Division 2

Site Work

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Excavation, Filling and Backfilling

APPENDIX NO. 1

TEST BORING DATA

DIVISION 2

SECTION 2A

EXCAVATION, FILLING AND BACKFILLING

1.0 SCOPE

This Specification Section includes performing all clearing, grubbing, excavating, filling, backfilling, installing ditches and culverts, compacting subgrade for plant site, outside tank and parking areas, lagoon, access road and all other items constructed as placed below finished grades, all as indicated on the drawings and described in the specification.

2.0 GENERAL

2.1 Codes and Standards

Contractor shall comply with the latest edition and latest addenda thereto, as of date of award, of all applicable Federal, State and Local Laws, Codes and Regulations in performing the work under this specification.

2.2 Test Borings

Test borings have been taken at the site and the results of the borings are included in Appendix 1 of this specification.

3.0 DETAILED REQUIREMENTS

3.1 Clearing

The surface of the ground within the limits defined on the contract drawings shall be completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish and all other objectionable materials resting upon or protruding through the surface of the ground.

3.2 Grubbing

All stumps, roots larger than 1 1/2 inches in diameter, matted roots, brush, timber, logs, or other organic or metallic

debris unsuitable as foundation material shall be excavated and removed to a depth of 18 inches below the original ground surface within the areas designated on the contract drawings.

3.3 Stripping of Top Soil

Areas designated on the contract drawings for clearing shall be stripped of top soil to a depth of at least 6 inches below the original surface. The top soil shall be stock piled at a location designated by the Engineer for later use in landscaping.

3.4 Excavation

3.4.1 Classification

The Contractor shall perform excavation of every description, regardless of the material encountered. Excavated material shall be classified for fill purposes only.

Class A fill shall be a granular soil with a maximum particle size of 1 inch, with not more than 25% passing the #200 sieve, and with a plasticity index of not over 6.

Class B fill shall be onsite material free of trash, roots, organic or frozen material.

3.4.2 Dimensions

Excavation shall conform to the dimensions and elevations indicated on the drawings or required for the work of this and other sections of the Specifications. Excavation shall extend a sufficient distance from walls and footings for placing and removing shoring and forms, the performing of all work in the excavations, and inspection, except where concrete for walls and footings is authorized to be deposited directly against excavated surfaces. Ditches and gutters shall be cut accurately to the crosssections and grades indicated. Care shall be taken not to excavate ditches and gutters below grades indicated.

3.4.3 Shoring & Drainage

Shoring, when and where required during excavation

shall be installed to protect workmen, banks, adjacent structures, roads and utilities. Shoring shall be designed by a Licensed Professional Engineer and submitted to the Owner for approval prior to installation. The Contractor shall provide and operate all pumps, hose and drainage lines, or other equipment required to keep all excavation free from water.

3.4.4 Pipe Trenches

The banks of pipe trenches shall be as nearly vertical as practical. Care shall be taken not to overexcavate. The bottom of trenches shall be accurately graded to allow for the proper amount of bedding to be installed.

4.0 INSTALLATION

4.1 Fill and Backfill

4.1.1 Fill and Backfill (For building and areas other than trenches, paved areas, access ramp to pump house and dike around the lagoon.)

Filling and backfilling shall be performed after the permanent work in the excavation has been inspected and approved. Shoring shall be removed in a manner to avoid damage or disturbance to the work. The excavations shall be free of forms and cleaned of trash. Backfill shall be Class A fill, as described in paragraph 3.4.1. Backfill shall not be placed on frozen or muddy surfaces. Fill and backfill shall be placed in horizontal layers not more than 6 inches in thickness. It shall be brought up evenly on each side of construction as far as practicable.

4.1.2 Backfilling Trenches

After bedding has been prepared and pipe installed, Class A fill shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe. Each layer shall be thoroughly compacted with a vibratory compactor as specified hereinafter. This shall continue until the fill is 6 inches above the largest pipe in the trench. Thereafter the trench shall be filled in 8 inch compacted layers of either Class A or Class B fill.

4.1.3 Backfill for Road Embankment, under paved areas, access ramp to pump house and dike around lagoon

Backfill for road embankment, and under paved areas shall be Class A fill, placed in 8 inch compacted layers, except that the maximum particle size may be 3 inches. For the access ramp to the pump house the fill shall be Class A fill, except that for the fill more than 12 inches below finished grade the maximum particle size may be 3 inches. The fill for the dike around the lagoon may be either Class A or Class B fill, except that the top 12 inches shall be Class A fill.

The finished surface of the access ramp to the pump house and of the dike around the lagoon, and the subgrade beneath paved surfaces, shall not show a deviation of 1/2 inch or more when tested with a 10 foot straight edge applied parallel with and at right angles to the centerline of the work.

4.1.4 Borrow

If the amount of backfill should exceed the required amount of excavation, the Contractor may procure the needed fill from onsite areas to be approved by the Engineer. If the Contractor chooses, he may bring in this extra fill from offsite, at no additional cost to the Owner. However, this additional fill must meet the requirements of Class A fill.

Where onsite borrow areas are used, the Contractor shall include in his price the cost of clearing, grubbing, stripping of top soil as called for in these specifications and of leveling as required by the owner.

4.1.5 Overall Area Grading

The area outside of foundations and structures and within the clearing limits shall be graded in accordance with the typical sections, grades or finished contours indicated on the drawings. All such areas for which no grades, finished contours or typical sections are shown shall be graded to the extent required to fill pot holes, eliminate all abrupt changes in grade and bring the ground to a smooth, even surface.

4.2 Compaction

4.2.1 Compaction for Building and Trenches

The fill or backfill shall be placed uniformly in horizontal layers, and each layer shall be compacted with a vibratory plate compactor such as Vibro-Plus Model CM-20 or other type of equal weight. The fill shall be compacted to a minimum dry weight density of 95% of the maximum dry weight density as determined by density test A.A.S.H.O. T180, Method D.

4.2.2 Compaction in Areas Other than for Building or Trenches

Each layer of fill or backfill shall be compacted by rolling with heavy equipment to a minimum dry weight density of 90% of the maximum dry weight density as determined by density test A.A.S.H.O. T180, Method D, except that the top 6 inches of the subgrade under paved areas, and the top 12 inches of the access road to pump house and dike around lagoon, shall have a minimum dry density of 100%.

Heavy equipment for spreading or compacting backfill shall not be operated closer than 5 feet from building walls or grade beams. In restricted areas where the heavy equipment cannot operate, the fill shall be compacted with a vibratory plate compactor Vibro-Plus Model CM-20 or equal.

4.2.3 Insufficient Compaction

When fill in place is insufficiently compacted as determined by in place density test, as described in paragraph 5.1, the fill shall be recompacted until compliance, or it shall be removed and replaced.

5.0 TESTING

5.1 Testing Laboratory and Inspection Service

The Contractor shall furnish an Inspection service as part of the Testing Laboratory to do the following:

1. Classify grade of fill material.
2. Determine that borrow material meets specification.
3. Determine maximum dry weight densities.
4. Determine in place density by A.A.S.H.O. Test T147.

The places where in place density tests are to be made shall be approved by the Engineer prior to taking sample. In place density tests shall be required for each 250 cubic yards of each class of fill, but not less than one determination for each 2 foot high increment of fill.

5.2 Tests to be Made

The following minimum tests shall be made:

1. Fill material shall be tested for gradation and plasticity index.

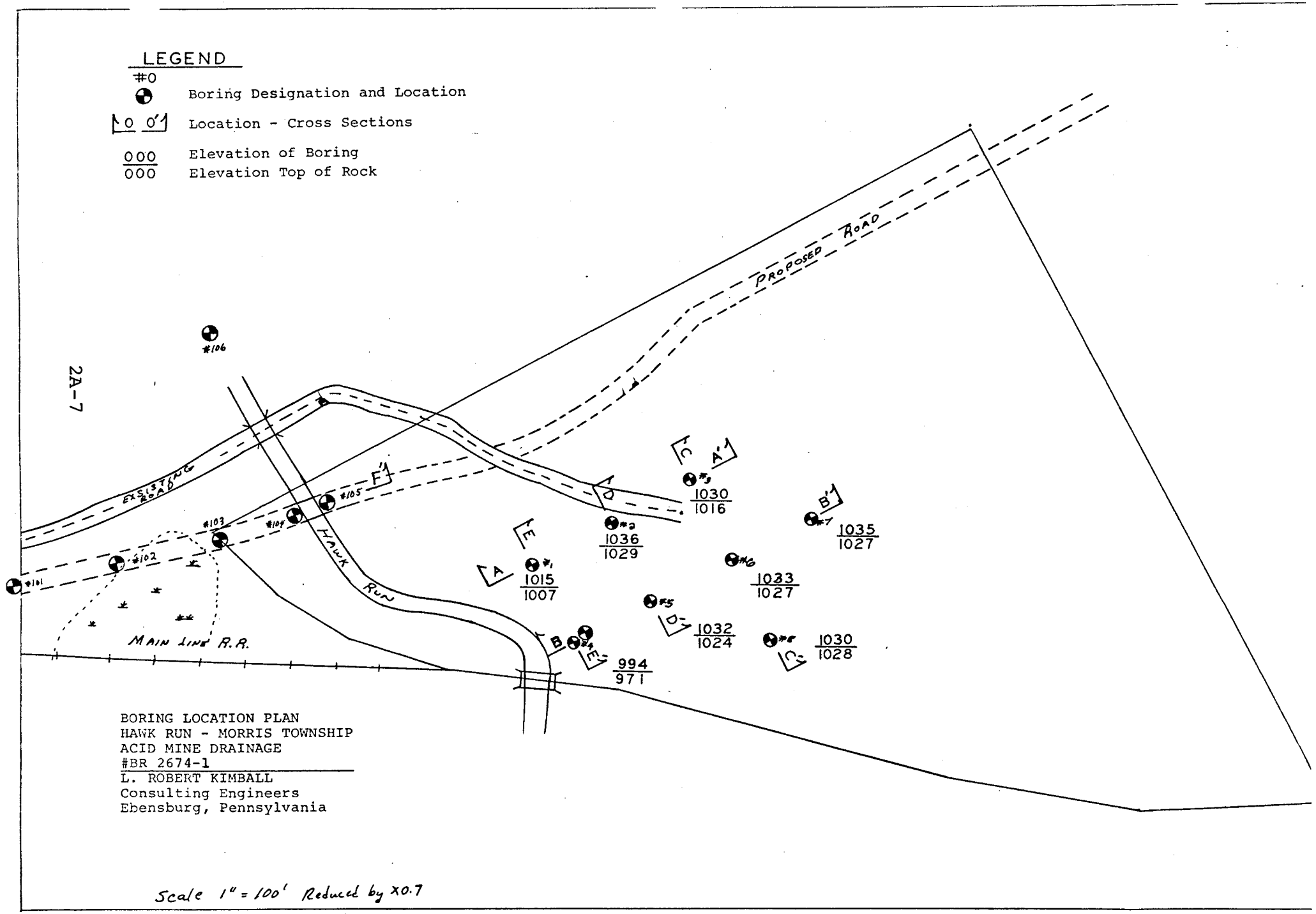
2. Determine maximum dry weight densities of soils to be used for fill.

3. Determine in place densities of fill.

6.0 INFORMATION TO BE SUBMITTED

Submit reports of results of tests made under Article 5.2 for approval within 60 days after award of contract.

Submit shoring plans for approval within 60 days after award of contract.



2A-7

BORING LOCATION PLAN
HAWK RUN - MORRIS TOWNSHIP
ACID MINE DRAINAGE
#BR 2674-1

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Scale 1" = 100' Reduced by X0.7

Sheet 1 of 1

Project Burns and Roe - Hawk Run Pa. Project — Job BR-2674-1

BORING NO. 1 — Driller McClanahan — Rig B-40

Location See Plan

Elevation; Datum U.S.G.S. — Surface 1015.51 — Water None @ Drilling

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
				Top Soil	OL	Boring Advanced w/3-7/8" Dia. Tricone Bit
				Med. Dense V, Brown, Sl. Silty, Fine, Med. Poorly Graded Sand	Sp	
5				w/Gravel-Cobbles		
				D.D. w/Boulders		
						Boring Cont. w/NX DBL Tube Core BBL (Diamond Bit) and Water
10				V. Stiff - Hard, Gray Sandy, Silty, Shale	SH	
				Broken to Crumbly (Weathered)		Start = 9.0' Run #1 Stop = 14.0' Run = 5.0' Rec = 4.5' Loss = 0.5'
15						Run #2 Start = 14.0' Stop = 19.0'
				Hard, Gray, Sandy, Silty, Laminated, Shale	SH	Run = 5.0' Rec = 5.0' Loss = 0.0
20				Broken (Mainly along bedding planes)		Run #3 Start = 19.0' Stop = 24.0' Run = 5.0' Rec = 5.0' Loss = 0.0'
						Bottom 24.0'

CONTRACT ITEMS: Soil 9.0' Rock 15.0'

Inspector McClanahan

Date 7-2-69

L. ROBERT KIMBALL
CONSULTING ENGINEERS

FIG. NO.

Sheet 1 of 1

Project Burns and Roe - Hawk Run, Pa. Project — Job BR 2674-1

BORING NO. 2 — Driller McClanahan — Rig B-40

Location See Plan

Elevation; Datum U.S.G.S. — Surface 1036.32 — Water None @ Drilling

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
			Blows per 6"	Top Soil	OL	Boring, advanced w/3-7/8" Dia. Tricone Bit
	S		4/ 9/ 10	Med Dense, Brown, Fine-Med. Poorly Graded, Sand w/Gravel and Cobbles	Sp	
5				D.O. w/Boulders		
						Boring Cont. w/NX DBL Tube Core BBL (Diamond Bit) and water
10				Med. Dense, Brown-Gray, Fine-Med Grained, Broken Sandstone w/silt seams	SS	Run #1 Start = 9.0' Stop = 14.0' Run = 5.0' Rec = 5.0' Loss = 0.0'
15						Run #2 Start = 14.0' Stop = 19.0' Run = 5.0' Rec = 5.0' Loss = 0.0'
20				D.O. w/carbonaceous material in breaks		Run #3 Start = 19.0' Rec = 1.5' Stop = 20.5' Loss = 0.0 Run = 1.5'
				Hard, gray, silty, sandy, shale	SH	Run #4 Start = 20.5' Stop = 21.2' Rec = 0.7' Run = 0.7' Loss = 0.0 Run #5 Start = 21.2' Rec = 2.8' Stop = 24.0' Loss = 0.0' Run = 2.8'
						Bottom 24.0'

CONTRACT ITEMS:
Soil 9.0 Rock 15.0'

Inspector McClanahan

Date 6-30-69

L. ROBERT KIMBALL
CONSULTING ENGINEERS

FIG. NO.

Sheet 1 of 1

Project Burns and Roe - Hawk Run, Pa. Project — Job BR 2674-1

BORING NO. 3 — Driller McClanahan — Rig B-40

Location See Plan

Elevation; Datum U.S.G.S. — Surface 1030.10 — Water None @ Drilling

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
			Blows per 6"	Top Soil	OL	Boring advanced w/3-7/8" dia. Tricone Bit
	S		5/25	Med dense, brown, fine-med, poorly graded, sand w/cobbles	SP	
5						
10						Boring cont. w/N2 DEL Tube Core BBL (Diamond Bit) & water
15				Med dense, brown, fine to med grained, badly broken, sandstone w/some fractures and some carbonaceous material in breaks	SS	Run #1 Start = 14.0' Stop = 17.0' Run = 3.0' Rec = 3.0' Loss = 0.0'
				V. stiff-hard gray, silty, sandy, shale Badly broken	SH	Run #2 Start = 17.0' Stop = 19.0' Run = 2.0' Rec = 1.8' Loss = 0.2'
20						Run #3 Start = 19.0' Stop = 22.0' Run = 3.0' Rec = 3.0' Loss = 0.0'
				Hard, gray, silty, sandy, shale	SH	Run #4 Start = 22.0' Stop = 24.0' Run = 2.0' Rec = 2.0' Loss = 0.0'
						Bottom 24.0'

CONTRACT ITEMS:
Soil 14.0' Rock 10.0'

Inspector McClanahan

Date 7-10-69

FIG. NO.

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Project Burns and Roe - Hawk Run, Pa. Project

Sheet 1 of 2

Job BR 2674-1

BORING NO. 4

Driller McClanahan

Rig B-40

Location See Plan

Elevation; Datum U.S.G.S. Surface 994.31 Water None @ Boring

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
			Blows per 6"	Mine Waste		Boring advanced w/3-7/8" dia. Tricone Bit
	S		7 10 10	Med dense, brown, SL silty, fine-med, poorly graded sand 2/cobbles	SP	
		2.0' 2.0'				
5	U		P			
10						
15						
20						Boring cont. w/NX DBL Tube Core BBl (Diamond Bit) & water
				Hard, gray, silty, sandy, shale - badly broken	SH	Start = 23.0' Stop = 28.0' Loss = 4.5' Run = 5.0' Rec = 0.5'

CONTRACT ITEMS:

Soil Rock

Inspector McClanahan

Date 7-12-69

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CONSULTING ENGINEERS

FIG. NO.

Project Burns and Roe - Hawk Run, Pa. Project

Sheet 2 of 2

Job BR 2674-1

BORING NO. 4

Driller McClanahan

Rig B-4

Location See Plan

Elevation; Datum U.S.G.S. Surface 994.31 Water

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
				Hard, gray, silty, shale badly broken	SH	
						Bottom 28.0'
30						
35						
40						
45						

CONTRACT ITEMS:

Soil 23. Rock 5.0'

Inspector McClanahan

Date 7-14-69

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FIG. NO.

Project: Burns and Roe - Hawk Run Pa. Project

Sheet 1 of 1

Job: BR 2674-1

BORING NO. 5

Driller: McClanahan

Rig: B-40

Location: See Plan

Elevation; Datum: U.S.G.S.

Surface: 1032.52

Water: None @ Drilling

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
			Blows per 6"	Top Soil	OL	Boring advanced w/3-7/8" dia. Tricone Bit
	S		4 7 7	Med dense, brown, fine-med, poorly graded sand w/cobbles	SP	
5						
						Boring cont. w/NX DBL Tube Core BBL (Diamond Bit) and water
				Med dense, brown, fine-med grained, badly broken sandstone	SS	Run #1 Start = 9.0' Stop = 14.8' Run = 5.0' Rec = 5.0' Loss = 0.0'
10						
				Alternating layers of brown, fine-med sandstone and brown shale w/silty clay seams - badly broken-crumbly	SS SH	
						Start = 14.0' Run #2 Stop = 16.5' Run = 2.5' Rec = 2.0' Loss = 0.5'
15						
				Hard, gray, sandy, silty, shale Broken	SH	Start = 16.5' Run #3 Stop = 19.0' Run = 2.5' Rec = 2.5' Loss = 0.0'
20						Start = 19.0' Run #4 Stop = 21.0' Run = 2.0' Rec = 0.0' Loss = 2.0'
						Start = 21.0' Run #5 Stop = 24.0' Run = 3.0' Rec = 3.0' Loss = 0.0'
						Bottom 24.0'

CONTRACT ITEMS:
Soil 9.0' Rock 15.0'

Inspector: McClanahan

Date: 7-8-69

FIG. NO.

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Sheet 1 of 1

Project Burns and Roe - Hawk Run, Pa. Project Job BR 2674-1

BORING NO. 6 Driller McClanahan Rig B-40

Location See Plan

Elevation; Datum U.S.G.S. Surface 1033.50 Water None @ Drilling

Depth	SAMPLE Type	Rec.	Resist. Blows per 6"	Description	Stratification Log	Special Notes Field Observations
				Top Soil	OL	Boring advanced w/3-7/8" dia. Tricone Bit and Water
	S		9 14 12	Med dense, brown, fine SL, silty sand w/cobbles	SP	
5						Boring cont. w/NX DBL Tube Core BBL (Diamond Bit) and water
				Med dense, brown, gray, fine-med grained, sandstone Broken	SS	Run #1 Start = 6.5' Stop = 11.5' Run = 5.0' Rec = 5.0' Loss = 0.0'
10						
						Run #2 Start = 11.5' Stop = 16.5' Run = 5.0' Rec = 5.0' Loss = 0.0'
15				Med dense, dark brown, fine-med, poorly cemented, sandstone	SS	
				Dense, gray, fine-med grained, cross-bedded med-bedded, sandstone	SS	Run #3 Start = 16.5' Stop = 21.5' Run = 5.0' Rec = 5.0' Loss = 0.0'
20						
						Run #4 Start = 21.5' Stop = 24.5' Run = 3.0' Rec = 2.9' Loss = 0.1'
						Bottom 24.5'

CONTRACT ITEMS:
Soil 6.5 Rock 18.0'

Inspector McClanahan

Date 7-9-69

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CONSULTING ENGINEERS

FIG. NO.

Sheet 1 of 1

Project Burns and Roe - Hawk Run Pa. Project — Job BR 2674-1

BORING NO. 7 — Driller McClanahan — Rig B-4

Location See Plan

Elevation; Datum U.S.G.S. — Surface 1035.03 — Water None @ Drilling

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
				Shale Road - Base		Boring advanced w/3-7/8" dia. Tricone Bit and water
				Med dense, brown, SL silty, fine-med, poorly graded, sand	SP	
5						Boring cont w/NX DBL Tube Core BBL (Diamond Bit) and Water
				Med dense, brown, weathered, fine-med grained, broken, poorly cemented, sandstone	SS	Run #1 Start = 7.5' Stop = 10.5' Run = 3.0' Rec = 2.3' Loss = .7' Lost Water Return
10						
				Med dense, brown-gray, fine-med, grained, sandstone w/fractures and zones of poor cementation	SS	Run #2 Start = 10.5' Stop = 15.5' Run = 5.0' Rec = 5.0' Loss = 0.0'
15						Run #3 Start = 15.5' Stop = 20.5' Run = 5.5' Rec = 5.0' Loss = 0.5'
20						
				Dense, gray, fine-med grained, sandstone med bedded	SS	Run #4 Start = 20.5' Stop = 24.0' Run = 3.5' Rec = 3.5' Loss = 0.0'
						Bottom 24.0'

CONTRACT ITEMS:
Soil 7.5' Rock 16.5'

Inspector McClanahan

Date 7-9-69

FIG. NO.

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CONSULTING ENGINEERS

Sheet 1 of 1

Project Burns and Roe - Hawk Run, Pa. Project — Job BR 2674-1

BORING NO. 8 — Driller McClanahan — Rig B-40

Location See Plan

Elevation; Datum U.S.G.S. — Surface 1030.30 — Water None @ Drilling

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
				Top Soil	OL	
				Med dense, brown, fine-med SL silty, poorly graded, sand w/cobbles	SP	Boring advanced w/3-7/8" dia. Tricone Bit and Water
				Med dense, brown - gray, fine-med grained, sandstone broken	SS	Boring cont. w/NX DBL Tube Core BAL (Diamond Bit) and Water
5						Run #1 Start = 4.5' Stop = 9.0' Run = 4.5' Rec = 4.5' Loss = 0.0' Lost Water Return
10						Run #2 Start = 9.0' Stop = 14.0' Run = 5.0' Rec = 5.0' Loss = 0.0'
15				Med dense, brown - gray, fine-med grained, broken and fractured, sandstone	SS	Run #3 Start = 14.0' Stop = 19.0' Run = 5.0' Rec = 5.0' Loss = 0.0'
20				V. stiff - hard, gray, silty, sandy, shale	SH	Run #4 Start = 19.0' Stop = 24.0' Run = 5.0' Rec = 5.0' Loss = 0.0'
						Bottom 24.0'

CONTRACT ITEMS:
Soil 4.5 Rock 19.5'

Inspector McClanahan

Date 7-11-69

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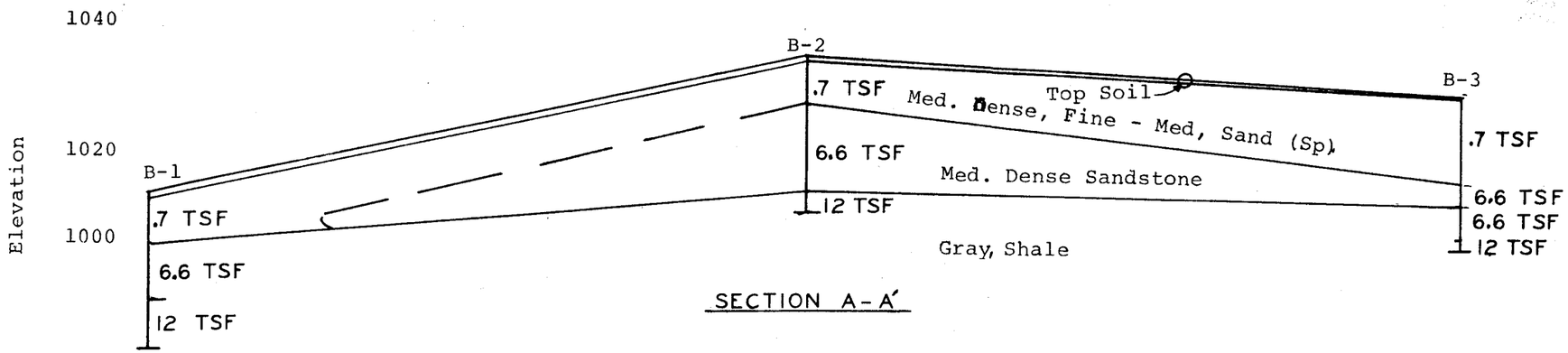
FIG. NO.



SECTION A-A'

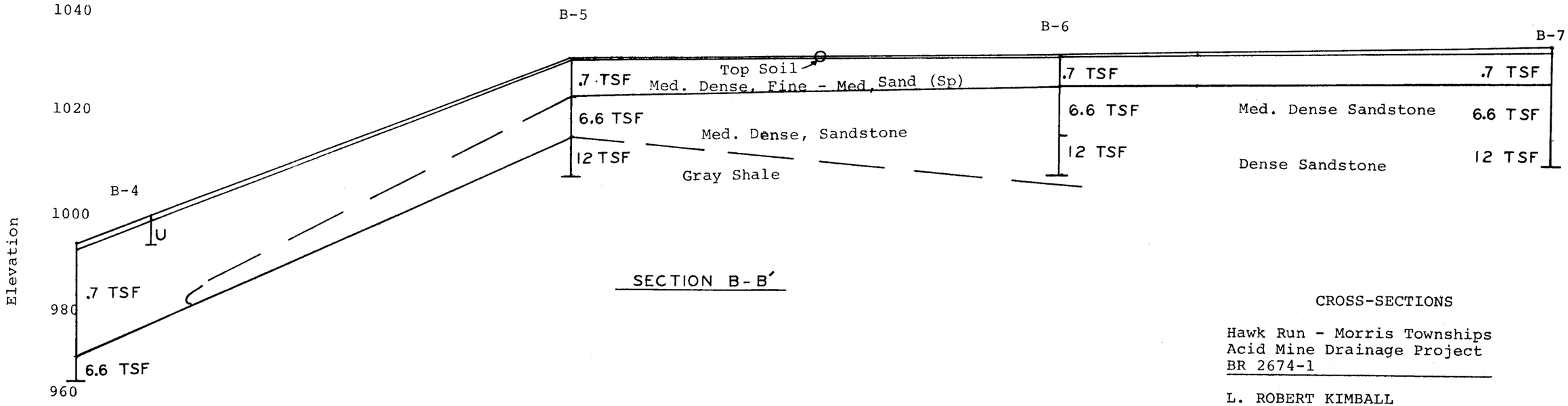
LEGEND

B40 Boring Designation

0 TSF Recommended Bearing Capacity

U Shelby Tube
Bottom of Boring

Scale - Vertical/Horizontal
1" - 20'



SECTION B-B'

CROSS-SECTIONS

Hawk Run - Morris Townships
Acid Mine Drainage Project
BR 2674-1

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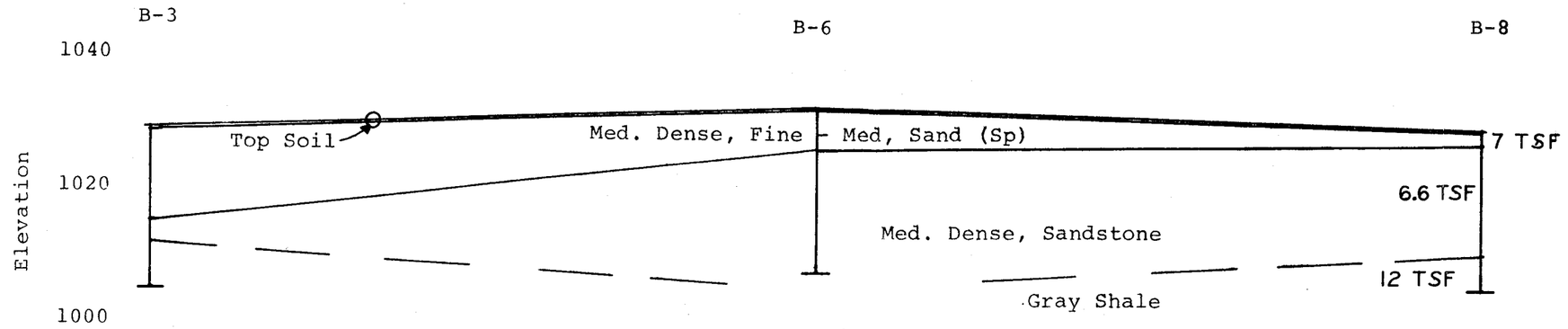
NOTE: Estimated profile of subsurface conditions obtained by interpolation between borings. Variances in actual field conditions are expected.



SECTION C-C'

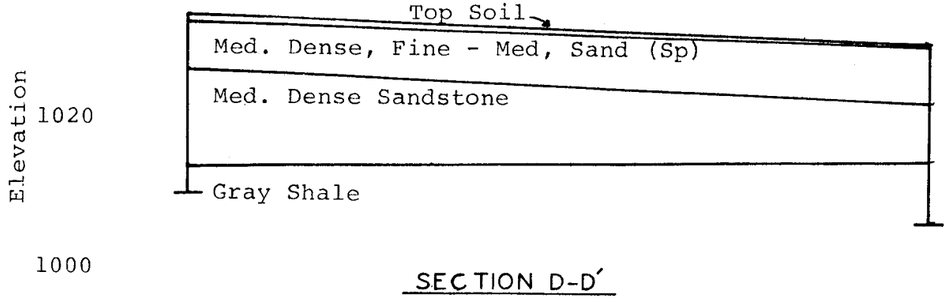
LEGEND

B-0 Boring Designation

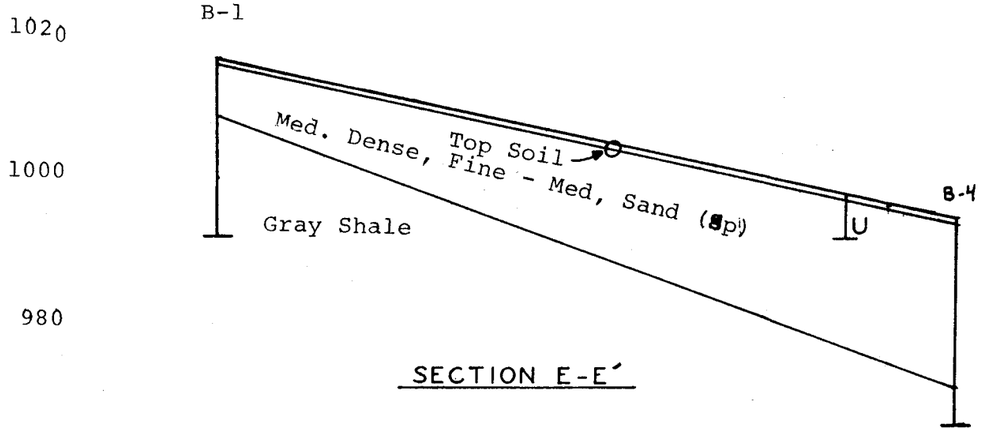
0 TSF Recommended Bearing Capacity

U Shelby Tube Bottom of Boring

Scale - Vertical/Horizontal
1 in = 20 ft.



SECTION D-D'



SECTION E-E'

NOTE: Estimated profile of subsurface conditions obtained by interpolation between borings. Variances in the actual field conditions are expected.

CROSS-SECTIONS

Hawk Run - Morris Townships
Acid Mine Drainage Project
BR 2674-1

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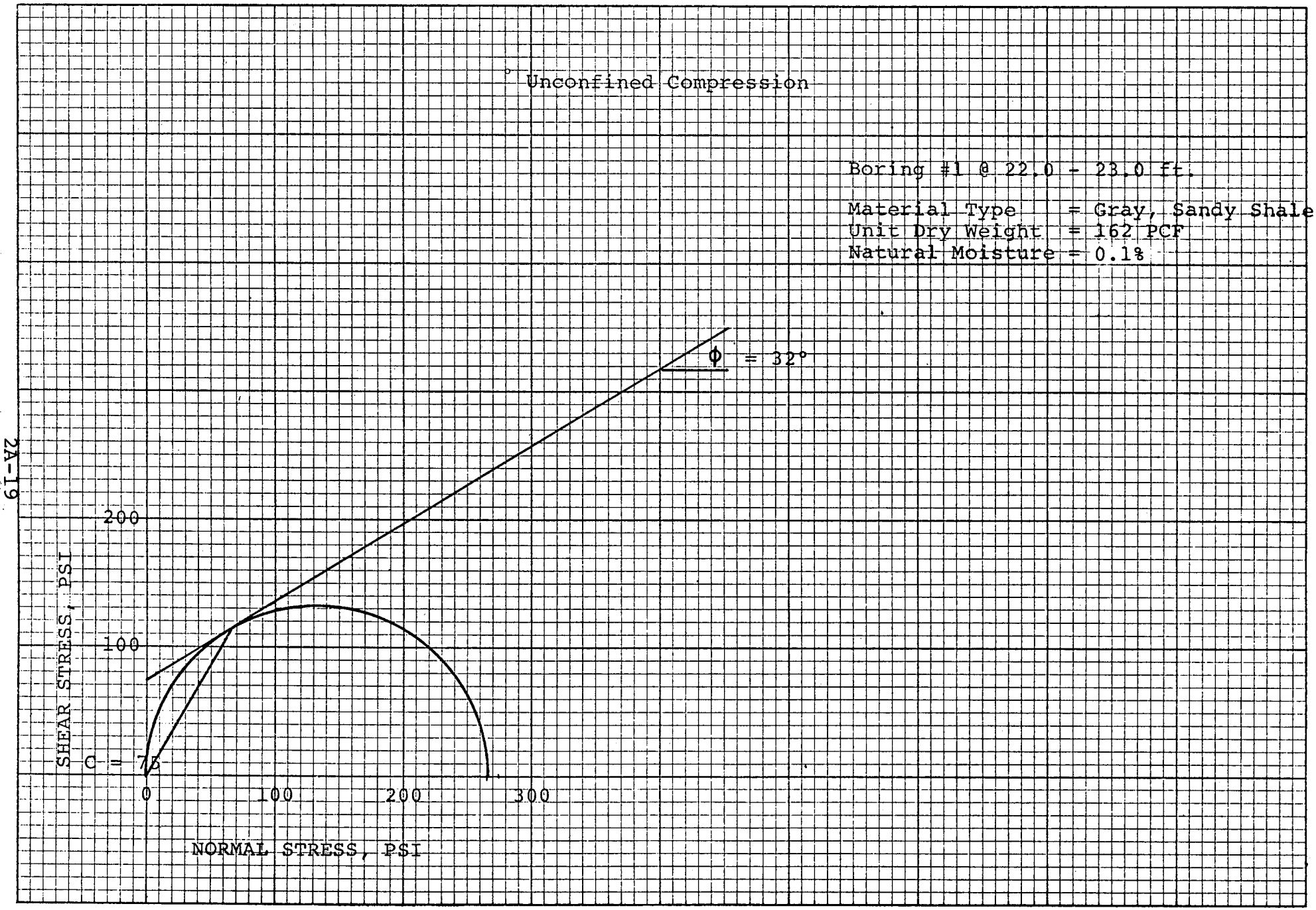
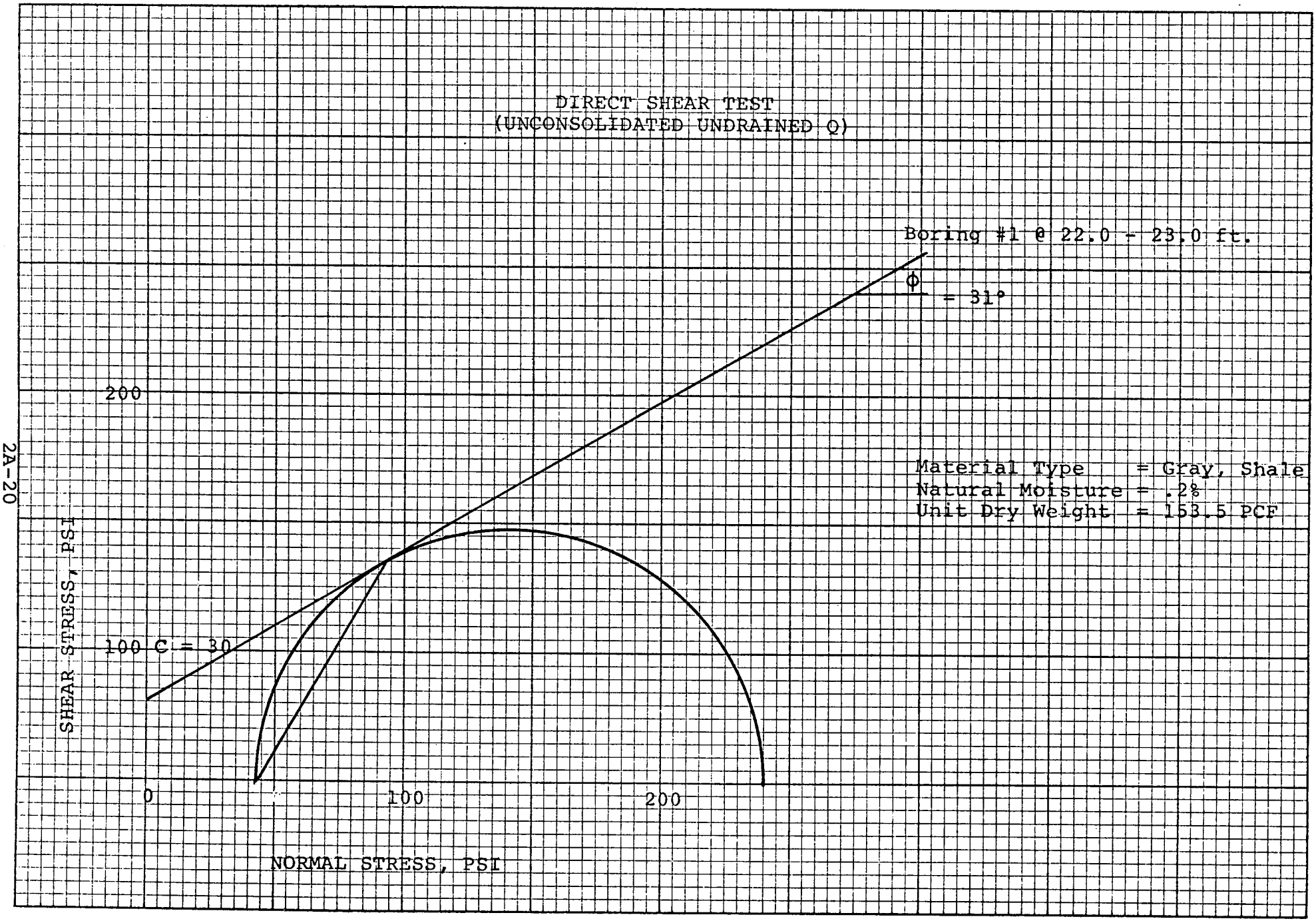
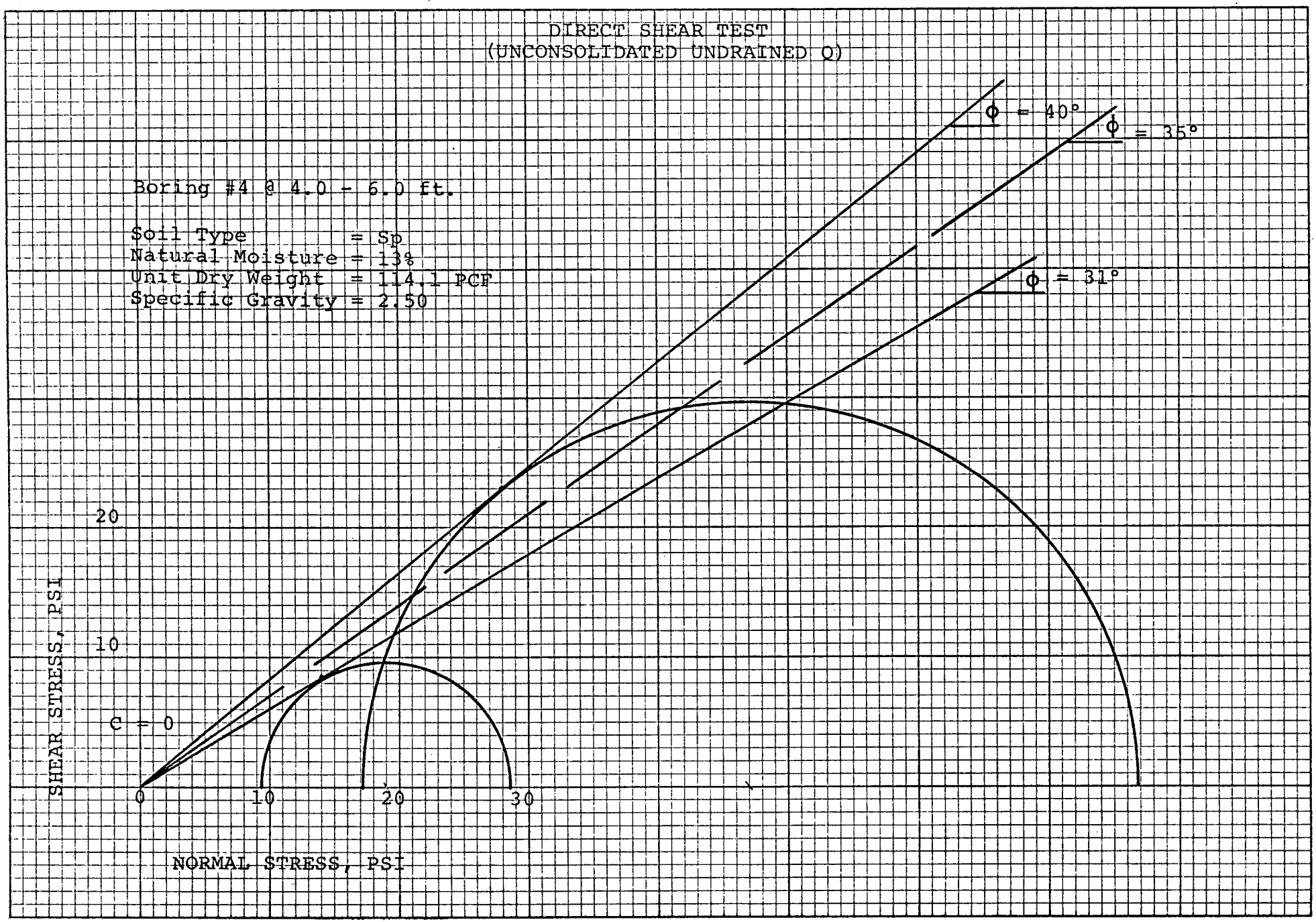
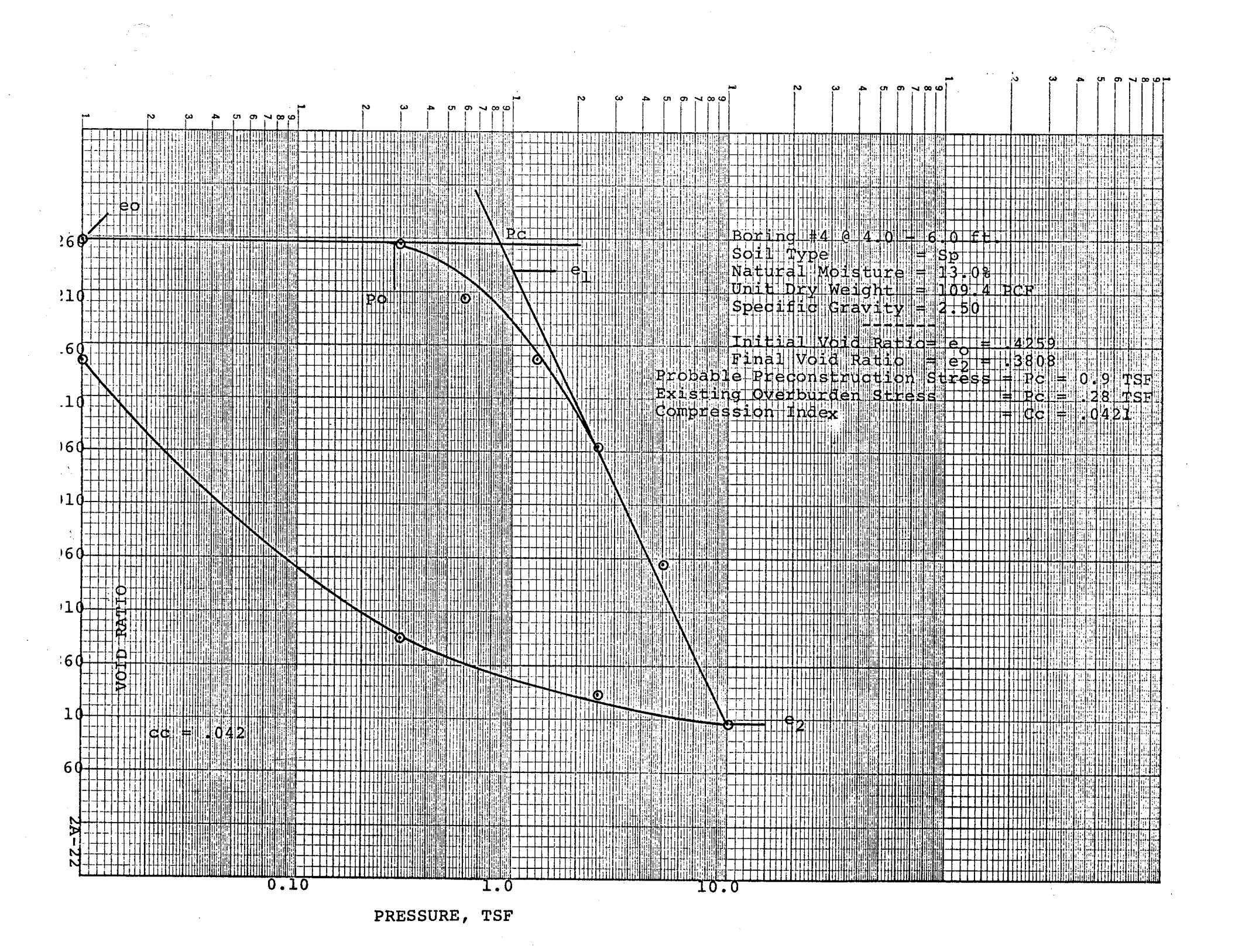
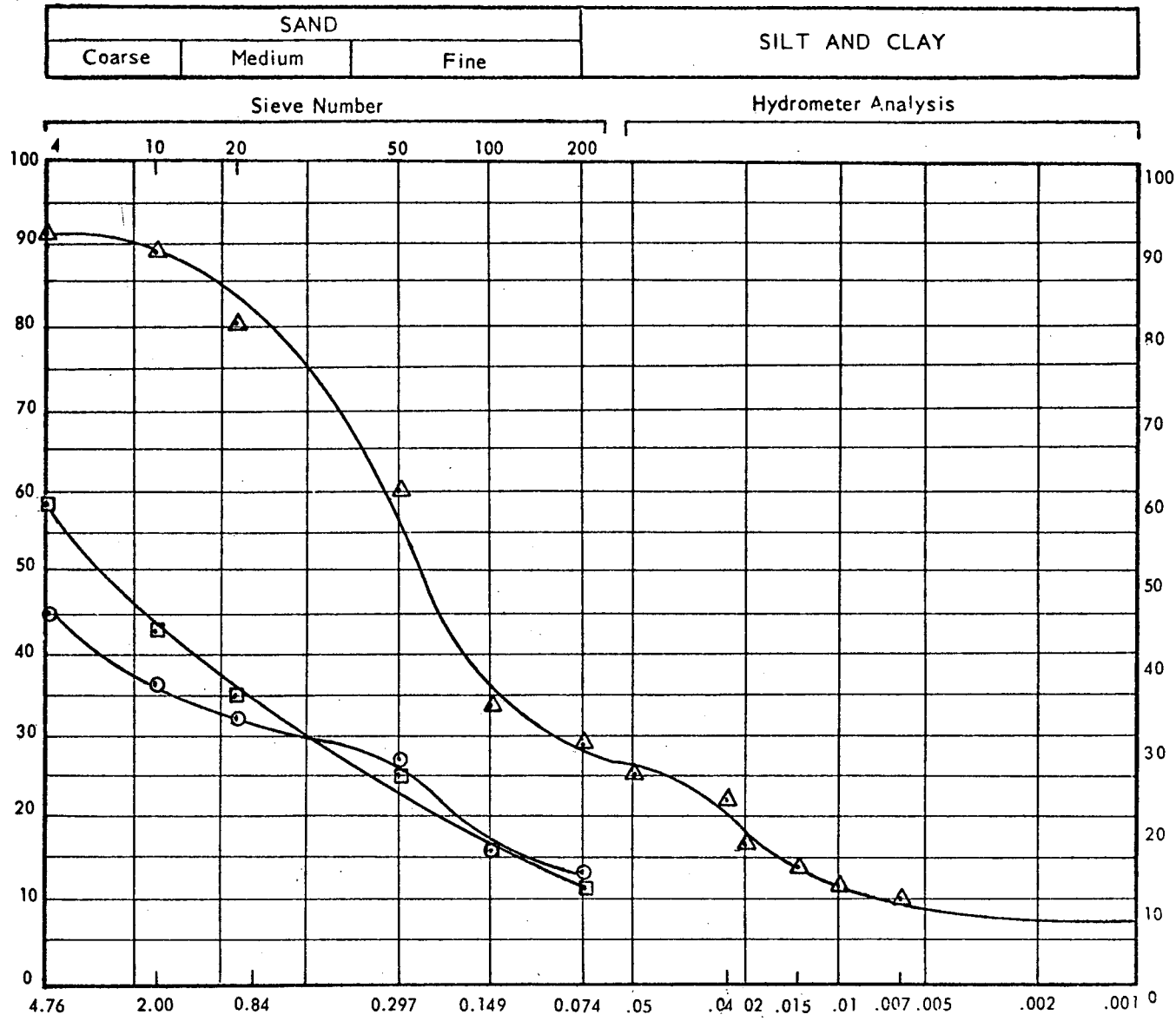
Ebensburg, Pennsylvania


Unconfined Compression
Boring #1 @ 22.0 - 23.0 ft.
Material Type = Gray, Sandy Shale
Unit Dry Weight = 162 PCF
Natural Moisture = 0.1%
ϕ = 32°
SHEAR STRESS, PSI
200
100
C = 75
0
100
200
300
NORMAL STRESS, PSI


DIRECT SHEAR TEST
(UNCONSOLIDATED UNDRAINED Q)
Boring #1 @ 22.0 - 23.0 ft.
Φ = 31°
Material Type = Gray, Shale
Natural Moisture = .2%
Unit Dry Weight = 153.5 PCF
200
100
C = 30
0
100
200
SHEAR STRESS, PSI
NORMAL STRESS, PSI


DIRECT SHEAR TEST
(UNCONSOLIDATED UNDRAINED Q)
Boring #4 @ 4.0 - 6.0 ft.
Soil Type = Sp
Natural Moisture = 13%
Unit Dry Weight = 114.1 PCF
Specific Gravity = 2.50
ϕ = 40°
ϕ = 35°
ϕ = 31°
c = 0
20
10
0
10
20
30
SHEAR STRESS, PSI
NORMAL STRESS, PSI

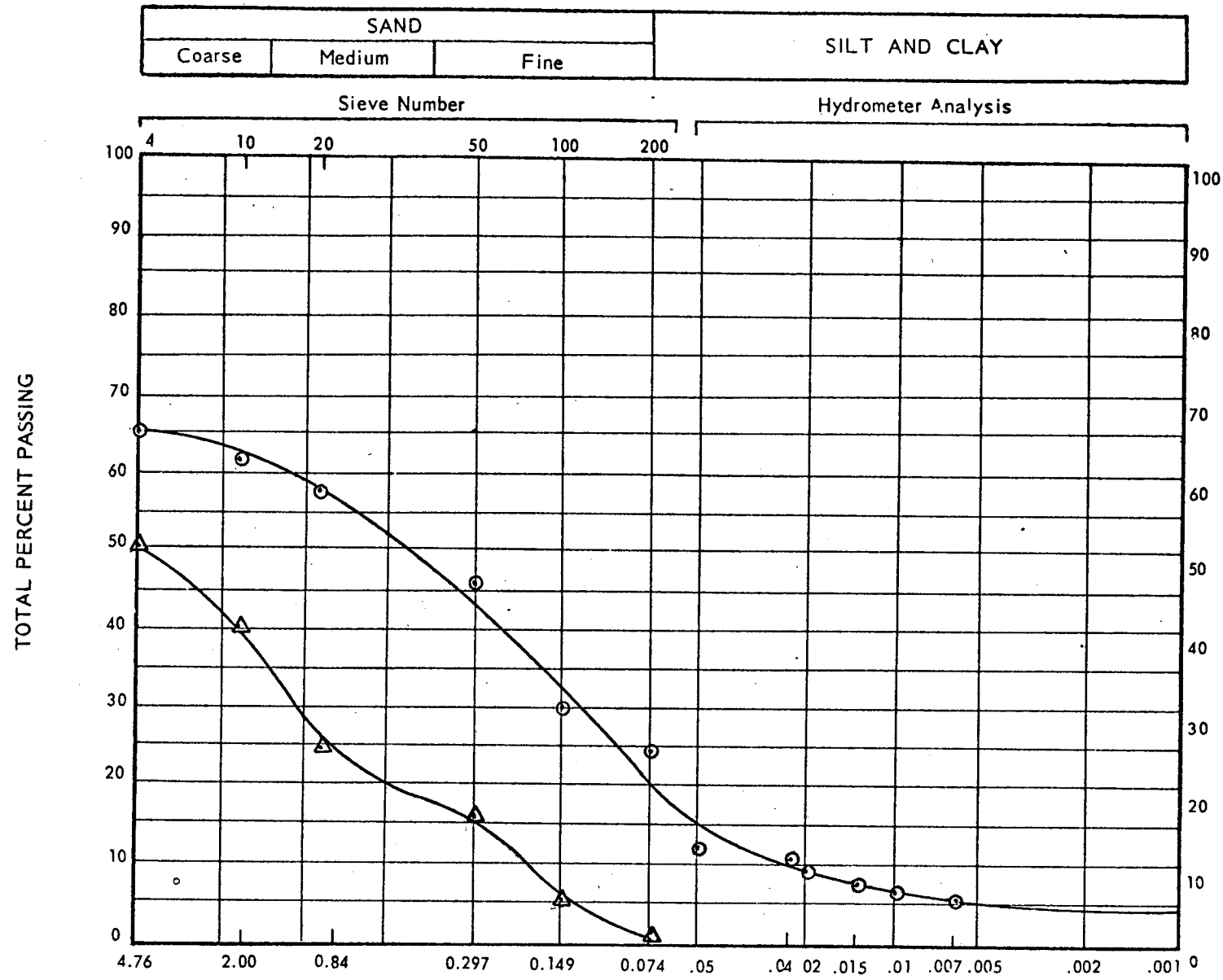

eo
Pc
e1
Po
e2
Boring #4 @ 4.0 - 6.0 ft.
Soil Type = Sp
Natural Moisture = 13.0%
Unit Dry Weight = 109.4 PCF
Specific Gravity = 2.50
Initial Void Ratio = eo = .4259
Final Void Ratio = e2 = .3808
Probable Preconstruction Stress = Pc = 0.9 TSF
Existing Overburden Stress = Pc = .28 TSF
Compression Index = Cc = .0421
Cc = .042
VOID RATIO
0.10
1.0
10.0
PRESSURE, TSF
ZA-ZZ



SAMPLE	CLASSIFICATION AND SYMBOL
3 @ 3-4'	○ SP
4 @ 4-6'	△ SP
5 @ 2-3.5'	□ SP

Project Hawk Run, Pa. No BR 2674-1 Date 7-18-69

GRAIN SIZE DISTRIBUTION CURVES



SAMPLE	CLASSIFICATION AND SYMBOL
4 @ 2-3.5'	O SP
6 @ 2-3.5'	Δ SP

Project Hawk Run, Pa. No BR 2674-1 Date 7/18/69

2A-24

GRAIN SIZE DISTRIBUTION CURVES

Project Burns and Roe - Hawk Run, Phillipsburg, Pa

Sheet 1 of 2

Job E-1-70

BORING NO. 101

Driller Gordon Snyder

Rig B-40

Location See Plan

Elevo ; Datum USGS Surface 1000.0 Water 5.0 feet

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
						Boring Advanced w/4" dia. C.F.A.
				Mod. Compact Fill Ashes, silt, sandstone cobbles, shale mixed w/silty, clay		
5						
	S		9			
			7			
10			10	Stiff-V. Stiff, Brown, Clayey, V. Silty, Fine to Medium, SAND	SM	
				w/sandstone cobbles	A-2-4	
15						Boring Cont. w/NX DBL Tube Core BBL - Diamond Bit and water
				Sandstone Boulders w/zones of stiff, brown clayey, silt		Start = 18.0' Stop = 25.0' Run = 7.0' Rec = 2.0' Loss = 5.0'
20						

CONTRACT ITEMS:

Soil Rock

Inspector

L. ROBERT KIMBALL
CONSULTING ENGINEERS

Date Jan. 28-29, 1970

FIG. NO.

Project Hawk Run

Sheet 2 of 2

Job E-1-70

BORING NO. 101

Driller

Rig

Location

Elev n; Datum

Surface

Water

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
				Stiff-V. Stiff, Dk Gray, Silty, SHALE	SH	Start=25.0' Rec =0.5' Stop =27.0' Loss=1.5' Run = 2.0'
				COAL		Start=27.0' Rec = 1.5' Stop =29.0' Loss= 0.5' Run = 2.0'
30				Stiff-V. Stiff, Gray, Silty, SHALE	SH	Start=29.0' Run=0.5' Stop =29.5 Rec=0.0' Loss = 0.5' Bottom = 29.5'
35						
40						
45						

CONTRACT ITEMS:

Soil Rock

Inspector

L. ROBERT KIMBALL
CONSULTING ENGINEERS

Date Jan. 27-28, 1970

FIG. NO.

Project Burns and Roe - Hauk Run, Phillipsburg, Pa.

Sheet 1 of 2

Job E-1-70

BORING NO. 102

Driller Gordon Snyder

Rig B-40

Location See Plan

Elevation; Datum USGS Surface 998.0 Water 3.5 feet

Depth	SAMPLE Type	Rec.	Resist.	Description	Stratification Log	Special Notes Field Observations
				Fill - cinders, silt, clay		Boring Advanced w/4" dia. C.F.A.
5	S		2/7/9	Stiff-V. Stiff, Lt Gray, V. Silty, Clay w/some sand and rock fragments	CL A-6	
10						
15	S		5/9/9	Med. Dense, Brown-Gray, V. Silty, SAND w/ sandstone fragments	Sm A-2-4	Boring Cont w/NX DBL Tube Core BBL-Diamond Bit, Water
20				Sandstone Boulders w/silt and clay matrix		Start = 18.0' Stop = 25.0' Run = 7.0' Rec = 2.0' Loss = 5.0'

CONTRACT ITEMS:

Soil Rock

Inspector

L. ROBERT KIMBALL
CONSULTING ENGINEERS

Date Jan. 27-28, 1970

FIG. NO.

Project Hawk Run

Sheet 2 of 2

Job E-1-70

BORING NO. 102

Driller

Rig

Location

Elevat ; Datum Surface Water

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
				D.O.		Start=25.0' Run=1.0' Stop =26.0' Rec=0.5' Loss=.5'
				COAL		Start=26.0' Stop =28.0' Run = 2.0' Rec = 1.0' Loss=1.0'
				V. Stiff, Dk Gray, Silty, SHALE	SH	Start=28.0' Run=1.0' Stop =29.0' Rec=0.9' Loss=0.1'
30						Bottom = 29.0'
35						
40						
45						

CONTRACT ITEMS:

Soil Rock

Inspector

L. ROBERT KIMBALL
CONSULTING ENGINEERS

Date Jan. 28, 1970

FIG. NO.

Project Burns and Roe - Hawk Run, Phillipsburg, Pa.

Sheet 1 of 2

Job E-1-70

BORING NO. 103

Driller Gordon Snyder

Rig B-40

Location See Plan

Elevation; Datum USGS

Surface 998.0

Water 8.0 feet

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
				Fill, railroad, ashes		Boring Advanced w/4" dia. C.F.A.
5	S		2/4/4	Med. Stiff, Tan, Sl. Silty, CLAY	CL A-7	
10	S		3/9/9	Med. Dense, Brown, Clayey, V. Silty, SAND w/sandstone fragments	Sm A-2-4	
15	S		6/15/12	D.O. - more and larger sandstone fragments	Sm	
20	S		10/12/20			Boring Cont w/NX DBL Tube Core BBL, Diamond Bit, Water
				Sandstone Boulders w/silt and clay matrix		Start=23.0' Rec = 0.1' Stop =25.0' Loss= 1.9' Run = 2.0'

CONTRACT ITEMS:

Soil Rock

Inspector

L. ROBERT KIMBALL
CONSULTING ENGINEERS

Date Jan. 19-23, 1970

FIG. NO. 2A-29

Project Hawk Run

Sheet 2 of 2

Job E-1-70

BORING NO. 103

Driller

Rig

Location

Elev n; Datum

Surface

Water

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
				D.O.		Start =25.0' Stop =27.5' Run = 2.5' Loss=2.0' Rec = 0.5'
				COAL		Start=27.5' Run=1.5' Stop =29.0' Rec=1.0' Loss = 0.5'
						Bottom = 29.0'
30						
35						
40						
45						

CONTRACT ITEMS:

Soil Rock

Inspector

L. ROBERT KIMBALL
CONSULTING ENGINEERS

Date Jan. 23, 1970

FIG. NO.

Sheet 1 of 2

Project Burns and Roe - Hawk Run, Phillipsburg, Pa. Job E-1-79

BORING NO. 104

Driller Gordon Snyder Rig B-40

Location See Plan

Elevation; Datum USGS Surface 999.0 Water 3.0 feet

Depth	SAMPLE Type	Rec.	Resist.	Description	Stratification Log	Special Notes Field Observations
						Boring Advanced w/4" dia. C.F.A.
				Soft, Brown, Clayey, Fine to Medium, V. Silty, SAND to Sandy, SILT w/rock fragments (Alluvium)	Sm / ML A-4 / A-2-4	
5						
	S		7 / 12 / 14	Med. Dense, Brown, V. Silty, Clayey, Fine to Coarse, SAND w/sandstone fragments	Sm A-2-4	
10						
15						
	S		6 / 8 / 10			
20						
				Stiff-V. Stiff, Dk Gray Silty, SHALE	SH	Boring Cont w/NX DBL Tube Core BBL, Diamond Bit, Water
				COAL		Start=24.0' Run=1.0' Stop= 25.0' Rec=1.0' Loss=0

CONTRACT ITEMS:
Soil Rock

Inspector

L. ROBERT KIMBALL
CONSULTING ENGINEERS

Date Jan. 29-30, 1980

FIG. NO.

Sheet 2 of 2

Project Hawk Run — Job E-1-70

BORING NO. 104

Driller — Rig

Location

Elev n; Datum — Surface — Water

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes / Field Observations
				COAL		Start=25.0' Run=1.5' Stop =26.5' Rec=1.5 Loss=0.0'
				V. Stiff-Hard, Lt Gray, Clayey, Silt "FireClay"	ML	Start = 26.5' Stop = 33.5' Run = 7.0' Rec = 6.0' Loss = 1.0'
				COAL		
30				V. Stiff-Hard, Dk Gray, Silty, Shale	SH	
						Bottom = 33.5'
35						
40						
45						

CONTRACT ITEMS:

Soil Rock

Inspector

Date Jan. 30, 1970

FIG. NO.

L. ROBERT KIMBALL
CONSULTING ENGINEERS

Project Burns and Roe - Hawk Run, Phillipsburg, Pa

Sheet 1 of 1

Job E-1-70

BORING NO. 105

Driller Gordon Snyder

Rig B-40

Location

Elevation ; Datum USGS Surface 998.0 Water

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes Field Observations
						Boring Advanced w/4" dia. C.F.A.
5	S		7 15 18	Med. Dense, Brown, Clayey, V. Silty, Fine to Coarse, SAND to Sandy, Silt w/sandstone fragments	Sm / ML	
10						Boring Cont w/NX DBL Tube Core BBL, Diamond Bit, Water
15				V. Stiff-Hard, Dk Grey, Silty, Shale	SH	Start = 14.0' Stop = 18.0' Run = 4.0' Rec = 3.8' Loss = 0.2'
20				COAL		Start = 18.0' Stop = 22.5' Run = 4.5' Rec = 4.5' Loss = 0.0'
				V. Stiff, Dk Gray, Clayey, Silt. "Fireclay"	ML	Start=22.5' Run=0.5' Stop =23.0' Rec=0.2' Loss = 0.3' Bottom = 23.0'

CONTRACT ITEMS:

Soil Rock

Inspector

L. ROBERT KIMBALL
CONSULTING ENGINEERS

Date Jan. 26, 1970

FIG. NO.

Project: Burns and Roe - Hawk Run, Phillipsburg, Pa

Sheet 1 of 2

Job E-1-70

BORING NO. 106

Driller Gordon Snyder

Rig B-40

Location See Plan

Elevation; Datum USGS

Surface 998.0

Water 5.0 feet

Depth	SAMPLE Type	SAMPLE Rec.	SAMPLE Resist.	Description	Stratification Log	Special Notes / Field Observations
						Boring Advanced w/4" dia. C.F.A.
				Med. Dense, Brown, Clayey, V. Silty, SAND to sandy, silt w/sandstone fragments	Sm / ML	
5						
	S		8 / 15 / 16			Boring Cont w/NX DBL Tube Core BBL, Diamond Bit, water
10				Sandstone Boulders w/silt and clay matrix		Start = 10.0' Stop = 20.0' Run = 10.0' Rec = 3.0' Loss = 7.0'
15						
20				V. Stiff-Hard, Dk Gray, Silty, Shale	SH	Start = 20.0' Stop = 24.0' Run = 4.0' Rec = 3.8' Loss = 0.2'
				COAL		Start=24.0' Run=1.0' Stop =25.0' Rec=1.0' Loss=0

CONTRACT ITEMS:

Soil Rock

Inspector

L. ROBERT KIMBALL
CONSULTING ENGINEERS

Date Jan. 26, 1970

FIG. NO.

Sheet 2 of 2

Project Hawk Run Job E-1-70

BORING NO. 106

Driller Rig

Location

Elev ; Datum Surface Water

Depth	SAMPLE Type	Rec.	Resist.	Description	Stratification Log	Special Notes Field Observations
				COAL		Start =25.0' Stop =28.0' Run = 3.0' Rec = 1.0' Loss = 2.0'
				V. Stiff, Gray, Clayey, Silt, "Fireclay"	ML	Start=28.0' Run=0.5' Stop =28.5' Rec=0.0' Loss=0.5'
30						Bottom = 28.5'
35						
40						
45						

CONTRACT ITEMS:

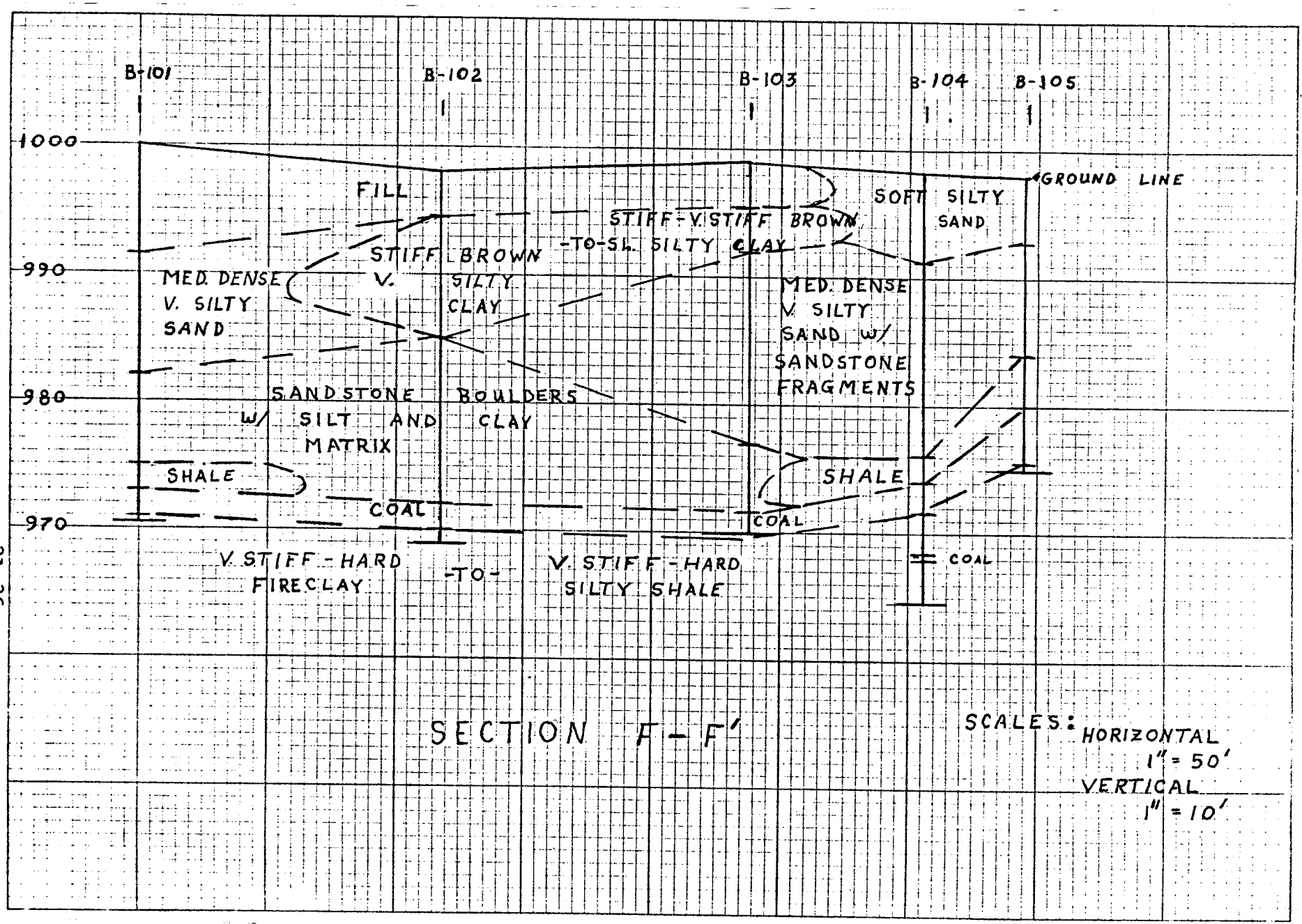
Soil Rock

Inspector

L. ROBERT KIMBALL
CONSULTING ENGINEERS

Date Jan. 27, 1970

FIG. NO.


B-101
B-102
B-103
B-104
B-105
1000
990
980
970
ELEVATION
GROUND LINE
FILL
SOFT SILTY SAND
STIFF-V.STIFF BROWN -TO-SL. SILTY CLAY
STIFF BROWN V. SILTY CLAY
MED. DENSE V. SILTY SAND
MED. DENSE V. SILTY SAND W/ SANDSTONE FRAGMENTS
SANDSTONE W/ SILT AND CLAY MATRIX
BOULDERS
SHALE
COAL
V. STIFF - HARD FIRECLAY -TO- V. STIFF - HARD SILTY SHALE
SECTION F - F'
SCALES: HORIZONTAL 1" = 50'
VERTICAL 1" = 10'

2A-36

Section 2B

Topsoil, Seeding and Shrubbery.

DIVISION 2

SECTION 2B

TOPSOIL, SEEDING AND SHRUBBERY

1.0 SCOPE

This Specification Section includes the furnishing and installation of all topsoil and seeding all as indicated on the drawings and described in the specifications.

2.0 GENERAL

2.1 Codes and Standards

The Work shall conform to the latest edition and latest addenda thereto, as of date of award, of the following codes and standards.

.1 Federal Specifications

O-F-241	Fertilizers; Mixed, Commercial
JJJ-S-181	Seeds, Agricultural

.2 U. S. Department Of Agriculture

Bulletin No. 480	Grass Seed, Tolerance for germination and purity.

2.2 Cash Allowance For Shrubbery

Contractor shall make a cash allowance of $5,000 to furnish and install Evergreen Shrubbery. Choice and location of shrubbery within planting area shall be by Owner. Installation shall be as specified in Para. 4.5.

3.0 DETAILED REQUIREMENTS

3.1 Areas Defined

All areas designated as planting areas on the drawings shall be topsoiled and seeded and shall receive shrubbery at locations to be determined by Owner.

3.2 Materials

3.2.1 Seed

The minimum percentages of pure seed and germination and the maximum allowable percentage of weed seed specified herein have been established by application of the tolerances provided for under the Federal Seed Act percentages by weight. These requirements shall apply whether the seed is used alone or in mixtures. Seed which fails to meet the minimum requirements for purity or germination or exceeds the maximum allowed for weed seeds will be rejected.

Kind of Seed	Pure Seed (Minimum)	Germinations (Minimum)	Weed Seed (Maximum)
Creeping Red Fescue (Festuca rubra)	95.50%	72%	0.87%
Kentucky Blue Grass (Poa Pratensis)	80.50%	72%	1.49%
Italian Ryegrass (Lolium multiflorium)	96.80%	83%	0.87%

Seed mixture shall be delivered in original sealed packages bearing the producer's guaranteed analysis for percentages of mixtures, purity, germination and weed seed content.

3.2.2 Topsoil

Topsoil shall be fertile, friable loam suitable for the growth of grass and plants and of the best quality obtainable in the locality. It shall contain considerable decomposed vegetable matter, finely divided and readily discernible by visual inspection, but in no case less than 6 percent by weight. It shall be reasonably free of course material such as clods, lumps, stones, stalks and roofs.

Topsoil shall have an acidity range of pH 5.0 to pH 7.0 and shall contain not less than i6 percent organic matter as determined by loss of ignition of moisturefree samples dried at 100 degrees C.

The mechanical analysis of topsoil shall be as follows:

Passing	Retained On	Percentage
1" Screen		100%
1" Screen	1/4" Screen (gravel)	Not more than 40% - 60%
1" Screen	No. 100 U.S.A. Mesh Sieve (sand)	40% - 60%
No. 100 U.S.S. Mesh Sieve	(Very fine sand, silt and clay)	40% - 60%

3.2.3 Fertilizer

Fertilizer shall be mixed commercial fertilizer conforming to Federal Specification O-F-241, containing nitrogen, phosphoric acid and potash. The combined N-P-K content shall be not less than 20 percent of the total, and the N content shall be not less than 5 percent of the total, by weight. Fertilizer shall be delivered in manufacturer's standard bags or containers, showing net weight, guaranteed analysis and manufacturer's name.

3.2.4 Ground Limestone

Ground limestone or agricultural lime shall be finely ground dolomitic agricultural limestone and shall have a calcium carbonate and magnesium carbonate content of not less than 85 percent by weight. It shall be delivered in manufacturer's standard bags or containers showing net weight, seven analysis and manufacturer's name. All material shall pass a No. 10 screen and not less than 50% shall pass a No. 100 screen.

3.3 Furnishing and Quality of Additional Topsoil, If Required

If the quantity of topsoil available is insufficient for completion of the topsoil spreading work, Contractor shall furnish additional topsoil in the quantity required at no additional cost to Owner. Quality of additional topsoil shall be as specified in subparagraph 3.2.2 of this section of the specification.

4.0 INSTALLATION

4.1 Finish Grading

After the filling, rough grading and other contract operations have been completed to the point where these areas will not be disturbed by any subsequent work, and before any topsoil is deposited, the subgrade shall be raked clear of stones, debris or rubbish. The surface of all areas shall be finished to a reasonably smooth surface. The accuracy of finish obtained by the use of templates and stringline will be required for areas adjacent to buildings and walks. The surface shall be scarified to a depth of 3 inches and graded to remove surface inequalities.

4.2 Spreading Topsoil

After approval of the condition of the subgrade by Engineer, the topsoil from stockpiles or additional topsoil if required, shall be spread, raked, compacted and otherwise manipulated so as to form, after settlement, smooth drainage grades. During the spreading operation, the topsoil shall be raked and all stones in excess of one inch in diameter and all rubbish shall be be removed and disposed of in a manner approved by Engineer. Contractor at its option may screen the topsoil at the stockpile. The topsoil shall be spread uniformly and then compacted by a roller weighing 85 to 100 pounds per foot of width to the required lines and levels and a minimum depth of 6 inches. The subgrade and topsoil shall be damp and free from frost when the work is performed and none of the work shall be done under dusty, muddy or freezing conditions.

4.3 Preparation of Topsoil Prior to Seeding

Agricultural limestone and commercial fertilizer shall be thoroughly and evenly mixed together in the following proportions or shall be applied separately in the same proportions.

Limestone 45-50 lbs. per 1,000 sq. ft.
Fertilizer in quantity specified below.

This mixture or the separate materials shall be immediately applied to the planting area and thoroughly

and evenly incorporated with the soil to a depth of 3 inches by discing, rototilling or other approved method. In areas inaccessible to power equipment they shall be incorporated with the soil by hand.

After incorporation of limestone and fertilizer in the soil, the seed bed shall be fine graded to remove all ridges and depressions and the surface shall be cleared of all stones 1 inch or more in diameter and of other debris. Seeding may be done immediately thereafter, provided the seed bed has remained in a good, friable condition and has not become wet. The fertilizer shall be used at a rate that will supply not less than 1.5 pounds of nitrogen (N) per 1,000 square feet of area, in accordance with the following schedule:

5N-lop-5K: 30 lbs.	8N-6P-6K: 20 lbs.
6N-12P-7K: 25 lbs.	10N-6P-4K: 15 lbs.
7N-7P-6K: 22 lbs.	10N-5P-5K: 15 lbs.

4.4 Seeding

Seeding shall be done between August 15th and October 15th, but may be done between March 15th and April 15th if spring sowing is authorized by Engineer.

Immediately before seeding, the ground shall be restored, as necessary, to a loose, friable condition by rototilling discing, or other approved method, to a depth of not less than 2 inches. The surface shall be cleared of any debris and of all stones 1 inch or more in diameter. Grass seed, shall be evenly sown with an approved mechanical seeder at the rate of not less than 5 pounds per 1,000 square feet, one half the quantity being sown in one direction followed immediately by the remaining one half at right angles to the first operation. Seeding shall be done only on a calm day when wind does not exceed 5 miles per hour. During dry weather, the lawns shall be kept watered with sprinklers or other methods approved by Engineer.

The seed mixture shall be:

By Weight	Species
85 percent	Kentucky Blue
10 percent	Creeping Red Fescue
5 percent	Perennial (Italian) Rye

4.5 Installation of Shrubbery

Shrub beds shall not be dug until the proposed locations have been approved by Owner, and shall not be backfilled with topsoil until approved by Engineer.

4.5.1 Table of Shrub Bed Sizes

Shrub Height	Diam. of Bed (Ft.)	Depth of Bed (Ft.)
2'-3'	2.00	1.00
3'-4'	2.00	1.00
4'-5'	3.00	2.00
8'-10'	4.00	2.00

All shrubs shall be set plumb and straight and at such a level, that after settlement a normal or natural relationship of the crown of the shrub with the ground surface will be established.

4.5.2 Pruning

Each shrub planted shall be pruned to preserve the natural character of the shrub. All soft wood or sucker growth and all broken or badly bruised branches shall be removed with a clean cut.

Pruning shall be done with sharp tools. All pruning cuts to be made flush and clean.

4.6 Protection and Maintenance of Seeded Areas

Contractor shall protect and maintain all seeded areas until acceptance.

For all seeded areas, maintenance shall include all necessary watering, weeding, mowing and rolling, also repairing and reseeding areas where erosion or settle-

ment occurs and areas where the catch of grass is unsatisfactory. All areas shall receive at least 3 mowings before inspection for acceptance. The first mowing of lawns shall be by hand mowers or hand propelled power mowers, subsequent mowings may be by power mowers and for all mowings of lawn areas, the knives shall be set to cut a height of 1-2 inches.

To be acceptable all areas must have a good uniform stand at grass, free of weed patches or thin spots.

5.0 TESTING

No additional tests beyond those normally employed either in manufacturing, installation or construction processes or as called for by the specified codes and standards are required under this Article.

6.0 INFORMATION TO BE SUBMITTED

6.1 Samples

Samples of grass seed before mixing shall be submitted to Engineer in one pound bags for approval 30 days prior to planting.

6.2 Certified Analysis

Certified analysis by a recognized laboratory shall be submitted for topsoil, fertilizers, grass seed, insecticides and materials of similiar character by Contractor at its own expense for approval by Engineer within 15 days before delivery to the Project.

Section 2C

Pavements

DIVISION 2

SECTION 2C

PAVEMENTS

1.0 SCOPE

This specification covers the selection, proportioning and installation of materials comprising the asphalt concrete base and surface courses for the roadway and parking area shown on the drawings.

2.0 GENERAL

2.1 Codes and Standards

The codes and standards listed in text of these specifications, as amended to date, are made part of this specification and shall apply to this work, except as otherwise stated.

3.0 DETAILED REQUIREMENTS

3.1 Equipment

The equipment shall include:

.1 One or more asphalt mixing plants designed to produce a uniform mixture within the job-mix tolerances.

.2 One or more self-powered pavers that are capable of spreading the mixture to the thickness and width specified, true to the line, grade and crown shown on the plans.

.3 Enough smooth metal-bedded haul trucks, with covers, when required, to ensure orderly and continuous paving operations.

.4 A pressure distributor that is capable of applying tack coat and prime material uniformly without atomization.

.5 One or more steel-wheeled rollers (10 tons minimum roller weight).

.6 One or more self-propelled pneumatic-tired rollers capable of applying up to 90 psi ground contact pressures.

.7 A power broom or a power blower or both.

.8 Hand tools necessary to complete the job.

Other equipment may be used in addition to, or in lieu of, the specified equipment when approved by the engineer.

3.2 Samples

Samples of all materials proposed for use shall be submitted to the selected laboratory for test and analysis. The material shall not be used until the test results are approved by the engineer. Samples shall also be submitted to the Engineer in quantities sufficient for visual inspection and retention at the job site for comparison with materials used in place.

Sampling of asphalt materials shall be in accordance with the latest revision of Sampling Asphalt Products for Specification Compliance, Manual Series No. 18 (MS-18), The Asphalt Institute. Sampling of mineral aggregate shall be in accordance with the latest revision of American Association of State Highway Officials (AASHO) Designation T 2 (American Society for Testing and Materials (ASTM) Designation D 75). Sampling of the asphalt mixture shall be in accordance with the latest revision of AASHO Designation T 168 (ASTM Designation D 979).

3.3 Methods of Testing

Samples of materials will be tested for the requirements called for in the Section of Materials by the applicable methods specified in this Article.

.1 Asphalt materials will be tested by the methods of test of the American Association of State Highway Officials (AASHO) designated in the applicable table in Specifications for Asphalt Cements and Liquid Asphalts, Specification Series No. 2 (SS-2), The Asphalt Institute. If an AASHO method of test procedure is not available, the equivalent American Society for Testing and Materials (ASTM) method will be used.

.2 Mineral aggregates will be tested by one or more of the following methods of test of the American Association of State Highway Officials (AASHO) or the American Society for Testing and Materials (ASTM).

Characteristic	Method of Test AASHO	ASTM
Amount of Material Finer than No. 200 Sieve in Aggregate	T 11	C 117
Unit Weight of Aggregate	T 19	C 29
Sieve Analysis, Fine and Coarse Aggregates	T 27	C 136
Sieve Analysis of Mineral Filler	T 37	C 546
Abrasion of Coarse Aggregate, Los Angeles Machine	T 96	C 131
Soundness of Aggregates	T 104	C 88
Plastic Fines in Graded Aggregates and Soils by use of the Sand Equivalent Test	T 176	D 2419

.3 The mixture will be tested for asphalt content by "Method of Test for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures," AASHO Designation T 164 (ASTM Designation D 2172). The mixture will be tested for compliance with aggregate grading requirements by "Method of Test for Mechanical Analysis of Extracted Aggregate," AASHO Designation T 30.

If the mixture is produced in a mixing plant having automatic controls and a print-out system, and the controls are in proper calibration, asphalt content compliance will be determined from recorded data. Hot bin analysis together with batch weight read-out data will be used to determine composition compliance.

3.4 Weather Limitations

Asphalt paving mixture shall be placed only when the specified density can be obtained. Precautions shall be taken at all times to compact the mixture before it cools too much to obtain the required density. The mixture shall not be placed on any wet surface or when weather conditions will otherwise prevent its proper handling or finishing. Asphalt surface course mixture shall not be placed when the air temperature is below 400F. Asphalt base course mixture shall not be placed when the air temperature is below 30°F.

3.5 Safety

Safety precautions shall be used at all times during the progress of the work. As appropriate, workmen shall be furnished with hard hats, safety shoes, asbestos gloves, respirators, and any other safety apparel that will reduce the possibility of accidents.

3.6 Materials

3.6.1 Asphalt

Asphalt cement for the paving mixture shall be Grade 85-100.

Liquid asphalt for the prime coat shall be MC-30.

Emulsified asphalt for the tack coat shall be SS-1.

The grade(s) of asphaltic material specified shall meet the requirements for the type and grade in the applicable table(s) of Specifications for Asphalt Cements and Liquid Asphalts, Specification Series No. 2 (SS-2), The Asphalt Institute.

3.6.2 Mineral Aggregate

.1 Base Course

The mineral aggregate for the base course mixture shall be crushed stone, crushed or uncrushed gravel, slag, sand, stone or slag screenings, mineral dust or a combination of two or more of these materials. The combined aggregate shall be of uniform quality throughout and after going through the dryer it shall have a sand equivalent value of not less than 35.

Slag, if used, shall be air-cooled blast-furnace slag and shall weight not less than 70 pounds per cubic foot.

Mineral filler shall meet the requirements of ASTM Designation D 242.

.2 Surface Course

The mineral aggregate for the surface course mixture shall be crushed stone, crushed gravel, crushed slag, sharpedged natural sand, or a combination of two or more of these materials. The combined aggregate shall be of uniform quality

throughout and after going through the dryer it shall have a sand equivalent value of not less than 45. Aggregates that have a history of polishing shall not be used. Coarse aggregate (material retained on the U.S. standard No. 8 sieve) shall have a percent wear by the Los Angeles abrasion machine test of not more than 40.

Fine aggregate (material passing the U.S. Standard No. 8 sieve) shall have a maximum loss of 12 percent at 5 cycles in a sodium sulfate solution by the Soundness of Aggregates test or shall have been proved sound through satisfactory service.

Slag, if used, shall be air-cooled blast-furnace slag and shall weight not less than 70 pounds per cubic foot.

50 percent by weight of the combined coarse aggregate, other than naturally occurring rough-textured aggregate approved by the engineer, shall consist of crushed pieces having one or more faces produced by facture.

Mineral filler shall meet the requirements of "Mineral Filler for Bituminous Paving Mixtures," ASTM Designation D 242.

3.7 Asphalt-Aggregate Mixture

The engineer will approve a job-mix formula for each mixture. The job-mix formula for the asphalt-aggregate base course mixture shall be within the following limits:

Asphalt Institute Mix Type IVc

Sieve Size	Total Percent Passing, by Weight
1 in.	100
3/4 in.	80-100
3/8 in.	60-80
No. 4	48-65
No. 8	35-50
No. 30	19-30
No. 50	13-23
No. 100	7-15
No. 200	1-8
Asphalt Content	3.5-7.0 percent by weight of total mix

The asphalt-aggregate base course mixture shall meet the following test criteria:

Stability (Marshall): 500 min.
Flow (Marshall Method): 8-18
Air voids: 3-8 percent
Voids in Mineral Aggregate: 14 percent, min.

The job-mix formula for the asphalt-aggregate surface course mixture shall be within the following limits:

Asphalt Institute Mix Type IVb

Sieve Size	Total Percent Passing, by Weight
3/4 in.	100
1/2 in.	80-100
3/8 in.	70-90
No. 4	50-70
No. 8	35-50
No. 30	18-29
No. 50	13-23
No. 100	8-16
No. 200	4-10
Asphalt Content	3.5-7.0 percent by weight of total mix

The asphalt-aggregate surface course mixtures shall meet the following test criteria for medium traffic:

Stability (Marshall): 500 min.
Flow (Marshall Method): 8-18
Air Voids: 3-5 percent
Voids in Mineral Aggregate: 15 percent, min.

The following tolerances for the job-mix formula will be allowed per single test:

Passing Sieve	Percent
No. 4 and larger	± 7
No. 8 through No. 100	± 4
No. 200	± 2
Asphalt	± 0.4

4.0 INSTALLATION

4.1 Preparing Area to Be Paved

.1 The area to be paved shall be substantially true to line and grade. It shall have a dry, firm, and compacted surface before paving operations begin. All loose and foreign material shall be removed.

.2 The compacted subgrade on which the asphalt base is to be placed shall be primed with 0.3 gallon per square yard of the type and grade of asphalt priming material designated in the Section of Materials above. The prime shall be applied in accordance with Specification P-1, "Asphalt Priming of Granular Type Base Courses," The Asphalt Institute.

.3 Excess asphalt in patches and joints shall be removed by burning or other method approved by the engineer.

.4 Immediately prior to application of the asphalt tack coat all loose and foreign material shall be removed by sweeping or by blowing, or both.

.5 Surfaces of curbs, gutters, vertical faces of existing pavements, and all structures to be in actual contact with the asphalt-aggregate mixture shall be given a thin, even coating of asphaltic material. Care shall be taken to prevent spattering, with asphalt, surfaces that will not be in contact with the asphalt-aggregate mixture.

4.2 Tack Coat

A tack coat of 0.1 gallon per square yard of diluted emulsified asphalt, of the type and grade designated in Section on Materials, above, shall be applied on each layer of the base course and allowed to cure before placing the succeeding course. The emulsified asphalt shall be diluted with equal parts of water. The tack coat shall be applied on only as much pavement as can be covered with asphaltaggregate mixture in the same day.

4.3 Preparing the Mixture

.1 The asphalt shall be heated at the paving plant to the viscosity at which it can be uniformly distributed throughout the mixture.

.2 The aggregate shall be dried and heated to a temperature between 255-325oF for pugmill mixing. The temperature, moisture content of the heated and dried aggregate, and the mixing times shall be such as to cover the aggregate particles uniformly with the asphalt, and to provide proper subsequent temperatures for placing and compacting of the mixture.

4.4 Placing the Mix

The base course mixture shall be placed in one or more lifts with an asphalt paver or spreader to provide a nominal compacted thickness as shown on the plans. The surface course mixture shall be placed with an asphalt paver to provide a nominal compacted thickness as shown on the plans. The minimum lift thickness shall be at least two times the maximum particle size. The maximum lift thickness shall be that which can be demonstrated to be laid in a single lift and compacted to required uniform density and smoothness. Placing the mixture shall be a continuous operation. If any irregularities occur, they shall be corrected before final compaction of the mixture.

4.5 Compacting the Mix

The mix shall be compacted immediately after placing. Initial rolling with a steel-wheeled tandem roller, steel three-wheeled roller, vibratory roller, or a pneumatictired roller shall follow the paver as closely as possible. Intermediate rolling with a pneumatic-tired roller shall be done immediately behind the initial rolling. Final rolling shall eliminate marks from previous rolling. In areas too small for the roller a vibrating plate compactor or a hand tamper shall be used to achieve thorough compaction.

4.6 Pavement Thickness, Density and Surface Requirements

The compacted base and surface shall each have a density equal to or greater than 97 percent of a laboratory specimen prepared by the method for asphalt-aggregate mixture specified in Article 3.7, above, from a sample taken from a truck delivering mixture to the job site. The laboratory density will be compared with the field density as determined from a core taken from the general area of pavement represented by the above sample.

The compacted base and surface shall have average thicknesses no less than that specified on the plans. Any deficiency in base thickness shall be made up with surface mixture when the surface course is placed.

Cores drilled or specimens sawed from the base course and surface course will be used to measure the thickness of the pavement. The same cores will be used to test the

density by either ASTM Method of Test D 1188, "Bulk Specific Gravity of Compacted Bituminous Mixtures, Using ParaffinCoated Specimens," or ASTM Method of Test D 2726, "Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens," whichever is applicable.

The surface of the completed pavement will be checked longitudinally for smoothness with a 10-foot straightedge. The surface shall not vary more than 3/16 inch in 100 feet.

5.0 TESTING

5.1 Testing Laboratory and Inspection Service

The contractor shall furnish an Inspection Service as part of the Testing Laboratory to do the following:

.1 Obtain samples of the hot-mix from the trucks as delivered to the job on basis of one sample per day or one sample per 200 tons or fraction thereof, if more than 200 tons are used per day.

.2 Note the area of pavement represented by the sample.

.3 Take core samples from the finished pavement in random parts of areas represented by the samples taken in (2) above. The places at which the core samples are taken shall be approved by the engineer prior to taking of the cores.

5.2 Test to Be Made

The following minimum tests shall be made and their results submitted for approval within 15 days after sampling:

.1 The aggregate samples shall be tested for gradation and hardness (abrasion).

.2 The hot mix samples shall be tested by extraction for asphalt content and for gradation, and also for Marshall stability.

.3 The cores shall be tested for thickness and density.

Other tests as may be required in meeting the requirements of the plans and specifications.

6.0 INFORMATION TO BE SUMBITTED

The following information shall be submitted to the Engineer for approval 30 days before installation.

6.1 Samples of Materials

The contractor shall submit for approval samples to the engineer of asphalt materials and mineral aggregates in quantities sufficient for visual inspection and retention at the job site for comparison with materials used in place. Samples shall also be submitted to the laboratory furnished under the contract. (See Testing Laboratory in the General Conditions.) The samples shall be of sufficient quantities to perform the tests as called for under Section 5.0.

6.2 Job-Mix Formula

The contractor shall submit for approval a job-mix formula for each of the courses required under these plans and specifications. The test criteria actually achieved in designing the mix shall be submitted for approval.

Section 2D

Fencing

DIVISION 2

SECTION 2D

FENCING

1.0 SCOPE

This Specification Section includes furnishing and installing the chain link fence and work incident thereto all as indicated on the drawings and described in the specification.

2.0 GENERAL

2.1 Codes and Standards

The Work shall conform to the latest edition and latest addenda thereto, as of date of award, of the following codes and standards.

.1 Federal Specifications

FF-P-101	Padlocks
RR-F-183	Fence-posts, Gates, and Accessories
RR-F-191	Fencing, Wire, (Chain Link Fabric)
RR-F-221	Fencing (Barbed Wire, Woven Wire, and Wire Netting)

.2 American Society for Testing and Materials

A90	Test for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles

2.2 Manufacturers Standard Items

Manufacturer's standard items shall be furnished insofar as applicable to the type shown.

3.0 DETAILED REQUIREMENTS

3.1 Material

Accessories shall consist of the parts specified and indicated for installation of chain-link fence except for fabric, posts, rails, and braces and gate frames. Accessories shall be of design standard with the manufacturer. Accessories shall be of steel, wrought iron or malleable iron and shall be equal to the materials and detail requirements specified in Federal Specification RR-F-183, except that accessories shall be zinc coated as specified in paragraph: Zinc-coating hereinafter.

.1 Chain-link fabrics shall conform to Federal Specification RR-F-191, Type A, No. 9 W & M gage, with a 2 inch mesh.

.2 Concrete shall conform to Section 3A, "CONCRETE" of this specification.

.3 Padlock shall conform to Federal Specification FF-P-101, Type EPB, 2 inch size, with chain.

.4 Posts, rails, braces and gate. frames shall conform to Federal Specification RR-F-183, and shall be of the sizes and shapes specified in Table I therein.

.5 Barbed wire shall conform to Federal Specification RR-F-221, Type A, grade 3 zinc-coated, two twisted strands of 12-1/2 gage wire, with 4-point, 14-gage round barbs spaced at not more than 5-inch centers.

.6 Tie wire for attaching chain-link fabric to posts, rails and gates shall be 1100-H-18 aluminum alloy of not less than 0.177-inch diameter.

3.2 Zinc Coating

Except for chain-link fabric and barbed wire, ferrous metal used in the construction of the fence shall be hot-dip zinc coated after fabrication with not less than 1.2 ounces of zinc per square foot of actual surface, as determined in accordance with tests set forth in ASTM A90. Chain-link fabric and barbed wire shall be zinc-coated before or after fabrication. Abraded surfaces of galvanized members and cut ends of fence fabric or barbed wire shall be touched up with zinc dust zinc oxide primer.

4.0 INSTALLATION

4.1 Preparation of Grade

The finished fence shall be installed on the previously prepared grade and shall be a 7 foot high chain link fabric surmounted by outward inclined brackets supporting 3 lines of barbed wire. Fence posts shall be set a minimum depth of 3 feet below the top of concrete.

4.2 Post Setting

Posts shall be set in concrete at a maximum spacing of 10 feet. Concrete shall be thoroughly compacted by the hand-tamp method with a rod of sufficient length to reach the bottom of the post hole and shall be finished in a dome. Line posts shall have minimum concrete base dimensions of 1 foot by 1 foot by 3 feet 6 inches deep. Corner and bracing posts shall have minimum concrete base dimensions of 1 foot 3 inches by 1 foot 3 inches by 3 feet 6 inches deep. Care shall be taken to insure proper alignment, and plumb installation. Concrete shall be allowed to cure a minimum of 72 hours before any further work is done on the posts.

4.3 Posts

Post tops shall be installed as recommended by the manufacturer. Post tops shall be of the design required to accommodate the top rail and barbed wire extension arms. In addition to manufacturer's standard connections, barbed wire extension arms shall be securely anchored to posts by use of through-bolts or other approved method.

4.4 Rails

Top rail shall be installed prior to installation of chain-link fabric. The top rail shall have expansion couplings spaced as indicated. An expansion-contraction coupler standard with the manufacturer shall be provided every 100 feet or fraction thereof. Straight runs between braced posts shall not exceed 500• feet. End clamps shall be used for attaching top rail to end posts, gate posts and pull posts, and for attaching braces to line posts and gate posts. Corner clamps shall be used for attaching top rail and braces at corner posts.

4.5 Wire Fabric

Fabric shall be pulled taut and secured to the top rail close to both sides of each post and at intervals of not more than 24 inches on centers and to the intermediate posts at intervals of not more than 14 inches on centers with wire ties specified hereinbefore. Fabric shall be attached to end, corner, pull, and gate posts with stretcher bars and stretcher-bar bands. Bands shall be equally spaced on the stretcher bar and not over 14 inches on centers. Bottom of fabric shall be not greater than 3 inches above finished grade.

4.6 Barbed Wire

Barbed wire shall be installed on extension arms above the fence posts. The method of securing wire shall be positive and completed at each contact. When the method includes several wires, the assembly shall be positive in all respects. Each strand shall be pulled taut and securely fastened to the extension arms in the manner recommended by the manufacturer of the extension arms. Wire shall be attached to end, corner, pull, or gate posts with wire stretching bands.

4.7 Gates

Gates shall be of the swing type, hinged to swing through 180 degrees from closed to open, and shall be complete with latches, stops, keepers, hinges, fabric, braces, and locks. Extension arms for three strands of barbed wire above the fabric shall be provided to match adjoining fence. Keepers shall be manufacturer's standard, located on gate or ground.

4.8 Gate Frames

Gate frames shall be constructed of round or square tubular members. Gate leaves more than 8 feet wide shall have intermediate members and diagonal truss rods or tubular members as necessary to provide rigid construction, free from sag or twist. Gates 8 feet wide or less shall have truss rods or intermediate braces. The end members of gate frames shall be extended sufficiently above the top member to carry strands of barbed wire in perfect horizontal alignment with the strands of barbed wire on the fence; clips or other approved attachments shall be utilized for securely fastening the barbed wire to the extended members. Joints between tubular members

shall be made by welding or by means of heavy fittings. Connections shall be rigid and weathertight. Truss rods shall be 3/8-inch minimum diameter. Plunger bars shall be provided on double gates. Plunger bars shall have top, bottom and middle locking points with the middle point arranged for padlocking. The padlock shall be accessible from both sides of the gate.

4.8.1 Gate Fabric Fasteners

Gate fabric shall be of the same chain link fabric used in the fence. Fabric shall be attached to gate-frame ends by use of bolt hooks, stretcher-bar bands and stretcher bars, or by other methods standard with the manufacturer, except that welding the fabric to the gate shall be attached with specified wire ties at intervals not exceeding 14 inches on centers.

4.8.2 Padlocks

Padlocks shall be furnished for gate openings and shall have chains that are securely attached to the gates. Padlocks shall be keyed alike and two keys shall be provided for each padlock.

5.0 TESTING

No additional tests beyond those normally employed either in manufacturing, installation or construction processes or as called for by the specified codes and standards are required under this Article.

6.0 INFORMATION TO BE SUBMITTED

The following information and data shall be submitted for approval by the Engineer within 30 days after award of contract.

6.1 Drawings

Drawings shall show materials, dimensions and details of construction and installation.

Section 2E

Yard Piping and Drainage Structures

DIVISION 2

SECTION 2E

YARD PIPING AND DRAINAGE STRUCTURES

1.0 SCOPE

The work covered by this specification shall include the furnishing of all plant, material, labor and equipment necessary in performing all operations in connection with furnishing and installing yard piping and drainage structures.

2.0 GENERAL

The codes and standards listed in the text of these specifications, as amended to date, are made part of this specification and shall apply to this work, except as otherwise noted.

3.0 DETAILED REQUIREMENTS

3.1 Materials

3.1.1 Piping

Material for yard piping shall be as called for in Section 15C of this specification. Material for sewer line shall be extra strength clay pipe, conforming to ASTM Standard Specification C 200, joints for the sewer line shall conform to ASTM Standard Specification C 425.

3.1.2 Culverts

Culverts shall be bituminous coated and smooth lined asbestos-bonded steel pipe.

The materials used in the fabrication of smooth lined asbestos-bonded corrugated steel pipe shall conform to the requirements of ASTM Designation A-569, with 0.20% minimum copper added. In addition, the metal sheets shall be coated on both sides with a layer of asbestos fibers applied in a sheet form by pressing it into a molten metallic bonding medium. Immediately after the metallic bond has solidified, the asbestos fibers shall

be thoroughly saturated with a bituminous saturant. The finished sheets shall be of first class commercial quality free from blisters and unsaturated spots.

Except as modified herein, the finished pipe shall conform to the requirements of AASHO Designation M-36. In addition, the pipe shall be coated as required in AASHO Designation M-190, Type A, and shall be lined on the inside of the pipe so that a smooth surface will be formed by completely filling the corrugations to a minimum thickness of 1/8 inch above the crest. The interior lining shall be applied by a centrifugal or other approved method and shall be free from sags and runs. The lining material shall meet the requirements of AASHO Designation M-190. Pipe shall be fabricated with riveted, lap joint construction, and shall have the rivets located in the inside valleys of the corrugations.

3.1.2.1 Culverts under road for area drainage shall be 15 inch diameter, 14 gage, bituminous coated, smooth lined, asbestos-bonded corrugated steel pipe.

3.1.2.2 Culverts under road for Hawk Run shall be 94 inch by 58 inch, 8 gage, bituminous coated, smooth lined, asbestosbonded corrugated pipe arch.

3.1.2.3 Culvert from lagoon to Hawk Run shall be 36 inch diameter, 14 gage, bituminous coated, smooth lined, asbestosbonded corrugated steel pipe.

3.1.3 Concrete

Concrete for headwalls, thrust blocks and bottom of manholes shall be as called for in Section 3A of the Specifications.

3.1.4 Manholes

3.1.4.1 Brick for manholes shall conform to ASTM Standard Specification C 32-Class NA.

3.1.4.2 Mortar for jointing and plastering shall consist of one part cement and two parts sand. Cement shall be Type V, ASTM Designation C 150.

3.1.4.3 Manhole cover and frame shall be cast iron conforming to ASTM Standard Specification A 48, Class 30. The manhole frame and cover shall be 24 inch diameter for pit construction, walkway type, Flockhart 618D or equal, as manufactured by the Flockhart.

3.1.4.4 Wrought iron steps shall conform to ASTM Standard Specification A 41.

4.0 INSTALLATION

4.1 Excavation and Backfill

Excavation and backfill for piping and drainage structures shall be as called for in Section 2A of the Specifications.

4.2 Piping

Piping, other than asbestos-cement, shall be installed as described in Section 15C of the Specifications. Asbestoscement pipe shall be installed in accordance with the manufacturers recommendations.

4.3 Manholes

Manholes shall be constructed of brick in accordance with the drawings. The invert channels shall be smooth and semi circular in shape conforming to the inside of the adjacent pipe. Changes in direction of flow shall be made with a smooth curve of as large radius as the size of the manhole will permit. Changes in grade of the channels shall be made gradually and evenly. The invert channels may be built up of concrete or with brick and mortar. The floor of the manhole outside the channels shall be smooth and shall slope toward the channels not less than one inch per foot. The joints of the brickwork shall be completely filled and shall be smooth and free from surplus mortar on the inside of the manhole. Manholes shall be plastered with 1/2 inch of mortar over the entire outside surface of the walls. Brick shall be laid in stretcher courses with every sixth course laid radially.

5.0 TESTING

5.1 Piping

Tests of piping and piping systems shall be as described in Paragraph 5.1 of Section 15C of the Specifications. However,

no backfilling shall be performed until after successful testing of piping.

6.0 INFORMATION TO BE SUBMITTED

6.1 With Bid

No information is required to be submitted with Bid.

6.2 Certification

Contractor shall submit written certification from manufacturers that material supplied is in conformance with specifications cited in this Specification within 30 days after award of contract.

6.3 Test Results

Results of tests called for in Article 5.1 of this Specification shall be submitted for approval within 3 days of the test.

6.4 Shop Drawings

Contractor shall submit shop drawings for manholes, culverts, headwalls, and timber gate, including raising mechanism and other structures, as required in this Specification within 45 days after award of contract.

Section 2F

Sewage Disposal System

DIVISION 2

SECTION 2F

SEWAGE DISPOSAL SYSTEM

1.0 SCOPE

This Specification Section includes furnishing and installing the sewage disposal system all as indicated on the drawings and described in the specification.

2.0 GENERAL

2.1 Work to be Provided

The work to be provided under this specification shall include the following:

.1 Detailed design of septic tank and distribution box.

.2 Furnishing and installing septic tank, distribution box and leaching system.

2.2 Work by others

.1 Percolation Test

.2 Submittal of permits

2.3 Codes and Standards

The work covered in this section shall conform to the applicable requirements contained in the latest edition and addenda thereto, as of the date of award of contract, of the following organizations:

.1 Sanitary Water Board, Department of Health, Commonwealth of Pennsylvania.

.2 Morrisdale Township, Codes and Ordinances

.3 National Plumbing Code

.4 U. S. Department of Health, Education and Welfare Manual of Septic Tank Practice.

.5 American Society for Testing Materials

3.0 DETAILED REQUIREMENTS

3.1 Design Conditions

3.1.2 Septic Tank

The septic tank shall be double compartment construction, capacity 1000 gallons, 500 gallons each compartment and shall be pre-cast reinforced concrete or steel coated with bitumastic inside and out. Thickness shall be adequate to support H-20 Loading, but not less than 2/" for precast concrete or ;4-" for steel. The top of the tank shall be set 4 feet below finished grade, and shall be fitted with three (3) 20 inch diameter access manhole, one over the inlet, one over the outlet and one over the partition. Manholes shall extend to finished grade, manhole covers shall be cast iron, heavy duty and gas tight. Venting shall be provided between compartments to allow free passage of gas. Provision shall be made for free flow between compartments. Properly supported "T" shall provide for the inlet and outlet connections in the septic tank to control the flow in and out of the septic tank.

3.1.3 Subsurface Tile System

a. The subsurface tile system shall have a minimum of 370 feet of tile divided into not less than four sections. No section shall be longer than 100 feet.

b. Tile field shall not be constructed under paved areas.

c. A distribution box shall be provided to assure equal distribution of effluent to the several lateral lines. Minimum interior dimensions shall be 2 feet deep 4 feet wide and 4 feet long. The invert of the lateral outlets shall be 6 inches above the floor of the distribution box.

d. Lateral distributors shall be laid in a trench 18 inches wide and a minimum of 25 inches deep. The trench shall be filled to a depth of 6" (the invert of the tile) with gravel 3/4 to 12 inches in size. The tile shall be 4" diameter standard strength perforated clay. Pipe ASTM C211,

with open joints (1/8 - 1/4 inch) with tar paper laid over the upper half of the joint. Slope of the tiles should be 2 to 4 inches per 100. Additional gravel should then be added to fill the trench to a depth 2 inches above the top of the tile. The top of the gravel is to be covered with untreated building paper before placing the backfill. The trench should be overfilled with 4 to 6 inches of earth to allow for settlement.

e. The lines connecting the distribution box to the laterals shall be of extra strength vitrified clay pipe and shall have compression joints conforming to ASTM Specification C 425 Type I. Lines shall be laid on the same slope as the laterials. A cleanout shall be provided at the start of each lateral and at the end. The cleanouts shall be jointed, and brought to a level at least 6" above finished grade. A slotted cover shall be provided for each cleanout.

f. Minimum distance between the walls of adjacent trenches shall be 6 feet. Minimum distance to the nearest property line from any trench shall be 10 feet.

4.0 INSTALLATION

Installation of the sewage disposal system shall comply with all local and state health codes. Excavation and backfill for sewer lines, septic tank and tile field shall be in accordance with Section 2A, EXCAVATION, FILLING AND BACKFILLING.

5.0 TESTING

No additional tests beyond those normally employed either in manufacturing, installation or construction processes or as called for by the specified codes and standards are required under this Article.

6.0 INFORMATION TO BE SUBMITTED

The following information and data shall be submitted.

6.1 DRAWINGS

Drawings shall show overall dimensions, details of construction and materials of sewage disposal system and shall be submitted for approval within 30 days after awards.

Section 2G

Sand Fill Under Water Tanks

DIVISION 2

SECTION 2G

SAND FILL UNDER WATER TANKS

1.0 SCOPE

This specification covers the selection, proportioning and installation of materials comprising the sand fill base under the water tanks shown on the drawings. The sand fill is a sand-oil mixture, compacted in place.

2.0 GENERAL

2.1 Codes and Standards

The codes and standards listed in the text of these specifications, as amended to date, are made part of this specification and shall apply to this work, except as otherwise noted.

3.0 DETAILED REQUIREMENTS

3.1 Equipment

The equipment shall include:

.1 One or more asphalt mixing plants designed to produce a uniform mixture within the job-mix tolerance.

.2 Paving equipment capable of spreading the mixture to the thickness, grade and crown shown on the plans.

.3 Enough smooth metal-bedded haul trucks, with covers, when required, to haul the mixture.

.4 One or more steel wheeled rollers, of approximately 5 tons roller weight.

.5 Or one or more self-propelled pneumatic-tired rollers capable of applying 90 psi ground contact pressure.

.6 Hand tools as required.

Other equipment may be used in addition to, or in lieu of, the specified equipment when approved by the Engineer.

3.2 Samples

Samples of all materials proposed for use shall be submitted to the selected laboratory for test and analysis. The material shall not be used until the test results have been approved by the Engineer. Samples shall also be submitted to the Engineer in quantities sufficient for visual inspection and retention at the job site for comparison with materials used in place.

3.3 Methods of Testing

Samples of materials will be tested for requirements called for in section of Materials by the applicable methods specified in the Article.

Mineral aggregates will be tested by one or more of the following methods of test of the American Association of State Highway Officials (AASHO) or the American Society for Testing and Materials (ASTM).

Characteristic	Method of Test AASHO	ASTM
Amount of Material Finer than No. 200 Sieve in Aggregate	T 11	C 117
Unit Weight of Aggregate	T 19	C 29
Sieve Analysis, Fine and Coarse Aggregates	T 27	C 136
Sieve Analysis of Mineral Filler	T 37	C 546
Plastic Fines in Graded Aggregates and Soils by use of the Sand Equivalent Test	T 176	D 2419

The in place density shall be determined by AASHO Test T 147.

3.4 Materials

3.4.1 Mineral Aggregate

The mineral aggregate for the sand fill shall be

crushed stone, crushed gravel, crushed slag, sharp-edged natural sand, or a combination of two or more of these materials. The combined aggregate shall be of uniform quality throughout and after going through the dryer it shall have a sand equivalent value of not less than 45.

3.4.2 Oil

The oil for the sand-oil mix shall be No. 2 fuel oil.

3.5 Sand-Oil Mixture

The Engineer will approve a job-mix formula. The job-mix formula shall be within the following limits:

The Aggregates are Based on the Asphalt Institute Mix Type IVb

Sieve Size	Total Percent Passing, by Weight
3/4 in.	100
1/2 in.	80-100
3/8 in.	70-90
No. 4	50-70
No. 8	35-50
No. 30	18-29
No. 50	13-23
No. 100	8-16
No. 200	4-10
Oil	As determined below.

The amount of oil shall be determined as a percent by weight of the total mix as follows:

The amount of oil shall be that amount that will provide the maximum density when mixed with the dry sand specified above. The amount of oil to achieve this maximum density shall be determined by a test procedure equivalent to the modified moisture-density tests, AASHO Designation T 180, Method D, or ASTM Designation D 1557, Method D, using the oil instead of water for moisture content.

4.0 INSTALLATION

The sand shall be dried by heating in a dryer of an asphalt plant or equivalent to a moisture content of not more than 2 percent. -

The oil, in quantity and type as specified above, shall be thoroughly mixed with the sand in a pugmill mixer or equivalent equipment.

The sand-oil mixture shall then be transported to and placed in the base of tanks in sufficient quantity and proper grade to provide a compacted base of thickness, grade and crown as called for on the drawings. The compaction shall be a minimum of 95% of the optimum density as determined for the Sand-Oil Mixture, Article 3.5, and shall be achieved by the use of the roller equipment designated in Article 3.1.

5.0 TESTING

The contractor shall furnish an Inspection Service as part of the Testing Laboratory to do the following, within 30 days after installation:

5.1 Determine in-place density for each tank base by AASHO Test T 147. The places where in-place density tests are to be made shall be approved by the Engineer prior to taking samples.

5.2 Determine in-place thickness at the time of taking sample for in-place density.

6.0 INFORMATION TO BE SUBMITTED

The following information shall be submitted to the Engineer for approval 30 days before installation.

6.1 Samples of Materials

The contractor shall submit for approval samples to the Engineer of the oil and mineral aggregates in quantities sufficient for visual inspection and retention at the job site for comparison with materials used in place. Samples shall also be submitted to the Laboratory furnished under the contract. (See Testing Laboratory in the General Conditions.) The samples shall be of sufficient quantity to perform the various tests and job-mix designs as required by these specifications.

6.2 Job-Mix Formula

The contractor shall submit for approval a job-mix formula and the density curves and other pertinent data developed in determining the formula.

6.3 Test Data

The contractor shall submit for approval the results of the tests called for in Article 5.0 within 10 days after sampling.