AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
· GEOTECHNICAL
· MATERIALS
· ENVIRONMENTAL

February 19, 2005

Mr. Bryan Gonzalez
Century Development Company
1301 Omaha Street, Suite 207
Rapid City, South Dakota 57701

Subject: Geotechnical Study
Proposed Philadelphia Street Bypass
Rapid City, South Dakota
AET No. 18-02412

Dear Bryan:

INTRODUCTION

This letter presents the results of the geotechnical study conducted for the proposed Philadelphia Street Bypass project to be constructed in Rapid City, South Dakota. This work was conducted under American Engineering Testing's (AET) proposal dated January 29, 2007, and your verbal authorization to proceed.

PROJECT INFORMATION

The Philadelphia Street Bypass project is located immediately north of the Executive Golf Course and Philadelphia Street. The bypass will be located approximately 300 feet north of the existing Philadelphia Street. The bypass alignment will run approximately 1200 feet in an east-west direction and then connect back to Philadelphia Street via a 350 foot extension of 11th Street. Based on the drawings provided, it appears cuts and fills of 10 feet or less will be required along the new alignment. The eastern half of the alignment will run perpendicular to the base of an existing 3H:1V slope. The street bypass will include placement of new water and storm sewer lines.

FIELD EXPLORATION

Five standard penetration test (SPT) borings were drilled for the project on January 31, 2007. The borings were drilled at locations selected by American Engineering Testing, and are illustrated on the attached Boring Location Map included as Figure 1 at the end of this letter. Boring elevations were interpolated from the project drawings provided.

Soil sampling was performed according to the procedures described by ASTM: D 3550. Using this procedure, a two-inch O.D. split barrel sampler is driven into the soil by a 140 pound weight falling 30 inches. After an initial set of six inches, the number of blows required to drive the sampler an

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additional 12 inches is known as penetration resistance or N value. The N value is an index of the relative density of cohesionless soils and the consistency of cohesive soils.

As the samples were obtained in the field they were visually and manually classified by the crew chief in accordance with ASTM: D 2488. Representative portions of all samples were then sealed and returned to the laboratory for further examination and for verification of the field classification. Included as Figures 2 through 6 are the Logs of the Test Borings indicating the depth and identification of the various strata, the N value, the laboratory test data, water level information and pertinent information regarding the method of maintaining and advancing the drill holes. A copy of the Unified Soil Classification System is included as Figure 7.

The soil samples remaining after the laboratory testing is complete will be retained for a period of fifteen (15) days. At that time they will be discarded. Please advise us in writing if you wish to have us retain them for a longer period of time.

SUBSURFACE CONDITIONS

A brief description of the general subsurface conditions encountered at the boring location follows. We wish to point out that the subsurface conditions at other times and locations at the site may differ from those found at our test boring location. If different conditions are encountered during construction, it is necessary that you contact us so that our recommendations can be reviewed.

In general, the soils encountered along the proposed street alignment consisted of varying depths of mixed alluvium consisting of silty and/or clayey sand, sandy gravel, sandy fat and/or lean clay. The alluvium extended to the final depths drilled of 11 ½ to 16 ½ feet with the exception of B-4 where weathered shale was encountered below the alluvium at a depth of 10 ½ feet.

Groundwater was encountered in B-5, only, at a depth of 9 feet below existing grade. Groundwater levels should be expected to fluctuate seasonally and yearly. The time of year that the borings were drilled and the history of precipitation prior to drilling should be known when using the water level information on the soil boring logs to extrapolate water levels at other points in time.

LABORATORY TESTING

Representative samples of the soils encountered were selected for laboratory testing to determine characteristic engineering and index properties. The tests included the determination of moisture content, dry density, moisture density relationships (proctors), CBRs and two soil resistivity tests. The laboratory tests are being performed in accordance with appropriate American Society for Testing and Materials (ASTM) procedures.

The moisture content and dry density test results can be noted on the attached boring logs opposite the samples upon which the tests were performed. The results of the moisture-density curves and CBRs are included on Figures 8-11. Results of the lab resistivity tests are summarized below:

Boring #	Soil Type	Depth(ft)	Resistivity (ohm/cm)	Corrosion Potential
3	Fat Clay	5 - 9	3250	Moderate to Severe
5	Sandy Gravel	5 - 9	24,200	Mild

Based on the above data, the fat clay along the street alignment should be considered to have a moderate to severe potential and the site sands and gravels have a mild potential towards corrosion of iron and other buried metals based on a scale published in the Technical Manual TM 5-811-7. "Electrical Design, Cathodic Protection" by the Department of the Army. If corrosion of buried metal is critical, it should be protected using a non-corrosive backfill, wrapping, coating, sacrificial anodes, or a combination of these methods, as designed by a qualified corrosion engineer.

ENGINEERING ANALYSIS AND RECOMMENDATIONS

Site Grading

All topsoil and grass should be removed from within the street alignment and all areas to receive engineered fill. The site soils and shale materials can be used as engineered fill across the development, below the proposed street sections and as utility trench backfill.

Prior to placement of engineered fill, areas to receive engineered fill should be scarified to a depth of 12 inches, moisture conditioned, and recompacted to at least 92% of the maximum density as determined by ASTM D:1557 (modified proctor). Approved engineered fill should then be placed as specified to reach the desired elevations.

It is our opinion the engineered fill should be placed on the prepared subgrade as follows. All recommendations are based on the Modified Proctor method (ASTM: D 1557):

1. All engineered fill should be moisture conditioned to within 3% of optimum moisture content prior to being placed.

2. All engineered fill should be placed in loose lift thicknesses of eight inches or less. If hand operated compaction equipment is used, the loose lift thickness should be reduced to four inches or less.

3. Each lift should be compacted to at least 92% of maximum proctor density with the top 12 inches compacted to at least 95% of the maximum proctor density.

4. Compaction density tests should be performed on alternating lifts to ensure the minimum density is maintained.

Utility Excavation

We recommend all utility lines be placed in accordance with the City of Rapid City Specifications. It is our opinion the site fill, sand and gravel soils should be classified as a Type C soil according to the OSHA Classification System, with a recommended cut slope of 1 ½ H: 1V. The sites sandy fat clay should be classified as a "Type B" soil, with a recommended cut slope of 1 horizontal to 1 vertical (1H:1V). The weathered shale may be classified as "Type A" soils with a recommended cut slope of 3/4 H:1V. These trench lay backs should be reviewed and checked in the field on a daily basis during construction.

Excavations deeper than 20 feet and/or in saturated soils or below the groundwater table should be considered on an individual basis. If the above trench layback recommendations are not feasible due to space limitations or other factors, the OSHA rules should be consulted for alternative trench stabilization methods. Trench boxes or shoring in compliance with OSHA rules may be acceptable alternatives. Trench boxes or bracing may be necessary depending on the soils conditions and the depth of the excavation.

Once the utility lines have been placed, we recommend the trench be backfilled as soon as possible. Trenches should not be left open for long periods of time as precipitation and surface drainage may cause trench instability.

PAVEMENT DESIGN

The following pavement sections are based on the City of Rapid City's Asphalt Concrete Pavement Section Design Standards and the "Simplified Guide for the Design of Concrete Pavements" from the American Concrete Pavement Association which is based on the 1997 "AASHTO Guide for the Design of Pavement Structures".

The subgrade soil strength was evaluated with two CBR tests run from remolded samples from B-2 and B-3. The soil samples were remolded to approximately 95% of maximum dry density at optimum moisture contents. Test results indicated CBR values of 12.6 from B-2 and 2.3 from B-3. The lower CBR value of 2.3 was used for design. A 20-year, 18-kip ESAL of 150,000 was used for Philadelphia Street and 75,000 was used for the extension of 11th Street based on the City of Rapid City design criteria.

Pavement Section

Based on the above design criteria our calculations indicate an applicable asphalt pavement section for the new Philadelphia Street Bypass should consist of 5 inches of asphalt over 8 inches of crushed base course. For the extension of 11th Street we recommend a section of 5 inches of asphalt over 6 inches of crushed base course. Both pavement sections include the use of edge drains along the concrete street curbs.

Subgrade Preparation
Prior to placement of any pavement sections, we recommend the exposed subgrade be scarified to a depth of 12 inches below existing grade, moisture conditioned to within 3% of optimum moisture content and be compacted to at least 95% of maximum density as determined by ASTM: D 1557.

The prepared subgrade should be proof rolled by a tandem axle dump truck loaded to its capacity. The proof rolling should be observed by our geotechnical engineer to identify areas of soft subgrade. Any areas that "pump" under the loaded dump truck should be excavated to a depth to be determined by the geotechnical engineer and replaced with coarse clean gravel to stabilize the subgrade. A geotextile fabric/grid should also be considered to help stabilize the subgrade. Once the subgrade has been proof rolled and approved by the geotechnical engineer, base course may be placed.

Base Course
Base course gravel should be compacted to a minimum of 95% of maximum density as determined by the modified proctor method (ASTM D:1557/AASHTO T-180) and should meet the requirements as outlined in Section 117 "Aggregates for Granular Bases and Surfacing" of the City of Rapid City Specifications.

Precautions
It is our opinion that excessive settlement could occur above underground utility trenches. The exact amount of settlement cannot be predicted; however, we strongly recommend that compaction tests be taken in the trenches to assure that proper compaction does exist.

CONSTRUCTION CONSIDERATIONS

Excavation
Conventional earth moving equipment should be able to perform the anticipated preparation work for the site soils. We recommend that all excavation work be conducted according to the Federal Register, Tuesday, October 31, 1989, Part II, Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926, Occupational Safety and Health Administration, Standards-Excavation; Final Rule.

Observation & Testing
The recommendations in this report are based on the subsurface conditions found at our test boring locations. Since the soil conditions can be expected to vary away from the soil boring locations, we recommend on-site observation by a geotechnical engineer/technician during construction to review these potential changes. Soil compaction testing should be performed on new fill placed in order to judge that project specifications for compaction have been satisfied. The construction plans and specifications should be reviewed by our firm to judge the applicability of the recommendations presented in this report.

CLOSING

The recommendations contained in this preliminary report represent our professional opinions. These opinions were arrived at in accordance with currently accepted engineering practices at this time and location. Other than this, no warranty is intended or implied. These recommendations will be reviewed and if required, modified in the final report.

If you have any questions or need additional information, please call our office at (605) 388-0029.

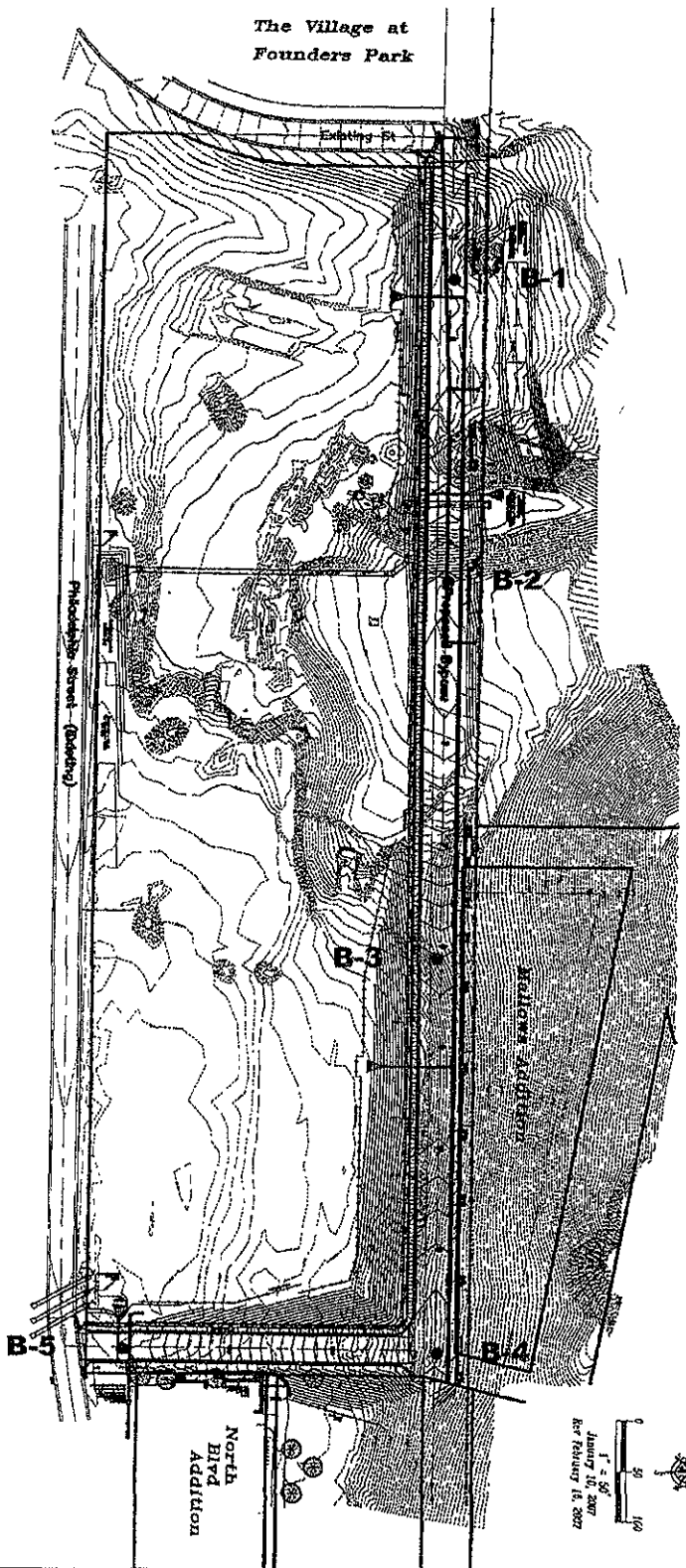
Sincerely,

Robert Temme P.E.
South Dakota Operations Manager

REGISTERED PROFESSIONAL ENGINEER
REG. NO. 4638
ROBERT J. TEMME
SOUTH DAKOTA

Reviewed by:

Ray Atkins, P.E.
Geotechnical Project Manager



AMERICAN ENGINEERING TESTING, INC.	Project: PHILADELPHIA STREET BY-PASS RAPID CITY, SOUTH DAKOTA		AET Job No. 18-02412
	Subject: BORING LOCATION MAP		Date: February 20, 2007
	Scale:	Drawn By: ksp / Checked By: rnt	FIGURE 1

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Figure 2

SUBSURFACE BORING LOG

AET JOB NO: 18-02412 LOG OF BORING NO. B-1

PROJECT: Philadelphia Street Bypass; Rapid City, South Dakota

DEPTH IN FEET	SURFACE ELEVATION: 3254.0 MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
1	**FILL** Clayey Gravel with sand, dark brown, dry (GC)	Fill									
2											
3			30		2L	18					
4											
5			27		2L	18					
6							9	105			
7	**SILTY SAND** fine grained, brown, moist, loose (SM)	Mixed Alluvium									
8			10		2L	18					
9											
10	**SANDY GRAVEL** with clay lenses and cobbles, brown, dry, very dense (GP)	Coarse Alluvium	50/.4		2L	18					
11											
	Bottom of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10.0	4" FA	1/31/07	15:30			10'		None
BORING COMPLETED: 1/31/07								
CC: BT	CA: PB Rig: RC-1							

AET CORP 18-02412.GPJ AET CORP.GDT 2/20/07

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Figure 3

SUBSURFACE BORING LOG

AET JOB NO: 18-02412 LOG OF BORING NO. B-2

PROJECT: Philadelphia Street Bypass; Rapid City, South Dakota

DEPTH IN FEET	SURFACE ELEVATION: 3268.0 MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
1	**SANDY LEAN CLAY** with gravel and cobbles, brown, dry, hard (CL)	Mixed Alluvium									
2											
3			35		2L	18					
4											
5			37		2L	18					
6											
7											
8			36		2L	18					
9							7	92			
10	**SANDY GRAVEL** with clay lenses and cobbles, brown, dry, very dense (GP)	Coarse Alluvium	66		2L	18					
11											
12	**CLAYEY SAND** with gravel, brown, dry, medium dense (SC)	Mixed Alluvium	24		2L	18					
13											
14											
15			24		2L	18					
16											
	Bottom of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
15.0	4" FA	1/31/07	11:05			15'6"		None
BORING COMPLETED: 1/31/07								
CC: BT	CA: PB Rig: RC-1							

AET_CORP 18-02412.GPJ AET_CORP.GDT 2/20/07

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Figure 4

SUBSURFACE BORING LOG

AET JOB NO: 18-02412 LOG OF BORING NO. B-3

PROJECT: Philadelphia Street Bypass; Rapid City, South Dakota

DEPTH IN FEET	SURFACE ELEVATION: 2355.0 MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
1	**SANDY FAT CLAY** with gravel and cobbles, brown, dry, hard (CH)	Mixed Alluvium									
2											
3			30		2L	18					
4											
5			63		2L	18					
6							11	108			
7											
8			44		2L	18					
9							17				
10			51		2L	18					
11											
	Bottom of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10.0	4" FA	1/31/07	11:55			11'		None
BORING COMPLETED:	1/31/07							
CC: BT	CA: PB Rig: RC-1							

AET_CORP 18-02412.GPJ AET_CORP.GDT 2/20/07

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Figure 5

SUBSURFACE BORING LOG

AET JOB NO: 18-02412 LOG OF BORING NO. B-4

PROJECT: Philadelphia Street Bypass; Rapid City, South Dakota

SURFACE ELEVATION: 3257.0

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
1	**SANDY FAT CLAY** with gravel and cobbles, brown, dry, hard (CH)	Mixed Alluvium									
2											
3			35		2L	18					
4	**CLAYEY GRAVEL** with sand leanses and cobbles, brown, dry, very dense (GC)	Mixed Alluvium									
5			70		2L	18					
6											
7	**SANDY FAT CLAY** with gravel and cobbles, brown, moist, hard (CH)	Mixed Alluvium	31		2L	18					
8											
9							18	102			
10			37		2L	18					
11	**WEATHERED SHALE** gray to yellow, dry, very stiff to hard (Textural Classification) Fat Clay (CH)	Mowry Formation									
12											
13			29		2L	18					
14											
15			31		2L	18					
16											
	Bottom of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
15.0	4" FA	1/31/07	14:05			16'6"		None
BORING COMPLETED: 1/31/07								
CC: BT	CA: PB Rig: RC-1							

AET CORP 18-02412.GPJ AET_CORP.GDT 2/20/07

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Figure 6

SUBSURFACE BORING LOG

AET JOB NO: 18-02412 LOG OF BORING NO. B-5

PROJECT: Philadelphia Street Bypass; Rapid City, South Dakota

DEPTH IN FEET	SURFACE ELEVATION: 3232.0 MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
0	**TOPSOIL** Sandy Lean Clay with some gravel, dark brown, dry (CL)	Topsoil									
1	**SILTY SAND** fine grained, reddish brown, dry, loose (SM)	Mixed Alluvium									
2											
			10		2L	18					
3											
4											
5	**SANDY GRAVEL** with silt lenses, brown to tan, dry, dense (GP)	Coarse Alluvium	35		2L	18					
6							3	103			
7	**SANDY GRAVEL** with clay lenses, brown, very moist to wet, medium dense (GP)	Coarse Alluvium									
			19		2L	18					
8											
9				▽			6				
10											
			14		2L	18					
11											
	Bottom of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10.0	4" FA	1/31/07	14:50			9'6"		9.0
BORING COMPLETED:	1/31/07							
CC: BT	CA: PB Rig: RC-1							

AET CORP 18-02412.GPJ AET CORP.GDT 2/20/07

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UNIFIED SOIL CLASSIFICATION SYSTEM
ASTM Designations: D 2487, D2488

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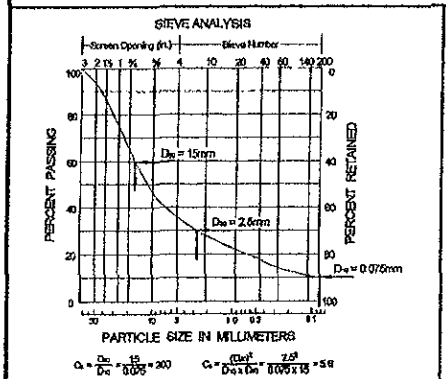
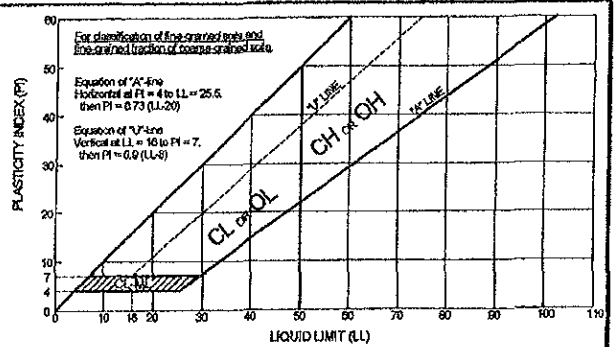
Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification: Group Symbol	Soil Classification: Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	Cu≥4 and 1≤Cc≤3[E]	GW	Well graded gravel[F]
			Cu<4 and/or 1>Cc>3[E]	GP	Poorly graded gravel[F]
		Gravels with Fines more than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	Cu≥6 and 1≤Cc≤3[E]	SW	Well-graded sand[I]
			Cu<6 and 1>Cc>3[E]	SP	Poorly-graded sand[I]
		Sands with Fines more than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve (see Plasticity Chart below)	Silts and Clays Liquid limit less than 50	inorganic	PI>7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI<4 or plots below "A" line[J]	ML	Silt[K,L,M]
		organic	Liquid limit–oven dried / Liquid limit – not dried <0.75	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		organic	Liquid limit–oven dried / Liquid limit – not dried <0.75	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
Highly organic soil			Primarily organic matter, dark in color, and organic in odor	PT	Peat[R]





Plasticity Chart

Notes

[A]Based on the material passing the 3-in (75-mm) sieve.

[B]If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C]Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D]Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E]$Cu = D_{60}/D_{10}$, $Cc = (D_{30})^2/D_{10} \times D_{60}$

[F]If soil contains ≥15% sand, add "with sand" to group name.

[G]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H]If fines are organic, add "with organic fines" to group name.

[I]If soil contains ≥15% gravel, add "with gravel" to group name.

[J]If Atterberg limits plot is hatched area, soils is a CL-ML silty clay.

[K]If soil contains 15 to 29% plus No. 200 add "with sand" or "with gravel", whichever is predominant.

[L]If soil contains ≥30% plus No. 200, predominantly sand, add "sandy" to group name.

[M]If soil contains ≥30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N]PI≥4 and plots on or above "A" line.

[O]PI<4 or plots below "A" line.

[P]PI plots on or above "A" line.

[Q]PI plots below "A" line.

[R]Fiber Content description shown below.

ADDITIONAL TERMINOLOGY NOTES USED BY AET FOR SOIL IDENTIFICATION AND DESCRIPTION

Grain Size

Term	Particle Size
Boulders	Over 12"
Cobbles	3" to 12"
Gravel	#4 sieve to 3"
Sand	#200 to #4 sieve
Fines (silt & clay)	Pass #200 sieve

Gravel Percentages

Term	Percent
A Little Gravel	3% - 14%
With Gravel	15% - 29%
Gravelly	30% - 50%

Consistency of Plastic Soils

Term	N-Value, BPF
Very Soft	less than 2
Soft	2 - 4
Firm	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	Greater than 30

Relative Density of Non-Plastic Soils

Term	N-Value, BPF
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	Greater than 50

Moisture/Frost Condition (MC Column)

D (Dry): Absence of moisture, dusty, dry to touch.

M (Moist): Damp, although free water not visible. Soil may still have a high water content (over "optimum").

W (Wet/ Waterbearing): Free water visible intended to describe non-plastic soils. Waterbearing usually relates to sands and sand with silt.

F (Frozen): Soil frozen

Layering Notes

Laminations. Layers less than ½" thick of differing material or color.

Lenses: Pockets or layers greater than ½" thick of differing material or color.

Fiber Content of Peat

Term	Fiber Content (Visual Estimate)
Fibric Peat:	Greater than 67%
Hemic Peat:	33 – 67%
Sapric Peat:	Less than 33%

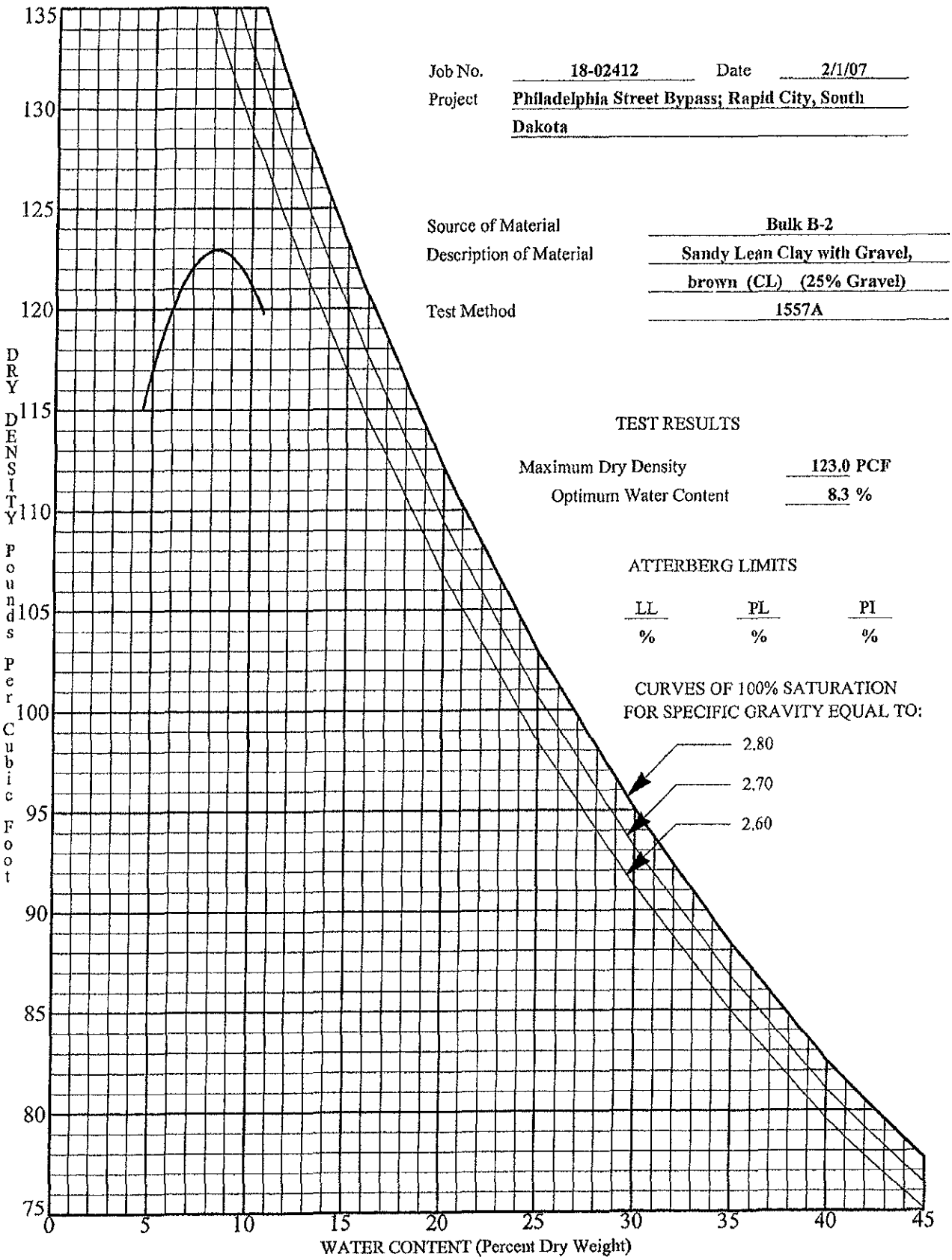
Organic/Roots Description (if no lab tests)

Soils are described as *organic*, if soil is not peat and is judged to have sufficient organic fines content to influence the soil properties. *Slightly organic* used for borderline cases.

With roots: Judged to have sufficient quantity of roots to influence the soil properties.

Trace roots: Small roots present, but not judged to be in sufficient quantity to significantly affect soil properties.

Figure 8



Job No. 18-02412 Date 2/1/07

Project Philadelphia Street Bypass; Rapid City, South Dakota

Source of Material: Bulk B-2

Description of Material: Sandy Lean Clay with Gravel, brown (CL) (25% Gravel)

Test Method: 1557A

TEST RESULTS

Maximum Dry Density: 123.0 PCF

Optimum Water Content: 8.3 %

ATTERBERG LIMITS

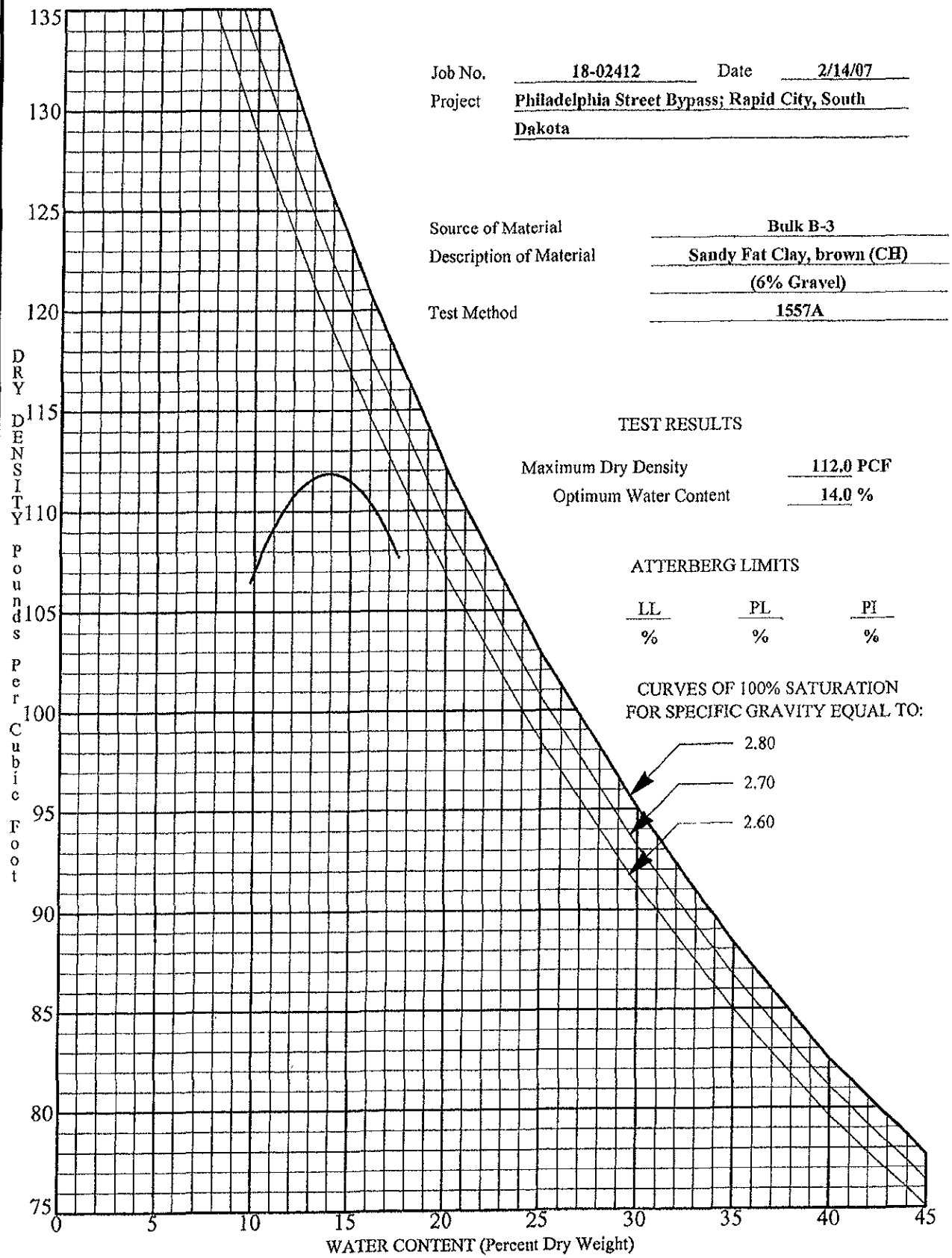
LL	PL	PI
%	%	%

CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

AMERICAN ENGINEERING TESTING, INC.

MOISTURE-DENSITY RELATIONSHIP

Figure 9



Job No. 18-02412 Date 2/14/07

Project Philadelphia Street Bypass; Rapid City, South Dakota

Source of Material: Bulk B-3

Description of Material: Sandy Fat Clay, brown (CH) (6% Gravel)

Test Method: 1557A

TEST RESULTS

Maximum Dry Density: 112.0 PCF

Optimum Water Content: 14.0 %

ATTERBERG LIMITS

LL	PL	PI
%	%	%

CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

2.80

2.70

2.60

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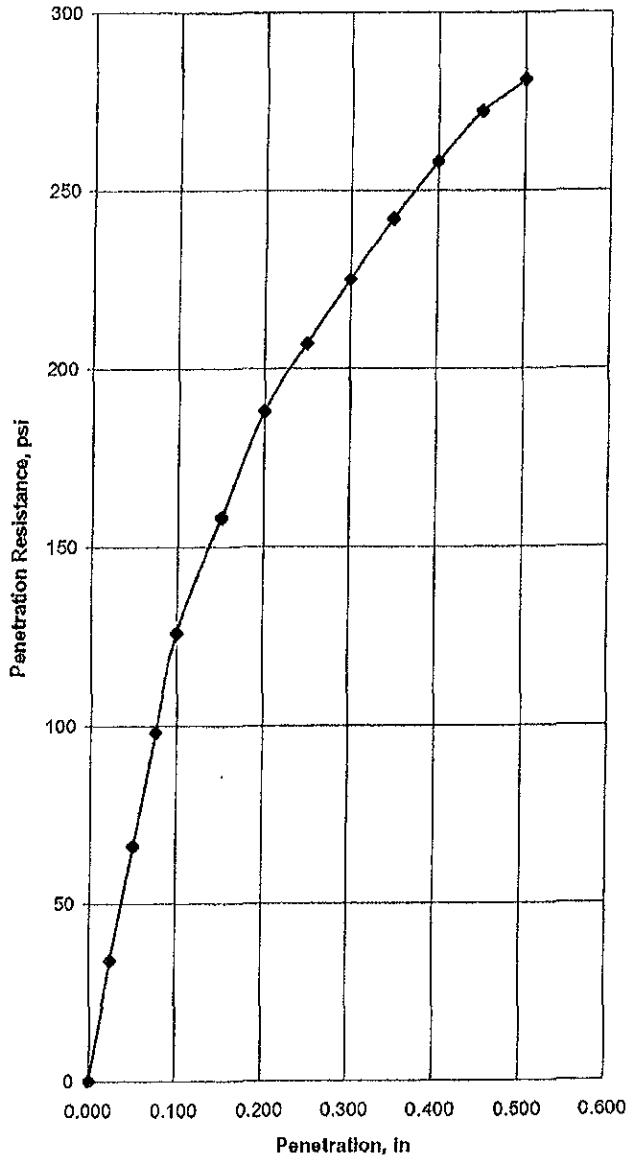
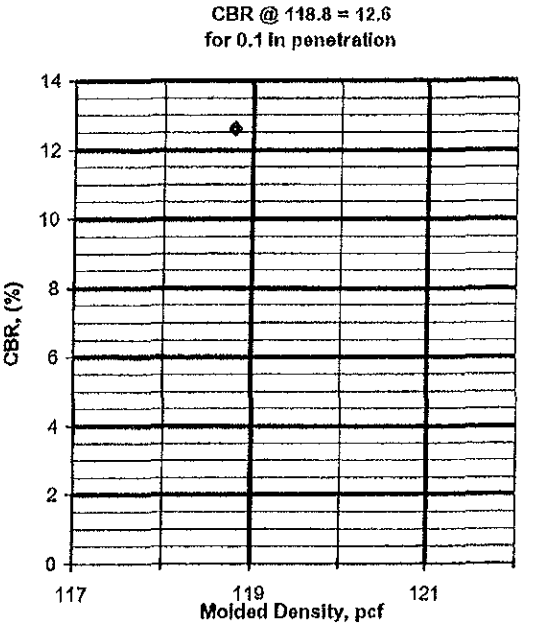
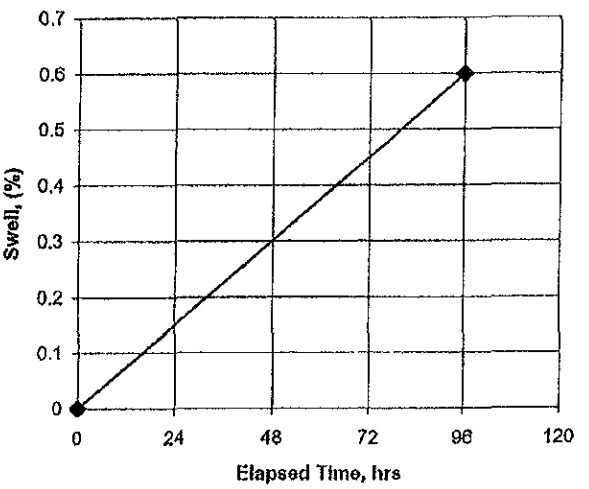
MOISTURE-DENSITY RELATIONSHIP







Molded			Soaked			CBR, (%)		Pen.	Swell
Dens.	% Max.	% Moisture	Dens.	% Max.	% Moisture	0.1 in	0.2 in	Surcharge	%
118.8	96.6	9.8	118.3	96	12.6	12.6	12.4	10	0.6
MATERIAL DESCRIPTION					USCS	Max. Dens.	Opt. Mois.	LL	PI
Sandy Lean Clay with Gravel					CL	123	8.3		

Project No: 18-02412 Boring B-2

Project: Philadelphia Street Bypass
Rapid City, South Dakota

Date: 2/16/2007

Test Descr. / Remarks

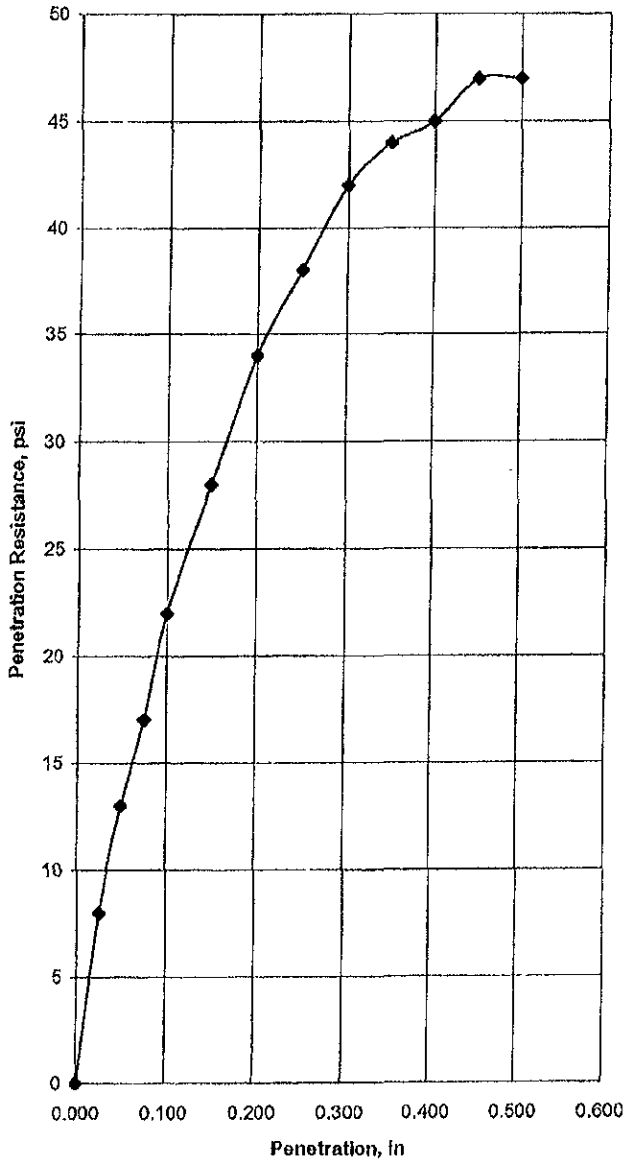
CBR By ASTM D: 1883

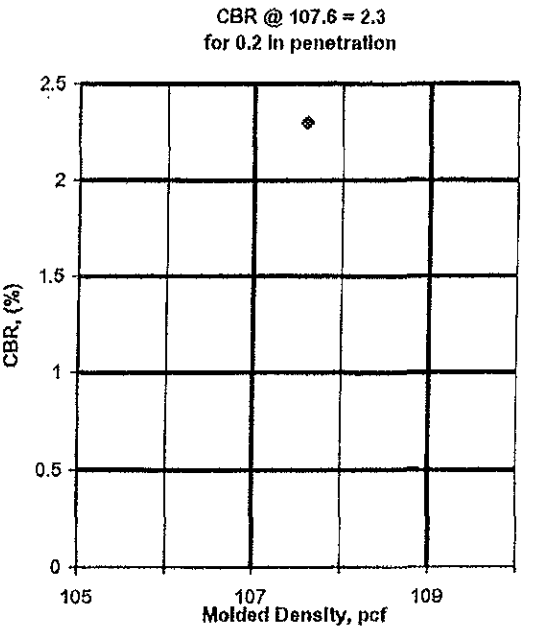
Proctor: ASTM-D 1557

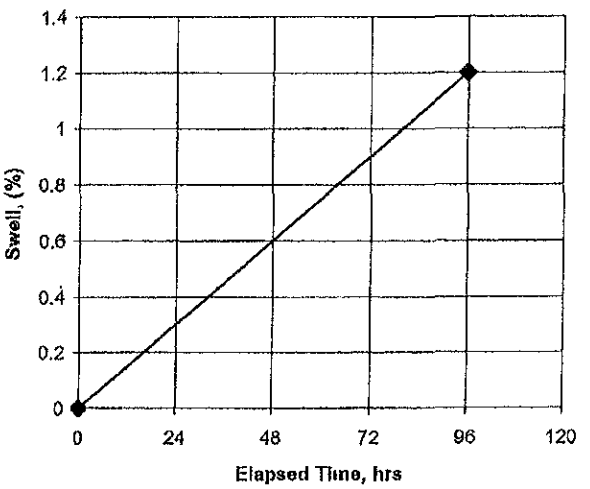
AMERICAN ENGINEERING TESTING, INC.

BEARING RATIO TEST REPORT

Figure 10







Molded			Soaked			CBR, (%)		Pen.	Swell
Dens.	% Max.	% Moisture	Dens.	% Max.	% Moisture	0.1 in	0.2 in	Surcharge	%
107.6	96.0	14.9	106.5	95	28.7	2.2	2.3	10	1.2
MATERIAL DESCRIPTION					USCS	Max. Dens.	Opt. Mois.	LL	PI
Sandy Fat Clay with Gravel					CH	112	14		

Project No: 18-02412 Boring B-3

Project: Philadelphia Street Bypass
Rapid City, South Dakota

Date: 2/16/2007

Test Descr. / Remarks

CBR By ASTM D: 1883

Proctor: ASTM-D 1557

AMERICAN ENGINEERING TESTING, INC.

BEARING RATIO TEST REPORT

Figure 11