requiring a minimum of one rolling per inch depth of each lift and a maximum of 8 inch lifts, and it is further required that the roller continue operation until it is supported on its feet, or the equivalent.

3.02 - Subgrade Preparation

- A. Preparation of subgrade shall not commence prior to the completion of any trenching operations under the area to be paved except as specified in Section 02400. If the subdrains are installed prior to subgrade preparation, the Contractor shall be responsible to protect the porous material from contamination with the subgrade material.
- B. The subgrade shall be constructed to have uniform stability for at least 12 inches below top of subgrade and for a width at least equal to that of the proposed pavement plus 2 feet on each side. It shall be brought to an elevation and cross section as set forth in the Contract Documents and such that, after being rolled, the surface shall be at the required elevation. If subdrains are installed prior to subgrade preparation, the area 2 feet outside the paved area does not require compaction in addition to consolidation of the porous material in the subdrain trench in accordance with Section 02500.
- C. Compaction of soils with greater than 6 percent fines shall be accomplished with an impact device.
- D. Compaction of soils with less than or equal to 6 percent fines shall be accomplished with vibratory devices.
- E. Subgrade Compaction:
 1. After rough grade has been established and prior to placement of any fill, the exposed subgrade should be proofrolled in the presence of the Engineer's representative. Proofroll subgrade with minimum 20 ton loaded tandem truck to determine uniformity and stability of subgrade.
 2. In cut sections, disk, scarify, moisture condition and recompact the top 12 inches of subgrade with Type A compaction.
 - a. If equipment is not sized to perform required compaction at minus 12 inches, then excavate top 6 inches of subgrade, then scarify, moisture condition, and recompact next 6 inches of subgrade with moisture and density control. Then replace, pulverize, moisture condition, and compact top 6 inches of subgrade.
 - b. The above requirement also applies for the top 12 inches of embankments.
 - c. The upper 12 inches of subgrade shall consist of a low-plasticity cohesive soil, or granular material. If fat clay exists at the subgrade elevation, lime or Class C fly ash could be incorporated into the soil to reduce its plasticity. The underlying fat clay should not be allowed to desiccate; the soil should be maintained at 0 to +4 percent of the soils optimum moisture value.
 3. Compact soil to 95 percent of the material's maximum standard Proctor dry density with moisture content between -2 to +3 percent of the soil's optimum moisture content.
 4. Unsuitable areas observed shall be improved by compaction or by undercutting and replacing with suitable compacted fill.
 5. Contractor shall repeat scarification, recompaction, and testing as many times as needed to obtain specified density.
- F. Remove large stones or rubble (i.e., concrete) over 3 inches in size from within 2 feet of the finished subgrade elevation.

- G. Unstable Material: If soft, yielding, or pumping areas are located, improve by scarifying, moisture conditioning and recompaction or remove unstable materials and replace with suitable materials and compact as specified.
- H. Following the trenching operations, the Contractor shall scarify, thoroughly mix, and recompact the materials present in the upper 12 inches of the subgrade for the full width of the subgrade area to produce a uniform condition. The compaction shall be to 95 percent of maximum standard proctor dry density with moisture content between -2 and +3 percent of soil's optimum moisture content.
 - 1. The Contractor shall determine if moisture content of the material is excessive or suitable for satisfactory compaction. The Contractor may elect to start rolling operations immediately after the smoothing operation, or may elect to delay rolling operations, and instead, aerate the material in preparation for rolling. Aeration and compaction operations shall proceed in an orderly fashion without unreasonable and unnecessary delay. Rolling operations made prior to any aeration operations for a lift will not be counted as any of the required coverages.
 - 2. Should the material be dry to the extent that it is likely to be unsatisfactorily compacted, the Contractor may moisten the material, or the Engineer may order the material to be moistened uniformly, before it is compacted. Authorization may be given for the use of water in the final finishing of the roadbed.
- I. Following completion of subgrade scarification and compaction, subgrade shall be proof-rolled in the presence of the Engineer. Proof-roll subgrade with a minimum 20-ton loaded tandem truck to determine uniformity and stability of subgrade.
- J. Subgrade Maintenance:
 - 1. Maintain subgrade prior to and during paving operations.
 - 2. Care should be taken to avoid saturation or desiccation of the subgrade prior to construction of pavement. If this occurs, the material shall be removed, or scarified, moisture conditioned and recompacted.
 - 3. Pavements shall be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavement could saturate the subgrade and contribute to premature pavement deterioration.
- K. If rutting or any other damage occurs to the subgrade for any reason, the Contractor shall immediately repair the subgrade. Such repair will include, if necessary, scarifying, aerating, and recompacting the subgrade.

3.03 - Subgrade Stabilization

- A. Prior to commencing with the removal of unsuitable or unstable material, the Contractor shall be responsible to notify the Engineer. The Engineer will review the conditions and, if appropriate, shall authorize the Work to proceed.
- B. The Engineer shall mark the limits of the excavation and may observe the Work.
- C. If the excavation is backfilled with suitable soil, the upper 8 inches shall be compacted as set forth in subgrade preparation. Any material below that shall be compacted in accordance with the requirements for the construction of embankment.
- D. If the excavation is backfilled with macadam stone base material, the material shall be consolidated as it is placed. Required depth for subgrade stabilization shall be established by the Engineer.
 - 1. Remove soft, unstable soil to a desired depth.
 - 2. Backfill area with material meeting the requirements of Paragraph 2.01.
- E. Subgrade areas from which unstable native material has been excavated may be lined with geotextile prior to placement of macadam stone for subgrade stabilization. Engineer shall determine the need for geotextile use.

- F. The following procedure for subgrade stabilization may be utilized, subject to the approval of the Engineer.
 - 1. Excavate unstable native subgrade to depth ordered by the Engineer, but not less than 12 inches.
 - 2. Place geogrid on excavated subgrade. Placement shall be in strict compliance with manufacturer's instructions, and with paragraph 3.05.
 - 3. Place granular subbase over excavated subgrade and in-place geogrid in accordance with manufacturer's instructions.
- G. **Contract Documents or the Engineer shall identify procedures for subgrade stabilization with cement, fly ash or lime kiln dust.**
- H. Contract Documents or the Engineer shall identify which of the above-described stabilization procedures is approved for a given project.

3.04 - Special Subgrade Treatment

- A. The Contractor shall be responsible to notify the Engineer of subgrade conditions which may warrant special treatment in order to develop material appropriate for use as subgrade under a paved area. Following review of the conditions by the Engineer, if appropriate, the Engineer will authorize the Contractor to proceed with special subgrade treatment.
- B. Material shall be removed, scarified and blended with an approved stabilizing material (lime or fly ash):
 - 1. Construct in 6 to 9 inch layers. Usually treat a minimum of 12 inches.
 - 2. Incorporate the stabilizing material uniformly, approximately 3 percent to 5 percent of hydrated lime or approximately 14 to 16 percent of Class C fly ash, depending on soil type.
 - 3. Incorporation is best performed with a rototiller type device rather than a disc.
 - 4. Test section for support.
- C. At such time as the subgrade material is of a suitable condition, it shall be recompacted as set forth in subgrade preparation and graded to the proper elevation and cross section.

3.05 - Soil Reinforcement Fabric/Geogrid

- A. General
 - 1. Remove and replace fabric areas damaged during construction. Lap or sew replaced fabric, as specified for the class of fabric used.
 - 2. Install geotextiles in accordance with manufacturer's recommendations.
 - 3. Do not run vehicles directly on engineering fabrics. Rubber tired vehicles shall not run on rock placed over soil reinforcement fabric.
- B. Soil Reinforcement Fabric
 - 1. Remove vegetation, large stones, and other debris from the area to be protected and grade the surface to a relatively smooth condition.
 - 2. Place the fabric on the prepared areas in a loose and unstretched condition to minimize shifting, puncturing, or tearing the fabric. Overlap only if permitted and then as per manufacturer's requirements. Provide a minimum overlap of 1 foot. Offset adjacent roll ends a minimum of 5 feet when lapped.
 - 3. Lay and overlap the fabric in the direction of water flow.
 - 4. If permitted, anchor the fabric in place by securing pins or other acceptable methods, along sewn seams or overlaps, at 3 foot spacing. Also place securing pins on a maximum 6 foot grid on the unsewn or unlapped portions of the fabric.
 - 5. Where slopes are flatter than 6:1, securing pins may be eliminated, provided that aggregate, rock, or other acceptable means are used to secure the fabric.

6. Cover the fabric with the covering material as soon as possible, so that fabric is not exposed for more than 2 weeks. Prevent slippage of the cover material on the fabric.
 7. Do not allow the rock placement procedure to puncture or damage the fabric. The Contractor shall repair fabric damaged during rock placement. A minimum 6 inch layer of bedding stone and a greater drop-height combination may be used if the combination produces the placement, thickness, gradation, and fabric integrity requirements, and if permitted.
- C. Soil Reinforcement Geogrid
1. Remove vegetation, large stones and other debris from the area to be protected and grade surface to a relatively smooth condition. Small symmetrical depressions may remain, but deep voids shall be filled.
 2. Roll out geogrid in the direction and to the dimensions shown on the Contract Drawings. Provide a minimum overlap of two (2) feet. Geogrid shall be pulled tight and held taught either by hand, pins, stakes or fill until the geogrid under tension has 70 percent of its area covered.
 3. Cover geogrid with covering material as soon as possible, so geogrid is not exposed for more than three (3) weeks. Prevent slippage of cover material.
 4. Fill placement is to be propagated in the direction of maximum reinforcement capacity, or as instructed by the Engineer.
 5. The Contractor shall not drop rocks on geogrid. The Contractor shall repair geogrid damaged in rock placement.
 6. Compact fill to density requirements as specified.

3.06 - Granular Subbase Preparation

- A. The placement and preparation of granular subbase shall not commence until the subgrade preparation operation, and any special subgrade treatment and/or subgrade stabilization has been completed.
- B. The placement of granular subbase, compacted to specifications herein, shall be performed following trenching operations.
- C. Upon placement of the granular subbase, the material shall have a moisture content in a range between the optimum moisture content and minus 2 percent of the optimum moisture content. The material will then be placed at the proper elevation and cross section such that, when compacted it will be at the correct elevation.
- D. Granular subbase shall be extended to a minimum of 2 feet beyond the back of curb line.
- E. Where storm sewer or subdrain has been installed parallel to the back of curb line, the Contractor shall take care to provide that clean porous trench backfill is in contact with clean granular subbase material. Any silt, mud, or foreign material which might serve to contaminate the porous trench backfill shall be removed before placing the granular subbase.
- F. The material shall be worked at the proper moisture content to provide for a minimum 95 percent compaction (ASTM D698).
- G. The Contractor is responsible for the maintenance of the completed subbase. If rutting or any other damage occurs to the subgrade for any reason, the Contractor shall immediately repair the subbase as set forth in this section.
- H. Unless noted otherwise in the Contract Documents, construction traffic is permitted on placed granular subbase, but it shall be kept to a practical minimum. The Contractor shall clean, replace contaminated material, or otherwise restore the granular subbase to a free-draining condition prior to pavement placement.
- I. The profile and cross section tolerances for granular subbase shall be zero to -0.05 feet.

3.07 - Special Backfill

- A. Special or selected backfill material shall be placed in areas shown in the Contract Documents or as directed by the Engineer. Placement and compaction shall be as provided within this specification Section 02100, with the following modifications: Where compaction with moisture and density control or with moisture control is required, the moisture content of special and selected backfill materials shall be within the limits specified.
- B. The moisture content of selected backfill material at the time of spreading and compacting shall not be drier than 2.5 percentage points below the optimum moisture shown in the Contract Documents. If not shown, the optimum moisture shall be determined by the Engineer. The moisture content of special backfill material at the time of spreading and rolling shall be not drier than 2 percentage points below, and shall not exceed, the maximum amount that will permit obtaining required compaction without rutting. The moisture content shall be uniform and may be adjusted by processing in an approved pugmill or by addition of water and road mixing in place, prior to spreading and compacting.
- C. When selected or special backfill material is placed in areas where unstable soils have been excavated and the thickness of backfill placed is 2 feet or more, the condition of underlying soil may limit the amount of compaction to be done in the bottom one foot of subgrade treatment. In exceptionally wet or unstable areas, the Contractor may be permitted to end dump the first foot of treatment material and doze it into position with only partial compaction, as directed by the Engineer. Material above the bottom one foot in such areas shall be compacted as provided above.
- D. When selected or special backfill is placed in areas of exceptionally wet or unstable soils and the thickness is less than 2 feet, the Engineer may require the tamping type roller to be used for compaction of the material placed in the first foot of thickness.

3.08 - Shoulder Preparation

- A. Earth Fill for Pavement and Bases
 - 1. Unless otherwise specified, material placed during shoulder operations at elevations more than 6 inches below subgrade elevation shall be treated as embankment construction. Material deposited above an elevation 6 inches below subgrade elevation shall be suitable earth. In no case shall shoulder material be deposited on pavement or base.
 - 2. The material more than 3 inches below the upper edge of pavement or base shall be spread in uniform layers not more than 6 inches in loose thickness and rolled at least three times. The final 3 inch layer need not be rolled except for one foot adjacent to the pavement or base. Where the width of shoulder will permit, a pneumatic tired roller shall be used. The Engineer may permit use of other rollers or other compactive methods that will produce equivalent results. Where the width of shoulder is less than 6 feet, wheels of pneumatic tired equipment may be used in lieu of the roller. Particular care shall be taken to assure thorough compaction against and adjacent to the edge of the base or pavement, and wheels of pneumatic tired equipment may be used for this purpose.
 - 3. When unpaved side roads, drives, or entrances extend through the shoulder area, the side roads, drives, and entrances shall be excavated or filled with earth to the extent necessary to provide a suitable approach with the design shoulder slope, as required by the Engineer.
 - 4. If the tool or machine used in finishing the shoulder produces a groove in the earth at the edge of the pavement or base, such groove shall be carefully filled and thoroughly compacted.
 - 5. In areas of pavement, shouldering operations shall be commenced when the pavement or base has attained the age requirements for opening to the Contractor, unless the Engineer specifically advises the Contractor to delay starting, pending strength requirements or satisfactory surface conditions. Adequate organization and equipment shall be assigned to the work so that the major portion of shouldering work may be completed within 6 working days after the pavement or base is released by the Engineer to the Contractor for shoulder work.

6. After earth shoulders have been compacted, they shall be shaped to the specified cross section and smoothed to a condition acceptable to the Engineer. The Contractor shall also smooth and finish any earth surfaces which have been constructed under the Contract and shall restore to an acceptable condition any sections of right-of-way which have been disturbed by operations.
- B. Granular Shoulders
1. Surface Preparation.
 - a. Earth Shoulder Fill.
 - i. This work involves construction of a shoulder fill of suitable material and to such elevation below that of the pavement edge as to allow for placement of granular shoulders as shown in the Contract Documents. Deviations in elevation of the shoulder fill exceeding 0.05 foot shall be corrected. When unpaved side roads, drives, or entrances extend through the shoulder area, the side roads, drives, and entrances shall be excavated or filled with earth as necessary to provide a suitable approach and as required by the Contract Documents and by the Engineer.
 - b. Trenching and Reshaping.
 - i. The earth of the existing shoulder shall be removed to the width and depth shown in the Contract Documents. Existing vegetation shall be removed and deposited on the foreslope. Unless otherwise specified in the Contract Documents, excess excavated material shall be removed from the Project. At driveways and intersecting roads which have fillets or pavement of a higher type, the shoulder shall not be excavated for placement of shoulders. Deviations in the elevation of the subgrade exceeding 0.05 foot shall be corrected. If necessary to backfill earth in preparing the subgrade, the backfill earth shall be thoroughly compacted by tamping or rolling in layers not exceeding 3 inches in depth.
 - ii. For reshaping earth shoulders to the specified cross section adjacent to the granular shoulder, earth fill need not be rolled except for one foot adjacent to the granular shoulder.
 2. Construction
 - a. Granular shoulder material shall be placed on the subgrade in such manner that no material is deposited on the adjacent pavement surface. If inadvertently spilled on the adjacent pavement, it shall be removed by shovels and brooms immediately.
 - b. The material shall be spread and compacted in such a manner that the finished elevation and width conform to the specified cross section.
 - c. Compaction shall be accomplished by six complete coverages with a pneumatic tired roller, followed by at least one complete finish coverage with a steel tired roller. The Engineer may reduce the rolling when unstable subgrade is encountered and may require additional finish rolling, if needed to ensure a satisfactory surface finish. Shaping shall be done concurrently with compaction. The tolerance for width of the completed shoulder shall be plus or minus 0.2 foot.

- d. The required moisture content shall be maintained in the granular shoulder material until it has been satisfactorily spread, compacted, and finished to the required dimensions.
- e. The Engineer will check the shoulder cross slope with a template furnished and used by the Contractor. The tolerance for shoulder cross slope shall not be less than or more than 1 percent greater than the slope specified.
- f. After removing the forms, where side forms are used, the space between the compacted aggregate and the earth backing shall be filled with earth or other approved material in such quantity and to the height that will compact to the final thickness of the course being constructed and allow at least a one foot width of the shoulder to be rolled and compacted, therewith, to the satisfaction of the Engineer. Where side forms are not used, earth or other approved material shall be placed along the edges of the top course, or, when the course is being constructed in two or more layers, to the thickness of each layer of the course, allowing in each operation at least a one foot width of the shoulder to be rolled and compacted simultaneously with the rolling and compacting of each layer of the surface course, as approved by the Engineer.

END OF SECTION 02100