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GEOTECHNICAL ENGINEERING STUDY

ALBUQUERQUE ARENA PROJECT
RAL AVENUE BETWEEN 1ST AND 2ND STREETS, N.W.
ALBUQUERQUE, NEW MEXICO

23 June 2004
AMEC Project No. 4-517-000073

GEOTECHNICAL ENGINEERING STUDY

ALBUQUERQUE ARENA PROJECT
CENTRAL AVENUE BETWEEN 1ST AND 2ND STREETS, N.W.
ALBUQUERQUE, NEW MEXICO

Submitted To:

Hunt Construction Company
416 N. 44th Street
Phoenix, Arizona 85008

Submitted By:

AMEC Earth & Environmental, Inc.
8519 Jefferson, N.E.
Albuquerque, New Mexico 87113

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23 June, 2004
AMEC Project No. 4-517-000073

Hunt Construction Company
416 N. 44th Street
Phoenix, Arizona 85008

Attention: Mr. Ronald Wildermuth

Ladies/Gentlemen:

RE: GEOTECHNICAL ENGINEERING STUDY
ALBUQUERQUE ARENA PROJECT
CENTRAL AVENUE BETWEEN 1st AND 2nd STREETS, N.W.
ALBUQUERQUE, NEW MEXICO

Our Geotechnical Engineering Study Report on the referenced project is enclosed. The report includes the results of test drilling, laboratory analyses and recommended criteria for foundation design, slab support and paving.

Should any questions arise concerning this report, we would be pleased to discuss them with you.

Respectfully submitted,

AMEC Earth & Environmental, Inc.

RALPH E. CROCKETT NEW MEXICO #10867 REGISTERED PROFESSIONAL ENGINEER

Ralph E. Crockett, P.E.
Geotechnical Engineering Manager

Reviewed by:

John C. Lommler, Ph.D., P.E.
Principal Geotechnical Engineer

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Hunt Construction Company
Albuquerque Arena Project
Central Avenue between 1st and 2nd Streets, N.W.
Albuquerque, New Mexico
AMEC Project No. 4-517-000073
23 June 2004

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1.0 INTRODUCTION

This report is submitted pursuant to a geotechnical engineering study made by this firm of the site of the proposed Albuquerque Arena Facility located on Central Avenue between 1st and 2nd Streets in Albuquerque, New Mexico. The object of this study was to evaluate the physical properties of the subsoils underlying the site to provide recommendations for foundation design, slab support, paving and related earthwork.

2.0 PROPOSED CONSTRUCTION

We understand that the project consists of an arena approximately two-stories high, approximately 200,000 square feet in plan area on a full city block in downtown Albuquerque. The base of the arena will be depressed approximately 20 feet below existing grade. Column loads are not likely to exceed 500 kips and wall loads will be relatively light.

3.0 INVESTIGATION

3.1 SUBSURFACE EXPLORATION

A total of eight (8) exploratory borings were drilled to depths of between 45 and 60 feet below existing grade utilizing a truck-mounted CME-75 drill rig equipped with 8-1/2" O.D. hollow stem auger. Standard penetration testing and open-end drive sampling were performed at selected intervals in the borings. During test drilling, the soils encountered were continuously examined, visually classified, and logged.

Results of the field study are presented in Appendix A, which includes a brief description of drilling and sampling equipment and procedures, a site plan showing the boring locations, and logs of the test borings.

3.2 LABORATORY ANALYSIS

Moisture content determinations were made on all samples recovered above the groundwater table, while dry densities were determined for selected 2.42-inch open-end drive samples. The results of these tests are shown on the boring logs.

Grain-size analysis (Sieves) and Atterberg limits tests (P.I.'s) were performed on selected samples to aid in soil classification. In addition, direct shear tests were performed on selected samples. The results of these tests are presented in Appendix B, along with a brief description of soil mechanics testing procedures.

4.0 SITE CONDITIONS & SOIL PROFILE

4.1 SITE CONDITIONS

At the time of the field investigation, the property was developed as two separate parking lots. First Street merges with Copper Avenue near the center of the property, creating the appearance of a single street running northwest to southeast. The eastern parking lot has a gravel surface with trees along the perimeter. The lot has a gentle slope to the southwest, and ends at a retaining wall running parallel to First Street. The wall is about 10 feet in height on the south end near the railroad, and tapers in height as it progresses to the northwest. The western parking lot has been paved with asphalt, and is relatively flat. Trees are planted around the perimeter of this lot, similar to the eastern parking lot.

4.2 GEOTECHNICAL PROFILE

As indicated by the exploratory borings, the geotechnical profile at the arena site consists of a surficial layer of sandy fill soils underlain generally by sands and silty sands with a distinct clay layer encountered between 20 and 30 feet below existing grade. The sandy fill soils, encountered in Boring No. B-1, B-2, B-3, B-4 and B7 from the surface to between 5 and 12 feet below exiting grade, were predominantly fine to medium grained, contain some fine gravel, brick and coal fragments, are nonplastic and discolored brown to black. The native sand soils are relatively clean to silty or clayey, are generally fine to medium grained and nonplastic to low plastic. These soils are loose to medium dense near the surface, becoming dense to very dense from 30 to 35 feet below grade. The clay contains varying amounts of sand, is of medium to high plasticity and is generally soft.

4.3 SOIL MOISTURE & GROUNDWATER CONDITIONS

Free groundwater was encountered throughout the project site at depths ranging between 40 and 50 feet below existing grade. Soil moisture contents above the water table were generally low to moderate, ranging between extremes of 1 percent and 47 percent. Most soils encountered had moisture contents ranging between 4 and 12 percent. A moist to wet clayey zone was encountered in most of the borings at depths of between 20 and 30 feet below existing grades.

5.0 DISCUSSION & RECOMMENDATIONS

5.1 ANALYSIS OF RESULTS

Spread-type foundations are not considered a viable alternative for the arena structure because the soils at the proposed foundation elevations are considered too weak to support the proposed structural loads involved (up to 500 kips on columns). Mat-type foundations could be used for support of the structure. However, due to the various floor (seating) elevations, mat-type foundations would probably not be the most economical foundation system.

A deep foundation system is the preferred system for the structure. Since groundwater is within 20 feet of the proposed lower floor elevation, drilled pier systems do not appear feasible without casings or slurry assisted drilling techniques. Therefore, an auger cast pile foundation system is recommended for the structure.

Detailed recommendations for auger cast pile foundations are presented in the following sections of this report.

5.2 AUGERCAST PILES

5.2.1 Pile Capacity

Based on the anticipated loads, auger cast pile foundations are recommended for the support of the structure. Safe downward capacities for 12 through 24-inch diameter piles are presented in the design tables in Appendix C.

The tables show the relationship between safe downward capacities versus length of pile. The minimum recommended depth of auger cast pile foundations is 20 feet below final floor elevations. The estimated capacities apply to full dead plus realistic live loads (i.e. service loads) and can be safely increased by one-third for total loads including wind or seismic forces. They apply to the allowable soil supporting capacities and do not consider the structural strength of the piles. A minimum spacing of 8 pile diameters, center to center, should be maintained to achieve the pile capacities specified herein.

Auger cast piles could be used to resist uplift forces included in design of the proposed structure. The safe uplift capacities for 12 through 24-inch diameter piles are also presented in Appendix C.

A factor of safety of 3.0 was used in determining the capacities. The safety factor may be reduced if pile load tests are performed at the site prior to construction.

Maximum settlements of pile foundations designed in accordance with criteria presented herein are estimated not to exceed 1/4 inch for service loadings. However, we recommend the test piles be installed and load tests performed prior to actual construction to more specifically determine pile capacities and settlements.

5.2.2 Lateral Pile Loads

Lateral load analysis of piles can be evaluated using the computer program "LPILE and GROUP", developed by L.C. Reese. These programs are based on the computation procedure used by COM624G, a lateral load analysis code developed by Reese (1984) for FHWA. These programs estimate lateral displacement behavior of single piles and groups of piles using a finite difference technique based on elastic beam column theory. Lateral load analyses can be performed when specific pile alternatives are established.

5.2.3 Construction Considerations

Installation of piling by the augercast method involves pumping of cement mortar (grout) through a hollow stem auger as the auger is slowly withdrawn, without rotation. The following procedures should be used to verify proper installation of the piles.

1. Careful measurements should be made to verify that piles are advanced to recommended depths.

2. Grout injection pressure should be maintained within the limits of 140 and 250 psi. These pressures should be checked by observation of the pressure gauge and pumping rate.

3. Grout flow should be maintained in the range of 13 to 15 seconds, as tested in general accordance with Corps of Engineers test method CRD-C-79-77, provided a 3/4 inch opening is substituted for the 2 inch opening.

4. The grout mix should be tested by making one set (six cubes) of 2 inch x 2 inch cubes for every sixth augercast pile placed. A set of cubes should consist of two cubes to be tested at 28 days, and two for other testing as required. Test cubes should be made and tested in accordance with ASTM C109.

5. Comparison should be made between the volume of grout expended and the theoretical volume of the pile. The actual volume of grout should be at least 10 percent greater than the theoretical neat volume for each pile. A grout reservoir should be used which enables physical measurement of the volume of grout used for each pile.

6. Auger cuttings should be continuously examined by the geotechnical engineer to evaluate soil conditions as compared to those presented in this report.

7. A period of 24 hours should pass before the construction of adjacent piles which are closer than eight pile diameters.

5.2.4 Inspection & Construction

Continuous inspection of the construction of augercast piles should be carried out by the geotechnical engineer. The inspector should verify proper depth and should also verify the nature of the subsurface materials encountered in the pile excavations. Grout placement should be continuously observed by the inspector to insure that it meets requirements.

5.3 Spread-Type Footings

5.3.1 Design Criteria for Downward Loads

Shallow, spread-type footings bearing at uniform depths below finished grade, in conjunction with the recommended site preparation and moisture protection of the supporting soils, can be used for support of lightly loaded walls and auxiliary structures. For purposes of this report, lightly loaded structures should generally be defined as structures having column and wall loads not exceeding 70 kips and 2.0 kips per lineal foot, respectively. A safe soil bearing pressure of 2,000 psf is recommended for the design a shallow spread-type footings bearing on a minimum thickness of 3.0 feet of structural fill. Structural fill should also extend a minimum of 3.0 feet laterally from footing perimeters. Minimum depths of footings should be 2.0 feet below lowest adjacent grade for perimeter footings and 1.5 feet below finished floor slab elevation for interior footings. Two feet and 1.33 feet are the minimum recommended widths of square and continuous footings, respectively.

The bearing pressure recommended above applies to full dead plus realistic live loads and can be safely increased by one-third for total loads, including wind or seismic forces.

5.3.2 Settlements

Vertical movements of spread-type footings designed as recommended above are estimated not to exceed 3/4 inch for the moisture contents of the native soils encountered during test drilling or compaction moisture contents introduced during construction. Differential movements are expected to be less than 75 percent of the total settlement. Significant moisture increases above these contents could create additional movements.

In order to minimize the sensitivity of structures to differential settlements, footings and stem walls should be reinforced to allow for a degree of load redistribution should a localized zone of supporting soils become saturated. Stem walls should be positively separated from slabs by use of expansion joint material. Slabs should not bear directly upon stem walls. Structures bearing on spread-type footings should also be positively separated from structures which are supported on pile foundations.

5.4 SITE GRADING & SLAB SUPPORT

With special surface treatment, the near surface native soils can be prepared to provide reliable slab support. However, all existing fill soils should be removed from beneath floor slabs.

The recommended surface treatment for shallow floor slabs consists of scarifying to a depth of 12 inches, prewetting, and vibratory compaction of the surface prior to fill placement in areas of the site used to support slab-on-grade floors. The site should then be brought up to finished grade with properly compacted structural fill. Cut sections should also be treated as described above after excavation to near finished grade. Detailed recommendations for site grading are presented in Appendix C.

Floor slabs to be located at depths of 20 feet or more below existing grade (soft clay zone) should be supported on a minimum of 3.0 foot of structural fill.

Heavily loaded concrete slabs cast directly on compacted granular subgrade soils should be designed using a modulus of subgrade reaction (k) of 200 pci. This value can be increased to 300 pci provided a minimum of 6 inches of compacted granular base is placed beneath the slab.

Provided site grading is carried out as recommended, the subgrade will provide adequate support for lightly loaded slab-on-grade floors so that granular base is not required for additional support. However, should it be desired as a working surface, granular base can be placed beneath the floor slabs.

Where used, the granular base should meet the following gradation requirements as determined in accordance with ASTM C136.

Sieve Size (Square Openings)	Percent Passing by Dry Weight
1 inch	100
3/4 inch	85-100
No. 4	45-95
No. 200	0-8

The granular base should have a plasticity index of no greater than 3 when tested in accordance with ASTM D4318. The coarse aggregate should have a percent of wear, when subjected to the Los Angeles abrasion test (ASTM C131), of no greater than 50. Granular base should be compacted to at least 95 percent of ASTM D1557 maximum dry density.

Granular base will tend to act as a positive capillary break against the rise of moisture to the slabs. If the moisture sensitivity of floor coverings are used over the slabs, an impervious membrane vapor barrier should be placed beneath floor slabs. In order to minimize differential shrinkage cracking of slabs, a 2-inch layer of clean sand should be placed between the vapor barrier and the slabs.

5.5 LATERAL LOADS

Earth pressures against subgrade walls will depend upon their degree of restraint and should be established for design on the basis of the following criteria. Rigid, absolutely restrained, walls would be subjected to earth pressures represented by a hydrostatic load diagram of about 55 pounds per square foot per foot of depth (the "at-rest" earth pressure imposed by backfill material). Rotation or lateral translation of the walls equal to about 0.001 times the height would reduce earth pressures to the "active" state of about 35 pounds per square foot per foot of depth.

The above recommendations apply to retaining walls with horizontal, non-saturated, backfill. Earth pressures for walls with sloping backfill, backfill with hydrostatic pressures, or surcharge loadings adjacent to retaining walls can be provided on a case by case basis by this firm as required.

The passive soils resistance against grade beams and below grade walls, with properly compacted backfill, should be considered as being equal to forces exerted by a fluid of 250 pounds per cubic foot unit weight. A coefficient of friction of 0.30 is recommended for computing the lateral resistance between the basis of slabs and the soils in analyzing lateral loads.

5.6 PAVING

On-site pavement for the project may consist of asphaltic concrete placed directly on compacted subgrade. It is recommended that the pavement should have a minimum thickness of 3.0 inches for all light truck and automobile traffic, and 5.5 inches for any areas subjected to a significant number of coverages of heavy truck traffic. An alternative to the previous section is 4.0 inches of aggregate base course placed directly on prepared subgrade, overlain by 2.0 inches of asphaltic concrete for light traffic areas, and 6.0 inches of aggregate base course under 4.0 inches of asphaltic concrete pavement for heavy truck traffic.

Asphaltic concrete materials quality and construction requirements should conform to Section 401 of current New Mexico State Department of Transportation (NMDOT) Standard Specifications for Road and Bridge Construction. The mineral aggregate should comply with Grading B and Type II requirements. A job mix formula should be established using the Marshall method of mix design, with the stability and flow being determined in accordance with ASTM D1559. Minimum stability should be 1,800 pounds. The bituminous material and aggregate proposed for used in construction by the contractor should be used in the mix design.

If used, the aggregate base course material should meet the following gradation requirements when tested in accordance with the ASTM C136 test method.

Sieve Size (Square Openings)	Percent Passing by Weight
1 inch	100
3/4 inch	85-100
No. 4	45-95
No. 10	30-55
No. 200	0-8

The base course material should have a plasticity index of no greater than 3 when tested in accordance with ASTM D4318. The aggregate should have a percent of wear of no greater than 50 when tested in accordance with the ASTM D131 test method. All base course material should be compacted to at least 95 percent of ASTM D1557 maximum dry density or at least 70 percent of ASTM D4253 maximum relative density, as applicable.

5.7 SITE DRAINAGE & MOISTURE PROTECTION

Positive site drainage should be provided during construction and maintained thereafter. Where pavements or slabs do not immediately adjoin structure, the ground surface should be sloped away from the structure in a manner to allow flow along the drainage lines at a minimum grade of 5 percent to points at least 15.0 feet away from building perimeter. Positive drainage should be provided from these points to streets or natural water courses.

Roof runoff should be conveyed away from structure by nonerosive devises at the ground surface. In no case should long-term ponding of water be allowed around the perimeter of structure. The possibility of moisture infiltration beneath structure, in the event of plumbing leaks, should be considered in the design and inspection of underground water and sewer conduits.

5.8 EARTHQUAKE DESIGN PARAMETERS

The site is located in the Rio Grande Rift, a region of moderate seismic activity. Both geologic evidence and seismic history of the region influencing the site indicate that many of the boundary faults of the Rio Grande Rift must be considered active in an engineering sense.

Evaluations by Sanford and others (1972) reached the conclusion that an earthquake of Richter magnitude (M_L) 6.0 at a 100-year recurrence interval is a reasonable assumption for the entire Rio Grande Rift.

Evaluation by this firm, of the Sandia-Rincon-San Francisco fault system (SHB, 1981), which forms the front of the Sandia uplift block, indicates Holocene activity as evidenced by fresh to moderately subdued fault scarps. This fault system is approximately 10 miles east of the site. Approximately four miles of fault trace exhibits Holocene movement. The total length of this fault system is in excess of 46 miles. Using the half fault length of 23 miles in the empirical relationship of fault length to earthquake magnitude presented by Slemmons (1977), the Sandia system may be capable of generating a maximum credible earthquake (M_L) of 7.0 magnitude. The attenuation relationships summarized by Donovan ad Bornstein (1978) indicate a magnitude of 7.0 event at a distance of three miles could produce peak on-site accelerations (A_a) of between 0.2g and 0.5g.

Regional seismic zonation of the area of the site has been made by various investigators. In these studies, contours of effective peak horizontal ground acceleration (A_a) were estimated for the region around the site. These studies are based on both the seismic history and a general appraisal of regional faulting and tectonics. The following summarizes these estimates:

EPA	Reference	Remarks
0.05g	Algermissen and others (1982)	90 percent probability of not being exceeded in 10 years.
0.10g	Algermissen and others (1982)	90 percent probability of not being exceeded in 50 years.
0.40g	Algermissen and others (1982)	90 percent probability of not being exceeded in 250 years.
0.70g	Applied Technology Council (1981)	90 percent probability of not being exceeded in 500 years.

Blume and Associates (1972) recommended an A_a of 0.20g for general design of the Veterans Administration Hospital in Albuquerque, while the I-40/I-25 "Big I" interchange in Albuqurque was designed for a maximum acceleration of 0.216g.

Using the 2003 International Building Code (IBC) and a Site Classification E for the site geotechnical profile, the Maximum Considered Earthquake Spectral Response Accelerations for short periods (S_{MS}) is 90.4. The Maximum Considered Earthquake Spectral Response Accelerations for a 1-second period (S_{MI}) is 59.8. Detailed calculation sheets are presented in Appendix E.

5.9 CONSTRUCTION SLOPES

To maintain stability and minimize erosion, cut slopes greater than 4 and less than 20 feet in depth should be designed and constructed at maximum 2:1 (horizontal:vertical) side slopes. Excavations extending 20 or more feet below grade will require sloping and retaining design by a registered engineer. All trench excavation procedures should adhere to local, state and federal regulations including those established by OSHA. Earthwork required for this project can be performed using standard earthmoving equipment.

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APPENDIX A

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APPENDIX A

Test Drilling Equipment & Procedures

Unified Soil Classification

Terminology Used to Describe the Relative Density, Consistency or Firmness of Soils

Site Plan

Logs of Test Borings

TEST DRILLING EQUIPMENT & PROCEDURES

Drilling Equipment - Truck-mounted drill rigs powered with gasoline or diesel engines are used in advancing test borings. Drilling through soil or softer rock is performed with hollow-stem auger or continuous flight auger. Carbide insert teeth are normally used on the auger bits so they can often penetrate rock or very strongly cemented soils which require blasting or very heavy equipment for excavation. Where refusal is experienced in auger drilling, the holes are sometimes advanced with tricone gear bits and NX rods using water or air as a drilling fluid.

Sampling Procedures - Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D1586 procedures. In most cases, 2-inch O.D., 1-3/8-inch I.D. samplers are used to obtain the standard penetration resistance. "Undisturbed" samples of firmer soils are often obtained with 3-inch O.D. samplers lined with 2.42-inch I.D. brass rings. The driving energy is generally recorded as the number of blows of a 140-pound, 30-inch free-fall drop hammer required to advance the samplers in 6-inch increments. However, in stratified soils, driving resistance is sometimes recorded in 2 or 3-inch increments so that soil changes and the presence of scattered gravel or cemented layers can be readily detected and the realistic penetration values obtained for consideration in design. These values are expressed in blows per foot on the logs. "Undisturbed" sampling of softer soils is sometimes performed with thin-walled Shelby tubes (ASTM D1587). Where samples of rock are required, they are obtained by NX diamond core drilling (ASTM D2113). Tube samples are labeled and placed in water-tight containers to maintain field moisture contents for testing. When necessary for testing, larger bulk samples are taken from auger cuttings.

Continuous Penetration Tests - Continuous penetration tests are performed by driving a 2-inch O.D. blunt nosed penetrometer adjacent to or in the bottom of borings. The penetrometer is attached to 1-5/8-inch O.D. drill rods to provide clearance to minimize side friction so that penetration values are as nearly as possible a measure of end resistance. Penetration values are recorded as the number of blows of a 140-pound, 30-inch free-fall drop hammer required to advance the penetrometer in one-foot increments or less.

Boring Records - Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares boring logs. Soils are visually classified in accordance with the Unified Soil Classification System (ASTM D2487), with appropriate group symbols being shown on the logs.

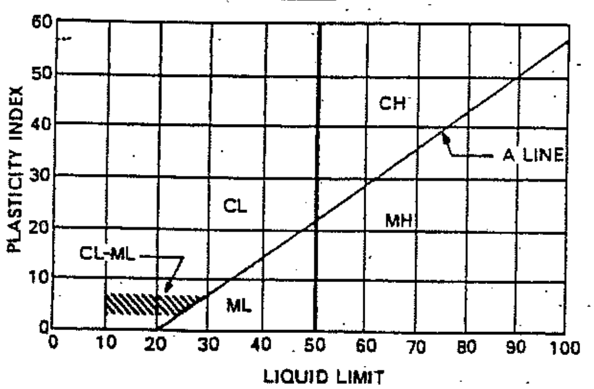
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the United Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-66T.

MAJOR DIVISIONS				GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVEL (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, OR SAND-GRAVEL-COBBLE MIXTURES
					GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, OR SAND-GRAVEL-COBBLE MIXTURES
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			Limits plot below "A" line & hatched zone on plasticity chart		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)			SW	WELL-GRADED SANDS, GRAVELLY SANDS
					SP	POORLY-GRADED SANDS, GRAVELLY SANDS
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		SM	SILTY SANDS, SAND - SILT MIXTURES
			Limits plot below "A" line & hatched zone on plasticity chart		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS (LIMITS PLOT BELOW "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)			ML	INORGANIC SILTS, CLAYEY SILTS WITH SLIGHT PLASTICITY
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)			MH	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	CLAYS (LIMITS PLOT BELOW "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS, SANDY CLAYS OF HIGH PLASTICITY.

Note: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.

PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to 3/4 in.
Fine gravel	3/4 in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve

TERMINOLOGY USED TO DESCRIBE THE RELATIVE DENSITY, CONSISTENCY OR FIRMNESS OF SOILS

The terminology used on the boring logs to describe the relative density, consistency or firmness of soils relative to the standard penetration resistance is presented below. The standard penetration resistance (N) in blows per foot is obtained by ASTM D1586 procedure using 2" O.D., 1-3/8" I.D. samplers.

1. Relative Density Terms for description of relative density of cohensionless, uncemented sands and sand-gravel mixtures.

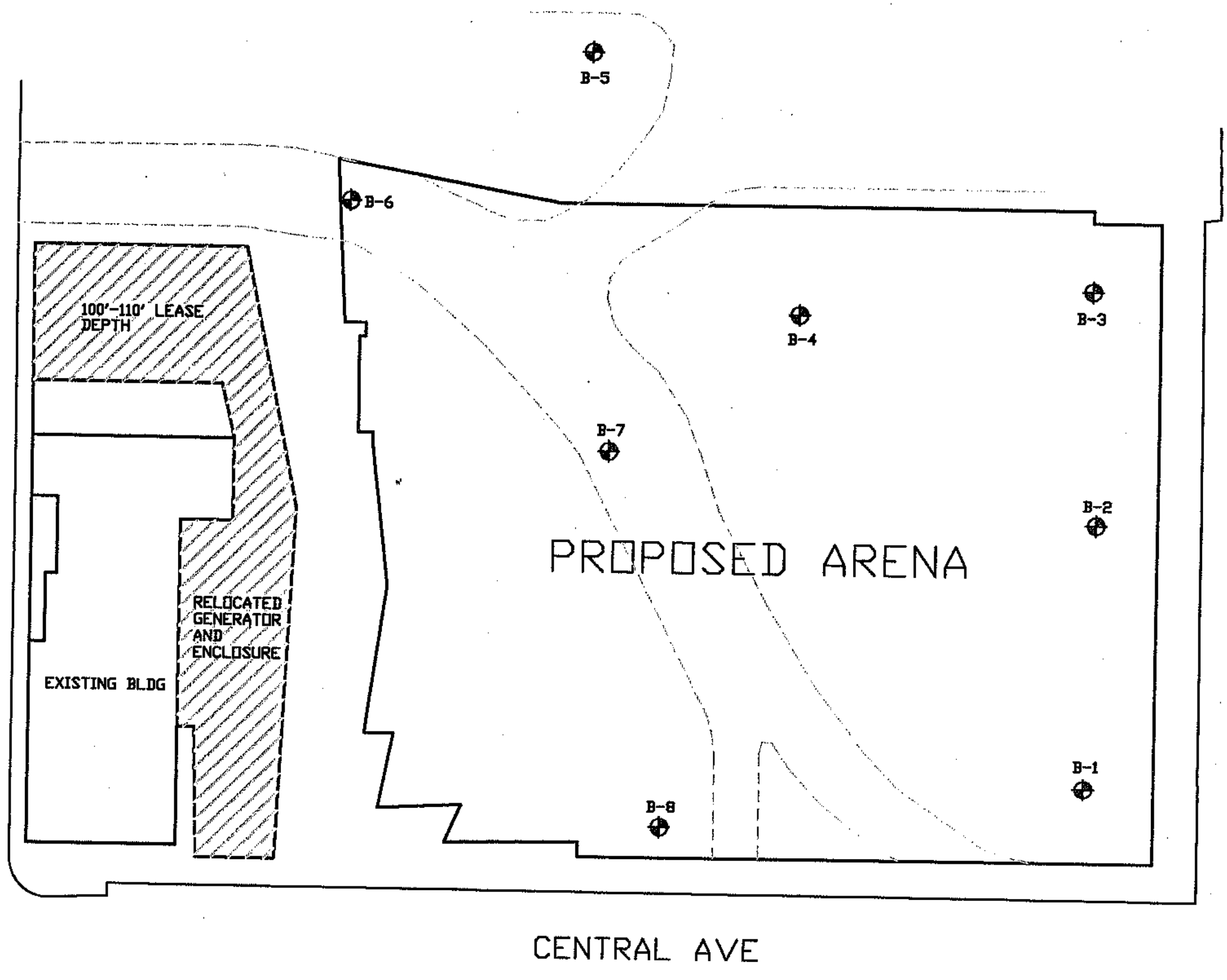
N	Relative Density
0-4	Very loose
5-10	Loose
11-30	Medium dense
31-50	Dense
50+	Very dense

2. Relative Consistency Terms for the description of clays which are saturated or near saturation.

N	Relative Consistency	Remarks
0-2	Very Soft	Easily penetrated several inches with fist
3-4	Soft	Easily penetrated several inches with thumb
5-8	Medium stiff	Can be penetrated several inches with thumb with moderate effort
9-15	Stiff	Readily indented with thumb, but penetrated only with great effort
16-30	Very stiff	Readily indented with thumbnail
30+	Hard	Indented only with difficulty by thumbnail

3. Relative Firmness Terms for the description of partially saturated and/or cemented soils which commonly occur in the Southwest including clays, cemented granular materials, silts and silty and clayey granular soils:

N	Relative Density
0-4	Very soft
5-8	Soft
9-15	Moderately firm
16-30	Firm
31-50	Very firm
50+	Hard



LEGEND
⊕ Boring Location

Albuquerque Arena Project Albuquerque, New Mexico AMEC Project No. 4-517-000073	amec 8519 Jefferson NE Albuquerque, New Mexico 87113	**Site Plan** Date Drawn: June 21, 2004 · Drawn By: EDT · Checked By: REC	Figure No. 1

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 DATE 5/20/04

LOG OF TEST BORING NO. B-1

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	19		6	SP	medium dense to very loose	FILL: **SAND**, predominantly fine to medium grained, some fine gravel, nonplastic, brown, with black-gray, brick-coal fragments
				S	22		8			
5				S	3		9			note: discoloration, gray/black, distinct diesel fuel odor at 5'
10				S	13		11	SC-SM	medium dense to very loose	**SILTY CLAYEY SAND**, fine grained, trace fine gravel, nonplastic, slightly gray, black stained
15				U	50/10"	103	9			note: diesel fuel odor at 15'
20				S	3		8			
25				U	14 no rec					
								CL	moderately firm	**CLAY**, medium to high plasticity, dark brown note: faint fuel odor
30				U	50	113	17			
								SP-SM	dense	**SILTY GRAVELLY SAND**, predominantly fine to medium grained, subrounded gravel to 3/4", nonplastic, gray-light brown note: continuous fuel odor from 30'
35				S	38		2			
40				S	33		2			
▽ 45				S	64			GP	very dense	**GRAVEL**, with sand, poorly graded, subrounded-rounded, nonplastic, light brown
50										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	45.0	12:00	5/20/04
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

amec

GEOTECH_BH 4517-073.GPJ AGRA_ALB.GDT 6/23/04

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 DATE 5/20/04

LOG OF TEST BORING NO. B-1

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50				S	45			SP	dense to very dense	**SAND,** predominantly medium to coarse, some fine gravel, nonplastic, light brown
55				S	75					medium to fine sand, no gravel at 55'
60				U	50/5"	113		SM	dense to very dense	**SILTY SAND,** fine grained, nonplastic, brown
65				S	39					
70				S	50/5"					
75				S	93/6"					
80				S	50/6"					
										Stopped auger @ 80' Stopped sampler @ 81'
85										
90										
95										
100										

GROUNDWATER

	DEPTH	HOUR	DATE
∇	45.0	12:00	5/20/04
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

amec

GEOTECH_BH 4517-073.GPJ AGRA_ALB.GDT 6/23/04

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

LOG OF TEST BORING NO. B-2

JOB NO. 4-517-000073 **DATE** 5/20/04

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth In Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			X	S	34		15	SM	dense to medium dense	FILL: **SAND**, predominantly fine to medium, grained, trace fine gravel, nonplastic, brown
			X	S	32		7			note: black diesel fuel discoloration from 3'
5			X	S	20		8	SM	medium dense to dense	**SILTY SAND** with gravel to 3/4", predominantly fine to medium grained, nonplastic, gray
10				U	23	104	7			
15			X	S	36		5			
20				S	50/2"		6			
25			X	S	3		30	CL	very soft	**CLAY**, trace sand, medium to high plasticity, gray note: very strong fuel odor
								SP	very dense to medium dense	**GRAVELLY SAND**, predominantly medium to coarse grained, fine rounded gravel, nonplastic, gray
30			X	S	60		7			
35			X	S	29		3			note: angular fine to coarse gravel fragments from 35'
40				U	50	127	2			
45			X	S	50/6"		6			
										Stopped auger @ 45' Stopped sampler @ 46'
50										

GROUNDWATER

	DEPTH	HOUR	DATE
∇			
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

amec

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 DATE 5/24/04

LOG OF TEST BORING NO. B-3

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		S	24			SP	medium dense to dense	FILL: **SAND**, predominantly fine to medium, grained, nonplastic, occasional angular gravel, brown-black
		S	6		6			
5		S	61		4			
10		S	40		8			note: black at 10' 5" - 11"
						SM	loose	**SILTY SAND**, fine to medium grained, nonplastic, brown-black
15		S	7		8			
20		U	7		10			
25		S	7		34	CL	soft	**SANDY SILTY CLAY**, medium to high plasticity, brown
30		U	23 no rec					
35		A	43 no rec		5	SP	dense to very dense	**SAND**, with gravel, predominantly fine to medium grained, coarse rounded gravel, nonplastic, gray
40		S	50/5"		5			
45		S	52		3	GP	dense to very dense	**SANDY GRAVEL**, poorly graded, coarse to fine grained, subrounded-subangular, some angular cobble fragments, nonplastic, brown
∇ 50								

GROUNDWATER

	DEPTH	HOUR	DATE
∇	50.0	10:40	5/27/04
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

amec

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 DATE 5/24/04

LOG OF TEST BORING NO. B-3

LOCATION

RIG TYPE CME-75 Autohammer

BORING TYPE 8-1/2" O.D. Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth In Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			X	S	50					
55			X	S	28					
60			X	S	50/5"			SM	very dense	**SILTY SAND**, fine grained, nonplastic, light brown
65			X	S	50/6"					
70			X	S	80/10"					
75			X	S	85					
80			X	S	88/11"					
										Stopped auger @ 80' Stopped sampler @ 81' 5"
85										
90										
95										
100										

GROUNDWATER

	DEPTH	HOUR	DATE
∇	50.0	10:40	5/27/04
▼			

SAMPLE TYPE

A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

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PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 DATE 5/21/04

LOG OF TEST BORING NO. B-4

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			X	S	32		4	SP	dense to medium dense	FILL: **GRAVELLY SAND**, predominantly fine to medium grained, fine to coarse gravel, nonplastic, light brown
			X	S	15		3			
5			X	S	14		7			
								SP	medium dense	**SAND**, predominantly fine to medium grained trace silt, light brown-tan
10			X	S	13		1			
15			X	S	13		3			
20				U	7	84	35	CL	soft to firm	**CLAY**, medium plasticity, brown, moist
25			X	S	4		32			note: gray color change at 26'
30				U	27	90	20			grades to silty clay, medium to high plasticity, brown at 30'
								SP	medium dense	**SAND**, predominantly fine to medium, grained, trace gravel, nonplastic, gray-light brown
35			X	S	23		3			
40			X	S	91/11"		5	GP	very dense to dense	**GRAVEL**, with sand, poorly graded fine to coarse, subrounded to angular, grey
∇ 45			X	S	39					
50										

GEOTECH_BH 4517-073.GPJ AGRA_ALB.GDT 6/23/04

GROUNDWATER

	DEPTH	HOUR	DATE
∇	45.0	11:00	5/21/04
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

amec

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 **DATE** 5/21/04

LOG OF TEST BORING NO. B-4

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			X	S	38			SP	dense	**SAND**, predominantly fine to medium grained, trace rounded gravel, nonplastic, brown
55			X	S	85			SM	very dense	**SILTY SAND**, fine grained, nonplastic, brown
60			X	S	50/5"					
										Stopped auger @ 60' Stopped sampler @ 60' 11"
65										
70										
75										
80										
85										
90										
95										
100										

GROUNDWATER

	DEPTH	HOUR	DATE
∇	45.0	11:00	5/21/04
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

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GEOTECH_BH 4517-073.GPJ AGRA_ALB.GDT 6/23/04

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 DATE 5/26/04

LOG OF TEST BORING NO. B-5

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										Turf = 3"
			X	S	5		8	SM	loose	**SILTY SAND**, fine grained, nonplastic, brown, moist
			X	S	4		27	CH	very soft	**SANDY CLAY**, fine grained, medium, black-brown, moist
5			X	S	7		11	SP-SM	loose	**SAND** with silt, fine to medium grained, nonplastic, brown
10			X	S	44		6	SP	dense to medium dense	**SAND**, with gravel, predominantly medium to fine grained, nonplastic, brown note: Cobbles at 13'
15			X	S	20		4			note: grades fine to medium sand, occasional fine gravel, light brown at 15'
20			X	S	7		27	CH	soft	**SANDY CLAY**, medium to high plasticity, brown
25				U	7	75	45			note: gray, moist, high plasticity at 25'
30			X	S	24		5	SM	medium dense	**SILTY SAND**, fine grained, nonplastic, gray
35			X	S	88/9"		2	SP	very dense to dense	**SAND**, with gravel, predominantly fine to medium grained, nonplastic, light brown
40			X	S	38		9			
45 ∇			X	S	86					
50										

GROUNDWATER

	DEPTH	HOUR	DATE
∇	45.0	11:15	5/26/04
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

amec

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 DATE 5/26/04

LOG OF TEST BORING NO. B-5

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			X	S	56		15	SP	very dense to dense	**SAND**, with gravel, poorly graded, predominantly fine to medium grained, nonplastic, light brown, wet
55			X	S	75/11"			SM	very dense	**SAND**, trace of silt, fine to medium grained, nonplastic, light brown
60				U	50/10"	114				
65			X	S	90/9"					
70			X	S	50/5"					
75			X	S	50/6"					
80			X	S	50/5"					Stopped auger @ 80' Stopped sampler @ 80' 11"
85										
90										
95										
100										

GROUNDWATER

	DEPTH	HOUR	DATE
∇	45.0	11:15	5/26/04
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

amec

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 DATE 5/25/04

LOG OF TEST BORING NO. B-6

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										8" reinforced concrete no base course
			X	S	21		9	CL		SANDY CLAY, low to medium plasticity, brown
			X	S	7		11	SP-SM	firm	SILTY SAND, predominantly fine grained, low plasticity to nonplastic, brown
5			X	S	13		5		loose to medium dense	
10			X	S	23		5	SP	medium dense	SAND, some gravel, predominantly fine to medium grained, nonplastic, brown
15			X	S	16		3			
20			X	S	3		38	CL	very soft to moderately firm	SILTY CLAY, medium plasticity, brown, some caliche mottling
25				U	11 no rec					note: color change to gray at 25'
				U	17	88	32	SM	medium dense	SILTY SAND, fine grained, nonplastic, gray
30			X	S	27		4			
35			X	S	67/12"		23	SP	very dense to loose	SAND, predominantly fine to medium grained, nonplastic, light brown
▽ 40			X	S	8					
								SP	dense	GRAVELLY SAND, predominantly medium to coarse grained, gravel to 1", nonplastic, brown
45			X	S	48					
50										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	40.0	13:15	5/25/04
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

GEOTECH_BH 4517-073.GPJ AGRA_ALB.GDT 6/23/04

amec

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 DATE 5/25/04

LOG OF TEST BORING NO. B-6

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			X	S	50/6"			SP	very dense	**GRAVELLY SAND**, predominantly medium to coarse grained, gravel to 1", nonplastic, brown
55			X	S	88/9"			SM	very dense	**SILTY SAND**, fine grained, nonplastic, gray-brown
60			X	S	85/9"					
										Stopped auger @ 60' Stopped sampler @ 60' 3"
65										
70										
75										
80										
85										
90										
95										
100										

GEOTECH_BH 4517-073.GPJ AGRA_ALB.GDT 6/23/04

GROUNDWATER

	DEPTH	HOUR	DATE
∇	40.0	13:15	5/25/04
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

amec

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 **DATE** 5/25/04

LOG OF TEST BORING NO. B-7

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Sample Type	Blows/ft 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								Concrete = 8" No base course
		S	34		7	SM	medium dense	FILL: **SILTY SAND**, predominantly fine grained, nonplastic, light brown to brown
		S	11		8			
5		S	11		8			note: concrete at 5'
						SP	medium dense	**SAND**, predominantly fine to medium grained, nonplastic, light brown
10		S	14		4			
15		S	14		3	SW	medium dense	**SAND**, well graded, nonplastic, light brown-tan
20		U	11	100	20	ML	moderately firm	**CLAYEY SILT**, low plasticity, light brown-tan
						CH	soft	**CLAY**, high plasticity, gray, moist
25		S	5		44			
30		U	11		9	SP-SM	medium dense	**SAND**, some silt, predominantly fine grained, nonplastic, gray
35		S	85/9"		4	SP	very dense	**SAND** with gravel, predominantly medium to fine grained, nonplastic, brown
⊻ 40		S	25 no rec					
45		S	85			GP	very dense	**GRAVEL**, with sand, poorly predominantly fine, round, nonplastic, brown
50								

GEOTECH_BH 4517-073.GPJ AGRA_ALB.GDT 6/23/04

GROUNDWATER

	DEPTH	HOUR	DATE
⊻	40.0	10:30	5/24/04
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 DATE 5/25/04

LOG OF TEST BORING NO. B-7

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			X	S	50/6"			GP	very dense	**SANDY GRAVEL**, poorly graded, fine to coarse grained, nonplastic, brown, wet
								SM	very dense	**SILTY SAND**, fine grained, nonplastic, light brown
55			X	S	80/11.5"					
60			X	S	88/11"					
										Stopped auger @ 60' Stopped sampler @ 61' 5"
65										
70										
75										
80										
85										
90										
95										
100										

GEOTECH_BH 4517-073.GPJ AGRA_ALB.GDT 6/23/04

GROUNDWATER

	DEPTH	HOUR	DATE
∇	40.0	10:30	5/24/04
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

amec

PROJECT	Albuquerque Arena Project Albuquerque, New Mexico		
JOB NO.	4-517-000073	DATE	5/24/04

LOG OF TEST BORING NO. B-8

LOCATION

RIG TYPE CME-75 Autohammer

BORING TYPE 8-1/2" O.D. Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										4" Asphaltic Concrete 2" Base Course
				S	11		12	CL		**SANDY CLAY**, medium to high plasticity, brown to light brown
				S	10		21			
5				U	15	114	13			
								SW-SM	medium dense to loose	**SAND**, with silt well graded, nonplastic, light brown
10				S	10		3			note: occasional fine gravel at 10'
								SP	medium dense	**SAND**, predominantly fine to medium grained, nonplastic, light brown
15				S	14		3			
20				S	6		33	CH	soft	**CLAY**, high plasticity, brown
25				S	5		47			note: gray at 25'
30				U	27	100	4	SW-SM	medium dense	**SILTY SAND**, well graded, nonplastic, gray
35				S	24		7			
40				S	43		8	GP	dense	**SANDY GRAVEL**, predominantly fine, nonplastic, brown
45 ▽				S	60					
								SP	very dense	**SAND**, some gravel, predominantly fine to medium grained, nonplastic, brown
50										

GEOTECH_BH 4517-073.GPJ AGRA_ALB.GDT 6/23/04

GROUNDWATER

	DEPTH	HOUR	DATE
▽	45.0	10:35	5/24/04
▼			

SAMPLE TYPE

A-Auger cuttings; NR-No Recovery

S-2" O.D. 1.38" I.D. tube sample.

U-3" O.D. 2.42" I.D. tube sample.

T-3" O.D. thin-walled Shelby tube.

C CME Continuous Sample

amec

PROJECT Albuquerque Arena Project
Albuquerque, New Mexico

JOB NO. 4-517-000073 **DATE** 5/24/04

LOG OF TEST BORING NO. B-8

LOCATION
RIG TYPE CME-75 Autohammer
BORING TYPE 8-1/2" O.D. Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows/ft. 140 lb. 30" free-fall drop hammer	Dry Density lbs. per cubic foot	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			X	S	66			SM	very dense	**SILTY SAND**, fine grained, nonplastic, brown
60				U	50/5"	126		SP	very dense	**SAND**, predominantly fine to medium grained, nonplastic, brown
								ML	very dense	**SILTY SAND**, fine grained, nonplastic, light brown
65			X	S	90/9"					
70			X	S	90/8"					
75			X	S	85/11"					
80			X	S	50/3"					
										Stopped auger @ 80' Stopped sampler @ 80' 11"
85										
90										
95										
100										

GROUNDWATER

	DEPTH	HOUR	DATE
∇	45.0	10:35	5/24/04
▼			

SAMPLE TYPE
A-Auger cuttings; NR-No Recovery
S-2" O.D. 1.38" I.D. tube sample.
U-3" O.D. 2.42" I.D. tube sample.
T-3" O.D. thin-walled Shelby tube.
C CME Continuous Sample

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APPENDIX B

APPENDIX B

Laboratory Testing Procedures

Classification Test Data

Direct Shear Test Data

LABORATORY TESTING PROCEDURES

Consolidation Tests Soiltest or Clockhouse apparatus of the "floating-ring" type are employed for the one-dimensional consolidation tests. They are designed to receive one inch high, 2.5 inch O.D. brass liner rings with soil specimens as secured in the field. Procedures for the tests generally are those outlined in ASTM D2435. Loads are applied in several increments to the upper surface of the test specimen and the resulting deformations are recorded at selected time intervals for each increment. For soils which are essentially saturated, each increment of load is maintained until the deformation versus log of time curve indicates completion of primary consolidation. For partially saturated soils, each increment of load is maintained until the rate of deformation is equal or less than 1/10,000 inch per hour. Applied loads are such that each new increment is equal to the total previously applied loading. Porous stones are placed in contact with the top and bottom of the specimens to permit free addition or expulsion of water. For partially saturated soils, the tests are normally performed at in situ moisture conditions until consolidation is complete under stresses approximately equal to those which will be imposed by the combined overburden and foundation loads. The samples are then submerged to show the effect of moisture increase and the tests continued under higher loadings. Generally, the tests are continued to about twice the anticipated curve due to overburden and structural loads, with a rebound curve then being established by releasing loads.

Expansion Tests The same type of consolidometer apparatus described above is used in expansion testing. Undisturbed samples contained in brass liner rings are placed in the consolidometers, subjected to appropriate surcharge loads and submerged. The loads are maintained until the expansion versus log of time curve indicates the completion of "primary swell".

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Client:	Hunt Construction Group Inc. 426 N 44th Street, Suite 410 Phoenix, AZ 85008-	**Report Date:**	June 13, 2004
		Project #:	4-517-000073
Attention:	Mr. Ronald Wildermuth	**Work Order #:**	1
Project Name:	Albuquerque Arena Project Central between 1st & 2nd St. Albuquerque, NM	**Sampled By:**	
		Date Sampled:	

Sieve Analaysis (ASTM C117/C136)
Plasticity Index (ASTM D4318)
Soil Classification (ASTM D2487)

SOILS / AGGREGATES

Sample Location	Soil Class.	L.L.	P.I.	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4'	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	6"	12"	Lab Number
B-1 @ 15.0-15.8'	SC-SM	22	5	48	71		84			95		99		100											4-0685-005
B-1 @ 35.0-36.5'	SP-SM	NV	NP	5.3	9		25			51		64		86	91	100									4-0685-009
B-2 @ 5.0-6.5'	SM	NV	NP	14	25		53			74		79		86	90	100									4-0685-015
B-2 @ 40.0-41.0'	GW	NV	NP	1.5	3		12			24		32		44	52	68	89		100						4-0685-022
B-4 @ 10.0-11.5'	SP	NV	NP	1.7	6		41			91		97		99	99	100									4-0685-040
B-4 @ 20.0-21.0'	CL	46	21	99	99		99			100															4-0685-042
B-5 @ 5.0-6.5'	SP-SM	NV	NP	9.0	24		88			100															4-0685-053
B-5 @ 25.0-26.0'	CH	81	57	69	74		86			99		100													4-0685-057
B-5 @ 60.0-60.9'	SP	NV	NP	4.5	13		57			96		99		100											4-0685-063
B-6 @ 15.0-16.5'	SP	NV	NP	1.9	6		33			75		85		92	92	100									4-0685-068
B-6 @ 45.5-46.5'	SP	NV	NP	3.1	4		20			44		52		63	70	91	100								4-0685-075
B-7 @ 5.0-6.5'	SM	NV	NP	13	45		91			99		100													4-0685-079
B-7 @ 30.0-31.0'	SP-SM	NV	NP	5.9	13		44			95		98		99	100										4-0685-084

Reviewed By:____________________

Distribution: Client: ☑ File: ☑ Supplier: ☑ Other: Addressee (2)

AMEC Earth Environmental, Inc.
8519 Jefferson NE
Albuquerque, NM 87113
Tel 5058211801
Fax 5058217371

www.amec.com

PROJECT:	Albuquerque Arena
LOCATION:	Albuquerque, NM
MATERIAL:	CL
SAMPLE SOURCE:	B-4 20-21 ft
SAMPLE PREPARATION:	In Situ

amec

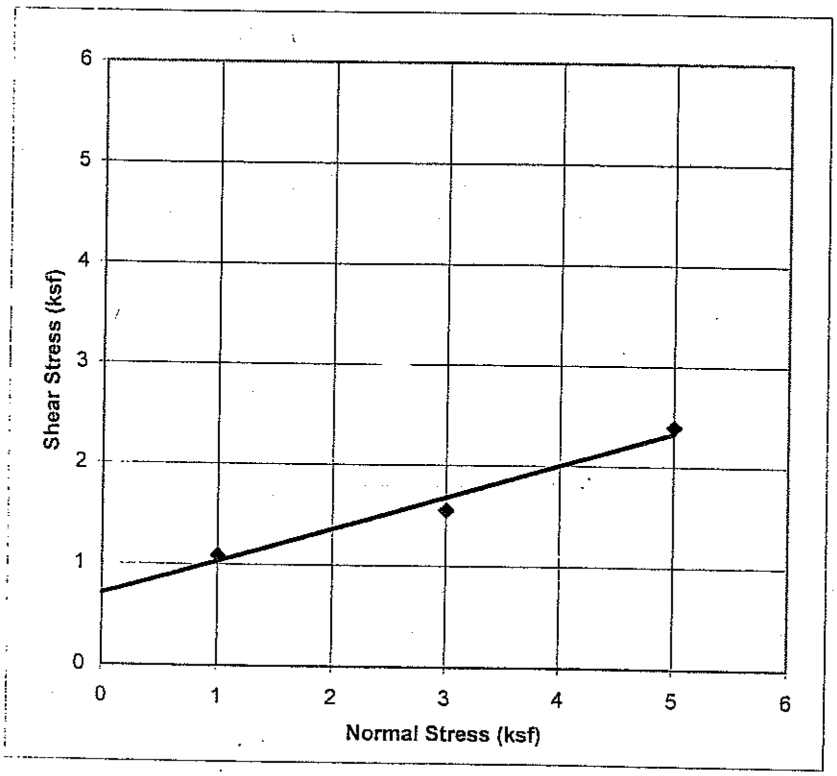
PROJECT NO:	4-517-000073
LAB NO:	4-0685-42
DATE SAMPLED:	05/21/04

Reviewed By: ____________

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS(ASTM D3080)

Initial thickness of specimen (in):	1.00		
Initial diameter of specimen (in):	2.42		
Shearing device used:	Geomatic Direct Shear Apparatus, Model 8914		
Rate of displacement (in/min):	0.008		
Direct shear point:	1	2	3
Dry mass of specimen (g):	102.6	105.0	101.0
Initial Moisture Content:	34.8%	33.2%	35.0%
Initial Wet Density (lb/ft^3):	114.9	116.2	113.3
Initial Dry Density (lb/ft^3):	85.2	87.2	83.9
Final Moisture Content (g/g):	31.3%	29.3%	31.4%
Final Wet Density (lb/ft^3):	114.6	120.1	120.3
Final Dry Density (lb/ft^3):	87.3	92.9	91.6
Normal Stress ($kips/ft^2$):	1.00	3.00	5.00
Maximum Shearing Stress ($kips/ft^2$):	1.1	1.6	2.4
Vertical Deformation @ Max Shear (in):	0.010	-0.006	-0.017
Horizontal Deformation @ Max Shear (in):	0.130	0.132	0.180
Internal Friction Angle ϕ	18°		
Cohesion ($kips/ft^2$)	0.7052		

Notes:



AMEC Earth Environmental, Inc.
8519 Jefferson NW
Albuquerque, NM 87113
Phone: (505) 821-1801
Fax: (505) 821-7371

www.amec.com

PROJECT:	Albuquerque Arena
LOCATION:	Albuquerque, NM
MATERIAL:	CH
SAMPLE SOURCE:	B-5 25-26 ft
SAMPLE PREPARATION:	In Situ

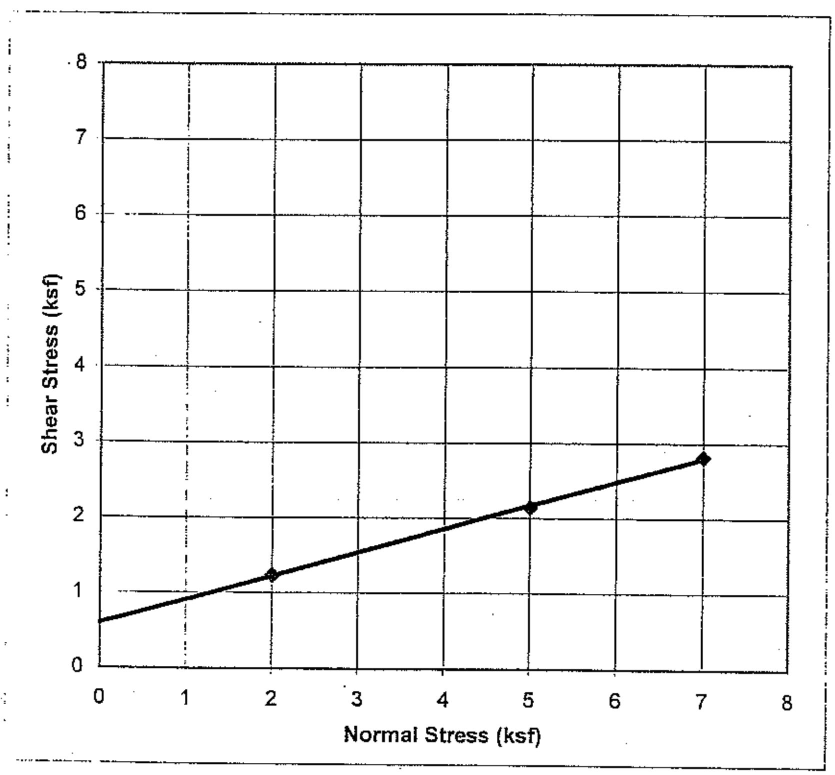
PROJECT NO:	4-517-000073
LAB NO:	4-0685-57
DATE SAMPLED:	05/21/04

Reviewed By: ____________________

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS(ASTM D3080)

Initial thickness of specimen (in):	1.00		
Initial diameter of specimen (in):	2.42		
Shearing device used:	Geomatic Direct Shear Apparatus, Model 8914		
Rate of displacement (in/min):	0.008		
Direct shear point:	1	2	3
Dry mass of specimen (g):	90.1	82.5	91.1
Initial Moisture Content:	45.0%	52.7%	43.6%
Initial Wet Density (lb/ft^3):	108.5	104.6	108.7
Initial Dry Density (lb/ft^3):	74.8	68.5	75.7
Final Moisture Content (g/g):	42.3%	47.0%	36.7%
Final Wet Density (lb/ft^3):	109.3	108.4	112.8
Final Dry Density (lb/ft^3):	76.8	73.7	82.5
Normal Stress ($kips/ft^2$):	2.00	5.00	7.00
Maximum Shearing Stress ($kips/ft^2$):	1.2	2.1	2.8
Vertical Deformation @ Max Shear (in):	-0.005	-0.006	-0.016
Horizontal Deformation @ Max Shear (in):	0.126	0.130	0.205
Internal Friction Angle ϕ	17.5°		
Cohesion ($kips/ft^2$)	0.5934		

Notes:



AMEC Earth Environmental, Inc.
8519 Jefferson NW
Albuquerque, NM 87113
Phone: (505) 821-1801
Fax: (505) 821-7371

PROJECT:	Albuquerque Arena
LOCATION:	Albuquerque, NM
MATERIAL:	Sand
SAMPLE SOURCE:	B-5 60-60.8 ft
SAMPLE PREPARATION:	In Situ, inundated

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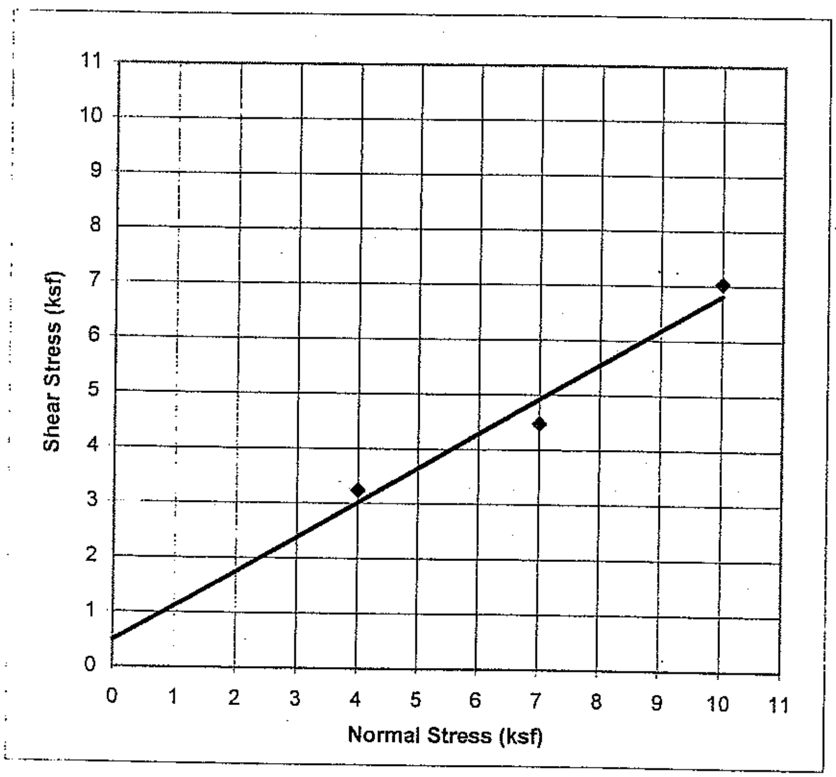
PROJECT NO:	4-517-000073
LAB NO:	4-0685-63
DATE SAMPLED:	05/21/04

Reviewed By: ____________________

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS(ASTM D3080)

Initial thickness of specimen (in):	1.00		
Initial diameter of specimen (in):	2.42		
Shearing device used:	Geomatic Direct Shear Apparatus, Model 8914		
Rate of displacement (in/min):	0.008		
Direct shear point:	1	2	3
Dry mass of specimen (g):	135.0	139.9	137.5
Initial Moisture Content:	17.7%	16.7%	17.1%
Initial Wet Density (lb/ft^3):	132.0	135.6	133.7
Initial Dry Density (lb/ft^3):	112.1	116.2	114.2
Final Moisture Content (g/g):	16.6%	18.2%	17.0%
Final Wet Density (lb/ft^3):	131.0	138.2	134.8
Final Dry Density (lb/ft^3):	112.4	116.9	115.2
Normal Stress (kips/ft^2):	4.00	7.00	10.00
Maximum Shearing Stress (kips/ft^2):	3.2	4.5	7.0
Vertical Deformation @ Max Shear (in):	0.010	0.006	0.008
Horizontal Deformation @ Max Shear (in):	0.098	0.092	0.142
Internal Friction Angle ϕ	32.4°		
Cohesion (kips/ft^2)	0.4792		

Notes:



AMEC Earth Environmental, Inc.
8519 Jefferson NW
Albuquerque, NM 87113
Phone: (505) 821-1801
Fax: (505) 821-7371

PROJECT:	Albuquerque Arena
LOCATION:	Albuquerque, NM
MATERIAL:	Sand w/clay slough on inner surface of ring
SAMPLE SOURCE:	B-7 30-31 ft
SAMPLE PREPARATION:	In Situ

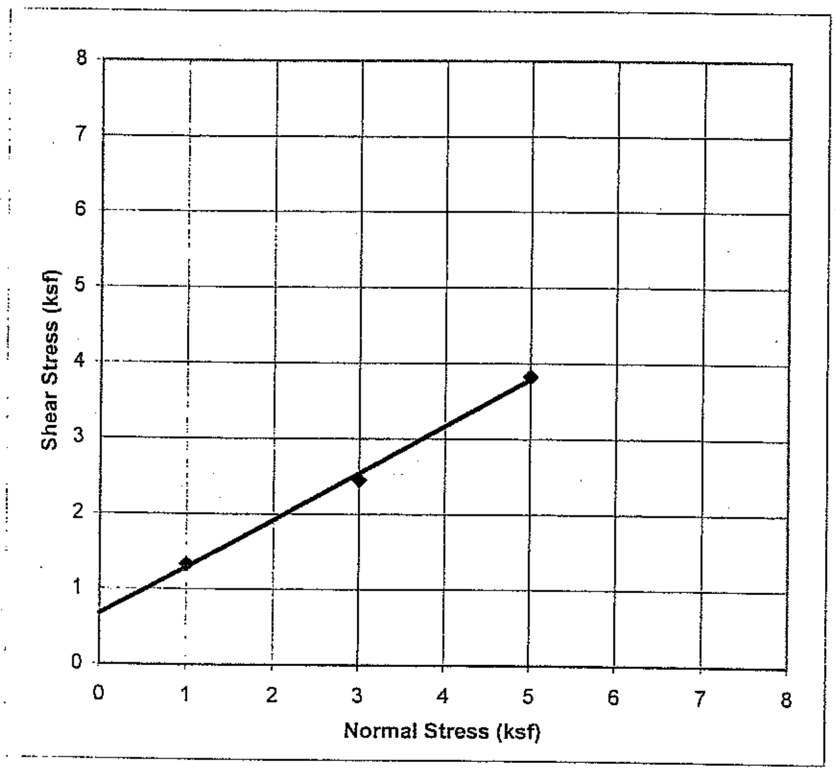
PROJECT NO:	4-517-000073
LAB NO:	4-0685-84
DATE SAMPLED:	05/21/04

Reviewed By: ____________________

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS(ASTM D3080)

Initial thickness of specimen (in):	1.00		
Initial diameter of specimen (in):	2.42		
Shearing device used:	Geomatic Direct Shear Apparatus, Model 8914		
Rate of displacement (in/min):	0.008		
Direct shear point:	1	2	3
Dry mass of specimen (g):	136.7	134.8	117.4
Initial Moisture Content:	3.0%	4.9%	7.0%
Initial Wet Density (lb/ft^3):	116.9	117.4	104.3
Initial Dry Density (lb/ft^3):	113.5	111.9	97.5
Final Moisture Content (g/g):	2.4%	2.8%	5.4%
Final Wet Density (lb/ft^3):	114.8	114.4	103.8
Final Dry Density (lb/ft^3):	112.1	111.4	98.5
Normal Stress (kips/ft^2):	1.00	3.00	5.00
Maximum Shearing Stress (kips/ft^2):	1.3	2.5	3.8
Vertical Deformation @ Max Shear (in):	0.013	0.021	0.005
Horizontal Deformation @ Max Shear (in):	0.070	0.138	0.199
Internal Friction Angle ϕ	31.9°		
Cohesion (kips/ft^2)	0.6703		

Notes:



AMEC Earth Environmental, Inc.
8519 Jefferson NW
Albuquerque, NM 87113
Phone: (505) 821-1801
Fax: (505) 821-7371

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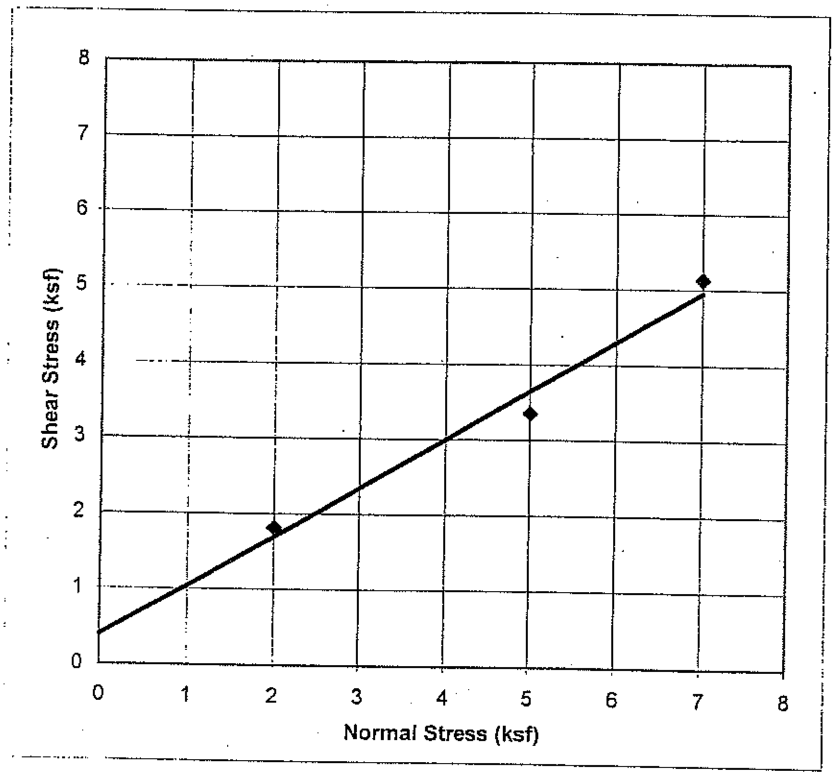
PROJECT:	Albuquerque Arena	PROJECT NO:	4-517-000073
LOCATION:	Albuquerque, NM	LAB NO:	4-0685-96
MATERIAL:	Sand, some gravel	DATE SAMPLED:	05/21/04
SAMPLE SOURCE:	B-8 30-31 ft		
SAMPLE PREPARATION:	In Situ		

Reviewed By: ____________________

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS(ASTM D3080)

Initial thickness of specimen (in):	1.00		
Initial diameter of specimen (in):	2.42		
Shearing device used:	Geomatic Direct Shear Apparatus, Model 8914		
Rate of displacement (in/min):	0.008		
Direct shear point:	1	2	3
Dry mass of specimen (g):	117.7	121.0	114.8
Initial Moisture Content:	4.0%	3.5%	4.0%
Initial Wet Density (lb/ft^3):	101.7	104.0	99.2
Initial Dry Density (lb/ft^3):	97.8	100.5	95.4
Final Moisture Content (g/g):	2.6%	2.8%	2.6%
Final Wet Density (lb/ft^3):	104.7	103.7	95.7
Final Dry Density (lb/ft^3):	102.1	100.9	93.3
Normal Stress (kips/ft^2):	2.00	5.00	7.00
Maximum Shearing Stress (kips/ft^2):	1.8	3.4	5.1
Vertical Deformation @ Max Shear (in):	0.013	0.008	0.009
Horizontal Deformation @ Max Shear (in):	0.100	0.172	0.160
Internal Friction Angle ϕ	33.1°		
Cohesion (kips/ft^2)	0.3909		

Notes:



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APPENDIX C

APPENDIX C

Specifications for Earthwork

Hunt Construction Company
Albuquerque Arena Project
Central Avenue between 1st and 2nd Streets, N.W.
Albuquerque, New Mexico
AMEC Project No. 4-517-000073
23 June 2004

SPECIFICATIONS FOR EARTHWORK

1.0 SCOPE

Includes all clearing and grubbing, removal of obstructions, general excavating, grading and filling, and any related items necessary to complete the grading for the entire project in accordance with these specifications.

2.0 SUBSURFACE SOIL DATA

Subsurface soil investigations have been made, and the results are available for examination by the contractor. The contractor is expected to examine the site and determine for himself the character of materials to be encountered.

No additional allowance will be made for rock removal, site clearing and grading, filling, compaction, disposal, or removal of any unclassified materials.

3.0 CLEARING & GRUBBING

A. **General**: Clearing and grubbing will be required for all areas shown on the plans to be excavated or on which fill is to be constructed.

B. **Clearing**: Clearing shall consist of removal and disposal of trees and other vegetation as well as down timber, snags, brush, existing foundations, slabs, and rubbish within the areas to be cleared.

C. **Grubbing**: Stumps, matted roots, and roots larger than 2 inches in diameter shall be removed from within 6 inches of the surface of areas on which fills are to be constructed except in roadways. Materials as described above within 18 inches of finished subgrade of roadways in either cut or fill sections shall be removed. Areas disturbed by grubbing will be filled as specified herein for EMBANKMENT.

D. **Grass & Topsoil**: Grass, grass roots, and incidental topsoil shall not be left beneath a fill area, nor shall this material be used as fill material. Grass, grass roots, and topsoil may be stockpiled and later used in the top 6 inches of fills outside roadways and building pads.

4.0 EARTH EXCAVATION

A. Earth excavation shall consist of the excavation and removal of suitable soils for use as embankment, as well as the satisfactory disposal of all vegetation, existing man-made fill, debris, and deleterious materials encountered within the area to be graded and/or in a borrow area.

B. Excavated areas shall be continuously maintained such that the surface shall be smooth and have sufficient slope to allow water to drain from the surface.

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5.0 EMBANKMENT

A. General: Embankments shall consist of a structural fill constructed in areas indicated on the grading plans.

B. Materials:

(1) Physical Characteristics: Structural fill material shall consist of soils that conform to the following physical characteristics:.

Sieve Size (Square Openings)	Percent Passing by Weight
3 inch	100
No. 4	50-100
No. 200	10-50

The plasticity index of the material, as determined in accordance with ASTM D4318, shall not exceed 12. Results of our investigation indicate that most of the on-site soils will meet these requirements, however, some blending may be required. The fill materials shall be free from roots, grass, other vegetable matter, clay lumps, rocks larger than 6 inches, or other deleterious materials.

(2) Borrow: When the quantity of suitable material required for embankments is not available within the limits of the jobsite, the contractor shall provide sufficient materials to construct the embankments to the lines, elevations, and cross sections shown on the drawings from borrow areas. The contractor shall obtain from owners of said borrow areas the right to excavate material, shall pay all royalties and other charges involved, and shall pay all expenses in developing the source, including the cost of right-of-way required for hauling the material.

C. Construction:

(1a) Building Areas with Deep Foundations: Existing fill materials should be removed in their entirety from beneath areas for proposed grade beams or pile caps.

(1b) Building Areas with Spread-Type Foundations: The building areas shall be overexcavated to such an extent as to remove all existing fill materials and to provide for a minimum of 3.0 feet of compacted structural fill beneath foundations. Overexcavation should extend laterally a distance equal to the depth of the excavation.

(1c) Floor Slabs: Areas below proposed floor slabs shall be overexcavated to such an extent as to provide for a minimum of 3.0 feet of structural fill below all floor slabs; however, provided that the existing subgrade soils meet the physical characteristics for structural fill as presented in Section B.1, only scarification and compaction to the requirements of Section 6.C.2 will be necessary.

(1d) Pavement Areas: Paved areas shall be overexcavated to such an extent so as to provide a minimum of 1.0 foot of structural fill beneath all pavements; however, provided that the existing subgrade soils meet the physical characteristics for structural fill, only scarification and compaction to the requirements of Section 5.C.2 will be necessary.

(1e) **General**: Prior to placement of fill, the building and paved areas shall be inspected and approved by a representative of the geotechnical engineer to insure satisfactory removal of native soils and the removal of any existing man-made fill.

Exposed cut surfaces, areas beneath foundations and floor slabs, as well as surfaces to receive fill, shall be scarified to a minimum depth of 8 inches and watered as necessary to bring the upper 12 inches to within 2 percent " of optimum moisture content. The upper 8 inches of the native soils shall then be compacted to a minimum of 95 percent of maximum dry density as determined in accordance with ASTM D1557.

Where vibratory compaction equipment is used, it shall be the contractor's responsibility to insure that the vibrations do not damage nearby buildings or other adjacent property.

(2) **Compaction**: Fill shall be spread in layers not exceeding 8 inches, watered as necessary, and compacted. Moisture content at the time of compaction shall be within 2 percent of optimum moisture content. A density of not less than 95 percent of maximum dry density within the building pads and paved areas shall be obtained for the structural fill. Structural fill, as well as the native soils, outside the building pads and paved areas shall be compacted to 90 percent of maximum dry density.

Optimum moisture content and maximum dry density for each soil type used shall be determined in accordance with ASTM D1557.

(3) **Weather Limitations**: Controlled fill shall not be constructed when the atmospheric temperature is below 35 degrees F. When the temperature falls below 35 degrees, it shall be the responsibility of the contractor to protect all areas of completed work against any detrimental effects of ground freezing by methods approved by the geotechnical engineer. Any areas that are damaged by freezing shall be reconditioned, reshaped, and compacted by the contractor in conformance with the requirements of this specification without additional cost to the owner.

D. Slope Protection & Drainage: The edges of the controlled fill embankments shall be graded to the contours shown on the drawings and compacted to the density required in paragraph 5.C(2). Slopes steeper than 1 vertical to 3 horizontal shall be protected from erosion.

6. INSPECTION & TESTS

A. Field Inspection & Testing: The owner shall employ the services of a registered, licensed geotechnical engineer to observe and test all controlled earthwork. The geotechnical engineer shall provide continuous on-site observation by experienced personnel during construction of controlled earthwork. The contractor shall notify the engineer at least two working days in advance of any field operations of controlled earthwork, or of any resumption of operations after stoppages. Tests of fill materials and embankments will be made at the following suggested minimum rates:

(1) One field density test for each 50 square yards of original ground surface prior to placing fill or constructing floor slabs.

(2) One field density test for each 250 cubic yards of fill placed or each layer of fill for each work area, whichever is the greater number of tests.

(3) One moisture-density curve for each type of material used, as indicated by sieve analysis and plasticity index.

B. **Report of Field Density Tests**: The geotechnical engineer shall submit, daily, the results of field density tests required by these specifications.

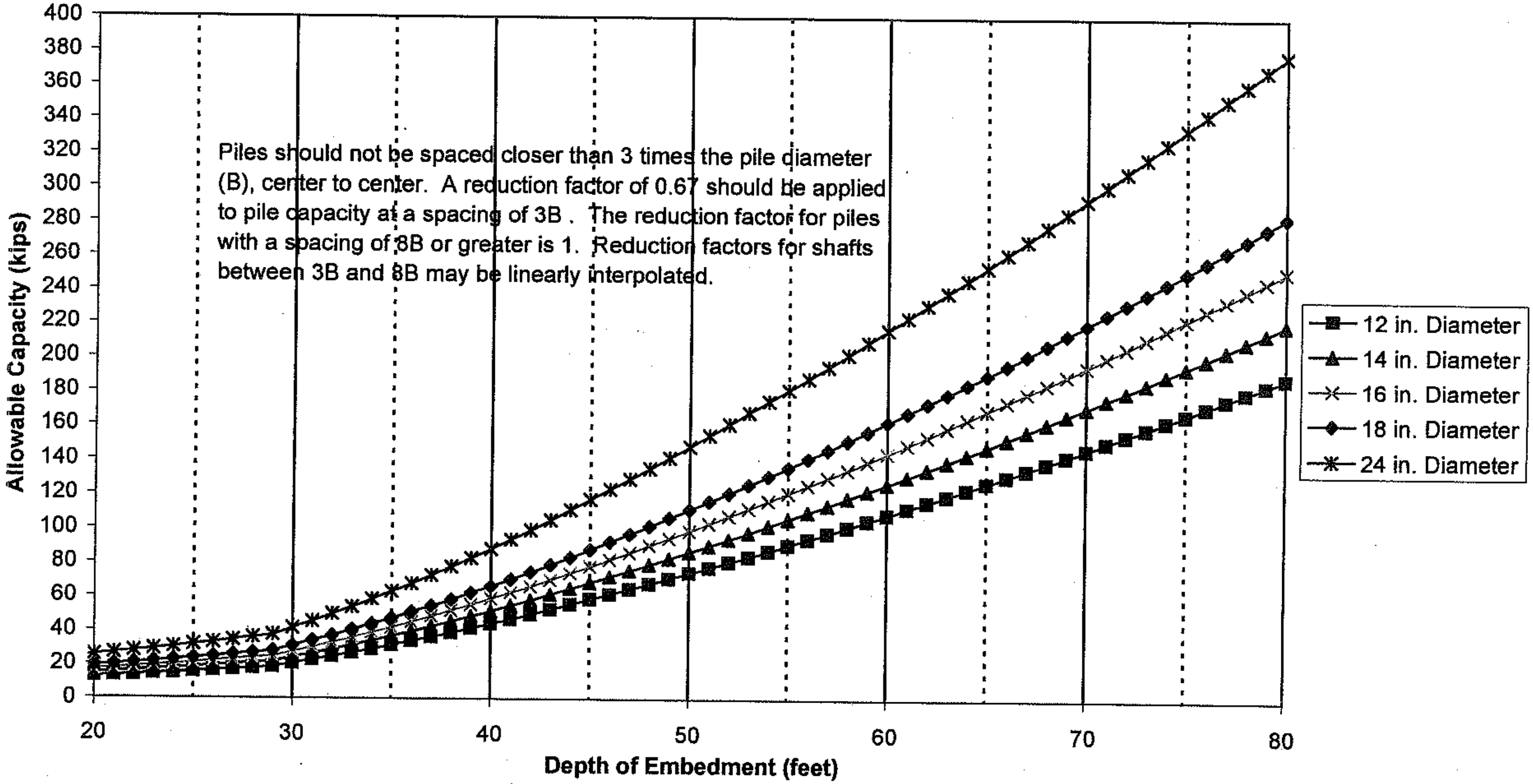
C. **Costs of Tests & Inspection**: The costs of tests, inspection and engineering, as specified in this section of the specifications, shall be borne by the owner.

APPENDIX D

APPENDIX D

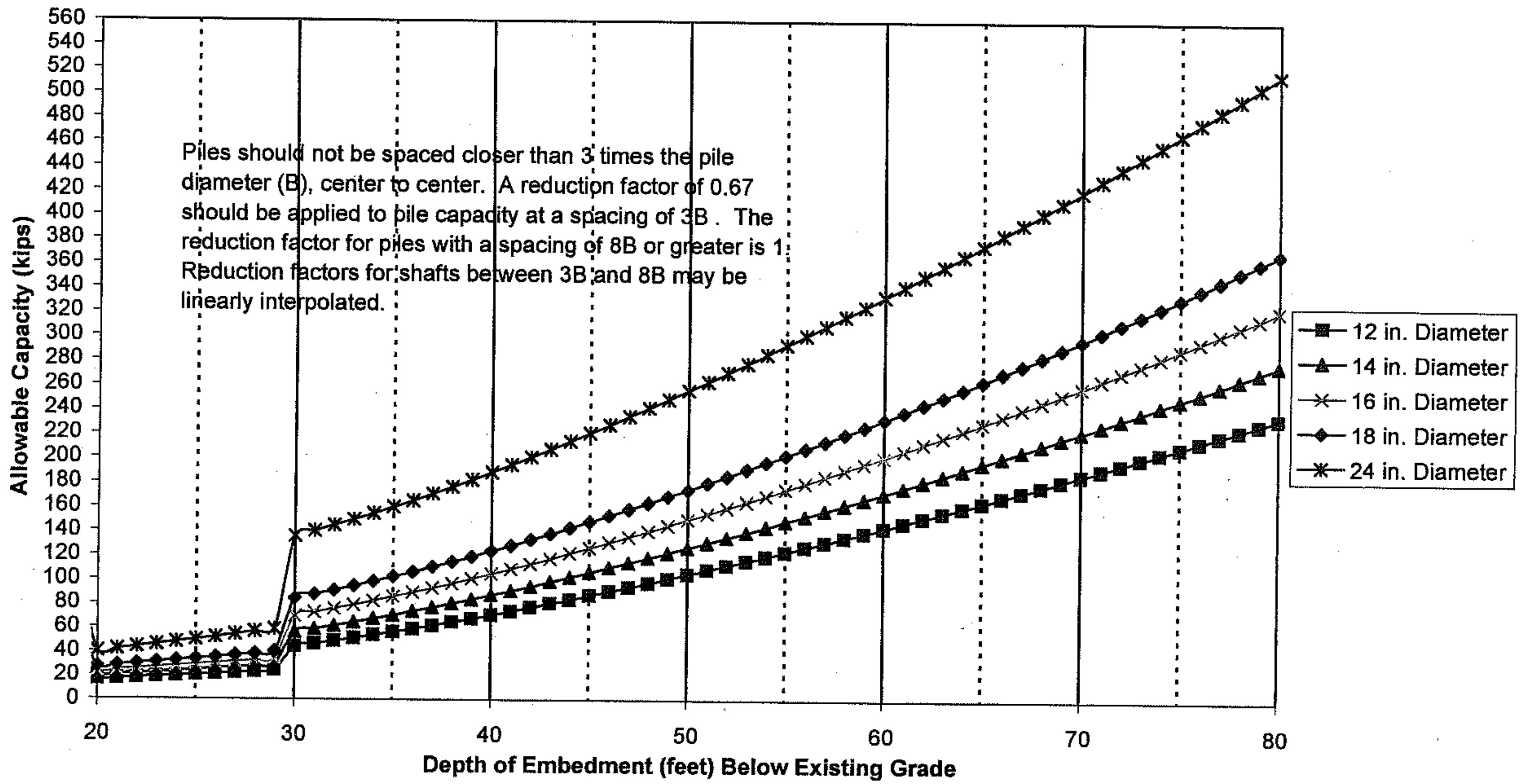
Pile Capacity Tables

Allowable Upward Capacity for Auger-Cast Piles



Note: Capacities pertain to allowable soil supporting capacity and do not consider the structural strength of the piles. Minimum depth of embedment is 20 feet below finished floor elevation (Finished floor assumed to be 2-feet below existing grade). Factor of safety = 3.0 (Assumes no load testing). 1 kip = 1000 pounds.

Allowable Downward Capacity for Auger-Cast Piles



Note: Capacities pertain to allowable soil supporting capacity and do not consider the structural strength of the piles. Minimum depth of embedment is 20 feet below finished floor elevation (Finished floor assumed to be 2-feet below existing grade). Factor of safety = 3.0 (Assumes no load testing). 1 kip = 1000 pounds.

Appendix E

APPENDIX E

Seismic Design Worksheets

Albuquerque Arena Project
Date and Time: 06/23/2004 3:34:59 PM

MCE Parameters - Conterminous 48 States
Zip Code - 87102 Central Latitude = 35.082729
Central Longitude = -106.646276
Data are based on the 0.10 deg grid set

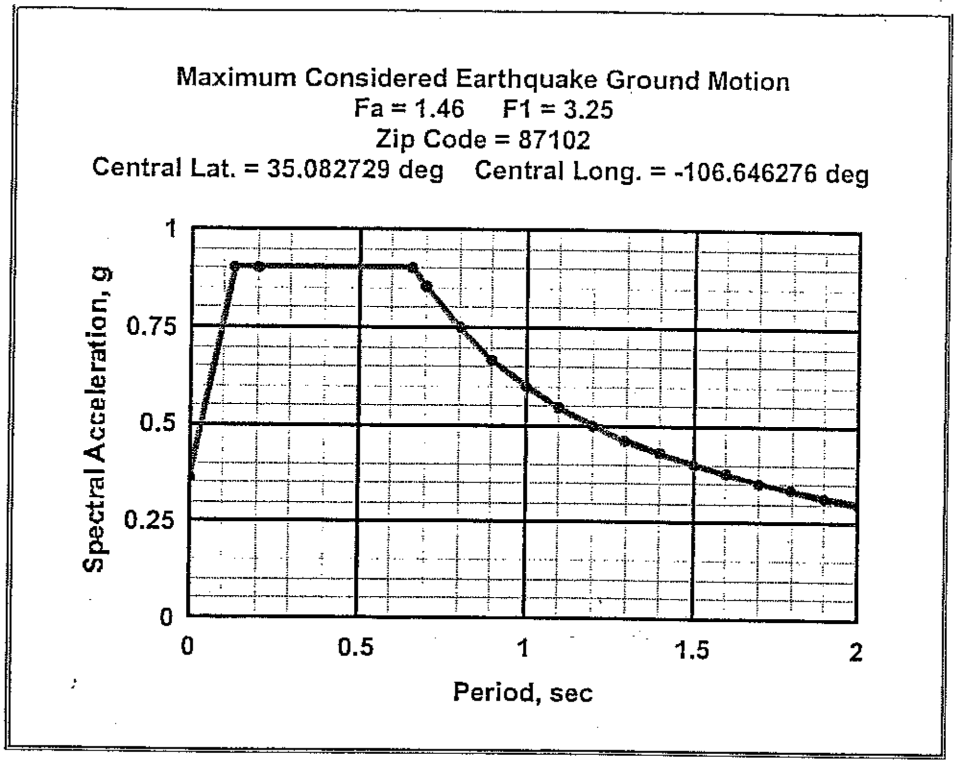
Period (sec)	SA (%g)	
0.2	061.9	Map Value, Soil Factor of 1.0
1.0	018.4	Map Value, Soil Factor of 1.0
MCE Parameters x Specified Soil Factors		
0.2	090.4	Soil Factor of 1.46
1.0	059.8	Soil Factor of 3.25

MCE Parameters - Conterminous 48 States
Zip Code - 87102 Central Latitude = 35.082729
Central Longitude = -106.646276
Data are based on the 0.10 deg grid set

Period (sec)	SA (%g)	
0.2	061.9	Map Value, Soil Factor of 1.0
1.0	018.4	Map Value, Soil Factor of 1.0

MCE SPECTRUM x SOIL FACTORS
Fa = 1.46
Fv = 3.25

Period (sec)	SA (%g)	
0.000	036.2	0.4FaSs
0.133	090.4	To
0.200	090.4	T=0.2, FaSs
0.663	090.4	Ts
0.700	085.6	
0.800	074.9	
0.900	066.6	
1.000	059.9	T=1.0, FvS1
1.100	054.5	
1.200	049.9	
1.300	046.1	
1.400	042.8	
1.500	040.0	
1.600	037.5	
1.700	035.3	
1.800	033.3	
1.900	031.5	
2.000	030.0	



Period, sec	Sa, g
0.00	0.362
0.13	0.904
0.20	0.904
0.66	0.904
0.70	0.856
0.80	0.749
0.90	0.666
1.00	0.599
1.10	0.545
1.20	0.499
1.30	0.461
1.40	0.428
1.50	0.400
1.60	0.375
1.70	0.353
1.80	0.333
1.90	0.315
2.00	0.300