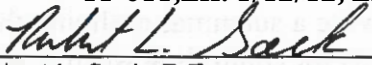


To:		<b>MODIFIED BY</b> <u>EI 13-006</u> <b>EFFECTIVE</b> <u>9/5/13</u>		<b>MODIFIED BY</b> <u>EI 14-009</u> <b>EFFECTIVE</b> <u>1/8/15</u>		<b>EI</b>  <b>09-027</b>	
				INSTRUCTION			
Title: <b>SECTION 733 – EARTHWORK MATERIALS</b>							
<b>SUPERSEDED BY</b> <b>EB 15-031</b> <b>EFFECTIVE 9/28/15</b>		yors (33) iltants (34) actors (39) _____ ( )		Approved: <b>Modified By: EI 11-001, Eff. 9/1/11; EI 11-011, Eff. 1/12/12; EI 12-015, Eff. 9/6/12</b>  Robert L. Sack, P.E. Deputy Chief Engineer (Research)		<u>21 Dec 09</u> Date	

**ADMINISTRATIVE INFORMATION:**

- This Engineering Instruction (EI) is effective beginning with projects submitted for the letting of May 6, 2010.
- Superseded issuance(s): This EI supersedes EI 08-035 and EI 08-038.
- The information transmitted by this issuance will be incorporated into a future revision to the Standard Specifications.

**PURPOSE:** The purpose of this EI is to issue new Section 733 *Earthwork Materials* of the Standard Specifications.

**TECHNICAL INFORMATION:**

- Specification §733-01 *Controlled Low Strength Material* and §733-02 *Mechanically Stabilized Earth System Backfill Material & §733-03 Geosynthetic Reinforced Earth System Slope Backfill Material* issued via EI 08-035 and EI 08-038 respectively are being reprinted as part of this updated issuance of Section 733 *Earthwork Materials* to organize and minimize shelf notes.
- To embrace the future that is SiteManager, the Geotechnical Engineering Bureau is changing how some of its specifications are written to align them with most Standard Specifications, which separate materials from pay items. Specification §733-04 is being assigned the material specifications related to subbase course. Specification §733-05 through Specification §733-07 and Specification §733-19 are being assigned the material specifications related to recycled materials that may be used as an alternate to a granular subbase material. Specification §733-08 through Specification §733-16 are being assigned the material specifications related to earthwork. Specification §733-17 and Specification §733-18 are being assigned the material specifications related to embankment construction control devices. Specification §733-20 is being assigned the material specifications related to underdrain filter material. Specification §733-21 through Specification §733-23 are being assigned the material specifications related to stone filling and rip-rap installations. These changes align the specifications with SiteManager’s methodology in defining its Material Codes and Pay Items, with Items referring to one or many materials.
- The materials section for subbase was revised to include:
  1. An outline of the provision for the Department to perform Quality Assurance (QA) testing on subbase material.
  2. Identification of the disallowance of Reclaimed Asphalt Pavement (RAP) as an alternate to Types 1, 3 and 4 at intersection locations or in areas of heavy truck traffic, unless Portland Cement Concrete pavement is to be installed as part of the pavement structure.

3. Requirements for acceptance of material on the job site and acceptance of the material as part of the contract quantities.
  4. The option to use recycled Corian® blended with RCA as a replacement for Subbase Types 1, 3, or 4.
- The material specifications related to earthwork construction were revised as follows:
    1. The restriction on winter earthwork operations has changed. The revision requires a Contractor to provide a submittal outlining the modification to the materials, methods for placement and methods for controlling weather effects on both the material and existing ground. The material requirements for winter earthwork are provided in §733-16 *Winter Earthwork*.
    2. The material requirements for Select Granular Subgrade, now provided in §733-13 *Select Granular Subgrade*, include a revision which allows the use of recycled material.
  - The Standard Specification Section 304 *Subbase Course* is being issued concurrently via EI 09-025.
  - The revised Standard Specification Section 203 *Excavation and Embankment* is being issued concurrently via EI 09-024.
  - A revision to the Construction Inspection Manual (CIM) Section 304 *Subbase Course* will be issued separately at a later date.
  - A revision to the Construction Inspection Manual (CIM) Section 203 *Excavation and Embankment* will be issued separately at a later date.

**IMPLEMENTATION:**

The Main Office Design Quality Assurance Bureau will insert these standard specification shelf notes beginning with projects submitted for the letting of May 6, 2010.

Section 733 *Earthwork Materials* includes the following new subsections:

- §733-01 *Controlled Low Strength Material.*
- §733-02 *Mechanically Stabilized Earth System Backfill Material.*
- §733-03 *Geosynthetic Reinforced Earth System Slope Backfill Material.*
- §733-04 *Subbase Course.*
- §733-05 *Glass Backfill.*
- §733-06 *Reclaimed Asphalt Pavement for Earthwork and Subbase.*
- §733-07 *Recycled Portland Cement Concrete Aggregate.*
- §733-08 *Embankment In Place.*
- §733-09 *Select Borrow.*
- §733-10 *Select Fill.*
- §733-11 *Select Granular Fill.*
- §733-12 *Select Granular Slope Protection.*
- §733-13 *Select Granular Subgrade.*
- §733-14 *Select Structural Fill.*
- §733-15 *Sand Backfill.*
- §733-16 *Winter Earthwork.*
- §733-17 *Surface Settlement Gauge.*
- §733-18 *Settlement Rod.*

- §733-19 *Corian® Backfill.*
- §733-20 *Underdrain Filter Material.*
- §733-21 *Stone Filling.*
- §733-22 *Rip-Rap.*
- §733-23 *Bedding Material.*

**TRANSMITTED MATERIALS:**

Standard Specification shelf notes of Section 733 *Earthwork Materials*. Both metric and U.S. Customary shelf notes are attached.

**BACKGROUND:** The NYS Department of Transportation is implementing Trns-*port SiteManager*, including both Construction and Materials functionality. Implementation of standard AASHTO software enables SiteManager to allow revising business practices to be more consistent with industry-accepted best practices. The revisions to the Standard Specifications are to conform to SiteManager's methodology in defining its Material Codes and Pay Items.

**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, [romer@dot.state.ny.us](mailto:romer@dot.state.ny.us). Questions or comments regarding the technical aspects of the Standard Specification Section should be directed to Don Dwyer, P.E., of the Geotechnical Engineering Bureau at (518) 457-4724, [ddwyer@dot.state.ny.us](mailto:ddwyer@dot.state.ny.us).

TABLE 1.1 - EARTHWORK MATERIALS

Material Code	Description
733-19	Corian® Backfill
733-20	Underdrain Filter Material
733-21	Stone Filling
733-22	Rip-Rap
733-23	Bedding Material

TABLE 1.2 - UNOBTAINED COMPRESSIVE STRENGTH

Material Code	Compressive Strength (psi)
733-19	1000
733-20	1000
733-21	1000
733-22	1000
733-23	1000

## SECTION 733 – EARTHWORK MATERIALS

Make the following changes to the Standard Specifications dated May 4, 2006:

Page 993, Delete SECTION 733 AND 734 (VACANT) and Replace it with the following:

### SECTION 733 – EARTHWORK MATERIALS

#### §733-01 – CONTROLLED LOW STRENGTH MATERIAL (CLSM)

**SCOPE.** This specification covers the material requirements and methods of testing CLSM generally used as a replacement for compacted soil backfill in sites where performing compaction is difficult and labor intensive.

**GENERAL.** Provide CLSM with a mix design based on the unconfined compressive strength requirements of the specification. Design the CLSM mix so that it sets within the time stated in the contract documents. If no set time is required, design the set time to meet Contractor's operational requirements.

#### MATERIAL REQUIREMENTS.

**A. MATERIAL.** Provide CLSM containing cement and water. At the Contractor's option, it may also contain fly ash (unless the No Fly Ash item is specified), 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 Table 733-01A *CLSM Material Requirements*:

TABLE 733-01A CLSM MATERIAL REQUIREMENTS	
Material	Subsection
Portland Cement, Type 1 or Type 2	§701-01
Water	§712-01

If used, provide materials meeting Table 733-01B *Requirements for Optional CLSM Material*:

TABLE 733-01B REQUIREMENTS FOR OPTIONAL CLSM MATERIAL	
Material	Subsection
Aggregate Gradation	§703-07 <i>Concrete Sand</i>
Fly Ash	Provide fly ash that complies with the requirements of §711-10 <i>Fly Ash</i> . Waive the loss on ignition requirement.
Chemical Admixtures	Provide admixtures that comply with §711-08 <i>Admixtures</i> . The mix may include high air generators manufactured for CLSM.

**B. UNCONFINED COMPRESSIVE STRENGTH.** Provide CLSM with a mix design generating an unconfined compressive strength in Table 733-01C *CLSM Unconfined Compressive Strength*:

TABLE 733-01C CLSM UNCONFINED COMPRESSIVE STRENGTH	
Test Age	Unconfined Compressive Strength
28 days	$275 \text{ kPa} \leq q_u \leq 1030 \text{ kPa}$

## SECTION 733 – EARTHWORK MATERIALS

### SAMPLING AND TESTING.

**A. SPREAD DIAMETER.** Provide CLSM that has, at the time of placement, a minimum diameter spread of 200 mm as determined by a Department Representative in accordance with ASTM D6103 *Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM)*.

**B. CYLINDER CAST.** A Department Representative will cast three (3) specimens (cylinders) for each batch of CLSM for QA testing.

**BASIS OF APPROVAL.** Mix designs will be approved based on certification of the unconfined compressive strength meeting the requirements of the specification.

**BASIS OF ACCEPTANCE.** CLSM material will be accepted on the jobsite upon submission of an approved mix design to the Engineer.

CLSM material will be accepted as part of the contract quantities upon successful completion of the field tests and Quality Assurance (QA) program indicating the material conforms to the specification. In addition to the requirements of Section 106 *Control of Material*, the Department will sample and test CLSM to assure quality. Three (3) specimens (cylinders) will be cast for each batch in accordance with this specification and tested for unconfined compressive strength. A batch is defined as the amount of material that can be mixed at one time.

### §733-02 – MECHANICALLY STABILIZED EARTH SYSTEM BACKFILL MATERIAL

**SCOPE.** This specification covers the material requirements and methods of testing backfill material generally used for the construction of a MSES.

**SAMPLING.** Perform material tests and assurance methods pertaining to the backfill requirements in conformance with the procedures contained in the geotechnical control procedure "*Procedure for the Control and Quality Assurance of Granular Materials*".

**GENERAL.** Provide backfill material for any MSES from a single source unless prior approval for use of designated multiple sources is obtained from the Director, GEB.

### MATERIAL REQUIREMENTS.

**A. STOCKPILE.** Stockpile the backfill material in accordance with the geotechnical control procedure "*Procedure for the Control and Quality Assurance of Granular Materials*".

**B. GRADATION.** Provide backfill material of one of the following types:

**1. Type A.** Material consisting of any mineral (inorganic) soil, blasted or broken rock, or similar materials of natural origin, including mixtures thereof, and having a gradation in accordance with TABLE 733-02A *Backfill Gradation*.

TABLE 733-02A BACKFILL GRADATION	
Sieve Size Designation	Percentage Passing by Weight
100 mm	100
6.3 mm	30-100
425 µm	0-60
75 µm	0-15

## SECTION 733 – EARTHWORK MATERIALS

**2. Type B.** Material consisting of crushed stone conforming to §703-02 *Coarse Aggregate, Size Designation 2*.

**3. Type C.** Material consisting of recycled Portland Cement Concrete Aggregate (RCA). Type C backfill consists of at least 95%, by weight, of RCA and is free from organic and other deleterious material. Material may contain up to 5% by weight asphalt and/or brick. Gradation for Type C backfill conforms to Table 733-02A *Backfill Gradation*.

**4. Type D.** Material consisting of recycled Portland Cement Concrete Aggregate (RCA). Type D backfill consists of at least 95%, by weight, of RCA and is free from organic and other deleterious material. Material may contain up to 5% by weight asphalt and/or brick. Gradation for Type D backfill conforms to §703-02 *Coarse Aggregate, Size Designation 2*.

**C. PLASTICITY INDEX.** Provide material having a Plasticity Index not exceeding 5.

**D. DURABILITY.** Provide material having a Magnesium Sulfate Soundness loss less than 30 percent.

**E. CORROSION POTENTIAL (METAL REINFORCING AND/OR CONNECTORS ONLY).** The Department will test for the corrosion potential of any system with exposed metal in the backfill. Stockpiled materials will be tested for resistivity and pH, and may be tested for sulfides at the Department's discretion. Material failing to meet the following requirements of Table 733-02B *Resistivity, Soluble Salts and pH Requirements*, will be rejected except as specified below:

Material failing to meet the resistivity criterion may be tested for sulfate and chlorides. Material meeting the criteria for both sulfates and chlorides and having a resistivity greater than 10 ohm-m will be acceptable. Chemical testing (i.e. resistivity, sulfate ion content, sulfide ion content, and chloride ion content) is not required for Type B backfill or for Type D backfill.

TABLE 733-02B RESISTIVITY, SOLUBLE SALTS AND pH REQUIREMENTS			
Property		Test Method	Acceptance Criteria
Resistivity		AASHTO T288	$\rho \geq 30$ ohm-m
Chlorides		AASHTO T291 Method A	$Cl^- \leq 100$ mg/kg
Sulfates		AASHTO T290 Method A, gravimetric	$SO_4^{2-} \leq 200$ mg/kg
		AASHTO T290 Method B, turbidmetric	
Sulfides		NYSDOT Test Method 711-12C	$S^{2-} \leq 300$ mg/kg
pH	Type A or C	NYSDOT GTM-24	$5 \leq pH \leq 10$
	Type B or D	NYSDOT GTM-24	$5 \leq pH \leq 12.5$

**BASIS OF APPROVAL.** Stockpiles of MSES backfill material will be approved by the GEB in accordance with the geotechnical control procedure "*Procedure for the Control and Quality Assurance of Granular Materials*" and the procedural directives of the GEB.

## SECTION 733 – EARTHWORK MATERIALS

**BASIS OF ACCEPTANCE.** Backfill material from approved stockpiles will be accepted on the contract site by delivery ticket. Each delivery ticket shall identify the Suppliers name, date, NYSDOT contract number, stockpile number, item number and quantity.

Backfill material from approved stockpiles will be accepted as part of the MSES upon confirmation that the material gradation type provided by the Contractor, outlined in §733-02B *Gradation*, conforms to the MSES submittal provided by the wall system designer-supplier and upon successful completion of the Quality Assurance (QA) program indicating that the material conforms to the specification. In addition to the requirements of Section 106 *Control of Material*, the Department will sample and test backfill taken from behind the newly-constructed wall to assure quality. The number of samples and their locations (plan and elevation) will be determined by the quantity of material to be used in each MSES structure. Results from chemical testing (i.e. resistivity, sulfate ion content, sulfide ion content, and chloride ion content) can take several weeks to obtain.

### §733-03 – GEOSYNTHETIC REINFORCED EARTH SYSTEM SLOPE BACKFILL MATERIAL

**SCOPE.** This specification covers the material requirements and methods of testing backfill material generally used for the construction of over steepened slopes utilizing Geosynthetic Reinforced Earth System (GRES).

**SAMPLING.** Obtain a representative sample of the source for the performance of a gradation analysis in accordance with the procedures contained in the geotechnical test method “*Test Method for the Grain-Size Analysis of Granular Soil Materials*”.

**MATERIAL REQUIREMENTS.** Any mineral (inorganic) soil, blasted or broken rock, or similar materials of natural origin, including mixtures thereof, may be suitable materials subject to the following:

**A. GRADATION.** Provide backfill material conforming to the following:

**1. Gradation Spread.** Provide backfill material having a gradation in accordance with TABLE 733-03A *Backfill Gradation*.

TABLE 733-03A BACKFILL GRADATION	
Sieve Size Designation	Percentage Passing by Weight
150 mm	100
425 µm	0-60
75 µm	0-40

**2. Gradation Ratio.** Provide backfill material having a gradation ratio in accordance with the following formula:

$$\frac{\text{Percent Pass. 75 } \mu\text{m sieve}}{\text{Percent Pass. 425 } \mu\text{m sieve}} \times 100 \leq 70$$

The gradation is evaluated at the contract level.

**BASIS OF APPROVAL.** Sources will be approved upon successful completion of the gradation tests indicating that the material conforms to the specification.

**BASIS OF ACCEPTANCE.** Backfill material will be accepted based upon successful completion of the gradation tests indicating that the material conforms to the specification.

## SECTION 733 – EARTHWORK MATERIALS

### §733-04 – SUBBASE COURSE

**SCOPE.** This specification covers the material requirements and methods of testing subbase material generally used in the construction of a pavement structure. The following subbase types are evaluated in this specification:

- 733.0401 – Subbase Course, Type 1
- 733.0402 – Subbase Course, Type 2
- 733.0403 – Subbase Course, Type 3
- 733.0404 – Subbase Course, Type 4

Subbase course types are based on the gradation of the material as outlined in Table 733-04A *Subbase Gradation*.

**SAMPLING.** Perform material tests and assurance methods pertaining to subbase requirements in conformance with the procedures contained in the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

**GENERAL.** Provide suitable material conforming to the requirements of Section 203 *Excavation and Embankment* and to the requirements contained herein.

**MATERIAL REQUIREMENTS.** For Types 1, 3 and 4 furnish materials consisting of approved Blast Furnace Slag, Stone, Sand, and Gravel, or blends of these materials.

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.

**A. STOCKPILE.** Stockpile subbase material in accordance with the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*” except as noted herein.

**1. Type 3.** Material furnished under Type 3 will not be required to be stockpiled unless it contains RCA, glass, or Corian®.

**2. Recycled Materials, Alternate C.** Stockpiling of the Reclaimed Asphalt Pavement (RAP) for Alternate C is not required.

**B. GRADATION.** Provide subbase material having a gradation in accordance with TABLE 733-04A *Subbase Gradation*.

TABLE 733-04A SUBBASE GRADATION				
Sieve Size Designation	Percentage Passing by Weight			
	Type 1	Type 2	Type 3	Type 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 µm	5-40	5-40	5-40	5-40
75 µm	0-10	0-10	0-10	0-10

**C. PLASTICITY INDEX.** Provide material having a Plasticity Index based on the material passing the 425 µm mesh sieve equal to or less than 5.0.

## SECTION 733 – EARTHWORK MATERIALS

### D. DURABILITY.

**1. Types 1, 2 and 4.** Provide material for Types 1, 2 and 4 having a Magnesium Sulfate Soundness loss less than 20% after four (4) cycles, unless material meeting the requirements of *Alternate C* (F. Recycled Materials) is used.

**2. Type 3.** Provide material for Type 3 having a Magnesium Sulfate Soundness loss less than 30% after four (4) cycles.

**E. 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%, by weight, of the particles retained on a 12.5 mm sieve is 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 Regional Geotechnical Engineer.

**F. RECYCLED MATERIALS.** The following materials are an acceptable replacement for Types 1, 3 and 4. Only one alternate shall be selected for use per stockpile.

- **Alternate A.** Recycled Portland Cement Concrete Aggregate (RCA) meeting the requirements of §733-07 Recycled Portland Cement Concrete Aggregate, Alternate A.
- **Alternate B.** Recycled Portland Cement Concrete Aggregate (RCA) meeting the requirements of §733-07 Recycled Portland Cement Concrete Aggregate, Alternate B.
- **Alternate C.** Reclaimed Asphalt Pavement (RAP) meeting the requirements of §733-06 Reclaimed Asphalt Pavement for Earthwork and Subbase.
- **Alternate D.** Blends of Blast Furnace Slag, Stone, Sand, and Gravel, with not more than 30% by weight of glass. Glass shall meet the requirements of §733-05 Glass Backfill.
- **Alternate E.** Blend of Alternate A with not more than 5% by weight of Corian®. Corian® shall meet the requirements of §733-19 Corian® Backfill.
- **Alternate F.** Blend of Alternate B with not more than 5% by weight of Corian®. Corian® shall meet the requirements of §733-19 Corian® Backfill.

**G. 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 geotechnical control procedure "*Procedure for the Control and Quality Assurance of Granular Materials*". Do not permanently incorporate material so approved into the work without following the appropriate acceptance procedure.

**BASIS OF APPROVAL.** Stockpiles of subbase material will be approved in accordance with the geotechnical control procedure "*Procedure for the Control and Quality Assurance of Granular Materials*".

**BASIS OF ACCEPTANCE.** Subbase material from approved stockpiles will be accepted upon successful completion of the Quality Assurance (QA) program indicating that the material conforms to the specification. If the QA program is not introduced, subbase material will be accepted upon the basis of the stockpile approval.

## SECTION 733 – EARTHWORK MATERIALS

### §733-05 – GLASS BACKFILL

**SCOPE.** This specification covers the material requirements and methods of assessing glass backfill material generally used as fill material.

**SAMPLING.** Perform material tests and assurance methods pertaining to the glass backfill requirements in conformance with the procedures for stockpiled granular materials contained in the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

#### MATERIAL REQUIREMENTS.

**A. STOCKPILE.** Stockpile glass backfill material in accordance with the procedures for stockpiled granular materials contained in the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

**B. GRADATION.** Provide glass crushed to a maximum particle size of 10 mm. The material shall be subject to visual inspection by the Regional Geotechnical Engineer.

**C. CHARACTERISTICS.** Glass may contain up to a maximum of 5% by volume of china, ceramics, plate glass products, paper, plastics or other deleterious materials.

**BASIS OF APPROVAL.** Glass backfill will be approved in accordance with the procedures for stockpiled granular materials contained in the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

The material shall be subject to visual inspection by the Regional Geotechnical Engineer.

**BASIS OF ACCEPTANCE.** Approved glass backfill material will be accepted upon successful completion of the Quality Assurance (QA) program indicating that the material conforms to the specification. If the QA program is not introduced, glass backfill material will be accepted upon the basis of the stockpile approval.

### §733-06 – RECLAIMED ASPHALT PAVEMENT FOR EARTHWORK AND SUBBASE

**SCOPE.** This specification covers the material requirements and methods of assessing Reclaimed Asphalt Pavement (RAP) generally used as fill material.

**SAMPLING.** Perform material tests and assurance methods pertaining to the RAP requirements in conformance with the procedures contained in the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

#### MATERIAL REQUIREMENTS.

**A. SOURCE.** Provide written documentation that the reclaimed bituminous material originated on a Department project. Include an identifier, such as State Highway number, construction contract number or Department Project Identification Number (PIN).

#### B. GRADATION.

**1. Gradation Spread.** Provide RAP having a maximum top size of 50 mm at the time of placement.

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**2. 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%, 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 Regional Geotechnical Engineer.

**C. CHARACTERISTICS.** Bituminous material that is well-graded from coarse to fine and free from organic or other deleterious material, including tar. This material is at least 95%, by weight, reclaimed bituminous material. No soundness or Plasticity Index testing will be required.

**BASIS OF APPROVAL.** RAP will be approved based upon a visual inspection by the Regional Geotechnical Engineer.

**BASIS OF ACCEPTANCE.** If 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 will be based on an evaluation by the Engineer.

Approved RAP will be accepted upon successful completion of the Quality Assurance (QA) program indicating that the material conforms to the specification. If the QA program is not introduced, RAP will be accepted upon the basis of the visual inspection by the Regional Geotechnical Engineer.

### §733-07 – RECYCLED PORTLAND CEMENT CONCRETE AGGREGATE

**SCOPE.** This specification covers the material requirements and methods of testing Recycled Portland Cement Concrete Aggregate (RCA) generally used as fill material. The following RCA types are evaluated in this specification:

733.0701 – Recycled Portland Cement Concrete Aggregate

733.0702 – Recycled Portland Cement Concrete Aggregate Mixture

**SAMPLING.** Perform material tests and assurance methods pertaining to the RCA requirements in conformance with the procedures contained in the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

#### MATERIAL REQUIREMENTS.

**A. STOCKPILE.** Stockpile RCA in accordance with the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

If RCA comes from other than a Department 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”.

#### B. GRADATION.

**1. Gradation Spread.** Provide RCA meeting the gradation requirements for the appropriate item of use.

**2. 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

## SECTION 733 – EARTHWORK MATERIALS

particles where not more than 30%, 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 Regional Geotechnical Engineer.

### C. CHARACTERISTICS.

**1. Alternate A.** At least 95%, by weight, of Recycled Portland Cement Concrete Aggregate (RCA), and free from organic and other deleterious material. This material may contain up to 5% by weight asphalt and/or brick.

**2. Alternate B.** A mixture of Recycled Portland Cement Concrete Aggregate (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.

**BASIS OF APPROVAL.** Stockpiles of RCA will be approved in accordance with the geotechnical control procedure "*Procedure for the Control and Quality Assurance of Granular Materials*".

**BASIS OF ACCEPTANCE.** RCA from approved stockpiles will be accepted upon successful completion of the Quality Assurance (QA) program indicating that the material conforms to the specification. If the QA program is not introduced, RCA will be accepted upon the basis of the stockpile approval.

### §733-08 – EMBANKMENT IN PLACE

**SCOPE.** This specification covers the material requirements and methods of assessing material generally used for embankment construction.

**MATERIAL REQUIREMENTS.** 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.

**A. GRADATION.** Provide suitable backfill material having no particles with a dimension in excess of two-thirds of the loose lift thickness controlled by the compaction equipment supplied by the Contractor.

Glass incorporated into embankments shall be thoroughly mixed with other suitable material so that Glass constitutes no more than 30% by weight anywhere in the embankment.

The material shall be subject to visual inspection by the Engineer.

**BASIS OF ACCEPTANCE.** Embankment material will be accepted upon visual inspection by the Engineer.

### §733-09 – SELECT BORROW

**SCOPE.** This specification covers the material requirements and methods of testing select borrow material generally used for backfilling in areas beneath the watertable.

**SAMPLING.** Perform material tests and quality assurance methods pertaining to the backfill requirements in conformance with the procedures for non-stockpiled materials contained in the geotechnical control procedure "*Procedure for the Control and Quality Assurance of Granular*

## SECTION 733 – EARTHWORK MATERIALS

Materials”.

### MATERIAL REQUIREMENTS.

**A. SOURCE.** Provide backfill material from a source approved in accordance with the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

**B. GRADATION.** Provide material consisting of rock, stone, slag, cobbles, or gravel, substantially free of shale or other soft, poor durability particles having no particles greater than 1 m in maximum dimension. Of the portion passing the 100 mm square sieve, the material shall have a gradation in accordance with TABLE 733-09A *Select Borrow Gradation*.

TABLE 733-09A SELECT BORROW GRADATION	
Sieve Size Designation	Percentage Passing by Weight
425 $\mu\text{m}$	0-70
75 $\mu\text{m}$	0-15

The gradation is evaluated at the project level.

**C. DURABILITY.** Provide material having a Magnesium Sulfate Soundness loss less than 35%.

**D. COMPOSITION.** RAP shall not be used.

**BASIS OF APPROVAL.** Sources will be approved in accordance with the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

A preceding source evaluation will be valid for the time identified in the manual. For sources without a current evaluation, samples shall be obtained under the direction of the Departmental Geotechnical Engineer and will be tested and evaluated by the Geotechnical Engineering Bureau.

**BASIS OF ACCEPTANCE.** Approved select borrow backfill material from approved sources will be accepted upon successful completion of the gradation tests and Quality Assurance (QA) program indicating that the material conforms to the specification. If the QA program is not introduced, approved select borrow material will be accepted upon successful completion of the gradation tests.

### §733-10 – SELECT FILL

**SCOPE.** This specification covers the material requirements and methods of testing select fill material generally used for backfilling in areas beneath the watertable.

**SAMPLING.** The sampling procedure contained in §733-09 *Select Borrow* shall apply.

**MATERIAL REQUIREMENTS.** The material requirements contained in §733-09 *Select Borrow* shall apply.

**BASIS OF APPROVAL.** The basis of approval contained in §733-09 *Select Borrow* shall apply.

**BASIS OF ACCEPTANCE.** The basis of acceptance contained in §733-09 *Select Borrow* shall apply.

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### §733-11 – SELECT GRANULAR FILL

**SCOPE.** This specification covers the material requirements and methods of testing select granular fill material generally used for backfilling around pipes. The following materials are evaluated in this specification:

733.1101 – Select Granular Fill (Typical)

733.1102 – Select Granular Fill for Corrugated Aluminum Pipe

**SAMPLING.** Perform material tests and quality assurance methods pertaining to the backfill requirements in conformance with the procedures for non-stockpiled materials contained in the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

#### MATERIAL REQUIREMENTS.

**A. SOURCE.** Provide backfill material from an approved source in accordance with the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

**B. GRADATION.** Provide material consisting of rock, stone, slag, cobbles, or gravel, substantially free of shale or other soft, poor durability particles and conforming to the following requirements:

**1. Typical.** Except when used as backfill material for aluminum pipe with Type IR corrugations (Spiral Rib Pipe), the material shall have a gradation in accordance with TABLE 733-11A *Select Granular Fill Gradation*.

Sieve Size Designation	Percentage Passing by Weight
100 mm	100
425 µm	0-70
75 µm	0-15

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

The gradation is evaluated at the project level.

**C. DURABILITY.** Provide materials substantially free of shale and soft, poor durability particles. Provide material having a Magnesium Sulfate Soundness loss less than 30%.

**D. 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.

**E. pH.** Where the State elects to test for this requirement, the material shall have a pH in accordance with TABLE 733-11B *Select Granular Fill pH Requirement*.

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<b>TABLE 733-11B SELECT GRANULAR FILL pH REQUIREMENT</b>		
<b>Property</b>	<b>Test Method</b>	<b>Acceptance Criteria</b>
<i>pH</i>	NYS DOT GTM-24	$5 \leq pH \leq 10$

When RCA is used as backfill in a non-aluminum pipe application, the pH requirements are waived.

**BASIS OF APPROVAL.** Sources will be approved in accordance with the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

A preceding source evaluation will be valid for the time identified in the manual. For sources without a current evaluation, samples shall be obtained under the direction of the Departmental Geotechnical Engineer and will be tested and evaluated by the Geotechnical Engineering Bureau.

**BASIS OF ACCEPTANCE.** Approved select granular fill backfill material from approved sources will be accepted upon successful completion of the gradation tests and Quality Assurance (QA) program indicating that the material conforms to the specification. If the QA program is not introduced, approved select granular fill backfill material will be accepted upon successful completion of the gradation tests.

### §733-12 – SELECT GRANULAR FILL SLOPE PROTECTION

**SCOPE.** This specification covers the material requirements and methods of testing select granular fill slope protection material generally used for stabilizing sloughing slopes. The following materials are evaluated in this specification:

- 733.1201 – Select Granular Fill Slope Protection (Blasted Rock)
- 733.1202 – Select Granular Fill Slope Protection (Typical)

**SAMPLING.** Perform material tests and quality assurance methods pertaining to the backfill requirements in conformance with the procedures for non-stockpiled materials contained in the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

#### MATERIAL REQUIREMENTS.

**A. SOURCE.** Provide backfill material from an approved source in accordance with the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

**B. GRADATION.** Provide material consisting of rock, stone, slag, cobbles, or gravel, substantially free of shale or other soft, poor durability particles.

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

**2.** All materials, other than broken or blasted unweathered rock, shall have a gradation in accordance with TABLE 733-12A *Select Granular Fill Slope Protection Gradation*.

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TABLE 733-12A SELECT GRANULAR FILL SLOPE PROTECTION GRADATION	
Sieve Size Designation	Percentage Passing by Weight
600 mm maximum dimension	100
150 mm maximum dimension	90-100
50 mm square sieve	0-30
6.3 mm sieve	0-10

The gradation is evaluated at the project level.

**C. DURABILITY.** Provide material having a Magnesium Sulfate Soundness loss less than 35%.

**BASIS OF APPROVAL.** Sources will be approved in accordance with the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

A preceding source evaluation will be valid for the time identified in the manual. For sources without a current evaluation, samples shall be obtained under the direction of the Departmental Geotechnical Engineer and will be tested and evaluated by the Geotechnical Engineering Bureau.

**BASIS OF ACCEPTANCE.** Approved select granular fill slope protection backfill material from approved sources will be accepted upon successful completion of the gradation tests and Quality Assurance (QA) program indicating that the material conforms to the specification. If the QA program is not introduced, approved select granular fill slope protection backfill material will be accepted upon successful completion of the gradation tests.

### §733-13 – SELECT GRANULAR SUBGRADE

**SCOPE.** This specification covers the material requirements and methods of testing select granular subgrade material generally used for backfilling undercuts. The following materials are evaluated in this specification:

- 733.1301 – Select Granular Subgrade (Blasted Rock)
- 733.1302 – Select Granular Subgrade (Typical)
- 733.1303 – Select Granular Subgrade (RCA)
- 733.1304 – Select Granular Subgrade (RCA Mixture)
- 733.1305 – Select Granular Subgrade (RAP)

**SAMPLING.** Perform material tests and quality assurance methods pertaining to the backfill requirements in conformance with the procedures for non-stockpiled materials contained in the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

#### MATERIAL REQUIREMENTS.

**A. SOURCE.** Provide backfill material from an approved source in accordance with the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

**B. GRADATION.** Provide material consisting of rock, stone, slag, cobbles, or gravel, substantially free of shale or other soft, poor durability particles.

1. Well graded rock may be used for this item. Particles shall not exceed 300 mm in greatest

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dimension nor  $\frac{2}{3}$  of the loose lift thickness, whichever is less.

2. 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 a gradation in accordance with TABLE 733-13A *Select Granular Subgrade Gradation*.

TABLE 733-13A SELECT GRANULAR SUBGRADE GRADATION	
Sieve Size Designation	Percentage Passing by Weight
6.3 mm	30-100
425 $\mu$ m	0-50
75 $\mu$ m	0-10

The gradation is evaluated at the project level.

**C. DURABILITY.** Provide material having a Magnesium Sulfate Soundness loss less than 35%.

**D. RECYCLED MATERIALS.** The following materials are an acceptable replacement for natural material:

- **Alternate A.** Recycled Portland Cement Concrete Aggregate (RCA) meeting the requirements of §733-07 Recycled Portland Cement Concrete Aggregate, Alternate A.
- **Alternate B.** Recycled Portland Cement Concrete Aggregate (RCA) meeting the requirements of §733-07 Recycled Portland Cement Concrete Aggregate, Alternate B.
- **Alternate C.** Reclaimed Asphalt Pavement (RAP) meeting the requirements of §733-06 Reclaimed Asphalt Pavement for Earthwork and Subbase.

**BASIS OF APPROVAL.** Sources will be approved in accordance with the geotechnical control procedure "*Procedure for the Control and Quality Assurance of Granular Materials*".

A preceding source evaluation will be valid for the time identified in the manual. For sources without a current evaluation, samples shall be obtained under the direction of the Departmental Geotechnical Engineer and will be tested and evaluated by the Geotechnical Engineering Bureau.

**BASIS OF ACCEPTANCE.** Approved select granular subgrade backfill material from approved sources will be accepted upon successful completion of the gradation tests and Quality Assurance (QA) program indicating that the material conforms to the specification. If the QA program is not introduced, approved select granular subgrade backfill material will be accepted upon successful completion of the gradation tests.

### §733-14 - SELECT STRUCTURAL FILL

**SCOPE.** This specification covers the material requirements and methods of testing select granular fill material generally used for backfilling behind structures.

**SAMPLING.** The sampling procedure contained in §733-11 *Select Granular Fill* shall apply.

**MATERIAL REQUIREMENTS.** The material requirements contained in §733-11 *Select Granular Fill* shall apply.

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**BASIS OF APPROVAL.** The basis of approval contained in §733-11 *Select Granular Fill* shall apply.

**BASIS OF ACCEPTANCE.** The basis of acceptance contained in §733-11 *Select Granular Fill* shall apply.

### §733-15 – SAND BACKFILL

**SCOPE.** This specification covers the material requirements and methods of testing sand backfill generally used for backfilling around utilities.

**SAMPLING.** Perform material tests and quality assurance methods pertaining to the backfill requirements in conformance with the procedures for non-stockpiled materials contained in the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

#### MATERIAL REQUIREMENTS.

**A. SOURCE.** Provide backfill material from an approved source in accordance with the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

**B. GRADATION.** Provide material have a gradation in accordance with TABLE 733-15A *Sand Backfill Gradation*.

TABLE 733-15A SAND BACKFILL GRADATION	
Sieve Size Designation	Percentage Passing by Weight
12.5 mm	100
6.3 mm	90-100
75 µm	0-5

The gradation is evaluated at the project level.

**C. DURABILITY.** Provide materials substantially free of shale and soft, poor durability particles.

**D. pH.** Where the State elects to test for this requirement, the material shall have a pH in accordance with TABLE 733-15B *Sand Backfill pH Requirement*.

TABLE 733-15B SAND BACKFILL pH REQUIREMENT		
Property	Test Method	Acceptance Criteria
pH	NYSDOT GTM-24	$5 \leq pH \leq 10$

**BASIS OF APPROVAL.** Sources will be approved in accordance with the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

A preceding source evaluation will be valid for the time identified in the manual. For sources without a current evaluation, samples shall be obtained under the direction of the Departmental Geotechnical Engineer and will be tested and evaluated by the Geotechnical Engineering Bureau.

**BASIS OF ACCEPTANCE.** Approved sand backfill material from approved sources will be accepted upon successful completion of the gradation tests and Quality Assurance (QA) program indicating that the

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material conforms to the specification. If the QA program is not introduced, approved sand backfill material will be accepted upon successful completion of the gradation tests.

### §733-16 – WINTER EARTHWORK

**SCOPE.** This specification addresses the material requirements and methods of assessing earthwork materials placed during construction operations between November 1<sup>st</sup> and April 1<sup>st</sup>. The following materials are evaluated in this specification:

- 733.1601 – Winter Earthwork Material for Embankment In Place
- 733.1602 – Winter Earthwork Material for Select Borrow
- 733.1603 – Winter Earthwork Material for Select Fill
- 733.160401 – Winter Earthwork Material for Select Granular Fill (Typical)
- 733.160402 – Winter Earthwork Material for Select Granular Fill for Corrugated Aluminum Pipe
- 733.160501 – Winter Earthwork Material for Select Granular Subgrade (Blasted Rock)
- 733.160502 – Winter Earthwork Material for Select Granular Subgrade (Typical)
- 733.160503 – Winter Earthwork Material for Select Granular Subgrade (RCA)
- 733.160504 – Winter Earthwork Material for Select Granular Subgrade (RCA Mixture)
- 733.1606 – Winter Earthwork Material for Select Structural Fill
- 733.1607 – Winter Earthwork Material for GRES Slope Backfill

**SAMPLING.** Perform material tests and quality assurance methods pertaining to the backfill requirements in conformance with the procedures contained in the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

### MATERIAL REQUIREMENTS.

**A. SOURCE.** Provide unfrozen backfill material from an approved source in accordance with the geotechnical control procedure “*Procedure for the Control and Quality Assurance of Granular Materials*”.

#### B. GRADATION.

**1. Winter Earthwork Material for Embankment In Place.** Provide material consisting of rock, stone, slag, cobbles, or gravel, substantially free of shale or other soft, poor durability particles. The material shall have no particles greater than 300 mm in maximum dimension. The material shall have a gradation in accordance with TABLE 733-16A Gradation of Winter Earthwork Material.

<b>TABLE 733-16A GRADATION OF WINTER EARTHWORK MATERIAL</b>	
<b>Sieve Size Designation</b>	<b>Percentage Passing by Weight</b>
Maximum Dimension	100
0.5(Maximum Dimension)	0-50
6.3 mm	0-10
75 µm	0-4

The gradation is evaluated at the project level.

**2. Winter Earthwork Material for Select Borrow.** Provide material meeting the requirements of §733-09 *Select Borrow* with the following gradation adjustment:

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The material shall have no particles greater than 1 m in maximum dimension. The material shall have a gradation in accordance with TABLE 733-16A Gradation of Winter Earthwork Material. The gradation is evaluated at the project level.

**3. Winter Earthwork Material for Select Fill.** The material requirements contained in §733-16 B.2. *Winter Earthwork Material for Select Borrow* shall apply.

**4. Winter Earthwork Material for Select Granular Fill.** Provide material meeting the requirements of §733-11 *Select Granular Fill* with the following gradation adjustment:

The material shall have no particles greater than 100 mm in maximum dimension. The material shall have a gradation in accordance with TABLE 733-16A Gradation of Winter Earthwork Material. The gradation is evaluated at the project level.

**5. Winter Earthwork Material for Select Granular Subgrade.** Provide material meeting the requirements of §733-13 *Select Granular Subgrade* with the following material and gradation adjustment:

The material shall have no particles greater than 150 mm in maximum dimension. The material shall have a gradation in accordance with TABLE 733-16A Gradation of Winter Earthwork Material. RAP shall not be used. The gradation is evaluated at the project level.

**6. Winter Earthwork Material for Select Structure Fill.** The material requirements contained in §733-16 B.4. *Winter Earthwork Material for Select Granular Fill* shall apply.

**7. Winter Earthwork Material for GRES Slope Backfill.** The material requirements contained in §733-16 B.5. *Winter Earthwork Material for Select Granular Subgrade* shall apply.

### C. CHARACTERISTICS.

1. No frozen material is to be incorporated into or be allowed to remain in any of the work.
2. Material of silt, clay, or high moisture content will not be permitted under any circumstances.

**BASIS OF APPROVAL.** Sources will be approved in accordance with the geotechnical control procedure "*Procedure for the Control and Quality Assurance of Granular Materials*".

A preceding source evaluation will be valid for the time identified in the manual. For sources without a current evaluation, samples shall be obtained under the direction of the Departmental Geotechnical Engineer and will be tested and evaluated by the Geotechnical Engineering Bureau.

**BASIS OF ACCEPTANCE.** Approved winter earthwork material from approved sources for the substitution of embankment in place, select borrow, select fill, select granular fill, select granular subgrade, select structural fill, or GRES slope backfill will be accepted upon successful completion of the gradation tests and Quality Assurance (QA) program indicating that the material conforms to the specification. If the QA program is not introduced, approved winter earthwork material will be accepted upon successful completion of the gradation tests.

### §733-17 – SURFACE SETTLEMENT GAUGE

**SCOPE.** This specification covers the material requirements and methods of installation of the embankment construction control device surface settlement gauge generally used for monitoring embankment construction. The following materials are evaluated in this specification:

- 733.1701 – Surface Settlement Gauge (Pipe Gauge)
- 733.1702 – Surface Settlement Gauge (Manometer Gauge)