

823 So. 6th
SOILS REPORT - 1986

823 So 6th



ETEC TESTING LABORATORIES, INC.

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PRELIMINARY - CONSTRUCTION
DATE: 11-86
as part of plans

C-224(86)

**GEOTECHNICAL INVESTIGATION
TWO-STORY OFFICE BUILDING
6TH STREET AT HOOVER
LAS VEGAS, NEVADA**

Prepared For:

**F.L. KENNEDY & ASSOCIATES
MAY 22, 1986**

Prepared By:

**DOUGLAS A. GRISHAM, P.E.
ETEC TESTING LABORATORIES, INC.**

ETEC REFERENCE: 610126



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F. L. Kennedy & Associates
3405 Cambridge
Las Vegas, NV 89109

May 22, 1986

Attention: Mr. Fred Kennedy, AIA

ETEC No. 610126

Reference: Two-Story Office Building
6th Street at Hoover
Las Vegas, Nevada

As you requested, this firm has conducted a geotechnical investigation for the proposed 2-story office building located at the northeast corner of 6th Street and Hoover Street in Las Vegas, Nevada.

The purpose of these services is to provide information and recommendations regarding:

- o Foundation design
- o Pavement sections
- o Surface and subsurface conditions
- o Earthwork procedures
- o Excavation conditions

At the time of site exploration, the site was a parking lot situated between a single story masonry complex to the south and a stucco building (to be removed) to the north. The parking lot drains to the east. The existing masonry building exhibits minor vertically-oriented settlement cracking on approximately 20-foot centers.

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Two-Story Office Building
6th Street at Hoover
Las Vegas, Nevada

ETEC No: 610126
Page 2

Due to site access restrictions, two test holes were made at the locations shown on the attached site sketch. During this exploration, subsöils were visually classified and select samples were obtained. The upper profile consisted of 3 to 5 inches of asphaltic pavement overlying 6 to 8 inches of gravel base. Below this to a depth of 8 feet were alternating layers of firm silt and medium dense clays. Between 8 to 12 feet, a partially cemented zone of caliche was encountered, underlain by medium dense clays to the depth of exploration. Maximum exploration depth was 15 feet. Groundwater was encountered at 10 feet, measured 50 hours after drilling.

Laboratory: Laboratory testing included a visual examination of returned samples, moisture content determinations (shown on logs of boring) and chemical testing to determine the presence and percentage of deleterious sulfate in the near surface material.

In-situ swell potential was evaluated by the following tests:

Boring	Depth Feet	Natural Moisture Content	Dry Density (#/Ft ³)	Surcharge (#/Ft ²)	Percent Swell	Swell Pressure (#/Ft ²)
B-1	2	18%	99.1	64	0	64
B-1	2	18%	-	-	0.6	-

Foundations: The very moist, compressible nature of the upper 8 feet of soil profile must be considered when recommending a suitable foundation system. In addition, the existing masonry building is already showing signs of some settlement distress. The use of conventional spread footings would result in long-term settlements (3/4 to 1-1/2 inches) which may not be acceptable for a masonry structure. The added soil loading from new spread footings would also aggravate the settlement to the existing adjacent building.

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Two-Story Office Building
6th Street at Hoover
Las Vegas, Nevada

ETEC No: 610126
Page 3

In order to address both these concerns, it is recommended that wall and column loads be founded on shallow, drilled cast-in-place piers. A grade beam would transfer wall loads to the piers. Piers should extend to a depth of approximately 8 feet to the layer of partially cemented material. Piers should be sized for an allowable bearing capacity of 6000 psf in end bearing.

Away from the existing footings, either of the following approaches could be utilized:

- o Continue the pier and beam system as described above, or
- o Excavate a 2-foot wide trench to approximately an 8-foot depth, backfill to bearing grade with a lean (3 sacks/CY) mix. Place normal 18-inch minimum width spread footings directly on this prepared surface. An allowable bearing capacity of 2000 psf may be assumed.

The above approach will provide minimum disturbance to existing structures during and subsequent to construction.

Settlements at the assumed loadings are estimated to be less than 3/8 inches. The recommended foundation system should not experience any additional settlement should the bearing soils become saturated.

Lightweight interior partitions can be supported on thickened slab footings provided they meet structural considerations and exert no more than 900 pounds per square foot on the soil.

Reinforcement of footings, stem walls and masonry walls is recommended to limit differential movement distress. Provision for joints at openings and discontinuities is also recommended for this reason.

General Site and Sub-Slab Preparation: Subsoil exploration suggests that excavation for normal depth foundations and utilities should be possible using conventional equipment. Earthwork preparation for the actual building site, the foundation elements and the slab-on-grade are recommended as follows:

1. Strip and remove all existing uncontrolled fill, loose soils, debris and structural remnants. Re-grade the area as required to accommodate compaction equipment.
2. Prepare all exposed soils to a depth of 8 inches by scarification or discing, moistening or drying, and compacting to specified density.
3. If any additional fill is required for re-grading the site, it should be placed in horizontal layers not exceeding 10 inches at near optimum moisture condition and compacted to specified density. All fill which will support slabs or other structural elements should meet the requirements for imported fill.
4. The final 10 inches directly underlying concrete floor slabs should consist of 8 inches of compacted Clark County Type 2 base course, overlain by a 6 mil. thickness vapor barrier (Visqueen or equivalent) and 2 inches of clean, moist concrete sand.
5. Imported fill should comply with the following criteria:

o Gradation (ASTM C136), Percent Passing By Weight

3" Sieve.....	100
No. 4 Sieve.....	25-75
No. 200 Sieve.....	20 (Max)

o Soluble Sulfates,
Maximum Percent..... 0.10

F. L. Kennedy & Associates
Two-Story Office Building
6th Street at Hoover
Las Vegas, Nevada

ETEC No: 610126
Page 5

6. Compaction criteria for this construction should meet the following recommendations:

- o Native Subgrade Fills: Minimum Percent Compaction
 - Below Footings..... 90
 - Below Slabs-on-Grade..... 90
 - Below Pavements..... 90
- o Subbase Fills:
 - Below Footings..... 90
 - Below Slabs-on-Grade..... 90
 - Below Pavements..... 90
- o Aggregate Base Course..... 95
- o Non-Structural Fills..... 85

All compactions refer to dry density as a percentage of ASTM D1557 density. Moisture content at placement should be at optimum plus or minus 3% for granular soils. In clayey soils, add 2% to this specified range.

Drainage: Site grading should be planned to provide flow of all surface water away from the structural bearing elements and slabs. Concentrations of roof runoff water and surface ponding of water adjacent to footing lines must be prevented.

Concrete: The results of chemical evaluation on the near-surface soils indicates a moderate level of soluble sulfates are present. Accordingly, all concrete to be used in the foundations, or where otherwise in contact with the soil, should comply with the following:

Type of Cement Permitted	Minimum Sacks of Cement Per Cubic Yard	Maximum Water/Cement Ratio
Type II	6.0	0.50
Type II & Fly Ash	5.5*	0.53
Type I-P	5.5	0.53
Type V	5.5	0.53
Type V & Fly Ash	5.5*	0.53

*Sacks per cubic yard before replacement with fly ash.

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Two-Story Office Building
6th Street at Hoover
Las Vegas, Nevada.

ETEC No: 610126
Page 6

Pavement: Based on existing subgrade conditions, the following pavement sections are recommended:

	<u>Asphaltic Concrete Pavement (inches)</u>	<u>Base Course* (inches)</u>
Passenger car parking & drives (low traffic frequency)	2.0	8.0
Major access drives, (medium traffic frequency)	2.5	8.0

*Base course should conform with Clark County specifications for a Type 2 material.

Existing subgrade soils should be cleaned of vegetation, debris, structural remnants and other deleterious materials. The subgrade should then be scarified, moistened and recompactd for a minimum depth of 8 inches prior to placement of fill and pavement materials. The gradient of paved surfaces should ensure positive drainage and water should not be allowed to pond in areas directly adjoining paved sections. The native clayey subgrade soils will exhibit softening and loss of stability if subjected to conditions which would result in an increase in moisture content.

Ground Compaction and Shrinkage Factors: A change in the ground surface elevation of 3/4 to 1 inch will occur by compacting the surface soils to a 12-inch depth and to an average density of 90% of the ASTM D1557 maximum dry density. The following tabulation presents the relationship between depth of compacted on-site material, percent compaction and approximate shrinkage losses for excavated on-site soils placed in compacted fill zones:

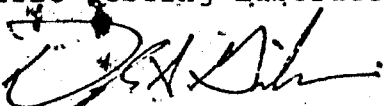
<u>Borrow Zone Depth Below Natural Grade (Ft)</u>	<u>Compaction Percent in Fill Zones (ASTM D1557)</u>	<u>Approximate Shrinkage (%)</u>
0 - 1	90	8 - 10

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Two-Story Office Building
6th Street at Hoover
Las Vegas, Nevada

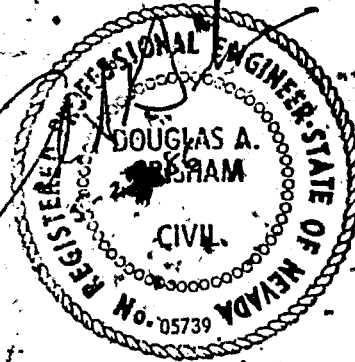
ETEC No: 610126
Page 8

It has been a pleasure working with you on this project. Should any questions arise regarding this report, please contact us.

Respectfully submitted,
ETEC Testing Laboratories, Inc.


Douglas A. Grisham, P.E.
Geotechnical Engineer

DAG:bjc
Attachments



Job No. 610126

SITE PLAN/TEST BORING LOCATION

TWO-STORY OFFICE BUILDING
6TH STREET AT HOOVER
LAS VEGAS, NEVADA

NORTH

NOT TO SCALE

EXISTING BUILDING

PROPOSED 2-STORY BUILDING

B-1

B-2

EXISTING MASONRY BUILDING

HOOVER STREET

CLIENT: F.L. KENNEDY & ASSOC.



LOG OF BORING NO. B-1

Project Two-Story Office Building, 6th & Hoover, Las Vegas Job No. 610126

Elevation _____ Datum _____

Type/Size Boring Rotary Wash/6" Rig Type Mayhew Date 5/16/86

Groundwater Conditions 10.5' - 50 hours after drilling

Depth, feet	Blows/6"		Sample Type	Dry Density pcf	Moisture Content, %	Unified Classification	Description
	C	N/R					
							3" ASPHALT, 8" GRAVEL BASE ON SURFACE
		3/4	R	79.1	18	MH	Light brown, silty CLAY 3.5'
5		2/4	R		30	CL	Light brown, clayey SILT with C-F sand 8.0'
10		16/7	R		19	CL	White, clayey SILT with trace of gravel, partially cemented 12.0'
15						CL	White, clayey SILT, soft 15.0'
20							Bottom of Boring 15.0'
25							
30							

LOG OF BORING NO. B-2

Project Two-Story Office Building, 6th & Hoover, Las Vegas Job No. 610126

Elevation --- Datum ---

Type/Size Boring Rotary Wash/6" Rig Type Mayhew Date 5/16/86

Groundwater Conditions Not Measured

Depth feet	Blows/6"		Sample Type	Dry Density pcf	Moisture Content, %	Unified Classification	Description
	C	N/R					
							5" ASPHALT, 6" GRAVEL BASE ON SURFACE
						MH	Light brown, silty CLAY, soft
2.0'							
		4/10	R		22	SM	Brown, silty, fine SAND, some gravel, with trace of clay
5.0'							
		2/4	R		29	CL	Brown, clayey SILT with trace of gravel
8.0'							
						CL	White, clayey SILT; partially cemented, stiff
10.0'							
						CL	White, silty CLAY with trace of gravel, stiff
12.0'							
15.0'							
							Bottom of Boring 15.0'
20.0'							
25.0'							
30.0'							

METHOD OF SOIL CLASSIFICATION (ASTM D 2487)

COARSE-GRAINED SOILS LESS THAN 50% FINES*

FINE-GRAINED SOILS MORE THAN 50% FINES*

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size
GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	
GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, MORE THAN 12% FINES	
GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, MORE THAN 12% FINES	
SW	WELL-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	SANDS More than half of coarse fraction is smaller than No. 4 sieve size
SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	
SM	SILTY SANDS, SAND-SILT MIXTURES, MORE THAN 12% FINES	
SC	CLAYEY SANDS, SAND-CLAY MIXTURES, MORE THAN 12% FINES	

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS	SILTS AND CLAYS Liquid limit less than 50
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
OL	ORGANIC SILTS OR ORGANIC SILTY-CLAYS OF LOW PLASTICITY	
MH	INORGANIC SILTY, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTS, ELASTIC SILTS	SILTS AND CLAYS Liquid limit more than 50
CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY	
PT	PEAT, MUCK, AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

NOTE:
Coarse grained soils receive dual symbols if they contain 5 to 12% fines (e.g. SW-SM, GP-GC, etc.)

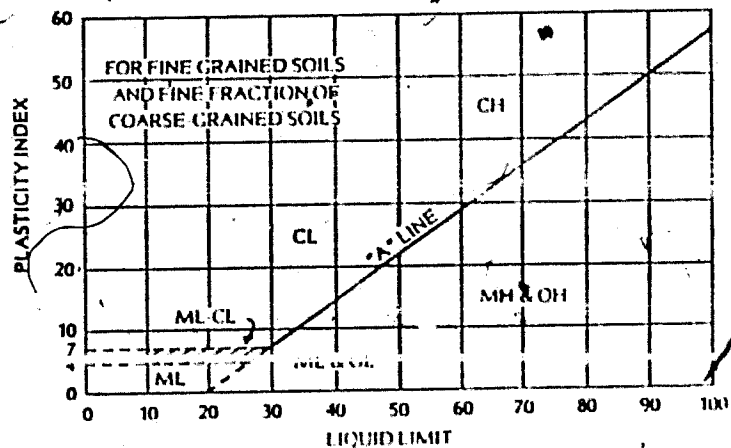
NOTE:
Fine grained soils receive dual symbols if their limits plot in the hatched zone on the Plasticity Chart (ML-CL)

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	ABOVE 12 in.
COBBLES	3 in. to 12 in.
GRAVEL	No. 4 to 3 in.
Coarse	3/4 in. to 3 in.
Fine	No. 4 to 3/4 in.
SAND	No. 200 to No. 4
Coarse	No. 10 to No. 4
Fine	No. 200 to No. 10
* FINES (Silt or Clay)	BELOW No. 200

NOTE:
Soil sizes smaller than three inches are used to classify soils.

PLASTICITY CHART



DEFINITION OF TERMINOLOGY

ALLOWABLE SOIL BEARING CAPACITY-
ALLOWABLE FOUNDATION PRESSURE

The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.

BACKFILL

Specified material placed and compacted in a confined area.

BASE COURSE

A layer of specified material placed on a subgrade or subbase.

BASE COURSE GRADE

Top of base course.

BENCH

A horizontal surface in a sloped deposit.

CAISSON

A concrete foundation element cast in a circular excavation which may have an enlarged base. Sometimes referred to as a cast-in-place pier.

CONCRETE SLABS-ON-GRADE

A concrete surface layer cast directly upon a base, subbase or subgrade.

CRUSHED ROCK BASE COURSE

A base course composed of crushed rock of a specified gradation.

DIFFERENTIAL SETTLEMENT

Unequal settlement between or within foundation elements of a structure.

ENGINEERED FILL

Specified material placed and compacted to specified density and/or moisture conditions under observation of a representative of a soil engineer.

EXISTING FILL

Materials deposited through the action of man prior to exploration of the site.

EXISTING GRADE

The ground surface at the time of field exploration.

EXPANSIVE POTENTIAL

The potential of a soil to expand (increase in volume) due to the absorption of moisture.

FILL

Materials deposited by the action of man.

FINISHED GRADE

The final grade created as a part of the project.

GRAVEL BASE COURSE

A base course composed of naturally occurring gravel with a specified gradation.

HEAVE

Upward movement.

NATIVE GRADE

The naturally occurring ground surface.

NATIVE SOIL

Naturally occurring on-site soil.

ROCK

A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.

SAND AND GRAVEL BASE

A base course of sand and gravel of a specified gradation.

SAND BASE COURSE

A base course composed primarily of sand of a specified gradation.

SCARIFY

To mechanically loosen soil or break down existing soil structure.

SETTLEMENT

Downward movement.

SOIL

Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.

STRIP

To remove from present location.

SUBBASE

A layer of specified material placed to form a layer between the subgrade and base course.

SUBBASE GRADE

Top of subbase.

SUBGRADE

Prepared native soil surface.