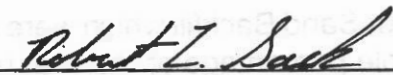


To: MODIFIED BY EI 02-041 EFFECTIVE 9/11/03 & EI 09-024 EFFECTIVE 5/6/10 MODIFIED BY EI 08-034 EFFECTIVE <u>5/7/09</u>		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 02-005
Title: STANDARD SPECIFICATION SECTIONS 203, 204, 304 AND 667			
SUPERSEDED BY EB 15-031 EFFECTIVE 9/28/15	Approved:  Robert L. Sack, Deputy Chief Engineer (Acting), Technical Services Division <u>1/23/02</u> Date		

ADMINISTRATIVE INFORMATION:

- This Engineering Instruction (EI) is effective for projects submitted for Letting on or after July 11, 2002, coinciding with the planned effective date for the proposed 2002 *Standard Specifications*.
- Superseded issuance(s) : This EI does not supersede any previous issuances. It does supplement EI 00-038.
- Disposition of issued materials : The information transmitted by this issuance will reside in the Standard Specifications.

PURPOSE: The purpose is to revise and update the Standard Specifications.

TECHNICAL INFORMATION:

Sections 203 and 304 in the Standard Specifications should be deleted and replaced with the new Sections 203 and 304 transmitted by this issuance. In addition, two new sections are being added to the Standard Specifications: Section 204 - Controlled Low Strength Material (CLSM), and Section 667 - Local Road Gravel Surface, Base and Subbase Courses.

IMPLEMENTATION:

The following Sections should be included in the next Standard Specifications: Section 203, Section 204, Section 304, Section 667.

TRANSMITTED MATERIALS: To save printing expense, the full text of Sections 203, 204, 304 and 667 will be contained in advance copies of the 2002 *Standard Specifications* to be made available to designers. Full text is also available on the IntraDOT site in the Design Quality Assurance Bureau's Specifications and Standards page and with the electronic version of this EI on our web site at www.dot.state.ny.us, "Site Index", "E", "Engineering Directives...", "EI Index", "EIs Issued in 2001".

BACKGROUND: Section 203 is being reissued to accommodate several significant changes.

1. The pay item 203.01 - Unclassified Excavation and Embankment, and all verbiage associated with it, is being deleted. This item was developed in the early days of interstate construction. Its purpose was to pay contractors for excavation, and use the excavated material to construct embankments. Since around 1978, however, the Department, as well as the rest of the nation, has adopted a two item system; one item to pay for excavation, and one to pay for placing fill. The two item system is more fair to contractors, reduces claims against the State, is easier to estimate in design, and

is easier to control in construction. The item, although seldom used anymore, is often used incorrectly, causing construction problems and orders-on-contract.

2. Clarification has been added for the use of concrete pieces from pavement removal operations in earthwork. Use of this material is routine, but until now has not been supported by the Standard Specifications.
3. Items for Sand Backfill which were issued in EI 00-038 have been simplified. Also, the allowable percentage of material passing the 75 μm sieve has been increased so as to make it easier and less expensive to obtain material, without reducing the performance. Other than these changes, the recommendations in EI 00-038 remain unchanged.

Section 204 is a new section that contains the provisions of special specification 17203.80 - Controlled Low Strength Material (CLSM). This special specification and its previous incarnations have been in use for many years. In 2000, a Standard Sheet was issued to provide details for the use of CLSM as pipe backfill. In addition, guidance for use of CLSM has been issued for inclusion in the Construction Inspection Manual (under 203-3.15 Fill and Backfill at Structures, Culverts, Pipes, Conduits and Direct Burial Cables), and the Highway Design Manual in Chapter 9. This material is so commonly used that it should no longer be controlled by a special specification.

Section 304 has been modified slightly for clarity. The major changes include the following:

1. The specification now includes a definition for the term "deleterious material". This term was used in the specification, but previously was not clearly defined.
2. The requirements for the subbase Types have been clarified.
3. The need to stockpile Type 3 subbase has been eliminated. Previously, material furnished under Type 3 was not required to be stockpiled if the total project quantity was more than 400 m^3 , meaning that for large projects stockpiling was already not necessary. Also note that because Type 3 subbase does not come in contact with HMA or concrete pavement, but is overlain by a layer of Type 4 subbase, quality assurance does not have to be as rigorous for Type 3 as it is for Types 1, 2 and 4.
4. Another Optional Type has been added; Option D., which consists of a single layer of Type 4 subbase.
5. The requirements for Type 2 subbase have been modified to allow blasted rock.

Section 667 is a new section that provides a specification for gravel surface, base, and subbase courses. It was developed for use on local roads only (it should not be used on State or Federally funded NYSDOT projects), and was developed at the request of and in cooperation with representatives from the Cornell Local Roads Program.

CONTACT: Questions or comments on this issuance should be directed to Don Dwyer of the Geotechnical Engineering Bureau at (518) 457-4724, ddwyer@gw.dot.state.ny.us.

SECTION 203 - EXCAVATION AND EMBANKMENT

203-1 DESCRIPTION. This work shall consist of excavation, disposal, placement and compaction of all materials that are not provided for under another section of these Specifications, and shall be executed in conformance with payment lines, grades, thicknesses and typical sections specified in the contract documents.

203-1.01 Unclassified Excavation. Unclassified excavation shall consist of the excavation and disposal of all materials, of any description, encountered in the course of construction, unless otherwise specified in the contract. Estimated limits and descriptions of subsurface deposits and formations which may be shown on the plans, are supplied in accordance with §102-05, Subsurface Information.

203-1.02 Embankment. The embankment is the portion of a fill section situated between the embankment foundation and the subgrade surface, excluding any material placed under another section of these specifications.

203-1.03 Embankment Foundation. The embankment foundation is the surface upon which an embankment is constructed after all work required under §203-3.09 has been completed.

203-1.04 Subgrade Surface. The subgrade surface is the surface of the road section upon which the select materials and/or subbase are placed.

203-1.05 Subgrade Area. The subgrade area is that portion of an embankment situated above either of the following, but excluding any material placed under another section of these specifications.

A. A line located 0.6 m below the subgrade surface and extended to the intersection with the embankment side slopes, or

B. The embankment foundation, whichever is higher.

The material and compaction requirements for the subgrade area in embankments are found in §203-2.02 and §203-3.12, respectively.

In cut sections, the subgrade area is not defined except where undercut and backfill with a select material item is specified or ordered: in such cases, the payment lines for undercut work shall define the subgrade area.

203-1.06 Embankment Side Slope Area. The embankment side slope areas are those cross-sectional areas of an embankment situated outside of lines projected downward and outward on a one on one slope from the edges of the subgrade surface to their intersection with the embankment foundation, but excluding any portion lying within a subgrade area.

203-1.07 Topsoil. See §613, Topsoil.

203-1.08 Suitable Material. A material whose composition is satisfactory for use in embankment construction is a suitable material. The moisture content of the material has no bearing upon such designation. In general, any mineral (inorganic) soil, blasted or broken rock and similar materials of natural or man made (i.e. recycled) origin, including mixtures thereof, are considered suitable materials. Determinations of whether a specific natural material is a suitable material shall be made by the Engineer on the above basis.

Recycled materials that the Department has evaluated and approved for general use shall be considered to be suitable material for embankment construction subject to the conditions for use as determined by the Department. The Regional Geotechnical Engineer and Geotechnical Engineering Bureau are available to provide guidance on the use of such materials. In general, the use of recycled materials must be also sanctioned by the Department of Environmental Conservation, usually in the form of a Beneficial Use Determination (BUD).

Glass from recycling facilities shall be considered suitable material for embankment construction.

Reclaimed Asphalt Pavement (RAP), and Recycled Portland Cement Concrete Aggregate (RCA) shall be considered suitable materials for embankment construction, subject to the following conditions for use:

- RAP - The Contractor shall provide and place RAP conforming to the requirements of Section 304.
- RCA - The Contractor shall provide and place RCA conforming to the requirements of Section 304.

Pieces of broken up concrete pavement from on-site pavement removal or in-place recycling (i.e. rubblizing, crack and seat, break and seat, etc.) may be used in embankment construction. Refer to §203-3.09 and §203-3.10.

203-1.09 Unsuitable Materials. Any material containing vegetable or organic matter, such as muck, peat, organic silt, topsoil or sod, that is not satisfactory for use in embankment construction under §203-1.08 is designated as an unsuitable material. Certain man made deposits of industrial waste, toxic or contaminated materials, sludge, landfill or other material may also be determined to be unsuitable materials, based on an evaluation by the Department's Geotechnical Engineering Bureau and Environmental Analysis Bureau, and the Department of Environmental Conservation.

203-1.10 Borrow. Borrow is material required for earthwork construction in excess of the quantity of suitable material available from the required grading, cuts and excavations. Borrow may be necessary even though not shown on the plans.

203-1.11 Embankment Construction Control Devices. This work shall consist of furnishing, installing and maintaining devices such as settlement gages, settlement rods, piezometers and other equipment used specifically for controlling earthwork construction.

203-1.12 Proof Rolling. Proof rolling consists of applying test loads over the subgrade surface by means of a heavy pneumatic-tired roller of specified design, to locate and permit timely correction of deficiencies likely to adversely affect performance of the pavement structure.

203-1.13 Graded Surfaces. The Contractor shall form and trim all graded surfaces to the lines and grades shown on the plans or as modified by the Engineer.

203-1.14 Select Granular Fill - Slope Protection. This work shall consist of excavating for, furnishing, and installing granular fill slope protection in accordance with these specifications, the standard sheets, conforming to the lines and grades shown on the plans, or where directed by the Engineer.

203-1.15 Applying Water. Under this work, the Contractor shall furnish and apply water for dust control, for compaction purposes and for such other purposes (not provided for in other Sections) as called for on the plans, in the itemized proposal or as directed by the Engineer. Water shall not be applied in inclement weather or when the temperature is below 0°C.

203-1.16 Modifying Cut Slopes and Other Means of Obtaining Borrow. The Regional Director may approve the modification of cut slopes and other means of obtaining material, which is not part of the contract, so long as provisions are made to prevent unsafe conditions, damage, and nuisances to property, wildlife areas, and haul routes within and outside the contract limits. Such approval may be granted only after review of a written proposal by the Contractor showing the final deposition of the material, the haul route, hauling hours, and provisions necessary to comply with the above. Should unanticipated conditions arise resulting in any unsatisfactory situation, the Engineer shall immediately rescind the approval pending satisfactory correction.

The following procedure shall apply to areas within the R.O.W. limits which are not designated as available sources of borrow by a Special Note in the contract proposal where the Contractor requests and is granted permission to modify slopes to obtain material for use on State contract work only. The Contractor will be required to reimburse the State with a rebate for the material obtained in these areas. Permission will

not be granted to excavate material beyond the design slopes if it is to be used on other than State contract work.

The rebate to be obtained from the Contractor for this material is comprised of 1) A royalty based on the actual value of the excavated material, and 2) A credit for the difference in the contractor's handling costs if these handling costs have been reduced. The royalty which is to be obtained for the excavated material shall be appropriate for the item for which it is to be utilized and shall be comparable to the current price being paid to purchase similar material in the area.

If the Contractor's handling costs associated with obtaining material from within the R.O.W. limits are greater than those for obtaining material from other acceptable sources, these additional handling costs must be borne by the Contractor. The royalty shall not be reduced to offset any increased handling costs incurred by the Contractor.

If the Contractor's handling costs associated with obtaining materials from within the R.O.W. limits are less than those for obtaining material from other acceptable sources, the differences shall be reimbursed to the State as a credit in addition to the royalty.

The difference in the Contractor's handling cost shall be determined by an analysis based on a comparison of haul lengths, hauling equipment, hauling operation, use of haul roads or public highways, preparation and restoration of the borrow areas, and any other variables involved.

Prior to modifying rock cut slopes, the Geotechnical Engineering Bureau must be consulted. If rock cut slopes are flattened sufficiently to eliminate the need for presplitting, an additional rebate will be necessary.

All special requirements to be fulfilled by the Contractor, at the Contractor's own expense, shall be clearly stated in the agreement. The foregoing requirement of receiving a rebate from the Contractor for material obtained by modification of slopes shall apply only to locations not designated in the Contract Documents.

All the requirements of §107-11, Restoration of Disturbed Areas within the Right-of-Way shall also apply.

203-1.17 Drainage Structure . Drainage structures include catch basins, field inlets, drop inlets, leaching basins and similar structures that collect and/or redirect runoff water.

203-1.18 Culvert. A culvert is an enclosed channel open at both ends serving as a continuation of and/or a substitute for an open stream or water course, where that stream or water course meets an artificial barrier such as a roadway embankment. See §101-15.

203-1.19 Closed Drainage System. A closed drainage system is defined as an enclosed channel which is closed at either one or both ends by a drainage structure, and may include intermediate manholes at junction points. It serves as a collection system for runoff water and carries the water to a discharge point.

203-1.20 Cleaning Culverts, Closed Drainage Systems, Drainage Structures and Manholes. The Contractor shall clean and maintain clean for the duration of the contract the existing culverts, closed drainage systems, drainage structures and manholes indicated in the contract documents or where directed by the Engineer.

203-2 MATERIALS

203-2.01 Tests and Control Methods. Materials tests and control methods pertaining to the item requirements and work of this Section will be performed in conformance with the procedures contained in the appropriate Departmental publication in effect on the date of the advertisement for bids. These publications are available upon request to the Regional Director or the Director, Geotechnical Engineering Bureau.

203-2.02 Select Materials and Subgrade Area Material Requirements. The requirements for select materials and subgrade area materials are described below. All processing operations including washing, removal of oversize material, blending, or crushing shall be completed at the source of the material. The procedure for acceptance or rejection of these materials shall be as described in the appropriate Geotechnical Control Procedure (GCP) manual.

A. Subgrade Area Material. Subgrade area material shall consist of any suitable material having no particles greater than 150 mm in maximum dimension, unless Select Granular Subgrade with the well graded rock option is used. In that case, refer to 203-2.02 E. 1. A.

If concrete is used, any exposed mesh or rebar shall not exceed 25 mm in length.

B. Select Borrow and Select Fill

1. Gradation. Material furnished for these items shall be suitable material having no particles greater than 1 m in maximum dimension. Of the portion passing the 100 mm square sieve, the material shall have the following gradation:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>	<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
425 µm	0 to 70	75 µm	0 to 15

2. Soundness. The material shall be sound and durable. A material with a Magnesium Sulfate Soundness Loss exceeding 35 percent will be rejected.

3. Composition. RAP shall not be used.

C. Select Granular Fill and Select Structural Fill. Materials furnished under these items shall be suitable and conform to the following requirements:

1. Gradation. Except when used as backfill material for aluminum pipe with Type 1R corrugations (Spiral Rib Pipe) or plastic pipe, the material shall have the following gradation:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>	<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
100 mm	100	75 µm	0 to 15
425 µm	0 to 70		

When used as backfill for Corrugated Aluminum Pipe, Type 1R (Spiral Rib Pipe) 100% of the material shall also pass the 50 mm sieve. When used as backfill for plastic pipe, 100% of the material shall pass the 19 mm sieve.

2. Soundness. The materials shall be substantially free of shale and soft, poor durability particles. A material with Magnesium Sulfate Soundness Loss exceeding 30% will be rejected.

3. Composition. RAP shall not be used.

When used as backfill for aluminum pipe, the material shall be free of Portland cement or Portland cement concrete.

4. pH. Where the State elects to test for this requirement, a material with pH of less than 5 or more than 10 shall be rejected.

D. Select Granular Fill Slope Protection. Material furnished for use under this item shall consist of rock, stone, slag, cobbles, or gravel, substantially free of shale or other soft, poor durability particles.

1. Gradation

a. Broken or blasted unweathered rock used for this item shall be well graded, having no particles greater than 600 mm in maximum dimension, and substantially free from particles greater than 300 mm in maximum dimension, containing little or no material passing the 2 mm mesh sieve.

b. All materials, other than broken or blasted unweathered rock, shall meet the following gradation requirements:

Material Size

Percent Passing by Weight

600 mm maximum dimension	100
150 mm maximum dimension	90 to 100
50 mm square sieve	0 to 30
6.3 mm sieve	0 to 10

2. **Soundness.** Where the State elects to test for this requirement, a material with a Magnesium Sulfate Soundness Loss exceeding 35 percent will be rejected.

E. Select Granular Subgrade.

1. Gradation

A. Well graded rock may be used for this item. Particles shall not exceed 300 mm in greatest dimension nor 2/3 of the loose lift thickness, whichever is less.

B. All materials, other than well graded rock, furnished under this item shall have no particles greater than 150 mm in maximum dimension. Of the portion passing the 100 mm square sieve, the material shall have the following gradation:

Sieve Size

Percent Passing by Weight

6.3 mm	30 to 100
425 μ m	0 to 50
75 μ m	0 to 10

2. **Soundness.** A material with a Magnesium Sulfate Soundness Loss exceeding 35 percent will be rejected.

3. **Composition.** RAP shall not be used.

F. Glass

1. **Gradation.** Glass shall be crushed to a maximum particle size of 10 mm.

2. **Characteristics.** Glass may contain up to a maximum of 5 percent by volume of china, ceramics, plate glass products, paper, plastics or other deleterious materials. The material shall be subject to visual inspection by the Regional Geotechnical Engineer and may be rejected based on this inspection. In case of rejection, the inspection must be documented in writing to the Engineer-In-Charge indicating the basis of rejection.

G. RAP

1. **Gradation.** RAP shall have a maximum top size of 50 mm at the time of placement.

2. **Characteristics.** RAP shall meet the requirements stated in Section 304.

H. RCA

1. **Gradation.** RCA shall meet the gradation requirements for the appropriate item of use.
2. **Characteristics.** RCA shall meet the requirements stated in Section 304, and the applicable parts of Section 203 herein.

I. Sand Backfill. Materials furnished under these items shall be suitable and conform to the following requirements:

1. **Gradation.** The material shall have the following gradation:

Sieve Size	Percent Passing by Weight	Sieve Size	Percent Passing by Weight
12.5 mm	100	6.3 mm	90 to 100
75 µm	0 to 5		

2. **Soundness.** The materials shall be substantially free of shale and soft, poor durability particles.

3. **pH.** Where the State elects to test for this requirement, a material with pH of less than 5 or more than 10 shall be rejected."

- J.** Necessary fill material for cleaning, grading and shaping the existing roadside section shall conform to the requirements of Subsection 203-2.02A, Subgrade Area Material.

203-2.03 Water. Water used for dust control or compaction purposes may be obtained from any source. When used for watering seeded or sodded areas, or surfaces to be seeded or sodded, water shall meet the requirements of §712-01.

203-2.04 Embankment Construction Control Devices. The materials details for embankment control devices shall be as specified in the current publication issued by the Department covering construction, installation, maintenance and abandonment of these devices.

203-3 CONSTRUCTION DETAILS

203-3.01 General. The Contractor shall remove all soil, rock, and other material, and utilize or dispose of these materials as required by the plans and specifications. All excavation and embankment work shall be executed to payment lines shown on the plans, except where directed by the Engineer, in writing, prior to performing the work. Attention is directed to the provisions of §107, Legal Relations and Responsibility to Public, regarding Contractor responsibilities in performing the work of this section.

All graded earth surfaces outside the roadway limits shall be smoothed and trimmed in reasonably close conformity (plus or minus 150 mm) of true grade. After trimming, the area shall be left in a compact and satisfactory condition, free of large stones or other objectionable materials, as determined by the Engineer.

Earthwork construction operations requiring compaction shall not be performed from November 1 thru April 1 except with written permission of, and under such special conditions and restrictions as may be imposed by the Regional Director, after discussion with the Regional Geotechnical Engineer or the Director, Geotechnical Engineering Bureau. Under no conditions will the contractor be permitted to place material that is frozen, or place fill material on frozen ground.

203-3.02 Archaeological Salvage. Whenever, during the course of construction, historical or prehistoric objects or human remains are encountered, such objects shall not be destroyed or moved. Work shall be stopped and rescheduled to avoid disturbing such areas and the Engineer-in-Charge of the project shall be notified immediately.

The Engineer will, through proper channels, notify the Director of the Construction Division who will notify the DOT Environmental Analysis Bureau and the Regional Cultural Resources Coordinator who will arrange to have an immediate inspection of the site.

In the event that the objects are to be removed or salvaged, agreements between the Commissioner and the Contractor will be made to cover the cost of any extra work. Such work will be limited to that performed within the right-of-way, and at any location under direct control of the Contractor used as a source of approved borrow material.

203-3.03 Scheduling of Work to Minimize Soil Erosion and Water Pollution. The Contractor shall ensure effective and continuous soil erosion and sedimentation control, in accordance with §107-12, throughout the construction period. The Contractor shall prepare and submit for approval, plans and schedules for all excavation, stripping, embankment, fill and grading operations connected with the project in or outside of the project limits as specified in §108-01. Such plans and schedules shall include but are not limited to temporary and permanent erosion control measures specified in Section 209, Soil Erosion and Sediment Control, Section 610, Turf and Wildflower Establishment and Section 612, Sodding.

203-3.04 Drainage and Grading. The Contractor shall provide and maintain slopes, crowns and ditches on all excavation and embankments to ensure satisfactory surface drainage at all times. Ditches and other drainage facilities necessary to remove ponded water shall be constructed as soon as practical to have the work area dry during the progression of work. All existing culverts and drainage systems shall be maintained in satisfactory operating condition throughout the course of the work. If it is necessary to interrupt existing surface drainage, sewers or under-drainage, then temporary drainage facilities shall be provided until the permanent drainage work is complete. Top-of-slope interceptor ditches, where shown on the plans, shall be completed before adjacent excavation operations are begun. In earth cuts, the Contractor shall progress excavation operations in such a manner that the portion of the cut immediately adjacent to the design slope is at least 1.5 m lower than the general level of the cut at all times until the lower payment line is reached.

The construction of these temporary drainage facilities shall be considered as incidental to the construction of the project and no additional payment will be allowed.

Any portion of an embankment or subgrade which has, in the opinion of the Engineer, been damaged by the Contractor's equipment during the course of construction, shall be repaired and recompacted by the Contractor to the satisfaction of the Engineer, and no extra payment will be made therefor.

Where seepage causes instability of slopes, excavation and backfill or other corrective measures shall be performed as ordered by the Engineer and paid for under the appropriate item. Excavation for the installation of slope protection may be necessary at any time and location throughout the duration of the contract and may not necessarily coincide with the Contractor's performance of the general excavation work.

203-3.05 Rock Excavation. Attention is directed to §107-05, SAFETY AND HEALTH REQUIREMENTS, concerning rock drilling and blasting work.

Presplitting is required where the design rock slope is one vertical on one horizontal or steeper and the vertical height of the exposed rock slope exceeds 1.5 m. Ripping will not be allowed within 3 m of a slope that requires presplitting. Test sections will be required at the outset of presplit drilling and blasting operations for the evaluation of the presplit rock slopes by a Departmental Engineering Geologist. The Contractor will be required to completely expose the presplit rock face in the test section for evaluation prior to any further presplit drilling.

All rock slopes shall be thoroughly scaled and cleaned to the satisfaction of the Engineer. For rock excavations involving multiple lifts, scaling of upper lifts shall be completed prior to drilling and fragmenting of lower lifts. Scaled rock slopes shall be stable and free from possible hazards of falling rocks or rock slides that endanger public safety. If, after scaling, such conditions still exist, a determination of the cause will be made by a Departmental Engineering Geologist and if it is determined that the conditions are the result of poor quality work or improper methods employed by the Contractor, the Contractor shall provide approved remedial treatment, at no expense to the State. Such treatment may include, but is not necessarily limited to,

laying back the slope, rock bolting, or shotcreting. In no case shall the subgrade be trimmed prior to the completion of the scaling operation at any location.

A. Presplitting. Prior to drilling presplitting holes, the overburden shall be completely removed to expose the rock surface along the presplitting line. The methods of collaring the holes to achieve required inclination and alignment shall be approved by the Engineer.

The presplitting holes shall be a maximum of 100 mm in diameter, spaced not more than 1 m center to center along the slope, and drilled at the designed slope inclination for a maximum slope distance of 20 m. When excavation operations are conducted in multiple lifts, the presplitting holes for successive lifts may be offset a distance of not more than 1 m for a design slope of one vertical on one horizontal and not more than 0.3 m for slopes of steeper design; however, a presplitting hole shall not be started inside the payment line. If presplitting is conducted in lifts, each lift shall be of approximately equal depth. All presplitting holes shall be checked and cleared of obstructions immediately prior to loading any holes in a round. All presplitting holes shall be loaded with a continuous column charge manufactured especially for presplitting which contains not more than 0.5 kg of explosive per meter. The top of the charge shall be located not more than 1 m below the top of rock. A bottom charge of not more than 1.5 kg of packaged explosive may be used; however, no portion of any bottom charge shall be placed against a proposed finished slope. Each presplitting hole shall be filled with No. 1A crushed stone stemming meeting the gradation requirements of §703-02, Coarse Aggregates. The presplitting charges shall be fired with detonating cord extending the full depth of each hole and attached to a trunk line at the surface. Detonation of the trunk line shall be with blasting cap(s) and shall precede the detonation of fragmentation charges within the section by a minimum of 25 milliseconds. Presplitting shall extend for a minimum distance equal to the burden plus 1 m beyond the limits of fragmentation blasting within the section.

B. Fragmentation Blasting. Fragmentation holes, or portions thereof, shall not be drilled closer than 1.2 m to the proposed finished slope. Where presplitting is required, fragmentation holes adjacent to the presplitting holes shall be drilled parallel to the presplitting holes for the full depth of the production lift at a spacing not exceeding the spacing of the production pattern. Only packaged explosives shall be used 3 m or less from a design slope which requires presplitting regardless of the construction sequence.

Fragmentation charges shall be detonated by properly sequenced millisecond delay blasting caps.

C. Explosive Loading Limits. In the absence of more stringent requirements, the maximum quantity of explosives allowed per delay period shall be based on a maximum particle velocity of 50 mm/s at the nearest structure to be protected. In the absence of seismic monitoring equipment, the following explosive loading limits shall apply:

DISTANCE EQUAL TO OR LESS THAN 65 m FROM THE NEAREST STRUCTURE

1. When the distance from the proposed blasting area to the nearest structure to be protected is 2 m or less, no blasting shall be allowed.
2. When the distance between the blasting area and the nearest structure to be protected is greater than 2 m and equal to or less than 4.5 m, a maximum of 0.1 kg of explosives per delay period (minimum of twenty-five (25) milliseconds) blasting cap shall be allowed.
3. When the distance between the blasting area and the nearest structure to be protected is greater than 4.5 m and equal to or less than 65 m, a Scaled Distance of 9 m shall be utilized to determine the maximum amount of explosive allowed per delay period (minimum of twenty-five (25) milliseconds) blasting cap. The Scaled Distance Formula is as described below:

$$SD = \frac{D}{1.5\sqrt{E_{Max}}}$$

where : SD = Scaled Distance

D = Distance from blasting area to nearest
structure to be protected in meters

OR

$$E_{Max} = \frac{D^2}{(SD)^2} (.45)$$

E_{max} = Maximum kilograms of explosive per delay period
(minimum of twenty-five milliseconds) blasting cap

DISTANCE GREATER THAN 65 m FROM THE NEAREST STRUCTURE

1. When the blaster elects to utilize more than 25 kg of explosive per delay period (minimum of twenty-five (25) milliseconds) blasting cap, a seismograph shall be employed to monitor the blasting vibrations generated. The initial loading shall be computed using a Scaled Distance of 9 m. The resulting particle velocity measured by the seismograph shall be evaluated by a Department Engineering Geologist. The Geologist's evaluation shall be the basis for adjusting the Scaled Distance.

No separate payment shall be made for this work. The cost shall be included in the appropriate excavation item. The above requirements shall in no way relieve the Contractor of liability for any damage incurred as a result of the blasting operations.

203-3.06 Suitable Materials. Moisture content has no bearing on the suitability of material to be used for embankment construction, however, the moisture content of a material may be such that its use will require manipulation. It is the Contractor's responsibility to determine the economics of using, or disposing and replacing, such materials. Material determined by the Contractor to be un-economical for use may be disposed of as specified under §203-3.08 and replaced with other material at no additional cost to the State.

When a contract includes the item "Unclassified Excavation and Disposal", all excavated suitable materials, including the excavation performed under "Structure Excavation" and "Trench and Culvert Excavation," shall become the Contractor's property for disposal or use under another item of these specifications.

203-3.07 Unsuitable Materials. All excavated unsuitable materials shall be the Contractor's property for disposal as surplus materials under the provisions of §203-3.08.

203-3.08 Disposal of Surplus Excavated Materials. Only unsuitable materials, or that portion of suitable material excavated in excess of the quantity required to construct all embankments on the project, shall be considered as surplus.

When the Contractor has surplus materials that he wishes to dispose of within the right-of-way, the Engineer will, whenever possible, allow the material to be used to flatten embankment side slopes, or if this is not possible, allow deposition in other locations within the right-of-way as designated and approved by the Engineer. However, no surplus excavated material shall be disposed of in or adjacent to wetlands, streams or flood plains. Where complete disposal of surplus materials cannot be accommodated within the right-of-way, the excess shall become the Contractor's property for disposal off the project, subject to the provisions of §107-10. All disposal within the right-of-way shall be subject to the Engineer's approval of final condition and appearance, but is not subject to the provisions governing lift placement and compaction of embankment contained in §203-3.10 and §203-3.12.

203-3.09 Embankment Foundation. After completion of the work required under §201, Clearing and Grubbing, and §202, Removal of Structures and Obstructions, the embankment foundation shall be prepared. Sod and topsoil shall be removed where the final pavement grade is 2 m or less above the existing ground surface and in other areas designated in the plans or by the Engineer. Prior to embankment construction and subbase course placement, the surface on which the embankment and/or subbase is to be placed shall be thoroughly compacted to the satisfaction of the Engineer. Unsuitable materials other than sod and topsoil shall

be removed to the depths shown in the plans or as directed by the Engineer. Underwater areas shall be filled with "Select Borrow or Select Fill," §203-2.02B, to 0.6 m above the water surface at the time of placement, and paid for under its appropriate item.

Where embankments are to be constructed over ground that will not adequately support embankment construction equipment, an initial layer of fill may be allowed to form a working platform. The need, manner of construction, and thickness of such a layer shall be subject to approval of the Engineer, and the layer will be permitted only where the lack of support is, as determined by the Engineer, not due to deficient ditching, grading or drainage practices or where the embankment could be constructed in the approved manner by the use of different equipment or procedures. Thicknesses of up to 1 m may be permitted for such a layer. Concrete slabs may be used at the bottom of such a layer, provided they are placed horizontally.

In locations where embankments are to be constructed on hillsides or against existing embankments with slopes steeper than 1 (vertical) on 3 (horizontal), the slopes shall be benched. Required benches shall be constructed as shown on the Standard Sheet, "Earthwork Transition and Benching Details."

Where old pavement is encountered within 0.6 m of the top of the subbase course, it shall be broken up or scarified.

203-3.10 Embankments. The embankment shall be constructed of suitable material as defined by §203-1.08, Suitable Material. Embankment material shall not be placed on frozen earth, nor shall frozen soils be placed in any embankments. Embankment material shall be placed and spread in lifts (layers) of uniform thickness, then uniformly compacted as specified under applicable portions of §203-3.12, Compaction. During embankment construction operations, earth moving equipment shall be routed so as to prevent damage to any compacted lift. Damage to any compacted lift at any time during the course of construction, such as rutting under the loads imposed by earth moving equipment, shall be fully repaired by the Contractor at his/her own expense prior to placement of any overlying materials. At the close of each day's work, the working surface shall be crowned, shaped and rolled with smooth steel wheel or pneumatic tired rollers, for positive drainage.

Particles with a dimension in excess of two-thirds of the loose lift thickness are designated as oversized particles. Oversized particles shall be removed prior to compaction of the lift and may be placed in the Embankment Side Slope Area, Subsection 203-1.06.

Pieces of concrete may be used provided that the voids between the pieces are completely filled, and the greatest dimension of any piece does not exceed $\frac{2}{3}$ the loose lift thickness. Exposed mesh or rebar shall not exceed 25 mm in length.

Embankments constructed using rock products or pieces of concrete shall be spread by bladed equipment on each lift to minimize the formation of large voids as the work progresses. The top lift of a rock or concrete fill shall be chinked.

When permitted by a note in the plans or proposal, stumps, logs, and other materials may be placed in the Embankment Side Slope Area, §203-1.06, provided that: 1) such matter is deposited and compacted concurrent with the adjacent embankment, and; 2) any stumps or woody material are covered by not less than 0.6 m of soil beneath the exposed side slope surface.

Glass shall not be placed in contact with synthetic liners, geogrids, geotextiles or other geosynthetics. Glass incorporated into embankments shall be thoroughly mixed with other suitable material so that Glass constitutes no more than 30 percent by volume anywhere in the embankment as visually determined by the Engineer-In-Charge.

203-3.11 Subgrade Area. Where a subgrade area is defined in an embankment by §203-1.05, Subgrade Area, the material placed shall conform to §203-2.02A, Subgrade Area Material, placed and compacted in conformance with §203-3.10 and §203-3.12. Where longitudinal and transverse changes from cut to fill are encountered in the work, a subgrade transition section shall be provided in conformance with Standard Sheet "Earthwork Transition and Benching Details." Where a subgrade area becomes defined by §203-1.05 in a cut section, the materials placed and other details shall be as specified under §203-3.14C, unless otherwise required by the contract documents. Prior to subbase course placement, the surface on which the subbase is to be placed shall be thoroughly compacted to the satisfaction of the Engineer.

203-3.12 Compaction

A. General Requirements. It shall be the Contractor's responsibility to properly place and compact all materials in the road section and other locations specified in the contract documents, and to correct any deficiencies resulting from insufficient or improper compaction of such materials throughout the contract period. The Contractor shall determine the type, size and weight of compactor best suited to the work at hand, select and control the lift (layer) thickness, exert control over the moisture content of the material, and other details necessary to obtain satisfactory results. During the progression of the work, the Department will inspect the Contractor's operations and will permit the work to continue where:

1. Lift thickness is controlled and does not exceed the maximum allowed according to the equipment classifications in subparagraph B of this subsection, and the equipment meets all specified class criteria. Thinner lifts and lighter equipment than the maximum allowed may be necessary for satisfactory results on some materials.

2. The compactive effort (number of passes and travel speed) is uniformly applied and not less than that specified for the given equipment class and lift thickness. Higher efforts than the minimum allowed may be necessary for satisfactory results on some materials.

3. The Engineer concludes from a visual observation that adequate compaction has been attained, with the exception of backfill at structures, culverts, pipes, conduits, and direct burial cables. However, the State reserves the right to perform density tests at any time. When tests are performed, the results shall indicate that not less than 90 percent of Standard Proctor Maximum Density is attained in any portion of an embankment, or 95 percent in a subgrade area, or as specified for other items with a percent maximum density requirement.

4. Significant rutting under the action of the compactor is not observed on the final passes on a lift.

Whenever the Contractor's operations do not conform to the above criteria, or requirements contained in other subparagraphs of this subsection, the Engineer will prohibit placement of an overlying lift until the Contractor takes effective corrective action.

When the Engineer determines that density tests are necessary, the Contractor shall provide any assistance requested to facilitate such tests. Such assistance shall include but will not be limited to excavation and backfill of test pits and holes. This work shall be considered to be incidental construction.

Damage to any compacted lift at any time during the course of construction such as rutting under the loads imposed by earth moving equipment, shall be fully repaired by the Contractor at his/her own expense prior to placement of any overlying materials.

B. Compaction Equipment. The selection of compaction equipment is the Contractor's responsibility, but shall be subject to meeting the requirements of this subparagraph and approval by the Engineer with respect to its provisions. All compaction equipment shall be marked by a permanently attached manufacturer's identification plate designating the name of the manufacturer, model number and serial number of the machine as minimum identification. This plate shall be installed in a readily visible location. Compaction equipment lacking such an original manufacturer's identification plate, or with altered or illegible plates, will not be recognized as acceptable compaction equipment. Any equipment not principally manufactured for compaction purposes and equipment which is not in proper working order in all respects shall not be approved or used. The Engineer will also withhold approval of any compactor for which the Contractor cannot furnish manufacturer's specifications covering data not obvious from a visual inspection of the equipment and necessary to determine its classification.

The term, "pass," for any type of compactor, shall denote one direct vertical application of compactor effort over all elemental areas of a lift surface. Terms in common parlance, such as "coverage," "trips," etc., have no significance, equivalence, or application under these specifications.

1. **Pneumatic-Tired Compactors.** This type of compactor shall be classified for use according

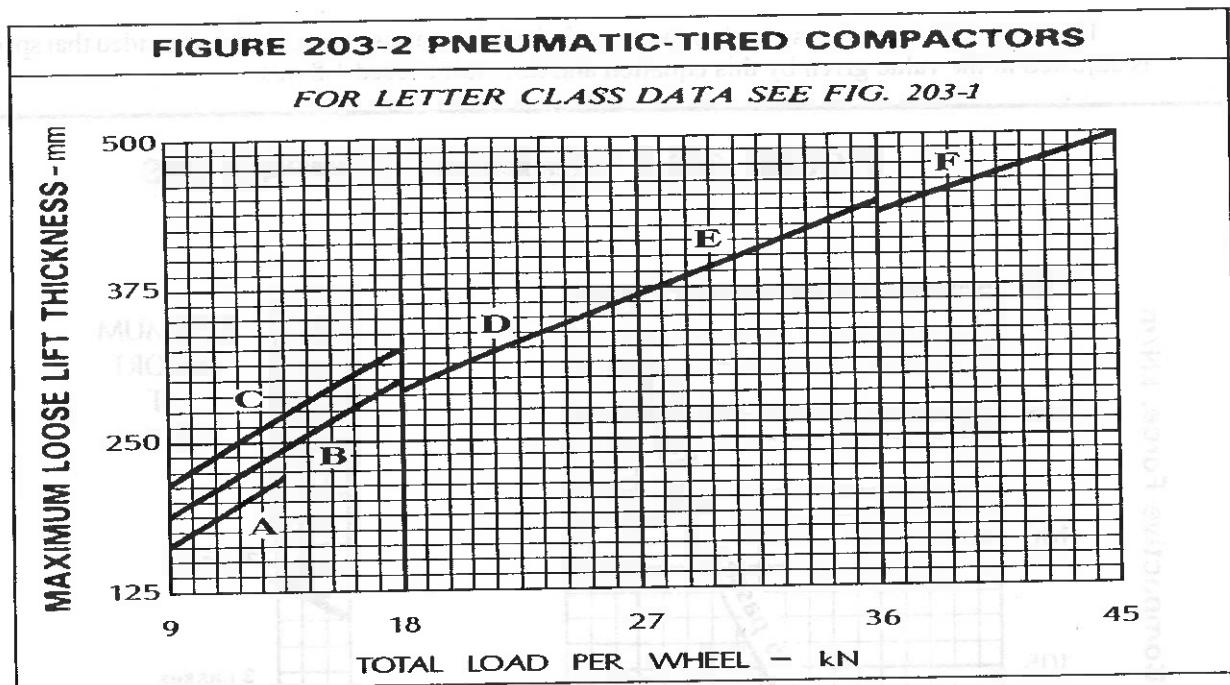
FIGURE 203-1
PNEUMATIC-TIRED COMPACTOR CLASSIFICATIONS

PNEUMATIC COMPACTOR CLASS	TIRE REQUIREMENTS			RANGE OF BALLASTED WHEEL LOADS (KILONEWTONS PER WHEEL)
	TIRE SIZE	NO. PLYS	INFL. PRESS. (kPa)	
A	7.50 x 15	4	240	9 - 14
B	7.50 x 15	6 {10}	415* 620*	9 - 18
C	7.50 x 15	14	900*	9 - 18
D	9.00 x 20	10 {12}	520* 620*	18 - 27
E	11.00 x 20	12 {18}	620*	27 - 36
F	13.00 x 24	18	690*	36 - 45

* Inflation pressure for not less than the last two passes on each lift. May be reduced during earlier passes and gradually increased to this level.

to the requirements of Figure 203-1. For the lift thickness selected by the Contractor, the minimum class and wheel load which will be allowed on that lift thickness, shall be as shown in Figure 203-2.

The minimum effort for all pneumatic compactors shall be 6 passes, at speeds up to 3.6 m/s on no more than the first 2 passes, and all subsequent passes at speeds of 1.8 m/s or less.



2. Smooth Drum Vibratory Compactors. This type of compactor is defined as a machine which primarily develops its compactive effort from the vibrations created and is classified for use

according to the developed compactive force rating (CFR) per linear meter of drum width.

The CFR is defined as follows:

$$CFR = \frac{\text{Unsprung Drum Weight (kN)} + \text{Dynamic Force (kN)}}{\text{Drum Width (m)}}$$

The unsprung drum weight is the static weight of the drum and appurtenances without any reaction transmitted to the drum from the main chassis of the compactor. The dynamic force produced is dependent on the frequency of vibration, and therefore, CFR ratings shall be determined for the actual operating frequency of the compactor. Approval for vibratory compactors shall be confined, however, to equipment operating at not less than 18 Hz, nor more than 25 Hz, and those where the actual dynamic force at the actual operating frequency is at least 2.5 times the unsprung drum weight.

Conversion of manufacturer's published ratings, at a given frequency, shall be made with the following equation:

$$F_2 = \frac{F_1(V_2)^2}{(V_1)^2}$$

where: F_1 = Dynamic Force at Rated Frequency
 F_2 = Dynamic Force at Operating Frequency
 V_1 = Rated Frequency
 V_2 = Operating Frequency

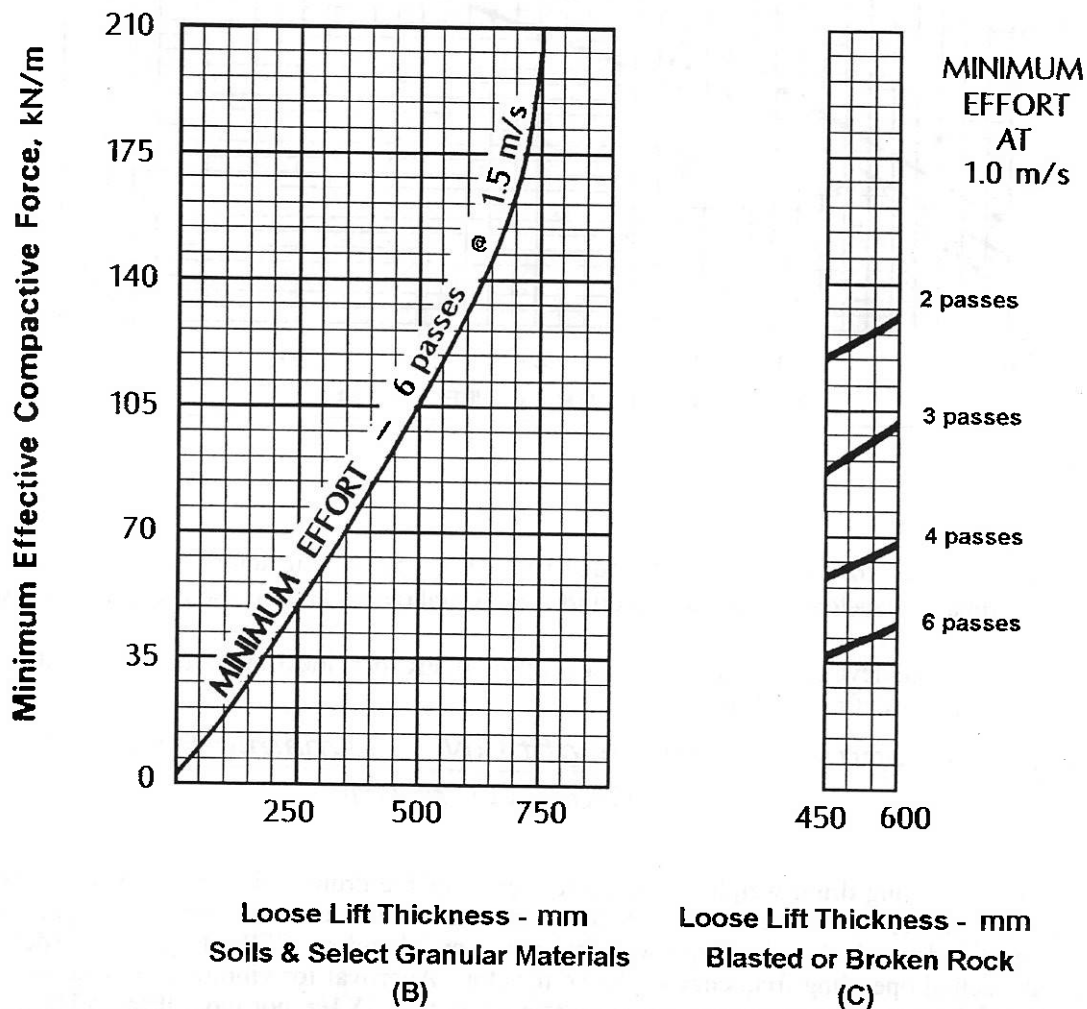
For the lift thickness selected by the Contractor, the **minimum** CFR rating and **minimum** effort on such a lift, shall be as shown in Figures 203-3B&C, respectively. Non-Centrifugal (Vertical force only) types of vibratory compactors shall be approved as above, less 30 kN/m before using Figures

203-3 B&C as a minimum number of passes at a single specified speed. An equivalent effort, relating varying numbers of passes to other speeds is given by the equation:

$$\text{Speed } X = \frac{(\text{Specified Speed}) (\text{Min. Passes at Speed } X)}{(\text{Specified Min. Passes})}$$

The Contractor may choose to alter the specified minimum pass requirement, provided that speed is adjusted to the value given by this equation and does not exceed 1.8 m/s.

FIGURE 203-3 VIBRATORY COMPACTORS



Where vibratory compactors are used on a project, the Contractor shall furnish for the exclusive use of the Engineer, one vibrating reed tachometer per project, plus one additional tachometer for each group of two vibratory compactors in excess of two per project. Tachometers shall have a frequency range adequate to cover operating frequencies of all vibratory compactors used on the project and shall have scale divisions of 1 Hz or less. Tachometers may be placed on the ground surface near the compactor when making readings, or with suitable damping materials interposed, placed directly on the compactor drum frame.

The dispensations permitted under this specification for vibratory compactors are contingent upon proper operation of the equipment at all times during compaction operations. In any instance where the Engineer encounters any problems with operators rolling without vibration, for any reason, and

immediate and effective corrective action is not taken by the Contractor, the Engineer will halt the work until the problem is resolved. If continuing problems of this nature occur, the Engineer may suspend all provisions of this subparagraph and consider the vibratory compactors as smooth steel wheel rollers classified according to their gross weight.

3. Sheepfoot Rollers. This type of compactor shall be defined as a machine which is primarily designed to compact a lift from the bottom to the top.

The maximum loose layer thickness of the material to be compacted shall be equal to the length of the feet plus fifteen (15) percent. The end area size and configuration of the feet shall be selected by the Contractor to suit the characteristics of soil being compacted.

Where sheepfoot rollers are used, with or without vibration, the number of passes required for job control shall be determined by a jobsite test in which the feet penetrate into the loose lifts and, with further passes, eventually and substantially "walk out" of the layer. This job control shall then be established for that machine, lift thickness and material, provided that adequate moisture control is continuously maintained per §203-3.12C. Sheepfoot rollers shall be operated at speeds not exceeding 2 m/s, when towed and 5 m/s when self-propelled.

4. Smooth Steel Wheel Rollers. Smooth steel wheel rollers shall be considered as primary compactors on layers whose maximum thickness, after compaction, is 200 mm. When so used, the roller shall have a nominal gross weight of not less than nine metric tons, exert a minimum force of not less than 50 kN/m of width on the compression roll faces, and a minimum of 8 passes shall be applied over each lift with the roller operating at a speed not exceeding 2 m/s.

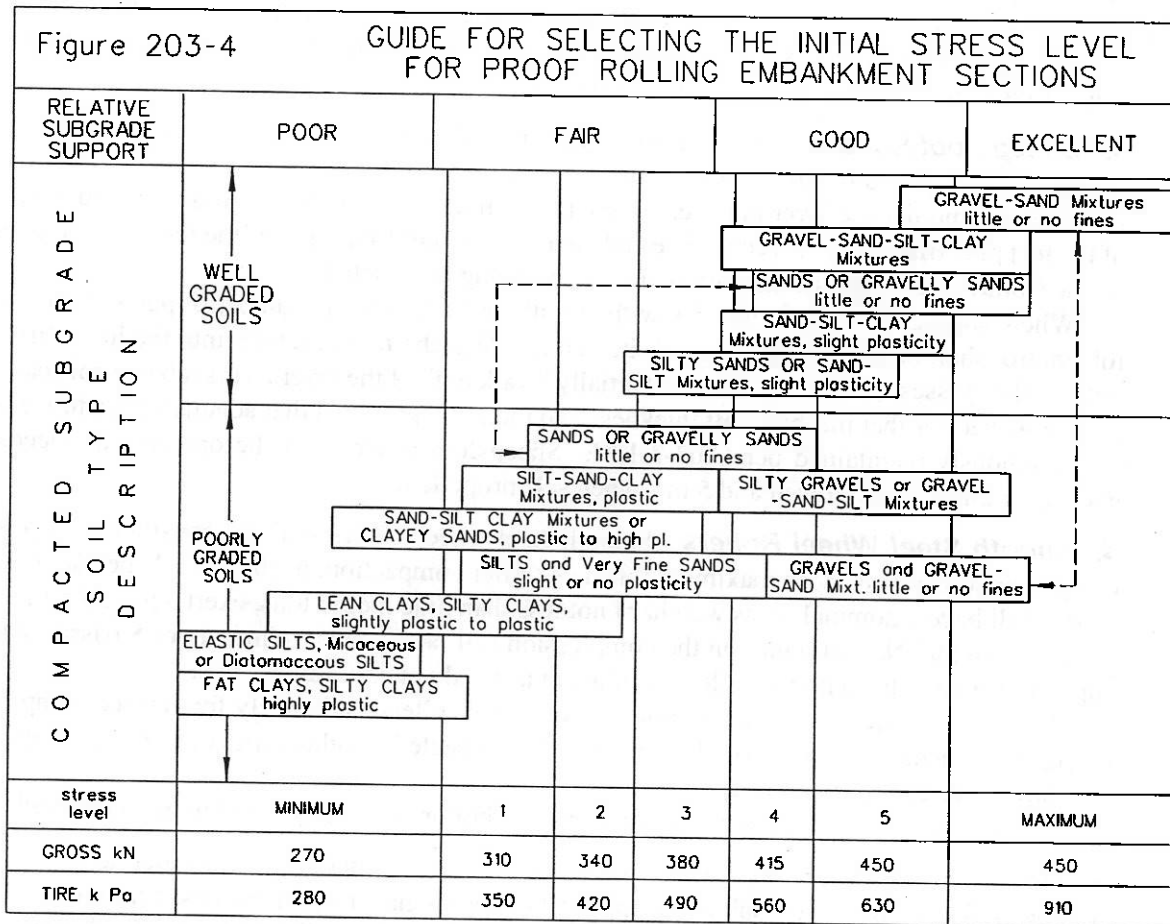
When the Contractor employs smooth steel wheel rollers exclusively for surface compaction, leveling or finishing operations on lifts previously compacted by other types of primary compactors, the above restrictions shall not apply.

This section applies to non-vibratory rollers or vibratory rollers operated in the static mode only.

5. Other Type of Compactors. Compactor types other than those classified above, may be employed by the Contractor, subject to approval by the Engineer of the proposed minimum applied effort (minimum number of passes and travel speed) and maximum lift thickness. Such approval by the Engineer will be based upon the results of appropriate on-site field tests.

6. Compaction Equipment for Confined Areas. In areas inaccessible to conventional compactors, or where maneuvering space is limited, impactor rammers, plate or small drum vibrators, or pneumatic buttonhead compaction equipment may be used with layer thickness not exceeding 150 mm before compaction. However, materials placed for subbase course construction shall have a maximum compacted thickness of 150 mm. Hand tampers shall not be permitted. The Engineer may approve or reject any of the above described mechanical devices based upon the results of appropriate on-site field tests.

C. Moisture Control. All fill or backfill material to be compacted, shall be at a moisture content for adequate compaction of that material using the compactor selected by the Contractor to perform the work. The Contractor shall be responsible for determining the appropriate moisture content, and for controlling it within the proper limits as the work is progressed. When water must be added to a material, it may be added on the lift or in the excavation or borrow pit. Water added on the lift, however, shall be applied by use of an approved pressure distributor. Distributors must be approved and documented by the Engineer. Documentation by the Engineer shall be adequate evidence of approval. Water added shall be thoroughly incorporated into the soil, and manipulation shall be provided whenever necessary to attain uniformity of moisture distribution in the soil. When the moisture content of a lift about to be compacted exceeds the required amount, compaction shall be deferred until the layer has dried back to the required amount. Natural drying may be accelerated by blending in a dry material or manipulation alone, to



increase the rate of evaporation. Increased loose lift thickness caused by blending in a dry material, however, may necessitate a change in compaction equipment to meet the minimum provisions of subparagraph B of this subsection.

203-3.13 Proof Rolling in Embankment Sections. Immediately prior to final trimming of the subgrade surface and placement of subbase materials in embankment sections, all areas of the subgrade surface within roadway limits shall be proof rolled according to the requirements of this subsection. This work, and any delays due to this work, shall be considered incidental to the embankment item.

A. (Vacant).

B. Equipment. The proof roller shall consist of a chariot type rigid steel frame with a box body suitable for ballast loading up to forty-five metric tons gross weight, and mounted on four (4) pneumatic tired wheels acting in a single line across the width of the roller on its transverse load center line. The wheels shall be equipped with 18.00 x 24 or 18.00 x 25, 24 ply tires, and shall be suspended on articulated axles such that all wheels carry approximately equal loads when operating over uneven surfaces.

C. Determination of Roller Stress. Initially, the gross ballasted weight and tire inflation pressure of the proof roller shall be adjusted to the highest stress level shown in Figure 203-4 based on:

1. The Engineer's general description of the subgrade soils.

2. The Engineer's estimation of the relative subgrade support within the subgrade soil description range.

The initial roller stress for embankments constructed of rock shall be the maximum level listed in Figure 203-4 (Gross Metric Tons 45, Tire kPa 910).

The roller shall be operated briefly to establish the acceptability of the initial stress level. Proof rolling of the embankment shall be performed at the next lower stress level whenever operation of the roller at a higher stress level is accompanied by consistent lateral displacement of soil out of the wheel paths.

D. Procedure. After an acceptable stress level is established, two complete passes of the roller shall be applied over all elements of the area to be proof rolled. Any deficiencies disclosed during the proof rolling operation shall be corrected. Subsidence depressions shall be filled with material similar to the subgrade soil and then compacted in a normal manner. After compaction, these areas shall be proof rolled again. Corrective work shall be judged complete and accepted by the Engineer when all elements of the subgrade surface over a given embankment show a satisfactory uniform response to the proof roller.

E. Exceptions. Proof rolling of the subgrade surface in embankment sections will not be required in any area where:

1. due to restrictions in available access and/or maneuvering space, use of the proof roller may damage adjacent work;
2. the proof roller will approach a culvert, pipe or other conduit closer than 1.5 m in any direction.

203-3.14 Proof Rolling in Cut Sections. Immediately prior to final trimming of the subgrade surface and placement of subbase materials in cut sections, all areas of the subgrade surface within roadway limits shall be proof rolled according to the requirements of this subsection. This work, and any delays due to this work, shall be considered incidental to the excavation item.

A. Purpose. In cut sections, the purpose of proof rolling is to determine the location and extent of areas below the subgrade surface that require corrective undercutting and are not so specified in the contract plans.

B. Equipment. The proof roller used in embankment sections, as specified in § 203-3.13B, shall be employed for proof rolling in cut sections except that the roller shall be loaded to achieve a single stress level in operation, using a gross ballasted weight of twenty-seven metric tons and all tires inflated to 275 kPa.

C. Procedure. Two complete passes shall be applied over all elements of the area to be proof rolled. Where any portion of the cut subgrade surface other than that which has been damaged by the Contractor's operations fails to provide a satisfactory support for the proof rolling operation, the Engineer may order corrective undercut and backfill work performed. Backfill of undercuts shown on the plans or ordered by the Engineer shall meet the requirements of Select Granular Subgrade, §203-2.202E, placed and compacted as approved by the Engineer. Where natural soil below this course will not support the weight of the construction equipment, and when ordered by the Engineer, the course shall be placed in one lift. No additional proof rolling shall follow corrective work.

D. Exceptions. Proof rolling of the subgrade surface in cut sections will not be required in any area where the subgrade surface is in a rock cut, or where undercut and backfill has been previously performed. The Engineer may order undercutting and backfill without proof rolling of any cut where the need for corrective work, as determined by the Engineer, is obvious without actual proof rolling. The Engineer

may also delete proof rolling in any cut section where, based upon a written evaluation by a Departmental Geotechnical Engineer, proof rolling would be detrimental to the work.

203-3.15 Fill and Backfill at Structures, Culverts, Pipes, Conduits and Direct Burial Cables.

The type of material to be used in bedding, filling and backfill at structures, culverts, pipes, conduit and direct burial cable and payment lines therefore shall be in conformance with the details shown on the appropriate Standard Sheet or as noted on the plans or as ordered by the Engineer. Do not use RAP. Do not use slabs or pieces of either concrete or asphalt.

Fill or backfill material at structures, culverts and pipes shall be deposited in horizontal layers not exceeding 150 mm in thickness prior to compaction. Compaction of each layer shall be as specified under §203-3.12, Compaction. A minimum of 95 percent of Standard Proctor Maximum Density will be required. When placing fill or backfill around culverts and pipes, layers shall be deposited to progressively bury the pipe or culvert to equal depths on both sides. When filling behind abutments and similar structures, all material shall be placed and compacted in front of the walls prior to placing fill behind the walls to a higher elevation. The limits to which this subsection will apply shall be in accordance with the Standard Sheets or as modified on the plans.

Fill or backfill for conduit or cable placed in a trench shall be carefully placed in a horizontal layer to a depth of 150 mm over the top of the conduit or cable. This layer of material shall not be compacted, however, the remaining portion of the trench shall be backfilled in accordance with the preceding paragraph. Where cables or conduits are placed and backfilled by a machine in one operation, the above requirements for backfilling do not apply.

Where sheeting has been used for the excavation, and incremental removal of sheeting is not specified in the plans or proposal, sheeting shall be pulled when the trench has been backfilled to the maximum unsupported trench depth allowed by Title 29 Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction (OSHA).

203-3.16 Borrow. The management of a borrow source and the acceptability of all borrow material shall be subject to the approval of the Engineer at all times. The Contractor shall notify the Engineer at least ten (10) work days in advance of opening any borrow area, and request approval of the source under the pay item involved. Test pits required by the Engineer to evaluate the acceptability and limits of the source, shall be provided by the Contractor at the Contractor's own expense. Concurrent removal of material for more than one pay item from a single source or pit shall be prohibited except with the written permission of, and under such conditions and restrictions as may be imposed by the Engineer. All borrow pits shall be stripped of sod, topsoil and vegetable matter well in advance of any working face. The minimum distance by which stripping shall lead excavation for a given source shall be established by the Engineer to suit local conditions. Where a borrow source is not under direct control of the Contractor or where special conditions exist, the Engineer may waive any of the above requirements and establish alternative provisions for the control and acceptability of borrow.

Ordinary borrow will be accepted for use where the material qualifies under the definition of Suitable Material, §203-1.08. The borrow of select granular materials enumerated in §203-2.02 shall be accepted subject to meeting the additional provisions contained, therein. All borrow, whether ordinary borrow or select borrow placed within the limits of Embankment or the Subgrade Area shall be placed in conformance with §203-3.10 or §203-3.11 respectively, as appropriate, or where used for fill or backfill at structures, culverts and pipes, in conformance with §203-3.15.

203-3.17 Select Granular Fill, Slope Protection. The Contractor shall perform the excavation in accordance with the requirements for "Unclassified Excavation and Disposal" as described elsewhere in these specifications. The Contractor shall then spread material conforming to the requirements given in §203-2.02D, in one layer to its full thickness by a method approved by the Engineer. The work shall be performed where shown on the plans or where directed by the Engineer in accordance with the standard sheets, and details shown on the plans. Compaction of the slope protection is not required. Slope Protection shall be either of two types, as described below:

A. Select Granular Fill, Slope Protection - Type A. Under this type, the Contractor shall furnish and install the slope protection where shown on the plans in accordance with the details shown on the Standard Sheets.

B. Select Granular Fill, Slope Protection - Type B. Under this type, the Contractor shall furnish and install the slope protection where directed by the Engineer in accordance with the details shown on the Standard Sheets.

203-3.18 Embankment Construction Control Devices

A. Settlement Gages and Settlement Rods. Settlement gages and rods shall be constructed, installed, and maintained where shown on the plans and in accordance with the details contained in the current publication issued by the Department covering construction, installation, maintenance, and abandonment of these devices.

Where settlement gages are called for, it will be the Contractor's option to install pipe gages or manometer gages, unless a definite type is specified on the plans or in the proposal. Settlement gages and settlement rods will be accepted for conformance with the specification requirements on the basis of an inspection of the installation by the Departmental Geotechnical Engineer.

B. Piezometers. Piezometers shall be constructed, installed, and maintained at the locations shown on the plans and in accordance with the detailed drawings and specifications included in the proposal.

203-3.19 Cleaning Culverts and Closed Drainage Systems. Culverts, closed drainage systems, drainage structures and manholes shall be thoroughly cleaned and maintained clean as determined by the Engineer for the duration of the contract. Materials removed shall be disposed of in accordance with §203-3.08 "Disposal of Surplus Excavated Materials."

203-3.20 Subgrade Surface Tolerance. After compaction, the subgrade surface shall not be above design elevation at any location.

203-3.21 Clean, Grade and Shape Existing Roadside Section. The Contractor shall remove earth, turf, brush and debris, or provide necessary fill material to restore adequate roadside drainage. Ditches shall be shaped as shown on the plans. Material removed shall be disposed of in conformance with the provisions of Subsection 203-3.08, Disposal of Surplus Excavated Materials.

Under Section 100, General Provisions, the Contractor shall protect all fences, markers, culverts, underground structures, utilities and other appurtenances adjacent to the work area. Any damaged facilities and/or disturbed areas shall be replaced in kind at no additional cost to the state.

203-4 METHOD OF MEASUREMENT

203-4.01 General. Quantities for all items of work with payment units in cubic meters encompassed by this Section, shall be computed from payment lines shown on the plans or standard sheets except where revised payment lines are established by the Engineer prior to performing the work. Work performed beyond any designated payment line, including any offset required for the construction of presplit rock slopes in lifts, shall not be included in the computation of quantities for the item involved.

For any item paid for in its final position, no additional quantity shall be measured for payment to make up losses due to foundation settlement, compaction, erosion or any other cause.

Cross sectioning, for the exclusive purpose of determining quantities for payment, shall be employed only where payment lines are not shown on the Plans or Standard Sheets, and cannot be reasonably established by the Engineer.

Quantities for benching shall be computed for payment from the details and instructions shown on the Standard Sheet, "Earthwork Transition and Benching Details."

The excavation of unsuitable materials designated as topsoil under §613, shall be included in the quantity measured for the appropriate unclassified excavation item, without distinction. Separate payment for placing topsoil, however, is made under §613.

203-4.02 (Vacant).

203-4.03 Unclassified Excavation and Disposal. Quantities shall be in cubic meters, computed in the original position for all excavation within right-of-way limits. No deduction shall be made for any pipes, culverts, structures, or other obstructions, unless these are measured for payment under another contract item. Excavation for borrow of suitable materials for embankment construction, shall not be included in the computation for this work.

203-4.04 Embankment in Place. Quantities shall be in cubic meters, computed in the final compacted position. Any additional quantity of material required to compensate for embankment settlement shall not be included in the measurement of this item. The quantities of embankment shall exclude the total volume of pipes, culverts, other roadway items, and granular backfill within the payment lines for such granular backfill.

203-4.05 Ordinary Borrow. Where the item, "Embankment in Place," is designated for the project by the proposal, all borrow of ordinary suitable materials shall be incidental to the work of that item.

203-4.06 Select Borrow. Quantities shall be in cubic meters, computed in the original position.

203-4.07 Select Fill and Select Granular Subgrade. Quantities for each of these items shall be in cubic meters, computed in the final compacted position.

203-4.08 Select Granular Fill, Select Structure Fill, and Sand Backfill. Quantities for this work shall be computed in cubic meters in the final compacted position. A deduction shall be made for pipes (based on nominal diameters) and other payment items when the combined cross-sectional area exceeds 0.1 m² unless otherwise shown on plans. No deduction will be made for the cross-sectional area of an existing facility.

203-4.09 Select Granular Fill, Slope Protection. Quantities shall be in cubic meters, computed in the final position.

203-4.10 (Vacant).

203-4.11 Embankment Construction Control Devices. Quantities shall be per each device satisfactorily installed and maintained under their respective items "Surface Settlement Gages," "Subsurface Settlement Gages," "Settlement Rods," or "Piezometers."

203-4.12 Cleaning Culverts and Closed Drainage Systems. This work will be measured by the number of meters of culvert and or pipe of the size range indicated in the Contract Documents. Measurement will be the total length end to end along the invert of culvert or closed drainage system cleaned. Multiple barrel culverts will be measured along each individual barrel. The length of closed drainage systems will be determined by measuring from the inside wall surface to the inside wall surface of the adjacent manhole or other drainage structure. The spans of culverts will be determined as the greatest internal horizontal width of the culvert measured perpendicular to the axis of the structure.

203-4.13 Cleaning Drainage Structures and Manholes. This work will be measured as the number of drainage structures or manholes cleaned and maintained within the inside walls of the structure, excluding existing structures being altered under Section 604.

203-4.14 Applying Water. The unit of measurement shall be one operating pressure distributor per calendar day, denoted hereafter as one p.d.d. Where the Contractor works in more than one separate and distinct shift per calendar day, each shift shall be considered as one p.d.d. A single shift plus overtime work, however, shall be considered as one p.d.d. The quantity thus determined shall be applied directly as the quantity to be paid for where the distributors used have a capacity of 11 000 L or less.

Provided that the Engineer determines that the total operating distributor capacity (number and sizes of all distributors) employed is reasonably commensurate with the needs for water application, additional payment will be allowed for distributors exceeding 11 000 L in capacity as follows:

Where the distributor capacity exceeds 11 000 L but is less than 19 000 L the p.d.d.'s shall be multiplied by 1.5 and where the capacity is 19 000 L or more, multiplied by 2.0 to determine the quantity for payment.

203-4.15 Clean, Grade and Shape Existing Roadside Section. This work will be measured as the number of meters along the edge of the adjacent roadway.

203-5 BASIS OF PAYMENT

203-5.01 General-All Items. The unit price bid for all pay items of work encompassed by this Section, shall include the costs of furnishing all equipment, labor and materials as necessary to complete the work of the item, except where specific costs are designated or included in another pay item of work. All incidental costs, such as acquisition of borrow pits or material outside of the right-of-way, rock drilling and blasting, compaction and special test requirements, stockpiling and rehandling of materials, precautionary measures to protect private property and utilities, to form and trim graded surfaces, proof rolling, re-proof rolling, corrective work disclosed by proof rolling and any delays caused by this corrective work, shall all be included in the unit price of the pay item where such costs are incurred. Except that, corrective work ordered in cut sections based on an evaluation of proof rolling will be paid for under the appropriate excavation and backfill items. When there is no pay item for Applying Water in the itemized proposal, the work shall be performed in accordance with the specifications for the appropriate items but the costs thereof shall be included in those pay items that require the application of water. When there is no pay item for Clearing and Grubbing in the itemized proposal, this work shall be performed in accordance with the specifications for the appropriate item but the cost thereof shall be included in those pay items that require clearing and grubbing.

Cleaning culverts, removing and resetting guiderail and establishing turf and sodding will be paid under their respective specification items.

Items with additional provisions to these are listed in subsections sequentially numbered following this subsection. Items with no additional provisions to these above are:

- Embankment In Place
- Select Borrow
- Select Fill
- Select Granular Fill
- Select Granular Fill, Slope Protection (Type A & B)
- Select Granular Subgrade
- Select Structure Fill
- Applying Water
- Sand Backfill

203-5.02 (Vacant).

203-5.03 Unclassified Excavation and Disposal. The unit price bid shall cover all costs of required excavation within the right of way limits, and all costs of disposal if the excavated materials are not used under another pay item.

203-5.04 (Vacant).

203-5.05 Embankment Construction Control Devices. The unit price bid shall cover all costs of providing, installing and maintaining each device, including excavation, trenching and backfill during the course of the work. No payment will be made under any other item of the contract for any work associated with these items.

A. Settlement Gages and Settlement Rods. When each installation is completed, 75 percent of the item unit price will be paid. The remaining 25 percent will be paid when each device has been properly maintained and is abandoned according to the procedures of §203-3.18A. Unless otherwise specified in the proposal, the unit price shall also include the costs of removal.

B. Piezometer. When each installation is completed and the device placed in satisfactory operation, 75 percent of the unit price will be paid. The remaining 25 percent will be paid when all earthmoving and slope work is completed in the vicinity of each installation. Any installation rendered inoperative due to damage by construction equipment after partial or full payment, shall be immediately repaired or the full amount of such payment shall be deducted from other monies due the Contractor under the contract.

203-5.06 Cleaning Culverts and Closed Drainage Systems. The unit price bid per linear meter shall include the cost of all labor, materials, and equipment necessary to satisfactorily perform the work.

Payment, for cleaning culverts and/or closed drainage systems will be made only for those facilities designated on the plans or by the Engineer. Only one payment for each facility will be made regardless of the number of times it is cleaned. The cleaning of drainage structures and manholes shall be paid for under their respective item.

203-5.07 Cleaning Drainage Structures and Manholes. The unit price bid for each shall include the cost of all labor, materials and equipment necessary to satisfactorily perform the work. Payment for cleaning drainage structures and manholes will be made only for those facilities designated on the plans or by the Engineer. Only one payment for each facility will be made regardless of the number of times it is cleaned.

Payment will be made under:

Item No.	Item	Pay Unit
203.02 M	Unclassified Excavation and Disposal	Cubic Meter
203.03 M	Embankment In Place	Cubic Meter
203.05 M	Select Borrow	Cubic Meter
203.06 M	Select Fill	Cubic Meter
203.07 M	Select Granular Fill	Cubic Meter
203.0801 M	Select Granular Fill, Slope Protection - Type A	Cubic Meter
203.0802 M	Select Granular Fill, Slope Protection - Type B	Cubic Meter
203.10 M	Surface Settlement Gages	Each
203.11 M	Subsurface Settlement Gages	Each
203.12 M	Settlement Rods	Each
203.13 M	Piezometers	Each
203.1601 M	Applying Water	P.D.D.
203.1770 M	Cleaning Culverts with Span of 1300 Millimeters or Less	Meter
203.1780 M	Cleaning Culverts with Span of More Than 1300 Millimeters	Meter
203.18 M	Cleaning Closed Drainage Systems	Meter
203.19 M	Cleaning Drainage Structures and Manholes	Each
203.20 M	Select Granular Subgrade	Cubic Meter
203.21 M	Select Structure Fill	Cubic Meter
203.25 M	Sand Backfill	Cubic Meter
203.51 M	Clean, Grade and Shape Existing Roadside Section	Meter

SECTION 204 - CONTROLLED LOW STRENGTH MATERIAL (CLSM)

204-1 DESCRIPTION. The work consists of mixing and placing Controlled Low Strength Material (CLSM) at the locations shown on the plans or where ordered by the Engineer.

204-2 MATERIALS

204-2.01 Tests and Control Methods. Provide CLSM containing cement and water. At the Contractor's option, it may also contain fly ash, aggregate, or chemical admixtures in any proportions such that the final product meets the strength and flow consistency requirements included in this specification.

Provide materials meeting the requirements of the following subsections:

Portland Cement, Type 1 or Type 2 : Subsection 701-01

Water: Subsection 712-01

If used, provide materials meeting the following requirements:

Aggregates: Gradation: 100% passing the 2.0 mm sieve and a maximum of 20% passing the 75 μ m sieve.

Fly Ash: Provide fly ash that complies with the requirements of Subsection 711-10. Waive the loss on ignition requirement.

Chemical Admixtures: Provide admixtures that comply with Subsection 711-08. The mix may include high air generators manufactured for CLSM.

Certify that the CLSM will have a 28 day compressive strength between 275 kPa and 1030 kPa, and provide this certification to the Engineer.

Design the CLSM mix so that it sets within the time stated in the contract documents. If no set time is required by the Department, design the set time to conform with the Maintenance and Protection of Traffic scheme and requirements of the project.

Prior to placement, the CLSM will have a minimum diameter spread of 200 mm as determined from the following procedure performed by the Engineer:

- Fill a hollow plastic or metal cylinder 150 mm in length and 75 mm inside diameter with the CLSM and strike off the surface.

- Raise the flow cylinder 150 mm in a continuous motion without rotation.

- Immediately measure the spread of the CLSM along two diameters which are perpendicular to each other.

Cast three (3) specimens (cylinders) for each batch in accordance with Materials Method 9.2. and deliver them to the Geotechnical Engineering Bureau within seven days of the pour date for evaluation.

204-3 CONSTRUCTION DETAILS

204-3.01 General. Provide all equipment for this work subject to approval of the Engineer.

Mix the materials at a stationary mixing plant which is either a continuous or a batch type plant, designed to accurately proportion either by volume or by weight, so that when the materials are incorporated in the mix, a thorough and uniform mix will result.

The mix may be transported in open haul units provided the material is placed within 30 minutes of the end of mixing. Use a rotating drum unit capable of 2 - 6 rpm to transport material which cannot be placed within 30 minutes after the end of mixing.

In work involving quantities of CLSM less than 2 cubic meters, the Engineer may permit the Contractor to use a small construction mixer. Provide a mixer capable of mixing CLSM that has the specified compressive strength and flow consistency. Mix all components so as to produce a uniform product.

Narrower trench widths can be employed when using CLSM due to the self-compacting properties of the material. Construction personnel and equipment are not required to be in the trench for compaction operations. Refer to the current Standard Sheet for Controlled Low Strength Material (CLSM) Installation Details for Circular and Elliptical Metal Pipes, Structural Plate Pipes and Pipe Arches, and Reinforced Concrete and Other Rigid Pipes. For installations that require that construction personnel temporarily occupy the trench follow all OSHA requirements.

204-3.02 Fill and Backfill at Structures, Culverts, Pipes, Conduits and Direct Burial Cables.

Place the CLSM using a method approved by the Engineer, in accordance with the appropriate Standard Sheet for additional guidance on the use of CLSM as backfill material.

When placing CLSM for pipe backfill, discharge the material onto the top of the pipe at the center.

Do not place CLSM in contact with aluminum pipe, including connections, fixtures, etc., unless the aluminum has been coated with an approved primer.

Do not place CLSM containing fly ash in contact with cast iron or ductile iron pipes, fittings or appurtenances.

CLSM should be kept encapsulated with soil, as it is highly erodible and disintegrates when left exposed to the environment

In situations where CLSM is used as backfill around lightweight pipe, take precautions to counteract the pipe's buoyancy.

204-4 METHOD OF MEASUREMENT

204-4.01 General. Payment for CLSM will be made for the number of cubic meters of satisfactorily placed CLSM computed between the payment lines shown on the contract documents or from payment lines established in writing by the Engineer.

A deduction shall be made for pipes (based on nominal diameters) and other payment items when the combined cross-sectional area exceeds 0.1 m² unless otherwise shown. No deduction will be made for the cross-sectional area of an existing facility.

No additional quantity shall be measured for payment to make up losses due to foundation settlement, compaction, erosion or any other cause.

Cross sectioning, for the purpose of determining quantities for payment, shall be employed only where payment lines are not shown on the contract documents or Standard Sheets, and cannot be reasonably established by the Engineer.

204-5 BASIS OF PAYMENT

204-5.01 General. The unit price bid shall include the costs of furnishing all equipment, labor and materials necessary to complete the work, except where specific costs are designated or included in another pay item of work.

Payment will be made under:

Item No.	Item	Pay Unit
204.01M	Controlled Low Strength Material (CLSM)	Cubic Meter

SECTION 304 - SUBBASE COURSE

304-1 DESCRIPTION

304-1.01 General. The work consists of furnishing, placing and compacting a subbase course in conformity with the lines, grades, thicknesses and typical sections shown on the plans, or as determined by field conditions and ordered in writing by the Engineer.

304-1.02 Optional Type. Unless otherwise stated in the plans or in the proposal, select any of the four (4) options as follows:

Option A. Subbase construction consisting of two (2) separate layers of Type 4 and Type 3 Subbase Course.

Option B. Subbase construction consisting of a single layer of Type 1 Subbase Course.

Option C. Subbase construction consisting of a single layer of Type 2 Subbase Course.

Option D. Subbase construction consisting of a single layer of Type 4 Subbase Course.

304-1.03 Definitions. Deleterious: Any material that does not consist of concrete, asphalt, glass, brick, stone, sand, gravel or blast furnace slag, when these materials are used in subbase in conformance with the specification requirements, OR any material which, in the opinion of the Director, Geotechnical Engineering Bureau, may adversely affect the performance of the product either during handling, during construction, or in its final application.

304-2 MATERIALS

304-2.01 Test and Control Methods. The Department will perform materials tests and quality control methods pertaining to the work of this section in conformance with the procedures contained in the appropriate Departmental publications which are current on the date of advertisement for bids. These publications are available upon request to the Regional Director or the Director, Geotechnical Engineering Bureau.

304-2.02 Material Requirements. Provide suitable material conforming to the requirements of Section 203 and to the requirements contained herein.

Provide a subbase material which meets the specification material requirements and is within the Contractor's capabilities to place and fine grade to the required tolerances. Should the subbase course become unstable at any time prior to the placement of the overlying course, correct the unstable condition to the satisfaction of the Engineer at no additional cost to the State. Perform any required modification prior to placing the material on the grade.

If used, glass shall conform to the applicable paragraph of Section 203.

If RCA is used and it comes from other than a Department of Transportation project, provide documentation showing that the material obtained is from a NYSDEC registered or permitted construction and demolition (C&D) debris processing facility as specified in Section 360-16.1 of 6NYCRR Part 360, "Solid Waste Management Facilities", Title 6 of the Official Compilation of Codes, Rules and Regulations.

If Blast Furnace Slag is to be used, provide documentation showing that it has undergone a NYSDEC beneficial use determination (BUD) prior to its use as specified in Section 360-1.15 of 6NYCRR Part 360, "Solid Waste Management Facilities", Title 6 of the Official Compilation of Codes, Rules and Regulations.

For Types 1, 3 and 4 furnish materials consisting of approved Blast Furnace Slag, Stone, Sand, and Gravel, or blends of these materials with not more than 30 percent by weight of glass. Alternately, the following materials are also acceptable under these types as a replacement for the materials mentioned above:

- Alternate A. At least 95 percent, by weight, of RCA, and free from organic and other deleterious material. This material may contain up to 5% by weight asphalt and/or brick.
- Alternate B. A mixture of RCA conforming to Alternate A above mixed with stone, sand, gravel or blast furnace slag. This material may contain up to 5% by weight asphalt and/or brick.
- Alternate C. Bituminous material that is reclaimed from bituminous pavement and/or shoulders (Reclaimed Asphalt Pavement, or RAP) on a project constructed by the Department of Transportation and is well-graded from coarse to fine and free from organic or other deleterious material, including tar. This material is at least 95 percent, by weight, reclaimed bituminous material and has a maximum top size, at time of placement, of 50 mm. The gradation requirements for the different Types listed below do not apply when the material consists of RAP. No soundness or Plasticity Index testing will be required for this Alternate.

For Type 2, furnish materials consisting of approved Blast Furnace Slag or of Stone which is the product of crushing or blasting ledge rock, or a blend of Blast Furnace Slag and of Stone.

If, in the opinion of the Regional Geotechnical Engineer, this material becomes unstable during construction, it may be necessary to add a mixture of natural suitable material to the RAP. Acceptance of the final product shall be based on an evaluation by the Regional Geotechnical Engineer.

Provide written documentation that the reclaimed bituminous material originated on a Department of Transportation project. Include an identifier, such as State Highway, Construction Contract or Departmental Project Identification Number (PIN).

A. Gradation. Gradation shall conform to Table 304-1.

TABLE 304-1 PERCENT PASSING BY WEIGHT				
Sieve Size Designation	Type			
	1	2	3	4
100 mm	-	-	100	-
75 mm	100	-	-	-
50 mm	90 - 100	100	-	100
6.3 mm	30 - 65	25 - 60	30 - 75	30 - 65
425 μ m	5 - 40	5 - 40	5 - 40	5 - 40
75 μ m	0 - 10	0 - 10	0 - 10	0 - 10

B. Soundness. Material for Types 1, 2 and 4 will be accepted on the basis of Magnesium Sulfate Soundness Loss after four (4) cycles of 20 percent or less, unless material meeting the requirements of Alternate C (304-2.02) is used. Material for Type 3 will be accepted on the basis of a Magnesium Sulfate Soundness Loss after four (4) cycles of 30 percent or less.

C. Plasticity Index. The required Plasticity Index of the material passing the 425 μ m mesh sieve is 5.0 or less.

D. Elongated Particles. A flat or elongated particle is defined herein as one which has its greatest dimension more than three (3) times its least dimension. Provide material consisting of particles where not more than 30 percent, by weight, of the particles retained on a 12.5 mm sieve are flat or elongated. When the State elects to test for this requirement, material with a percentage greater than 30 will be rejected. Acceptance for this requirement will normally be based on a visual inspection by the Engineer.

304-2.03 Stockpiling. Stockpile all material except as noted herein.

A. Material furnished under Type 3 will not be required to be stockpiled unless it contains RCA or glass.

B. Stockpiling of the reclaimed bituminous material for Alternate C is not required.

Stockpile construction requirements, sampling, testing and acceptance/rejection procedures are stipulated in the appropriate Departmental publication.

304-2.04 Material for Temporary Work. Material used as a subbase for the construction of temporary work may be approved by a Departmental Geotechnical Engineer by visual inspection in accordance with the procedure in the current Departmental publication. Do not incorporate material so approved into the final project without following the appropriate acceptance procedure for the item of intended use.

304-3 CONSTRUCTION DETAILS

304-3.01 General. Notify the Engineer in writing of which placement option, material option (if applicable) and/or material type is proposed for use, at least 14 calendar days prior to performing the work. If it is proposed that more than one option or type is to be used, submit a plan to the Engineer describing where each option or type is proposed for use. This plan must be approved by the Engineer prior to incorporating it into the project. The State reserves the right to disapprove the use of more than one option on a project. Use uniform subbase types and materials between the roadbed limits.

304-3.02 Placement

- Place the upper course material on the grade in a manner to minimize segregation, using equipment and procedures approved by the Engineer. Do not perform uncontrolled spreading from piles dumped on the grade.
- The maximum compacted layer thickness is 380 mm, or as shown on the plans. In confined areas as defined by the Engineer the maximum compacted layer thickness is 150 mm. The minimum loose lift thickness is 1.5 times the maximum particle size.
- Place Type 1 with a minimum compacted layer thickness of 150 mm.
- Do not place Type 3 material within 100 mm of the bottom of a pavement course.
- Do not place materials blended with glass in contact with synthetic liners, geogrids, geotextiles or other geosynthetics. Ensure that glass incorporated into subbase is thoroughly mixed so that glass constitutes no more than 30 percent by weight anywhere in the subbase.
- When placing material under Option A, place and compact each material in a separate lift.

304-3.03 Compaction. When the moisture content is within the limits for proper compaction, compact the material in accordance with the requirements of §203-3.12, Compaction. Density tests are not required for the acceptance of these courses.

If a subbase course is disturbed by frost action prior to paving, re-compact the subbase where directed by the Engineer.

304-3.04 Traffic and Contamination. The movement of highway traffic over the final surface of the subbase may be permitted at locations designated by, and under such restrictions as ordered by the Engineer, provided such movements take place prior to the final finishing of this course to the specified tolerance. Do not allow highway traffic to move over subbase containing glass. The movement of construction equipment on this course may be permitted at locations designated by and under such restrictions as ordered by the Engineer. At locations where permission is granted for such movement, place and maintain the temporary surface of the course, upon which the construction traffic is running, at least 50 mm above the final surface of the course. Just prior to paving and after all construction traffic not required for the removal has ceased, remove the 50 mm protective layer, and prepare and compact the exposed surface of the course to the specified tolerance.

No payment will be made for furnishing, placing, maintaining, removing and disposing of the 50 mm thick protective layer. Include the cost thereof in the price bid for Subbase Course.

If, in the opinion of the Engineer, the subbase is damaged or mixed with the subgrade or any other material due to the Contractor's operation, remove such material and replace it with the appropriate subbase material at no additional cost to the State.

304-3.05 Tolerance. Place Types 1, 2 or 4 so that after compaction the top surface of the course does not extend more than six (6) mm above nor more than six (6) mm below true grade for the course at any location. Place Type 3 course so that the finished surface does not extend above the true grade and surface for this course at any location.

304-4 METHOD OF MEASUREMENT

304-4.01 Subbase Course. The quantity is the number of cubic meters of material, computed from payment lines shown on the plans or, where changes have been ordered, from payment lines established by the Engineer.

304-5 BASIS OF PAYMENT

304-5.01 Subbase Course. The unit price bid for this work includes the cost of furnishing all labor, material and equipment necessary to complete the work. Include the cost of adding water in the price bid unless the items for furnishing and applying water are included in the contract. No direct payment will be made for losses of material resulting from compaction, foundation settlement, erosion, or any other cause. Include the cost of such losses in the price bid for this item. No deductions will be made for the volumes occupied by manholes, catch basins and other such objects.

No additional payment will be made for the protective layer, as stated in 304-3.04.

Progress payments will be made after the subbase course has been properly placed and compacted. Payment will be made at the unit price bid for seventy-five (75) percent of the quantity. The balance of the quantity will be paid for after the final finishing to the required tolerance and just prior to the placing of the next course.

Payment will be made under:

Item No.	Item	Pay Unit
304.11 M	Subbase Course, Type 1	Cubic Meter
304.12 M	Subbase Course, Type 2	Cubic Meter
304.13 M	Subbase Course, Type 3	Cubic Meter
304.14 M	Subbase Course, Type 4	Cubic Meter
304.15 M	Subbase Course, Optional Type	Cubic Meter

304-4

SECTION 667 - LOCAL ROAD GRAVEL SURFACE, BASE, AND SUBBASE COURSES

667-1 DESCRIPTION.

667-1.01 General. The work consists of furnishing, placing and compacting gravel surface, base and subbase courses in conformity with the lines, grades, thicknesses and typical sections shown on the plans, or as determined by field conditions and ordered in writing by the municipality.

667-1.02 Material Types. Provide materials as specified by the following options.

Type A. Surface quality material with a maximum particle size of 25 mm (1 inch).

Type B. Base quality material with a maximum particle size of 50 mm (2 inches).

Type C. Subbase quality material with a maximum particle size of 75 mm (3 inches).

667-2 MATERIALS.

667-2.01 Test and Control Methods. All tests shall be performed by laboratories accredited under the AASHTO accreditation program. Materials tests and quality control methods pertaining to the work of this section will be performed in conformance with the procedures contained in the appropriate New York State Department of Transportation (NYSDOT) and/or American Association of State Highway and Transportation Officials (AASHTO) publications which are current on the date of advertisement of bids.

667-2.02 Materials Requirements. Provide materials for road gravel surface, base, and subbase courses that consist of Sand and Gravel, approved Blast Furnace Slag or Stone that meet the requirements contained herein. Provide materials well graded from coarse to fine, and free from organic or other deleterious materials. Any gravel material will be rejected if it is determined to contain any unsound or deleterious materials.

A. Gradation. Perform sieve analysis in accordance with the AASHTO procedures T 27, T 88 or T 311. Report the following sieves for all tests: 75 μ m, 425 μ m, 6.3 mm, 12.5 mm, 19 mm, 25 mm, 37.5 mm, 50 mm, 75 mm.

Provide material meeting the gradation limits from Table 1.

Material Properties	Maximum Permissible Limit (%)
Plasticity Index	3.0
Sand Equivalent	40

Sieve (U.S. sieve)	Option Type		
	A(Surface)	B (Base)	C (Subbase)
75 mm (3")			100
50 mm (2")		100	-
37.5 mm (1.5")		85-100	70-100
25 mm (1")	100	-	-
19 mm (3/4")	85-100	-	-
6.3 mm (1/4")	50-75	30-50	30-55
425 μ m (#40)	15-35	5-20	5-25
75 μ m (#200)	8-15	0-5	0-8

Table 1: Percent passing by weight of gravel materials

B. Soundness. Material for local road gravel surface, base, and subbase courses will be accepted on the basis of Magnesium sulfate Soundness Loss after four (4) cycles performed according to NYSDOT procedures and Table 2.

C. Plasticity. Determine plasticity using either of the following methods:

1. **Plasticity Index.** The Plasticity Index of the material passing the #40 mesh sieve shall meet the values in Table 2. Determine plasticity using AASHTO tests T 89 and T 90.
2. **Sand Equivalent.** The sand equivalence of the granular material shall meet the values in Table 2. Determine sand equivalence using AASHTO test T 176.

Material Properties	Material Type		
	A (Surface)	B (Base)	C (Subbase)
Maximum Soundness loss (%)	20	20	25
Plasticity Index	2-9	0-5	0-8
Sand Equivalent	>25	>40	>35

Table 2: Test and control limits of gravel materials

D. Elongated Particles. Not more than 30 percent, by weight, of the particles retained on a 12.5 mm sieve shall consist of flat or elongated particles. A flat or elongated particle is defined herein as one which has its greatest dimension more than 3 times its least dimension. Acceptance for this requirement will normally be based on a visual inspection. When the municipality elects to test for this requirement, material with a percentage greater than 30 will be rejected.

E. Fractured Faces. When the municipality elects to test for this requirement, Type A material shall have at least two fractured faces on 50 percent of the stone particles larger than 12.5 mm or at least one fractured face on 75 percent of the particles larger than 12.5 mm. Type B material shall have at least one fractured face on 50 percent of the stone particles larger than 12.5 mm.

667-2.03 Stockpiling. Stockpile all material, except that material furnished under Type C will not be required to be stockpiled if the total project quantity is more than 500 tons, unless otherwise stated in the contract documents. Follow stockpile construction requirements, sampling, testing and acceptance/rejection procedures as stipulated by applicable NYSDOT procedures.

667-3 CONSTRUCTION DETAILS.

667-3.01 General. Use uniform gravel types and materials between the roadbed limits.

667-3.02 Placement

A. Place the upper course material on the grade in a manner to minimize segregation, using equipment and procedures approved by the Engineer. Do not perform uncontrolled spreading from piles dumped on the grade.

B. The maximum compacted layer thickness is 380 mm, or as shown on the plans. In confined areas as defined by the Engineer the maximum compacted layer thickness is 150 mm. The minimum loose lift thickness is 1.5 times the maximum particle size.

667-3.03 Compaction. When the moisture content is within the limits for proper compaction, compact the material in accordance with the requirements of §203-3.12, Compaction. Density tests are not required for the acceptance of these courses. If a subbase course has been disturbed by frost action prior to paving, recompact the layer.

667-3.04 Traffic and Contamination. The movement of highway traffic over the final surface of the base or subbase may be permitted at locations designated by, and under such restrictions as directed by the Engineer, provided such movements take place prior to the final finishing of this course to the specified tolerance. The movement of construction equipment on this course may be permitted at locations designated by and under such restrictions as directed by the Engineer.

No payment will be made for furnishing, placing, maintaining, removing and disposing any protective layer. Include the cost thereof in the price bid.

If a layer is damaged or mixed with the subgrade or any other material due to the Contractor's operation, remove such material and replace it with the appropriate material at no additional cost to the State.

667-3.05 Tolerance.

Surface and Base Course. Place material so that after compaction the top surface of the course does not extend more than six (6) mm (1/4 inch) above nor more than six (6) mm below true grade for the course at any location.

Subbase Course. Place material so that after compaction the top surface of the course does not extend more than twelve (12) mm (½ inch) above nor more than twelve (12) mm below true grade for the course at any location.

667-4 METHOD OF MEASUREMENT. The quantity is the number of cubic meters of material, computed from payment lines shown on the plans or, where changes has been ordered, from payment lines established by the Engineer.

667-5 BASIS OF PAYMENT. The unit price bid for this work includes the cost of furnishing all labor, material and equipment necessary to complete the work. Include the cost of adding water in the price bid unless the items for furnishing and applying water are included in the contract. No direct payment will be made for losses of material resulting from compaction, foundation settlement, erosion, or any other cause. Include the cost of such losses in the price bid for this item. No deductions will be made for the volumes occupied by manholes, catch basins and other such objects.

Progress payments will be made after each Type course has been properly placed and compacted. Payment will be made at the unit price bid for seventy-five (75) percent of the quantity. The balance of the quantity will be paid for after the final finishing to the required tolerance and just prior to the placing of the next course or Type.

Payment will be made under:

Item No.	Item	Pay Unit
667.01 M	Local Road Gravel Surface Course, Type A	Cubic Meter
667.02 M	Local Road Gravel Base Course, Type B	Cubic Meter
667.03 M	Local Road Gravel Subbase Course, Type C	Cubic Meter