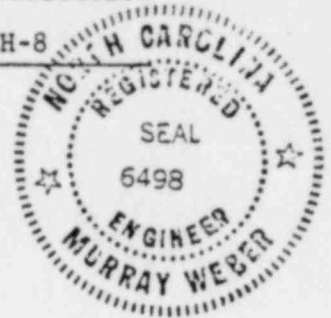


Project Identification

No. CAR-SH-CH-8



EBASCO SERVICES INCORPORATED

EBASCO SPECIFICATION

EXCAVATION, BACKFILL, FILLING & GRADING

(This specification is applicable to Seismic  
Category I and Non-Seismic Structures.  
For classification see applicable drawings)

PURCHASER: \_\_\_\_\_

OWNER: CAROLINA POWER &amp; LIGHT COMPANY

OPERATING COMPANY: CAROLINA POWER &amp; LIGHT COMPANY

PROJECT: SHEARON HARRIS NUCLEAR POWER PLANT

UNIT NO.: 1,2,3&amp;4 NOMINAL KW 900,000 KW PER UNIT

LOCATION: WAKE COUNTY, NORTH CAROLINA

SEILER: \_\_\_\_\_

"THIS DOCUMENT IS DELIVERED IN ACCORDANCE WITH AND IS SUBJECT TO THE  
PROVISIONS OF SECTION X OF THE CONTRACT BETWEEN CAROLINA POWER & LIGHT  
COMPANY AND EBASCO SERVICES INCORPORATED DATED SEPTEMBER 1, 1970,  
AS AMENDED."

Prepared under the supervision of A. A. Ferlito, NC PE NO. 4935  
Andrew A Ferlito  
Murray Weber NC PE NO. 6498

CP&amp;L

Spec. Status	Date	Prepared By:	Reviewed By:	Pages Affected	Approval Date
Original	9/12/73	M M Kamble <i>JS</i>	J L Ehasz <i>JS</i>		July 18, 1974
R1	12/10/73	S N Goyal <i>JS</i>	J L Ehasz <i>JS</i>	2, 5, 10 & 11	12/5/73
R2	5/22/74	S N Goyal <i>JS</i>	J L Ehasz <i>JS</i>	2, 7, 8, 9, 10, 11 & 12	5/8/74
R3	11/5/74	S N Goyal <i>JS</i>	J L Ehasz <i>JS</i>	2, 8, 9, 11 & 12	10/3/74
R4	10/18/77	S N Goyal <i>JS</i>	J L Ehasz <i>JS</i>	8	10/3/77
R5	See Next Page				

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<u>Spec. Status</u>	<u>Date</u>	<u>Prepared By:</u>	<u>Reviewed By:</u>	<u>Pages Affected</u>	<u>CP&amp;L Approval Date</u>
R5	1/10/78	<i>S. N. Goyal</i> S N Goyal	<i>J. L. Ehasz</i> J L Ehasz	1, 8, & 9	12/30/77
R6	4/4/78	<i>S. N. Goyal</i> S N Goyal	<i>J. L. Ehasz</i> J L Ehasz	11	3/28/78
R7	1/8/79	<i>S. N. Goyal</i> S N Goyal	<i>J. L. Ehasz</i> J L Ehasz	Cover	12/14/78

EBASCO SERVICES INCORPORATED

EBASCO SPECIFICATION  
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RS

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1. SCOPE

This specification covers the excavation, foundation preparation and backfilling for plant area buildings, all reservoir concrete structures and filling and grading in the plant area as shown on the drawings.

In addition, the work under this specification shall also include:

- a - Grubbing, removal and disposal of stumps, roots and organic material
- b - Storage or disposal of all earth, sand, gravel, rock, boulders, debris and/or other materials at the locations shown on the drawings or approved by the Owner
- c - The maintenance of all excavations during construction
- d - Providing, installing, maintaining and removing any necessary sheet piling, sheeting, bracing and/or shoring
- e - Erecting and maintaining substantial barricades around excavations where required for safety
- f - Backfilling of all unauthorized over-excavations
- g - Care and removal of all surface water, rain water or ground water seeping and flowing into the excavations by means of ditching, damming, pumping or other suitable means approved by the Owner
- h - The foundation preparation in advance of concrete placement under the plant buildings and all concrete structures in the reservoir area

In addition to the general requirements of this specification, all additional specific requirements pertaining to excavation as defined in Specifications CAR-SH-CH-4, "Embankments, Dams, Dikes and Channels" and CAR-SH-CH-3, "Clearing and Grubbing" shall also apply.

2. STANDARDS AND DEFINITIONS

2.1 Standards

Equipment and/or services furnished in accordance with this specification shall comply with all Federal and State laws and local ordinances of the place of installation and with the following codes to the extent referenced herein. Unless otherwise noted, the document with addenda, amendments and revisions in effect on the date of the contract will apply. Later editions may be used by mutual consent in writing between the Contractor and Owner.

- a - ASTM D2049, "Relative Density of Cohesionless Soils"
- b - ASTM D698, "Moisture-Density Relations of Soils using 5.5 lb Rammer and 12 in. Drop"
- c - ASTM D2216 "Laboratory Determination of Moisture Content of Soil"
- d - ASTM D3017 "Moisture Content of Soil and Soil-Aggregate in place by Nuclear Methods (Shallow Depth)"

R2

R5

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2. STANDARDS AND DEFINITIONS (Cont'd)

.1 Standards (Cont'd)

- e - ASTM D1556 "Density of Soil in Place by Sand Cone Method" R1
- f - ASTM D2167 "Density of Soil in Place by the Rubber-Balloon Method"
- g - ASTM D2937 "Density of Soil in Place by the Drive-Cylinder Method"
- h - ASTM D2922 "Determining the Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)" R3
- i - ASTM C88, "Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate" R2
- j - ASTM C131, "Test for Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine"
- k - Ebasco Specifications CAR-SH-CH-3, "Clearing and Grubbing"  
CAR-SH-CH-4, "Embankments, Dams, Dikes and Channels"

.2 Definitions

a - Owner

In these specifications, the word "Owner" shall mean the individual appointed by the Owner and charged with technical acceptance of the work for the Owner, or his authorized agents, engineers, assistants and inspectors acting severally within the scope of the particular duties and authorities delegated to them.

b - Engineer

In this specification, the word "Engineer" shall mean the Design Engineer, Ebasco Services Incorporated.

3. EXCAVATION - GENERAL

Stumps remaining from clearing operations shall be cut flush or removed as directed by the Owner. All stump holes shall be filled and the area rough graded. All debris shall be disposed of as specified in Paragraph 4 of Specification CAR-SH-CH-3 "Clearing and Grubbing." Burying of debris shall not be permitted within 1000 ft of the area grubbed.

During the course of all excavation work located in areas beyond the clearing and grubbing lines shown on the drawings, extreme care shall be exercised by the Contractor to preserve and avoid damage to trees, shrubs and all other vegetation which does not directly hamper work progress. The Contractor's plans for the dimensions and routes of required access roads shall be subject to the approval of the Owner and he shall not enter any designated picnic, camping or recreational areas, except with written permission of the Owner. The discharge into natural streams or ponds of gasoline, oil or any other waste material is prohibited.

In rock excavation where the drawings show or the Owner directs that structures are to be founded on compacted crushed rock and random or concrete fill, the foundation shall be over-excavated to provide for a minimum of 6 in. of such material, unless otherwise noted on the drawings.



3. EXCAVATION - GENERAL (Cont'd)

Adequate barricades shall be erected and maintained around excavations where required for safety.

4. CLASSIFICATION OF EXCAVATION

All excavation shall be considered to fall within the following two classifications:

a - Unclassified

Unclassified excavation shall consist of the removal, storage and/or disposal of all materials required to be removed such as topsoil, clay, sand, gravel, rock fragments, boulders, soft and disintegrated rock or any other material that can be effectively removed by a D9 Caterpillar Tractor or equal equipped with a single tooth ripper.

b - Rock

Rock excavation shall consist of the removal, storage and/or disposal of such bedrock formations which require continuous drilling and blasting.

5. VARIATION IN EXCAVATION

It is likely that fissures, cracks, joints, cavities, overhangs or other irregularities in the rock surface may be encountered that will require excavation in excess of the foundation lines and grades initially shown on the drawings or specified. The right is reserved by the Owner to vary the depth, width and length of excavation and to increase or decrease the slopes of the excavations for the purpose of obtaining the most stable or economical foundation or the most desirable final result. The right is also reserved by the Owner to require that additional excavation be performed after excavation has been commenced or has been completed to the lines and/or grades shown on the drawings, previously specified, ordered, or staked on the ground.

.1 Variations of depth, width and length of excavation or increase and decrease of excavation slopes from those shown on the drawings or established by the Engineer which are required by the Contractor for any reason shall be approved by the Owner before such changes are made.

6. DISPOSITION OF EXCAVATED MATERIAL

.1 Topsoil

Immediately after grubbing and stump removal operations and before general excavation commences, topsoil shall be removed where and to such a depth as may be directed by the Owner. Topsoil is defined as the loamy dark surface or top layer of soil including fine roots, the herbaceous vegetation and overlying grass and is characterized by the presence of organic matter.

The topsoil to be reused shall be stockpiled at convenient approved locations. Compaction of this soil shall be accomplished by two or three passages of hauling and spreading equipment. Stockpiles shall be smoothed to a measurable outline and shall be constructed as directed and approved by the Owner.

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6. DISPOSITION OF EXCAVATED MATERIAL (Cont'd)

.2 Suitable Excavated Material

Insofar as it is practicable, all suitable materials resulting from open cut excavations shall be used for permanent construction.

The Contractor's blasting and other operations in the excavations shall be such that the materials excavated shall yield as much required suitable material as practicable, and shall be subject to the approval of the Owner. Where practicable, materials suitable for use for construction shall be excavated separately from materials to be wasted. Suitable material shall be segregated by loads during the excavation and shall be placed in temporary stockpiles and later placed in the designated final locations in accordance with the appropriate drawings.

.3 Unsuitable Excavated Material

Excavated materials which are unsuitable for use in accordance with this specification and Specification CAR-SH-CH-4, "Embankments, Dams, Dikes and Channels" and the appropriate drawings or which are waste or excess material not required for construction of dams, dikes, backfill for plant area buildings or fill for the plant area or reservoir embankment shall be disposed of in waste disposal areas shown on the drawings or designated by the Owner.

All waste or excess material shall be disposed of in a manner which will avoid the necessity of rehandling or the interference with other work. It shall be spread and graded in uniform layers and compacted by two passages of crawler-type tractors, smooth rollers or other equipment approved by the Owner. If disposed of in benches, precautions shall be taken, to the Owner's satisfaction, to prevent material from rolling downhill. Waste piles shall be shaped to insure drainage.

In particular, the sandy silty alluvium, located in the existing streambed areas of the plant area shall be removed and if suitable, shall be placed elsewhere as random fill and compacted as hereinafter specified.

7. PRESPLITTING

Presplitting of in-situ rock, either competent or weathered, shall be performed where required by the Owner to obtain final specified open cut excavation surfaces for the plant area buildings, spillway-channels and other structures.

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7. PRESPLITTING (Cont'd)

.1 Drilling and blasting for presplitting may proceed well in advance of general blasting. Alternately, all blasting may be performed at once if the presplitting holes are detonated first, using delay techniques.

.2 All drill holes for presplitting shall be a minimum of 2-1/2 in. in diameter with center to center spacing no closer than 2 ft. Holes may be percussion drilled along the lines and to the inclinations indicated on the drawings and established by the Owner. Every effort should be made to secure precise location and strict parallelism of all presplit holes to provide a continuous split.

8. BLASTING

The Contractor shall obtain all necessary blasting permits from the regulatory agencies before proceeding with the work. It shall be the obligation of the Contractor to select explosives which will produce the desired work of excavation with maximum safety and overall project economy. The Contractor's proposed plans for transportation, unloading, storage, magazine location and distribution of explosives from storage to the blast area shall be submitted to the Owner for his approval prior to the commencement of the work of excavation. As a minimum, the handling and storage of all explosives and blasting supplies, at all stages of their existence, shall comply with procedures as outlined in the "Blaster's Handbook" published by E I Du Pont de Nemours and Company Inc, of Wilmington, Delaware. Existing North Carolina or Federal governmental laws or regulations embodying more stringent requirements than outlined in the "Blaster's Handbook" shall be considered as superseding the applicable portions of the Handbook and shall be complied with in all respects.

.1 All necessary precautions shall be taken to preserve the rock beyond and below the lines of excavation in a sound condition. Heavy blasting will not be permitted closer than 3 ft to the rock which will form the final foundation of concrete structures. In excavations for Class I structures this 3 ft may be increased by the Owner as necessary to ensure complete soundness of the final excavated foundation rock. As an excavation approaches its final lines, the depth of holes for blasting and the amount of explosive used per hole shall be reduced progressively such that in the opinion of the Owner light blasting is used to remove the material effectively. Where presplitting techniques as outlined in Section 7 are not used, and in the opinion of the Owner, satisfactory results will not be obtained through light blasting closer than 3 ft to the final required rock face, excavation of the foundation shall then continue by barring, wedging, picking or other suitable means approved by the Owner. Damage done to surfaces by blasting, including the shattering of the material beyond the required excavation lines, shall be repaired by removal of the damaged materials and backfilling with concrete or other selected materials as set forth in Section 9 of this specification. R1



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8. BLASTING (Cont'd)

.2 Before the start of any large scale rock excavation, various arrangements of blasting charges, hole diameters and hole spacing shall be tested for all types of blasting to determine those which will produce the desired results with maximum economy.

.3 The spacing and size of drill holes may be varied with the approval or at the direction of the Owner to suit the material encountered during construction so that a smooth face, reasonable free of loose rock is produced. It shall be the Contractor's responsibility to drill as many holes as are required to satisfactorily complete the work.

.4 No blasting shall be performed in any excavation until the size and pattern of blast holes and the amount and distribution of blasting charges has been reviewed by the Owner. Each and every blast will be prerecorded and the Owner will sign off each blast prior to the firing.

.5 When blasting is being done within 500 feet of concrete structures, whether newly placed or existing, a careful and documented monitoring program of velocity measurements must be conducted with calibrated instrumentation. Generally no blasting shall be performed for first 24 hours after concrete placement. If blasting must be done during the first 24 hours then the powder and distance relationships must be controlled to limit the peak particle velocities at the newly placed concrete to the following limits; the first 12 hours shall be limited to less than 0.2 inches per second, 12 to 24 hours shall be limited to 0.6 inches per second at 12 hours and allowed to increase linearly at the rate of 0.3 inches per second per hour. The limiting peak particle velocity after 24 hours shall be 4 inches per second. The Contractor shall submit to the Owner for approval prior to blasting the drilling pattern, ignition pattern, charge and other details of the operations and any calculations used to establish that the existing structures will not be damaged by blasting.

9. OVER-EXCAVATION

.1 If unclassified materials are excavated excessively beyond the lines shown on the drawings or established by the Owner, the Owner may direct that such over-excavation be backfilled. The backfill shall be a selected backfill material, as hereinafter specified, placed in layers not more than 6 in. thick, if hand compacted, or 9 in. thick, if machine compacted, moistened and thoroughly compacted by tamping or rolling to the degree of compaction specified on the drawings or in the specifications.

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9. OVER-EXCAVATION (Cont'd)

.2 In all rock excavations where concrete is to be placed upon or against rock surfaces, over-excavation beyond the lines shown on the drawings or lines established by the Owner shall be backfilled with concrete. It shall be the same class as that of the concrete to be placed in contact with the rock.

10. FOUNDATION PREPARATION

All rock foundations which will be in contact with masonry shall be suitably prepared by washing, or blowing by compressed air in advance of concrete placement. All soil, muck, small rock fragments and other foreign materials shall be removed. In any area where the nature of the rock is such that it would be softened by washing with water, blow pipes and compressed air shall be used and a concrete seal mat shall immediately be placed by the Contractor. Any water and debris collecting in the low spots shall be removed.

The preparation of foundation rock surfaces under dams, dikes and embankments shall be performed in accordance with the appropriate section of Specification CAR-SH-CH-4, "Embankments, Dams, Dikes and Channels."

11. BACKFILL GENERAL

Backfill material around masonry structures shall not be placed until released by the Owner after consideration of curing and strength requirements for the concrete.

.1 Care shall be taken to place backfill symmetrically, and in uniform layers, to prevent harmful eccentric loading on a structure or foundation.

.2 Where a large number of lifts are required to complete a backfill operation and the elapsed time between placement is large, the surface of each lift should be sloped slightly to facilitate drainage and prevent ponding on the fill.

.3 All necessary processing, including raking, crushing, removal of oversize materials, mixing and watering or aerating shall be performed in the stockpile or borrow pit. Only minor adjustments in water content will be permitted on the fill after it has been placed. However, adding ~~water to increase water content in fill during placement~~ may be permitted by the Owner where sheepsfoot/wedgfoot roller is used for compaction.

.4 Unless otherwise specified or directed by the Owner, heavy hauling or compacting equipment shall be permitted no closer than three feet to any structure or foundation during backfilling. In all areas closer than three feet,

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11. BACKFILL GENERAL (Cont'd)

.4 (Cont'd)

or where work space is limited, portable equipment such as vibratory plates, rammers, or pneumatic tampers shall be used. The equipment and procedures used shall be subject to the approval of the Owner.

.5 In-place density of backfill shall be determined by either one of the following four methods ASTM D 1556, D 2167, D 2937 or D 2922 - Method B as designated by the Owner. To calculate dry density from wet density determined according to ASTM D 2922, moisture content shall be determined by ASTM D 2216 or D 3017. If ASTM D 3017 is used to determine moisture content, one calibration test for the equipment shall be performed after every 10 tests by comparison with moisture content by ASTM D 2216. If the calibration test indicates a deviation of more than \* 2% moisture content the use of nuclear method shall be discontinued. If ASTM D 2922 is used to determine in place density, one calibration test for the equipment shall be performed after every ten tests by comparison with in-place density test by ASTM D 1556, D 2167 or D 2937 as designated by the Owner. The calibration test shall be performed on a similar material for which the equipment is used in the field. The calibration test frequency may be reduced by the Owner from one in ten to one in 25 after a review of the performance of the equipment after at least 10 calibration tests (i.e. 100 tests) for each piece of equipment have been performed and the deviation of moisture content when compared with ASTM D 2216 or density when compared with ASTM D 1556, D 2167 or D 2937 is not more than \* 2%.

R5

R5

## Basic Specification

### Excavation, Backfill, Filling and Grading

#### Project Identification

No. CAR-SH-CH-8

#### BACKFILL OR FILL MATERIAL

The backfill or fill materials used at any location shall be those called for on the drawings, specified herein or designated and approved by the Owner and shall conform to the following requirements:

##### 1 Random Fill

The materials used for random fill may be any excavated unclassified material or rock and shall be free of stumps, roots, brush, rubbish, organic topsoil and other objectionable material. While no specific requirements covering type, gradation or size limitation for this material are presented herein, sources shall be subject to the approval of the Owner.

##### .2 Selected Backfill

Selected backfill shall be used around pipes and at places shown or called for on the drawings. Selected backfill shall be soil overburden material with the maximum size of stones not more than 3 in. obtained from local overburden excavation at the site. Selected backfill around plant buildings shall be clayey and silty residual soils, predominantly (over 90%) derived from claystones and siltstones, obtained from excavations or borrow areas from and the vicinity of plant, auxiliary dam and spillway, and auxiliary dike areas, and shall be free of stones larger than 3 in. and 95% of the material shall pass thru 3/4 in. screen.

##### 3 Riprap

Riprap materials shall consist of sandstone, conglomerate or granitic rock fragments that are dense blocky, resistant to abrasion and free of cracks, seams and other defects that would tend to increase their destruction by water and frost actions. To determine the suitability of riprap materials, Los Angeles Abrasion Test in accordance with the provisions of ASTM C131, Sodium Sulfate Soundness Test in accordance with the provisions of ASTM C88, and Accelerated Expansion Test in accordance with the procedure described herein shall be performed on the riprap materials.

Procedure for Accelerated Expansion Test: Soak 10-12 lb of rock fragments weighing 3 to 3/4 inch in ethylene glycol in a plastic or glass container at room temperature. Examine the rock pieces daily for a maximum period of 15 days for any signs of deterioration. Rocks withstanding this test during the "full period of the test will be acceptable".

R5



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12. BACKFILL OR FILL MATERIAL (Cont'd)

.3 Riprap (Cont'd)

Riprap shall be classified as Type A, Type B and Type C riprap, and shall be well graded as specified below:

Type A riprap shall have seventy percent of rock ranging in size from 24 inches to 48 inches. The average size shall not be less than 30 inches and the dimension in any direction shall not be less than 18 inches.

Type B riprap shall have seventy percent of the rock ranging in size from 12 inches to 24 inches. The average size shall not be less than 16 inches and the dimension in any direction shall not be less than 10 inches.

Type C riprap shall have seventy percent of rock ranging from 8 inches to 16 inches. The average size shall not be less than 10 inches and the dimension in any direction shall not be less than 6 inches.

In all types of riprap mentioned above, slabs or rock slivers with maximum dimensions larger than twice the respective specified average dimension will not be accepted.

.4 Crushed Rock

Crushed rock for drainage layer, bedding or road base shall be used at the following locations:

- a - Behind retaining walls shown on the drawings to serve as a drainage layer or as fill material as shown on the drawings.
- b - As bedding material for pipes, conduits, electrical conduits, cable trenches or other structures where required in rock excavations.
- c - As a filter blanket or bedding beneath riprap slope protection where specified.
- d - As road base where specified.
- e - Elsewhere as directed by the Owner or shown on the drawings.

The crushed rock shall consist of hard, durable rock such as granite, sandstone or conglomerate and may be obtained from structure rock excavation or quarry and shall meet the following gradation requirements:

Size	Percent Finer when used as Drainage Layer, Filter Blanket, or Fill-Material as shown on Drawings	Percent Finer when used as Bedding for Pipe, etc	Percent Finer when used as Road Base
3 in.	95-100	-	-
1-1/2 in.	55-80	-	80-100



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12. BACKFILL OR FILL MATERIAL (Cont'd)

.4 Crushed Rock (Cont'd)

<u>Size</u>	<u>Percent Finer when used as Drainage Layer, Filter Blanket, or Fill-Material as shown on Drawings</u>	<u>Percent Finer when used as Bedding for Pipe, etc</u>	<u>Percent Finer when used as Road Base</u>	
3/4 in.	30-55	-	68-100	
1/2 in.	-	100	55-100	
3/8 in.	5-20	-	-	
No. 4	0-10	83-100	35-80	
No. 40	-	36-54	14-45	
No. 200	-	0-15	5-25	R6

The road base material given above is same as "Soil Type Base Course 910.5 (Type B)" of standard specifications for roads and structures, North Carolina State Highway Commission.

Crushed rock used as bedding beneath various types of riprap shall meet the following gradation requirements:

<u>Percentage By Weight Passing</u>				
<u>Size</u>	<u>Bedding Type A for Riprap Type A</u>	<u>Bedding Type B for Riprap Type B</u>	<u>Bedding Type C for Riprap Type C</u>	
12 in.	100	-	-	
6 in.	83-100	100	-	
3 in.	66-81	78-100	100	
1-1/2 in.	50-66	56-76	76-90	
3/4 in.	32-49	34-50	50-65	
3/8 in.	16-32	17-34	25-40	
No. 4	0-16	0-17	12-22	
No. 8	-	-	0-10	

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13. PLACEMENT OF BACKFILL OR FILL

.1 Random Fill

Random fill as specified in Section 12.1 shall be placed in the area and to the lines and grades shown on the drawings or as directed by the Owner.

Before placement of any random fill, a test fill section shall be constructed using a vibratory roller having a dynamic force of not less than 40,000 lb, or a sheepsfoot/wedgfoot roller having an operation weight of not less than 4000 lb per linear foot or a 50-ton rubber tired roller compactor. Various combinations of layer thickness and roller passes shall be tried. For each layer thickness tested, either settlement readings shall be taken after each pass at a number of points on the fill and the average plotted against layer thickness or density tests shall be performed after each pass at a number of points in the fill when the size of material is small enough to conduct in-place density tests by the Sand Cone Method. The final choice of layer thickness and number of passes will be determined by the Engineer and the Owner based upon these results as well as appearance and response to rolling. R2 R2 R1

If 90 percent of the random material passes 3/4 in. screen, construction of test section shall not be required. It shall be compacted in layers not more than 8 in. compacted thickness to 95 percent of the maximum density obtained in Standard Proctor Compaction Test (ASTM D698-Method A,B,C or D to be used shall be determined by the Owner). In-place density shall be determined as specified in Paragraph 11.5. Layers up to 12 inches compacted thickness may be permitted by the Owner when found satisfactory by testfill program performed on a similar material. R3 R1 R2

The random fill shall be placed carefully so as not to injure structures or piping or disturb previously placed backfill of any type.

Where random fill is placed in conjunction with drainage layers, both materials shall be placed at the same rate. Care shall be taken to prevent mixing of material which would hamper the effectiveness of the drainage layer.

All materials shall be deposited and graded so that cobbles, gravel and boulders will be well distributed and not concentrated in pockets or in any one layer. The fill material shall not be placed while frozen nor shall it be placed on frozen surfaces.

Prior to placing random fill, any soft and unsuitable material in foundation shall be removed and such removals shall be filled back with the same material or with random fill and compacted to required density according to the specification.

Where random fill is to be placed over firm ground other than rock, a series of open furrows shall be formed not less than 8 in. deep below the ground at intervals of not more than 3 ft and compaction of the existing ground will not be required prior to the placement of random fill.

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13. PLACEMENT OF BACKFILL OR FILL (Cont'd)

.2 Selected Backfill

Selected backfill shall be hand or machine compacted in layers not more than 6 in. compacted thickness to a density not less than 95 percent Standard Proctor Density and in-place density shall be determined as specified in Paragraph 11.5.

R1  
R3

.3 Riprap

Rock for riprap shall be placed on the crushed rock bedding in such a manner as to ensure that the individual sections will be interlocked and form a rough surface so that the completed riprap is stable, without tendency to slide and with no unreasonably large protrusions from or hollows in the surface or unfilled spaces within the riprap. The inclusion of rock spalls or gravel in the mass in an amount not in excess of that required to fill voids in the riprap will be permitted. Riprap may be placed concurrently with the placement of the random fill or, in a single operation after all random fill has been placed to final lines and grades.

R2

If the riprap is placed in a single operation, it shall be placed to its full slope thickness as indicated on the drawings in one operation and in such a manner as to avoid displacing the underlying materials. Placing dumped riprap in sloping layers will not be permitted. The individual sections must be carefully placed so that the riprap will be interlocked and form a rough surface.

.4 Crushed Rock

Crushed rock materials except when used as a bedding for riprap may be compacted by the passage of dozers or by surface vibrators, smooth rollers, power tampers or other equipment approved by the Owner.

R2

The relative density of the compacted material shall be not less than 70 percent as determined from tests conducted in accordance with the provisions of ASTM D2049, "Relative Density of Cohesionless Soils." In-place density shall be determined as specified in Paragraph 11.5.

R1  
R3

Where compaction of crushed rock backfill is performed by hand portable equipment, the material shall be deposited in horizontal layers, which, after compaction, are not more than 6 in. thick. Where compaction is performed using dozers, rollers or other similar equipment, the material may be deposited in layers which, after compaction, are not more than 12 in. thick.

During the compaction of crushed rock, the material shall be wetted thoroughly throughout the entire layer being compacted.