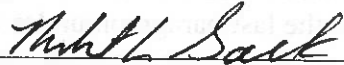


SUPERSEDED BY EB 15-031 EFFECTIVE 9/28/15		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 14-010								
Title: STANDARD SPECIFICATION SECTION 203 EXCAVATION AND EMBANKMENT											
Target Audience: <table border="0"> <tr> <td>☐ Manufacturers (18)</td> <td>☐ Surveyors (33)</td> </tr> <tr> <td>☒ Local Govt. (31)</td> <td>☒ Consultants (34)</td> </tr> <tr> <td>☒ Agencies (32)</td> <td>☒ Contractors (39)</td> </tr> <tr> <td></td> <td>☐ _____ ()</td> </tr> </table>		☐ Manufacturers (18)	☐ Surveyors (33)	☒ Local Govt. (31)	☒ Consultants (34)	☒ Agencies (32)	☒ Contractors (39)		☐ _____ ()	Approved:  Robert L. Sack, P.E. Deputy Chief Engineer (Research) 8 July 14 Date	
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ADMINISTRATIVE INFORMATION:

- This Engineering Instruction (EI) is effective beginning with projects submitted for the letting of January 8, 2015.
- This EI supersedes EI 09-024
- The revisions issued with this EI will be incorporated into the next update of the Standard Specifications.

PURPOSE: The purpose of this EI is to issue revised Standard Specification Section 203 *Excavation and Embankment*.

TECHNICAL INFORMATION:

- Section 203 in the Standard Specifications is deleted and replaced with the revised Section 203 transmitted by this issuance.
- A revised Standard Specification §733-16 *Winter Earthwork* is being issued concurrently via EI 14-009.
- A revision to Geotechnical Engineering Manual (GEM-12) *Guidelines for Embankment Construction* is being issued concurrently via EB 14-024.
- A revised Standard Specification Section 304 is being issued concurrently via EI 14-011.
- A revised Standard Specification Section 554 is being issued concurrently via EI 14-012.
- The revisions to the Standard Specification Section 203 include the following:
 1. Added §203-1.01 P. *Winter Earthwork*.
 2. Added §203-2.03 1. *Embankment In Place - Winter Earthwork*.
 3. Added §203-2.04 1. *Select Borrow - Winter Earthwork*.
 4. Added §203-2.05 1. *Select Fill - Winter Earthwork*.
 5. Added §203-2.06 1. *Select Granular Fill - Winter Earthwork*.
 6. Added §203-2.07 1. *Select Granular Fill Slope Protection - Winter Earthwork*.
 7. Added §203-2.12 1. *Select Granular Subgrade - Winter Earthwork*.
 8. Added §203-2.13 1. *Select Structural Fill - Winter Earthwork*.
 9. Revised the third paragraph under §203-3.01 to state:
“Earthwork construction operations requiring compaction shall not be performed from November 1st thru April 1st except with a Winter Earthwork submittal subject to the provision of this Section and approved by the Regional Director or his designated representative. Winter earthwork operations constitute an additional risk to the Department and Winter Earthwork submittals should not be expected to be automatically approved. Winter Earthwork will be subject to the following restrictions:”

10. Revised the second bullet statement of the third paragraph under §203-3.01 to state:
“● Between November 1st and April 1st, if the air temperature, ground temperature, or material temperature is at or below 32° F, earthwork may only proceed using material that meets the requirements of §733-16 *Winter Earthwork* and/or standard earthwork material placement utilizing the modified methods and procedures contained in the approved Winter Earthwork Submittal.”
11. Revised the last paragraph under §203-3.01 to state:
“In all work incorporated into the final product, the Contractor shall not place material that is frozen, or place fill material on ground that is frozen to any depth regardless of the date.”
12. Added §203-3.01 A.3. *Procedures*.
13. Revised §203-3.01 A.4. *Seasonal Adjustment Acceptance* to state:
“4. *Seasonal Adjustment Acceptance*. Provide acknowledgement of a transition period allowing the continued use of standard earthwork materials between November 1st and April 1st only under conditions where the air temperature, ground temperature and material temperature are all above 32° F at the time of placement. Provide acknowledgement of the winter earthwork restrictions stating that, if the air temperature, ground temperature, or material temperature is at or below 32° F, earthwork will only proceed using material that meets the requirements of §733-16 *Winter Earthwork* and/or standard earthwork material placement utilizing the modified methods and procedures contained in the approved Winter Earthwork Submittal.”

IMPLEMENTATION:

- The Main Office Design Quality Assurance Bureau will insert these standard specification revisions into contract proposals beginning with projects submitted for the letting of January 8, 2015.

TRANSMITTED MATERIALS: Revision to Standard Specification Section 203 *Excavation and Embankment*. Both metric and US Customary revisions are attached.

BACKGROUND: Compaction of soil during cold weather is difficult and can be impractical. Water acts as a lubricant aiding in the process of compaction. As the temperature decreases, the water becomes more viscous (less slippery) and inhibits efforts to pack the soil particles together. Eventually, the water becomes ice, at which point compaction is impossible.

Earthwork construction operations requiring compaction shall not be performed from November 1st thru April 1st except with a Winter Earthwork submittal. A Winter Earthwork submittal shall outline the modifications to materials and/or methods including the following:

1. **Material Requirements.** The material shall meet the requirements of §733-16 *Winter Earthwork*.
2. **Material Placement.** The proposed methods will control the weather effects on the material and existing ground conditions (i.e. insulation, enclosures, canvas and framework). The methods will include a plan such that all snow, ice, and frozen material is to be removed from the surface of the ground on which embankment or backfill material is to be placed, and from the surface under construction before succeeding lifts are added.
3. **Procedures.** Procedures will be used to verify that the existing ground is not frozen to any depth (e.g. test pits) and to address freeze-thaw action in earthwork that has remained idle during temperature fluctuations (e.g. re-roll and seal the surface prior to placement of succeeding lift).

4. Seasonal Adjustment Acceptance. Acknowledgement of a transition period is provided to allow the continued use of standard earthwork materials between November 1st and April 1st only under conditions where the air temperature, ground temperature and material temperature are all above 32° F at the time of placement. Also acknowledged are the winter earthwork restrictions stating that, if the air temperature, ground temperature, or material temperature is at or below 32° F, earthwork will only proceed using material that meets the requirements of §733-16 *Winter Earthwork* and/or standard earthwork material placement utilizing the modified methods and procedures contained in the approved Winter Earthwork Submittal.

CONTACT: Questions or comments regarding this issuance should be directed to Randall J. Romer, P.E., of the Geotechnical Engineering Bureau at (518) 457-4714, or via e-mail at rromer@dot.state.ny.us. Questions or comments regarding the technical aspects of the revision to the Standard Specification should be directed to Don Dwyer, P.E., of the Geotechnical Engineering Bureau at (518) 457-4724, ddwyer@dot.state.ny.us.

SECTION 203 EXCAVATION AND EMBANKMENT

Make the following changes to the Standard Specifications dated May 1, 2008 as modified by EI 09-024:

Delete entirely SECTION 203 and Replace it with the following:

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 Definitions.

A. 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 in the contract documents are supplied as a part of Base Line Data.

B. 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.

C. Embankment Foundation. The embankment foundation is the surface upon which an embankment is constructed after all work required under §203-3.03A. *Embankment Foundation* has been completed.

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

E. 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.

1. A line located 2 ft. below the subgrade surface and extended to the intersection with the embankment side slopes, or

2. The embankment foundation, whichever is higher.

The material and compaction requirements for the subgrade area in embankments are found in §203-2.01A. *Subgrade Area Material* and §203-3.03C. *Compaction*, 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.

F. 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.

G. Topsoil. See Section 613 *Topsoil*.

H. 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

SECTION 203 EXCAVATION AND EMBANKMENT

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 meeting the requirements of §733-05 *Glass Backfill* 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 §733-06 *Reclaimed Asphalt Pavement for Earthwork and Subbase*.

RCA-The Contractor shall provide and place RCA conforming to the requirements of §733-07 *Recycled Portland Cement Concrete Aggregate*.

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 §203-3.03A. *Embankment Foundation* and §203-3.03B. *Embankments*.

I. Unsuitable Material. Any material containing vegetable or organic matter, such as muck, peat, organic silt, topsoil or sod, or other material that is not satisfactory for use in embankment construction under §203-1.01H. *Suitable Material* 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 Office of Environment, and the Department of Environmental Conservation.

J. 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 in the contract documents.

K. Embankment Construction Control Devices. Embankment construction control devices allow real-time observations of embankment construction to assess the actual performance of the embankment compared to that envisioned in the design phase. Settlement and pore water pressure are common measures of embankment performance. Techniques for monitoring settlement include a settlement rod or a surface settlement gauge. A settlement rod is an optical survey technique to monitor settlement of the embankment surface. The settlement rod(s) establish monitoring point(s) in relation to a reliable bench mark.

A surface settlement gauge is an optical survey technique to monitor settlement of the existing ground surface, below the embankment installation. The surface settlement gauge is installed prior to placing the embankment and extended upwards through the fill.

Pore water pressure monitoring may be used to determine the effective overburden diagrams (the basis of all geotechnical analyses), monitoring consolidation progress of embankments constructed over soft soils, evaluating seepage in natural slopes or earth dams (slope stability), checking the effectiveness of subsurface drainage facilities, or monitoring water well tests.

A piezometer is an instrument which provides measurements of pore water pressure at the elevation of the installed sensor. Pore pressure data is needed in a foundation soil to assess the excess pore water pressure and hence the undrained strength of the soil. Piezometers are used at various

SECTION 203 EXCAVATION AND EMBANKMENT

depths within cohesive foundation soils. Some piezometers are used in granular foundation soils to assess their drainage behavior.

L. 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.

M. Select Granular Fill – Slope Protection. Select granular fill – slope protection is a material used to protect the grade of a slope from erosion and sloughing from runoff and groundwater seepage. Seepage is the slow movement of water through small openings and spaces in the surface of unsaturated soil into or out of a body of surface or subsurface water. Sloughing is a shallow surface failure caused by erosive removal of supporting material.

Select granular fill – slope protection is highly permeable while also providing sufficient frictional resistance to resist seepage forces and remain in place.

N. Applying Water. Under this work, the Contractor shall furnish and apply water for dust control. Moisture control for compaction purposes is the Contractor's responsibility. Water shall not be applied in inclement weather or when the temperature is 32° F or less.

O. 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.

SECTION 203 EXCAVATION AND EMBANKMENT

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.

P. Winter Earthwork. Compaction of soil during cold weather is difficult and can be impractical. Water acts as a lubricant aiding in the process of compaction. As the temperature decreases, the water becomes more viscous (less slippery) and inhibits efforts to pack the soil particles together. Eventually, the water becomes ice, at which point compaction is impossible. For this reason, New York State does not permit normal earthwork placement between November 1st thru April 1st unless there is an approved Winter Earthwork submittal.

Winter Earthwork is defined as construction operations requiring soil compaction performed from November 1st thru April 1st. The execution of Winter Earthwork requires modifications to compaction procedures, changes to material requirements, and/or additional equipment and structure assembly for controlling the weather effects on the material and existing ground conditions.

Although Winter Earthwork may be performed when the air temperature, ground temperature, or material temperature is at or below 32° F, frozen material will not be placed, nor will fill material be placed on ground frozen to any depth, in any work incorporated into the final product

203-2 MATERIALS

203-2.01 General. 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 in conformance with the procedures contained in the geotechnical control procedure "Procedure for the Control and Quality Assurance of Granular Materials".

A. Subgrade Area Material. Subgrade area material shall consist of any suitable material having no particles greater than 6 in. in maximum dimension, unless Select Granular Subgrade with the well graded rock option is used. In that case, refer to §733-13 *Select Granular Subgrade*. If concrete is used, any exposed mesh or rebar shall not exceed 1 in. in length. RAP is also permitted.

B. Glass Backfill. Provide backfill material meeting the requirements of §733-05 *Glass Backfill*.

C. RAP. Provide backfill material meeting the requirements of §733-06 *Reclaimed Asphalt Pavement for Earthwork and Subbase*.

D. RCA. Provide backfill material meeting the requirements of §733-07 *Recycled Portland Cement Concrete Aggregate*.

E. Miscellaneous. Necessary fill material for cleaning, grading and shaping the existing roadside section shall conform to the requirements of §203-2.01A, *Subgrade Area Material*.

203-2.02 Unclassified Excavation and Disposal. None Specified.

203-2.03 Embankment In Place. Provide backfill material meeting the requirements of §733-08 *Embankment In Place*.

1. Embankment In Place – Winter Earthwork. If modified methods and procedures are not outlined in the Winter Earthwork Submittal, provide backfill material meeting the requirements of §733-16 *Winter Earthwork Material for Embankment In Place*.

SECTION 203 EXCAVATION AND EMBANKMENT

203-2.04 Select Borrow. Provide backfill material meeting the requirements of §733-09 *Select Borrow*.

1. Select Borrow – Winter Earthwork. If modified methods and procedures are not outlined in the Winter Earthwork Submittal, provide backfill material meeting the requirements of §733-16 *Winter Earthwork Material for Select Borrow*.

203-2.05 Select Fill. Provide backfill material meeting the requirements of §733-10 *Select Fill*.

1. Select Fill – Winter Earthwork. If modified methods and procedures are not outlined in the Winter Earthwork Submittal, provide backfill material meeting the requirements of §733-16 *Winter Earthwork Material for Select Fill*.

203-2.06 Select Granular Fill. Provide backfill material meeting the requirements of §733-11 *Select Granular Fill*.

1. Select Granular Fill – Winter Earthwork. If modified methods and procedures are not outlined in the Winter Earthwork Submittal, provide backfill material meeting the requirements of §733-16 *Winter Earthwork Material for Select Granular Fill*.

203-2.07 Select Granular Fill Slope Protection. Provide backfill material meeting the requirements of §733-12 *Select Granular Fill Slope Protection*.

1. Select Granular Fill Slope Protection – Winter Earthwork. If modified methods and procedures are not outlined in the Winter Earthwork Submittal, provide backfill material meeting the requirements of §733-16 *Winter Earthwork Material for Select Granular Fill Slope Protection*.

203-2.08 Surface Settlement Gauges. Provide materials for the embankment construction control device surface settlement gauge meeting the requirements of §733-17 *Surface Settlement Gauge*.

203-2.09 Settlement Rods. Provide materials for the embankment construction control device settlement rod meeting the requirements of §733-18 *Settlement Rod*.

203-2.10 Piezometers. Provide materials for the piezometer installation meeting the requirements of §732-11 *Open Well Piezometer*.

203-2.11 Applying Water. Water used for dust control purposes may be obtained from any source.

203-2.12 Select Granular Subgrade. Provide backfill material meeting the requirements of §733-13 *Select Granular Subgrade*.

1. Select Granular Subgrade – Winter Earthwork. If modified methods and procedures are not outlined in the Winter Earthwork Submittal, provide backfill material meeting the requirements of §733-16 *Winter Earthwork Material for Select Granular Subgrade*.

203-2.13 Select Structural Fill. Provide backfill material meeting the requirements of §733-14 *Select Structural Fill*.

1. Select Structural Fill – Winter Earthwork. If modified methods and procedures are not outlined in the Winter Earthwork Submittal, provide backfill material meeting the requirements of §733-16 *Winter Earthwork Material for Select Structural Fill*.

SECTION 203 EXCAVATION AND EMBANKMENT

203-2.14 Sand Backfill. Provide backfill material meeting the requirements of §733-15 *Sand Backfill*.

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 contract documents. All excavation and embankment work shall be executed to payment lines shown in the contract documents.

All graded earth surfaces outside the roadway limits shall be smoothed and trimmed in reasonably close conformity (6± in.) 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 1st thru April 1st except with a Winter Earthwork submittal subject to the provision of this Section and approved by the Regional Director or his designated representative. Winter earthwork operations constitute an additional risk to the Department and Winter Earthwork submittals should not be expected to be automatically approved. Winter Earthwork will be subject to the following restrictions:

- Transitioning from the normal construction season to the exempt winter earthwork months between November 1st and April 1st, the use of standard earthwork materials may be permitted only under the conditions where the air temperature, ground temperature and material temperature are all above 32° F at the time of placement. Modifications to compaction procedures, including but not limited to the use of thinner lifts, may be required when the temperatures are above 32° F but below 40° F at the time of placement.

- Between November 1st and April 1st, if the air temperature, ground temperature, or material temperature is at or below 32° F, earthwork may only proceed using material that meets the requirements of §733-16 *Winter Earthwork* and/or standard earthwork material placement utilizing the modified methods and procedures contained in the approved Winter Earthwork Submittal.

In all work incorporated into the final product, the Contractor shall not place material that is frozen, or place fill material on ground that is frozen to any depth regardless of the date.

A. Winter Earthwork Submittal. For Contractors choosing to proceed with earthwork construction operations requiring compaction between November 1st thru April 1st, provide the Engineer with a Winter Earthwork submittal, with a copy to the Regional Geotechnical Engineer, outlining the modifications to the materials and/or methods including the following:

1. Material Requirements. The material meets the requirements of §733-16 *Winter Earthwork*. Provide information on material composition and source substitute, if proposed.

2. Material Placement. Provide information on the proposed methods for controlling the weather effects on the material and existing ground conditions (i.e. insulation, enclosures, canvas and framework). Devise a plan to be outlined in the Winter Earthwork Submittal such that all snow, ice, and frozen material shall be removed from the surface of the ground on which embankment or backfill material is to be placed, and from the surface under construction before succeeding lifts are added.

3. Procedures. Provide verification procedures to ensure the existing ground is not frozen to any depth (e.g. test pits). Provide procedures to address freeze-thaw action in earthwork that has remained idle during temperature fluctuations (e.g. re-roll and seal the surface prior to placement of succeeding lift).

4. Seasonal Adjustment Acceptance. Provide acknowledgement of a transition period allowing the continued use of standard earthwork materials between November 1st and April 1st only under conditions where the air temperature, ground temperature and material temperature are all above 32° F at the time of placement. Provide acknowledgement of the winter earthwork restrictions stating that, if the air temperature, ground temperature, or material temperature is at or below 32° F, earthwork will only proceed using material that meets the requirements of §733-16

SECTION 203 EXCAVATION AND EMBANKMENT

Winter Earthwork and/or standard earthwork material placement utilizing the modified methods and procedures contained in the approved Winter Earthwork Submittal.

Proceed with Winter Earthwork only after receiving written approval by the Regional Director or his designated representative subject to the provisions of this Section.

B. Scheduling of Work to Minimize Soil Erosion and Water Pollution. The Contractor shall ensure effective and continuous soil erosion and sediment control throughout the construction period. The Contractor shall prepare and submit for approval, plans and schedules for all excavation, stripping, embankment, fill and grading operations. 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*.

C. 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 contract documents, 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 5 ft. 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 been damaged by the Contractor's equipment during the course of construction, shall be repaired and re-compacted by the Contractor at no additional cost to the State.

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.

D. 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 of and replacing, such materials. Material determined by the Contractor to be uneconomical for use may be disposed of as specified under §203-3.02B. *Disposal of Surplus Excavated Materials* 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.

E. Unsuitable Materials. All excavated unsuitable materials shall be the Contractor's property for disposal as surplus materials under the provisions of §203-3.02B. *Disposal of Surplus Excavated Materials*.

F. 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

SECTION 203 EXCAVATION AND EMBANKMENT

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, §203-1.01H. *Suitable Material*. All borrow placed within the limits of Embankment or the Subgrade Area shall be placed in conformance with §203-3.03B. *Embankments* or §203-3.01G. *Subgrade Area* respectively, as appropriate, or where used for fill or backfill at structures, culverts and pipes, in conformance with §203-3.06 *Select Granular Fill* and §203-3.17 *Select Structural Fill*.

G. Subgrade Area. Where a subgrade area is defined in an embankment by §203-1.01E. *Subgrade Area*, the material placed shall conform to §203-2.01A. *Subgrade Area Material*, placed and compacted in conformance with §203-3.03B. *Embankments* and §203-3.03C. *Compaction*. 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 §203-1.01E. *Subgrade Area* in a cut section, the materials placed and other details shall be as specified under §203-3.02C. *Proof Rolling in Cut Sections*. *Procedure*, 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.

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

203-3.02 Unclassified Excavation and Disposal.

A. Rock Excavation. Presplitting is required where the design rock slope is 1 vertical on 1 horizontal or steeper and the vertical height of the exposed rock slope exceeds 5 ft. Ripping will not be allowed within 10 ft. 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. 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.

1. 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 4 in. in diameter, spaced not more than 3 ft. center to center along the slope, and drilled at the designed slope inclination for a maximum slope

SECTION 203 EXCAVATION AND EMBANKMENT

distance of 60 ft. When excavation operations are conducted in multiple lifts, the presplitting holes for successive lifts may be offset a distance of not more than 3 ft. for a design slope of 1 vertical on 1 horizontal and not more than 1 ft. for slopes of steeper design; however, a presplitting hole shall not be started inside the payment line. The Contractor shall control the presplit drilling operations by using proper equipment and technique to achieve the design slope and maximum bench between lifts. 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 0.35 lbs. of explosive per foot. The top of the charge shall be located not more than 3 ft. below the top of rock. A bottom charge of not more than 3 lbs. 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 Aggregate*. 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 3 ft. beyond the limits of fragmentation blasting within the section.

2. Fragmentation Blasting. Fragmentation holes, or portions thereof, shall not be drilled closer than 4 ft. 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 10 ft. 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.

3. 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 2 in./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 212 ft. FROM THE NEAREST STRUCTURE

- a. When the distance from the proposed blasting area to the nearest structure to be protected is 6 ft. or less, no blasting shall be allowed.
- b. When the distance between the blasting area and the nearest structure to be protected is greater than 6 ft. and equal to or less than 15 ft., a maximum of ¼ lb. of explosives per delay period (minimum of 25 milliseconds) blasting cap shall be allowed.
- c. When the distance between the blasting area and the nearest structure to be protected is greater than 15 ft. and equal to or less than 212 ft., a Scaled Distance of 30 ft. shall be utilized to determine the maximum amount of explosive allowed per delay period (minimum of 25 milliseconds) blasting cap. The Scaled Distance Formula is as described below:

$$SD = \frac{D}{\sqrt{E_{\max}}}$$

where: SD = Scaled Distance

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

SECTION 203 EXCAVATION AND EMBANKMENT

or

$$E_{\max} = \frac{D^2}{(SD)^2}$$

where: $E_{\max}$ = Maximum pounds of explosive per delay period (minimum of 25 milliseconds) blasting cap

DISTANCE GREATER THAN 212 ft. FROM THE NEAREST STRUCTURE

a. When the blaster elects to utilize more than 50 lbs. of explosive per delay period (minimum of 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 30 ft. 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.

B. 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.

Where disposal of surplus materials cannot be accommodated within the right of way, the excess shall become the Contractor's property for disposal. Surplus material disposed of within the right-of-way shall be placed in accordance with §107-10 *Managing Surplus Material And Waste*.

C. 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.

1. 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 documents.

2. Equipment. The proof roller used in embankment sections, as specified in §203-3.03D. *Proof Rolling in Embankment Sections* 1. *Equipment*, 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 30 tons and all tires inflated to 40 psi.

3. 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 in the contract documents or ordered by the Engineer shall be in conformance with §203.3-13 *Select Granular Subgrade*. 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.

SECTION 203 EXCAVATION AND EMBANKMENT

4. 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.

203-3.03 Embankment In Place.

A. Embankment Foundation. After completion of the work required under Section 201 *Clearing and Grubbing*, and Section 202 *Removal of Structures and Obstructions*, the embankment foundation shall be prepared. Sod and topsoil shall be removed where the final pavement grade is 6 ft. or less above the existing ground surface and in other areas designated in the contract documents 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 contract documents or as directed by the Engineer. Underwater areas shall be filled in accordance with §203-3.04 *Select Borrow* or §203-3.05 *Select Fill* 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 3 ft. may be permitted for such a layer. Concrete or asphalt 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 2 ft. of the top of the subbase course, it shall be broken up or scarified.

B. Embankments. The embankment shall be constructed of suitable material as defined by §203-1.01H. *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 §203-3.03C. *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 $\frac{2}{3}$ 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.

Pieces of concrete or asphalt 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 1 in. in length.

SECTION 203 EXCAVATION AND EMBANKMENT

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 contract documents, stumps, logs, and other materials may be placed in the Embankment Side Slope Area, 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 2 ft. of soil beneath the exposed side slope surface.

Glass shall not be placed in contact with synthetic liners, geogrids, geotextiles or other geosynthetics.

C. Compaction

1. 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:

a. Lift thickness is controlled and does not exceed the maximum allowed according to the equipment classifications in subparagraph 2. *Compaction Equipment*, 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.

b. 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.

c. 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% of Standard Proctor Maximum Density is attained in any portion of an embankment, or 95% in a subgrade area, or as specified for other items with a percent maximum density requirement.

d. 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.

As part of the Department's Quality Assurance (QA) program, the Engineer or his representative may verify the adequacy of the compaction at any time through QA testing. When the Engineer determines that QA 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.

2. 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

SECTION 203 EXCAVATION AND EMBANKMENT

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 soil 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.

TABLE 203-1 PNEUMATIC-TIRED COMPACTOR CLASSIFICATIONS

Pneumatic Compactor Class	Tire Requirements			Range of Ballasted Wheel Loads (lbs. per Wheel)
	Tire Size	No. Plys	Inflation Pressure (psi)	
A	7.50 x 15	4	35	2,000 – 3,000
B	7.50 x 15	6	60*	2,000 – 4,000
		10	90*	
C	7.50 x 15	14	130*	2,000 – 4,000
D	9.00 x 20	10	75*	4,000 – 6,000
		12	90*	
E	11.00 x 20	12	90*	6,000 – 8,000
		18		
F	13.00 x 24	18	100*	8,000 – 10,000

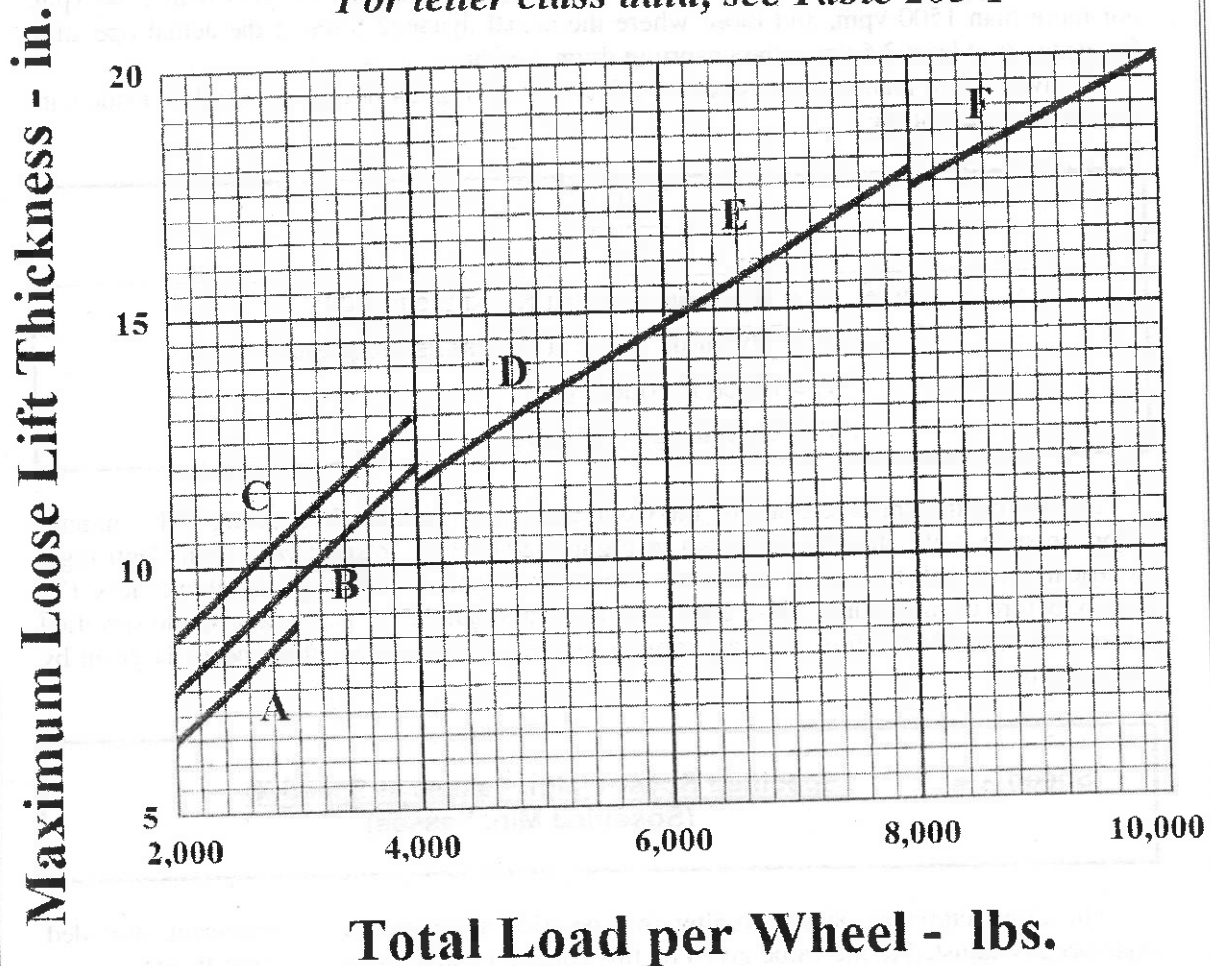
* Inflation pressure for not less than the last two passes on each lift. May be reduced during earlier passes and gradually increased to this level.

a. Pneumatic-Tired Compactors. This type of compactor shall be classified for use according to the requirements of Table 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 203-1.

SECTION 203 EXCAVATION AND EMBANKMENT

FIGURE 203-1 PNEUMATIC-TIRED COMPACTORS

For letter class data, see Table 203-1



The minimum effort for all pneumatic compactors shall be 6 passes, at speeds up to 12 ft./sec on no more than the first 2 passes, and all subsequent passes at speeds of 6 ft./sec. or less.

b. 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 inch of drum width.

The CFR is defined as follows:

$$\text{CFR} = \frac{\text{Unsprung Drum Weight (lbs.)} + \text{Dynamic Force (lbs.)}}{\text{Drum Width (in.)}}$$

SECTION 203 EXCAVATION AND EMBANKMENT

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 1100 vpm, nor more than 1500 vpm, 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

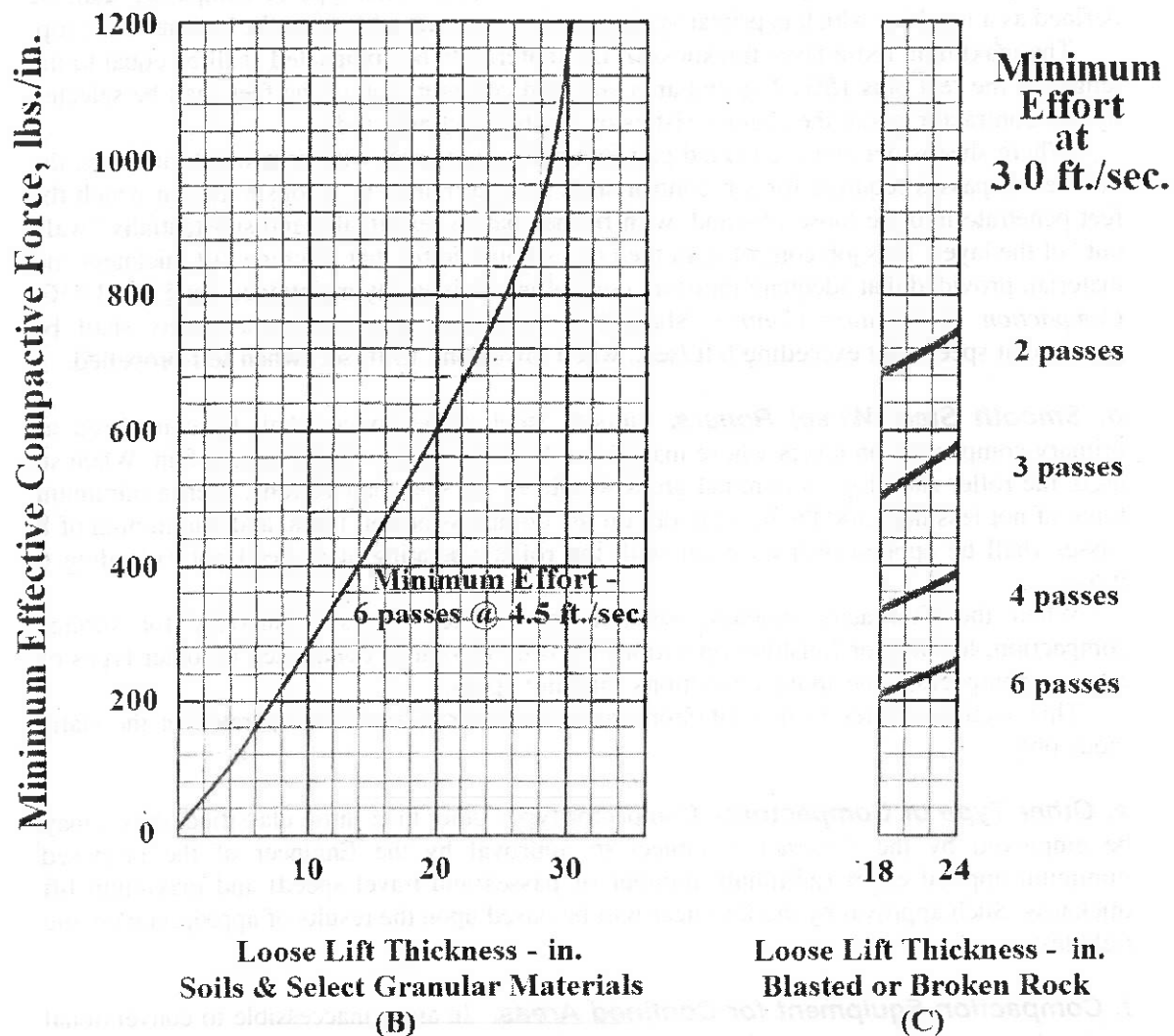
For the lift thickness selected by the Contractor, the minimum CFR rating and minimum effort on such a lift, shall be as shown in Figures 203-2B&C, respectively. Non-Centrifugal (Vertical force only) types of vibratory compactors shall be approved as above, less 175 lbs./in. before using Figures 203-2 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 6 ft./sec.

SECTION 203 EXCAVATION AND EMBANKMENT

FIGURE 203-2 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 50 vpm 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

SECTION 203 EXCAVATION AND EMBANKMENT

and consider the vibratory compactors as smooth steel wheel rollers classified according to their gross weight.

c. Sheepfoot and Segmented Pad Foot 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 15%. 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 and segmented pad foot 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 §203-3.03C. *Compaction 3. Moisture Control.* Sheepfoot and segmented pad foot rollers shall be operated at speeds not exceeding 6 ft./sec., when towed and 15 ft./sec. when self-propelled.

d. Smooth Steel Wheel Rollers. Smooth steel wheel rollers shall be considered as primary compactors on layers whose maximum thickness, after compaction, is 8 in. When so used, the roller shall have a nominal gross weight of not less than 10 tons, exert a minimum force of not less than 300 lbs/in. 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 6 ft./sec.

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.

e. 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.

f. 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 6 in. before compaction. 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.

3. 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 the soil shall be manipulated to attain uniform moisture distribution. 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