Applied Geotechnical Engineering Consultants, Inc.

GEOTECHNICAL INVESTIGATION

INNOVATIONS OFFICE PARK

4000 WEST 13400 SOUTH

RIVERTON, UTAH

PREPARED FOR:

THE SORENSON COMPANIES
2511 SOUTH WEST TEMPLE
SALT LAKE CITY, UTAH 84115

ATTENTION: CLYDE P. SMITH

PROJECT NO. 1000892

JANUARY 29, 2001

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EXECUTIVE SUMMARY

1. The subsurface soils encountered in the northern portion of the site in the area of the proposed convenience store, fast food and retail consist of approximately 4 feet of clay overlying silt with some gravel and silty sand layers extending the full depth investigated, approximately 15½ feet.

   The subsurface soils encountered in the central and southern portion of the development in the area of the proposed restaurants and office buildings consist of approximately 3 to 5 feet of clay overlying gravel which extends the full depth investigated, approximately 25½ feet.

2. No subsurface water was encountered to the maximum depth investigated, approximately 25½ feet.

3. The proposed convenience store, fast food and retail buildings to be located in the northern portion of the site and the restaurants in the eastern portion of the site may be supported on spread footings bearing on at least 2 feet of compacted structural fill extending down to the undisturbed natural soil. Spread footings bearing on at least 2 feet of compacted structural fill may be designed using an allowable net bearing pressures of 3,000 pounds per square foot.

   With the significantly higher loads anticipated for the proposed office buildings, the buildings may be supported on spread footings bearing on the undisturbed natural gravel, on compacted structural fill extending down to the undisturbed natural gravel or on at least 3 feet of compacted structural fill. Spread footings bearing on the undisturbed natural gravel or on compacted structural fill may be designed using an allowable net bearing pressure of 3,000 pounds per square foot.

4. The upper natural soil consists of clay. The clay may result in access difficulties for rubber-tired construction equipment during periods when the upper soil becomes very moist to wet, such as during periods of precipitation or spring runoff. Placement of granular fill will assist in accessing the property when the upper clay is very moist to wet.

5. Some of the upper clay and silt exhibits a low moisture sensitivity. Good surface drainage should be provided for the proposed pavement and around the proposed buildings.

6. Geotechnical information related to foundations, subgrade preparation, pavement design and materials are included in the report.

SCOPE

This report presents the results of a geotechnical investigation for the proposed Innovations Office Park to be located at the southeast corner of 4000 West and 13400 South in Riverton, Utah. The report presents the subsurface conditions encountered, laboratory test results, and recommendations for foundations and pavement. The study was conducted in general accordance with our proposal dated December 14, 2000.

Field exploration was conducted to obtain information on the subsurface conditions. Samples obtained from the field investigation were tested in the laboratory to determine physical and engineering characteristics of the on-site soil. Information obtained from the field and laboratory was used to define conditions at the site for our engineering analysis and to develop recommendations for the proposed foundations and pavement.

This report has been prepared to summarize the data obtained during the study and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to construction are included in the report.

SITE CONDITIONS

The site is a vacant field. There are no permanent structures or pavement on the site with the exception of a small wooden shack located in the northwest corner of the site. Based on a review of old aerial photographs of the site, there were two houses in the northern portion of the property. These houses have since been removed.

A large overhead utility line extends through the northeast portion of the property. A large underground gas line also extends through the property in a general northwest/southeast direction.

Rose Creek extends through the northern portion of the property. No water was observed in Rose Creek at the time of our site visit. There is a ditch extending in an east/west direction through the middle portion of the site and extending north to Rose Creek.

There are fill piles approximately 2 to 3 feet in height located along the west boundary of the site. A small fill pile approximately 7 feet in height is located in the north-central portion of the site.

The ground surface at the site slopes gently downward to the east. There is approximately 30 feet in elevations difference across the property.

Portions of the site are alfalfa fields and the northern portion of the site is vegetated with short grass and weeds. An area in the north-central portion of the site has been cleared of vegetation.

The site is bordered to the west by 4000 West Street with a middle school located on the other side of 4000 West Street. The site is bordered to the north by 13400 South Street. There are open fields to the north. Bangerter Highway borders the east side of the property. There are open fields to the east of Bangerter Highway and a large four-story office building to the northeast. Open fields lie beyond the site to the south.

FIELD STUDY

The field study was conducted on January 8, 9 and 10, 2001. Thirteen borings were drilled at the approximate locations indicated on Figure 1 using 8-inch diameter hollow stem auger powered by an all-terrain drill rig. The borings were logged and soil samples obtained by an engineer from AGEC. Logs of the subsurface conditions encountered in the borings are graphically shown on Figures 2, 3 and 4.

SUBSURFACE CONDITIONS

The subsurface soils encountered in the northern portion of the site in the area of the proposed convenience store, fast food and retail consist of approximately 4 feet of clay overlying silt with some gravel and silty sand layers extending the full depth investigated, approximately 15½ feet.

The subsurface soils encountered in the central and southern portion of the development in the area of the proposed restaurants and office buildings consist of approximately 3 to 5 feet of clay overlying gravel which extends the full depth investigated, approximately 25½ feet.

A description of the various soils encountered in the borings follows:

Fill - The fill consists of silty sand with gravel which is moist and light brown in color.

Topsoil - The topsoil consists of sandy lean clay which is moist and brown to dark brown in color with roots.

Lean Clay - The clay contains a small to large amount of sand. It is medium to very stiff, slightly moist to moist and brown in color.

Laboratory tests conducted on samples of the clay indicate natural moisture contents range from 8 to 20 percent and natural dry densities range from 82 to 95 pounds per cubic foot (pcf).

Consolidation tests conducted on samples of the clay indicate that the soil will compress a small to moderate amount with the addition of light to moderate loads. The results of the tests indicate that the soil is more compressible when wetted. Results of the consolidation tests are presented on Figures 5 and 7.

Silt - The silt contains sand and silty sand layers. It is loose to medium dense, slightly moist to moist and brown in color.

Laboratory tests conducted on a sample of the silt indicate a natural moisture content of 13 percent and a natural dry density of 84 pcf.

A consolidation test conducted on a sample of the silt indicates that the soil will compress a small to moderate amount with the addition of light to moderate loads. The test results indicate that the silt is more compressible when wetted. Results of the consolidation test are presented on Figure 6.

Silty Sand - The silty sand contains silt layers. It is medium dense, slightly moist to moist and brown in color.

Poorly to Well Graded Gravel with Silt and Sand - The gravel contains silty sand layers and some cobbles. It is dense to very dense, slightly moist to moist and brown in color.

Laboratory tests conducted on samples of the gravel indicate a natural moisture content of 5 percent and natural dry densities ranging from 100 to 105 pcf.

The results of gradation tests conducted on samples of the gravel are presented on Figure 8.

Results of the laboratory tests are summarized on Table I and are included on the Logs of the Exploratory Borings.

SUBSURFACE WATER

No subsurface water was encountered in the borings to the maximum depth investigated, approximately 25½ feet.

PROPOSED CONSTRUCTION

We understand that a convenience store, fast food restaurant and retail building are planned for the northern portion of the site. Two restaurants are planned for the northeastern portion of the site. Three and four-story office buildings are planned for the south and central portions of the development.

We anticipate that the restaurants, retail building and convenience store will be single-story, wood frame or masonry structures with relatively light loads. We have assumed that loads for these structures will consist of column loads less than 50 kips and wall loads less than 3 kips per lineal foot.

We anticipate that the office buildings in the southern and central portions of the property will be steel structures. The structural engineer indicates that the buildings will have column loads up to approximately 490 kips.

We anticipate that paved parking lots and access roads will be constructed. We have assumed three traffic conditions for the proposed pavement areas which are described in the Pavement Section of the report.

If the proposed construction, anticipated building loads, or traffic are significantly different from those described, we should be notified so that we can re-evaluate our recommendations.

RECOMMENDATIONS

Based on the subsoil conditions encountered, laboratory test results, and the proposed construction, the following recommendations are given:

A. Site Grading

We anticipate that there will be relatively small amounts of cut and fill required for the site grading.

1. Subgrade Preparation

Prior to placing grading fill or base course, any existing unsuitable fill, organics, topsoil, debris and other deleterious material should be removed. The subgrade should be scarified to a depth of approximately 8 inches, the moisture adjusted to within 2 percent of the optimum moisture content and compacted to at least 90 percent of the maximum dry density as determined by ASTM D-1557. The subgrade should then be proof-rolled to identify soft areas. Soft areas should be removed and replaced with granular fill containing less than 15 percent passing the No. 200 sieve.

The upper soil consists of clay which may results in construction difficulties for rubber-tired equipment, when the upper soils become very moist to wet such as in the winter or spring or after periods of precipitation. Care should be taken not to disturb the natural soil to remain below the proposed buildings and pavement. When the upper natural soil is very moist to wet, it may be necessary to place granular borrow above the subgrade in areas of construction traffic to provide access and a working surface for construction of the pavement. When the upper soils are very moist to wet, the subgrade should not be

but should be cut to undisturbed natural soil and a sufficient thickness of granular fill placed to provide equipment access.

2. Excavation

Excavation at the site can be accomplished with typical excavation equipment.

A flat cutting edge should be used for excavation equipment when excavating for foundations in the clay and silt, to reduce disturbance of the bearing soil.

Some difficulty in excavation may be encountered in areas of cobbles, particularly for confined excavations.

3. Compaction

Compaction of materials placed at the site should equal or exceed the minimum densities as indicated below when compared to the maximum dry density as determined by ASTM D-1557.

Fill To Support	Compaction
Foundations	≥ 95%
Concrete Flatwork and Pavement	≥ 90%
Landscaping	≥ 85%
Retaining Wall Backfill	85 - 90%

To facilitate the compaction process, the fill should be compacted at a moisture content within 2 percent of the optimum moisture content.

The base course should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D-1557.

Fill placed for the project should be frequently tested for compaction.

4. Materials

Material placed as fill to support foundations should be non-expansive granular soil.

Listed below are materials recommended for imported structural fill.

Fill to Support	Recommendations
Footings	Non-expansive granular soil Passing No. 200 Sieve < 35% Liquid Limit < 30% Maximum size 4 inches
Floor Slab (Upper 4 inches)	Sand and/or Gravel, Passing No. 200 Sieve < 5% Maximum size 2 inches
Slab Support	Non-expansive granular soil Passing No. 200 Sieve < 50% Liquid Limit < 30% Maximum size 6 inches

The natural clay and silt is not suitable for use as structural fill below building areas but may be used as site grading fill in pavement areas or as utility trench backfill if the topsoil, organics and other deleterious material are removed or it may be used in landscape areas. The use of the on-site clay and silt for fill may required moisture conditioning (wetting or drying) prior to use as fill. Drying of the soil may not be practical during cold or wet periods of the year.

The natural gravel exclusive of over-sized particles is suitable for use as structural fill or site grading fill.

5. Drainage

Some of the clay and silt exhibit a relatively low moisture sensitivity. The ground surface surrounding the proposed buildings should be sloped away from the buildings in all directions. Roof down spouts and drains should discharge beyond the limits of backfill.

The collection and diversion of drainage away from the pavement surface is important to the satisfactory performance of the pavement section. Proper drainage should be provided.

B. Foundations

1. Bearing Material

With the proposed construction and the subsurface conditions encountered, the buildings may be supported on spread footings bearing on the undisturbed natural gravel or on compacted structural fill. The smaller structures may be supported on natural gravel, on compacted structural fill extending down to the gravel or on a minimum of 2 feet of compacted structural fill. The 3 and 4-story office building structures may be supported on the undisturbed natural gravel, on compacted structural fill extending down to the undisturbed natural gravel or on a minimum of 3 feet of compacted structural fill extending down to the undisturbed natural soil.

Structural fill should extend out away from the edge of the footings a distance equal to the depth of fill beneath footings.

7. Construction Observation

A representative of the geotechnical engineer should observe all footing excavations prior to structural fill or concrete placement.

C. Concrete Slab-on-Grade

1. Slab Support

Concrete slabs may be supported on the undisturbed natural soil or on compacted structural fill extending down to the undisturbed natural soil.

2. Underslab Sand and/or Gravel

A 4-inch layer of free draining sand and/or gravel (less than 5 percent passing the No. 200 sieve) should be placed below the concrete slabs for ease of construction and to promote even curing of the slab concrete.

3. Vapor Barrier

A vapor barrier should be placed under the concrete floor if the floor will receive an impermeable floor covering. The barrier will prevent water vapor from passing from below the slab to the floor covering. At least 3 inches of free draining material should be provided between the concrete and the vapor barrier.

D. Lateral Earth Pressures

1. Lateral Resistance for Footings

Lateral resistance for spread footings placed on the natural soil or on compacted structural fill is controlled by sliding resistance between the footing and the foundation soils. A friction value of 0.35 may be used in design for ultimate lateral resistance. A friction value of 0.45 may be used where the footings or structural fill extend down to the natural gravel.

2. Subgrade Walls and Retaining Structures

The following equivalent fluid weights are given for design of subgrade walls and retaining structures. The active condition is where the wall moves away from the soil. The passive condition is where the wall moves into the soil and the at-rest condition is where the wall does not move. The values listed below assume a horizontal surface adjacent the wall.

Soil Type	Active	At-Rest	Passive
Clay & Silt	50 pcf	65 pcf	250 pcf
Sand & Gravel	40 pcf	55 pcf	300 pcf

3. Seismic Conditions

Under seismic conditions, the equivalent fluid weight should be increased by 23 pcf for active and at-rest conditions and decreased by 23 pcf for the passive condition. This assumes a horizontal ground acceleration of 0.25g which represents a 10 percent probability of exceedance in a 50-year period (Frankel and others, 1996).

4. Safety Factors

The values recommended above assume mobilization of the soil to achieve the assumed soil strength. Conventional safety factors used for structural analysis for such items as overturning and sliding resistance should be used in design.

All topsoil, unsuitable fill, debris and other deleterious materials should be removed from below footing areas.

2. Bearing Pressure

Spread footings bearing on the undisturbed natural gravel or on compacted structural fill and indicated above may be designed using an allowable net bearing pressure of 3,000 psf. Footings should have a minimum width of 2 feet and a minimum depth of embedment of 1 foot.

3. Temporary Loading Conditions

The allowable bearing pressure may be increased by one-half for temporary loading conditions such as wind or seismic loads.

4. Settlement

Based on the subsoil conditions encountered and the assumed building loads, we estimate that total settlement for foundations designed as indicated above will be on the order of 1 inch. Differential settlement is estimated to be on the order of ¾ of an inch.

Care will be required not to disturb the natural soil at the base of foundation excavations to maintain settlement within tolerable limits.

5. Frost Depth

Exterior footings and footings beneath unheated areas should be placed at least 30 inches below grade for frost protection.

6. Foundation Base

The base of all footing excavations should be cleared of loose or deleterious material prior to structural fill or concrete placement.

1. Subgrade Support

The near surface soils consists of clay. We have assumed a CBR value of 3 percent which assumes a clay subgrade.

2. Pavement Thickness

Based on the subsoil conditions, assumed traffic, a design life of 20 years for flexible and 30 years for rigid pavement and methods presented by the Utah Department of Transportation, the following pavement sections are calculated.

Traffic Condition	Flexible Pavement			Rigid Pavement
	Asphaltic Concrete	Base Course	Granular Borrow	Portland Cement Concrete
Passenger Vehicles	3"	6"	--	--
	--	--	--	5"
1 Delivery Truck/day & 2 Garbage Trucks/week	3"	8"	--	--
	--	--	--	5"
5 Heavy Trucks/day *	3½"	12"	--	--
	3½"	6"	8"	--
	--	--	--	5½"

* Assumes 5 loaded 30 kip trucks.

In areas where the subgrade consists of clay and becomes very moist to wet, it may be necessary to place granular borrow below traffic areas as discussed in the Subgrade Preparation section of the report.

E. Seismicity and Liquefaction

The site is located in an area which is mapped as having a "very low" potential for liquefaction (Salt Lake County Planning Department, 1997). The subsurface soils encountered in the borings to the depth investigated are not susceptible to liquefaction.

There are no mapped active faults extending near or through the property. The closest mapped active fault to the site is the Wasatch Fault located approximately 8½ miles to the east (Salt Lake County Planning Department, 1997).

Based on the location of the site we recommend that the buildings be designed and constructed to at least meet the Uniform Building Code Seismic Zone 3 criteria using a soil type profile of "S_D".

F. Water Soluble Sulfates

One sample of the natural soil was tested in the laboratory for water soluble sulfate content. The test results indicate there is less than 0.1 percent water soluble sulfate in the sample tested. Based on the results of the test and published literature, the natural soil possesses negligible sulfate attack potential on concrete. The concentration of water soluble sulfates present in the soil at the site indicates that sulfate resistant cement is not needed for concrete placed in contact with the natural soil. Other conditions may dictate the type of cement to be used in concrete for the project.

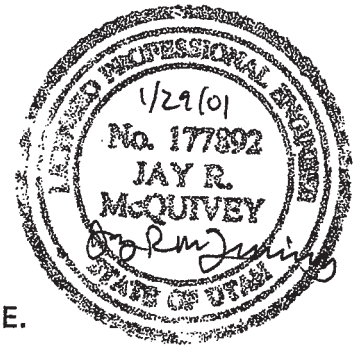
G. Pavement

Based on the subsoil conditions encountered, laboratory test results and the assumed traffic, the following pavement support recommendations are given.

LIMITATIONS

This report has been prepared in accordance with generally accepted soil and foundation engineering practices in the area for the use of the client for design purposes. The conclusions and recommendations included within the report are based on the information obtained from the borings drilled and the data obtained from laboratory testing. Variations in the subsurface conditions may not become evident until excavation is conducted. If the subsurface conditions or groundwater level are found to be significantly different from those described above, we should be notified to re-evaluate our recommendations.

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



Jay R. McQuivey, P.E.

Reviewed by Douglas R. Hawkes, P.E., P.G.

JRM/cs

3. Pavement Materials and Construction

a. Flexible Pavement (Asphaltic Concrete)

The pavement materials should meet the Utah Department of Transportation specifications for gradation and quality. Other materials may be considered for use in the pavement section. The use of other materials may result in the need for different pavement material thicknesses.

b. Rigid Pavement (Portland Cement Concrete)

The pavement thickness assumes that the pavement will have aggregate interlock joints and that a concrete shoulder or curb will be provided.

Pavement materials should meet the Utah Department of Transportation Specifications. The pavement thickness indicated above assumes that the concrete will have a 28 day compressive strength of 4,000 psi. Concrete should be air entrained with approximately 6 percent air. Maximum allowable slump will depend on the method of placement but should not exceed 4 inches.

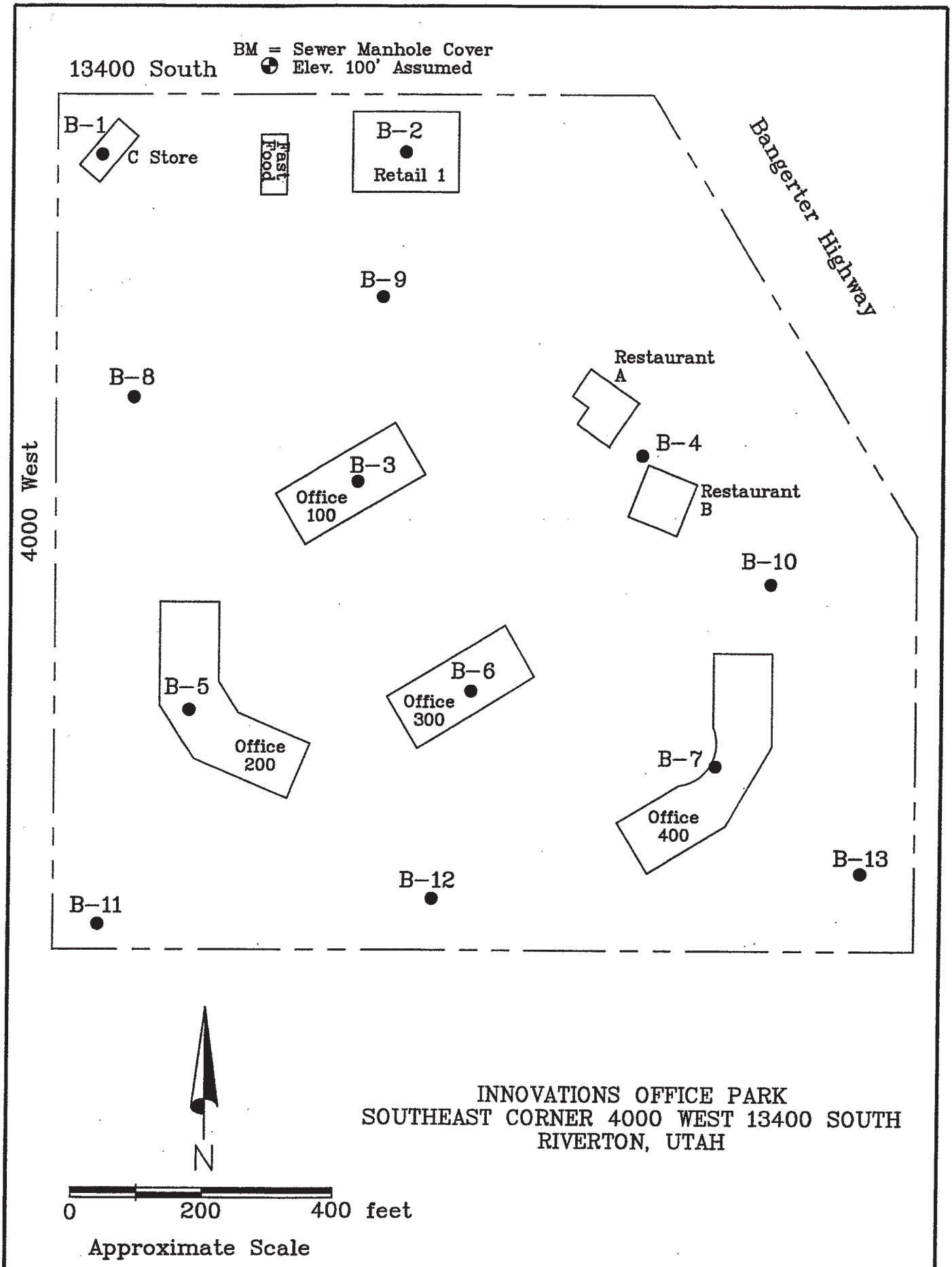
4. Jointing

Joints for concrete pavement should be laid out in a square or rectangular pattern. Joint spacings should not exceed 30 times the thickness of the slab. The joint spacings indicated should accommodate the contraction of the concrete and under these conditions steel reinforcing will not be required. The depth of joints should be approximately one-fourth of the slab thickness.

REFERENCES CITED

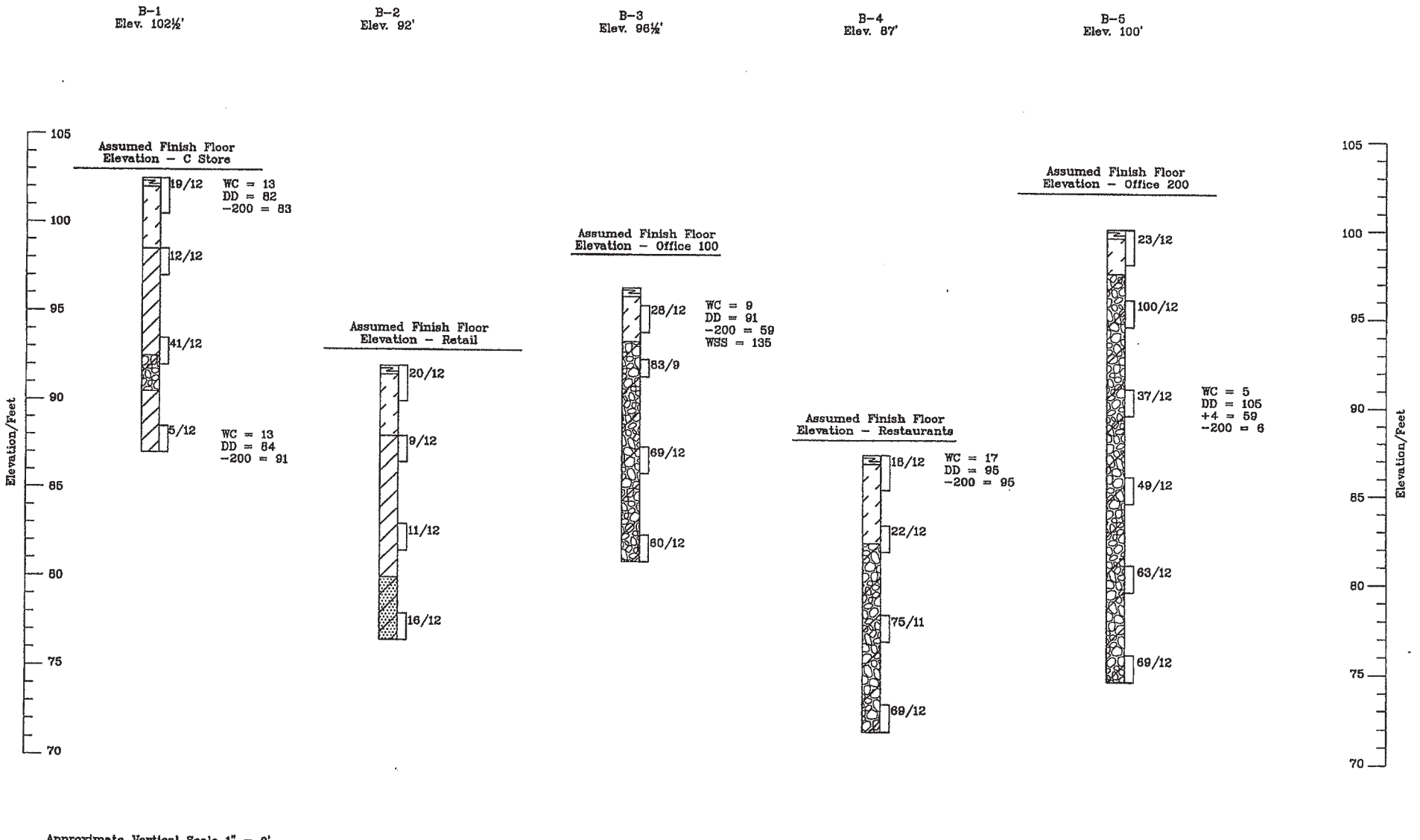
Frankel, A., C. Mueller, T. Barnhard, D. Perkins, E.V. Leyendecker, N. Dickman, S. Hanson and M. Hopper, 1996; National Seismic Hazard Maps, U.S. Geological Survey Open File Report 96-532.

Salt Lake County Planning Department, 1997, Surface Rupture and Liquefaction Potential Special Study Areas Map, Salt Lake County, Utah, adopted March 31, 1989, revised March 1997, Salt Lake County Public Works, Planning Department, 2001 South State Street, Salt Lake City, Utah.



INNOVATIONS OFFICE PARK
SOUTHEAST CORNER 4000 WEST 13400 SOUTH
RIVERTON, UTAH

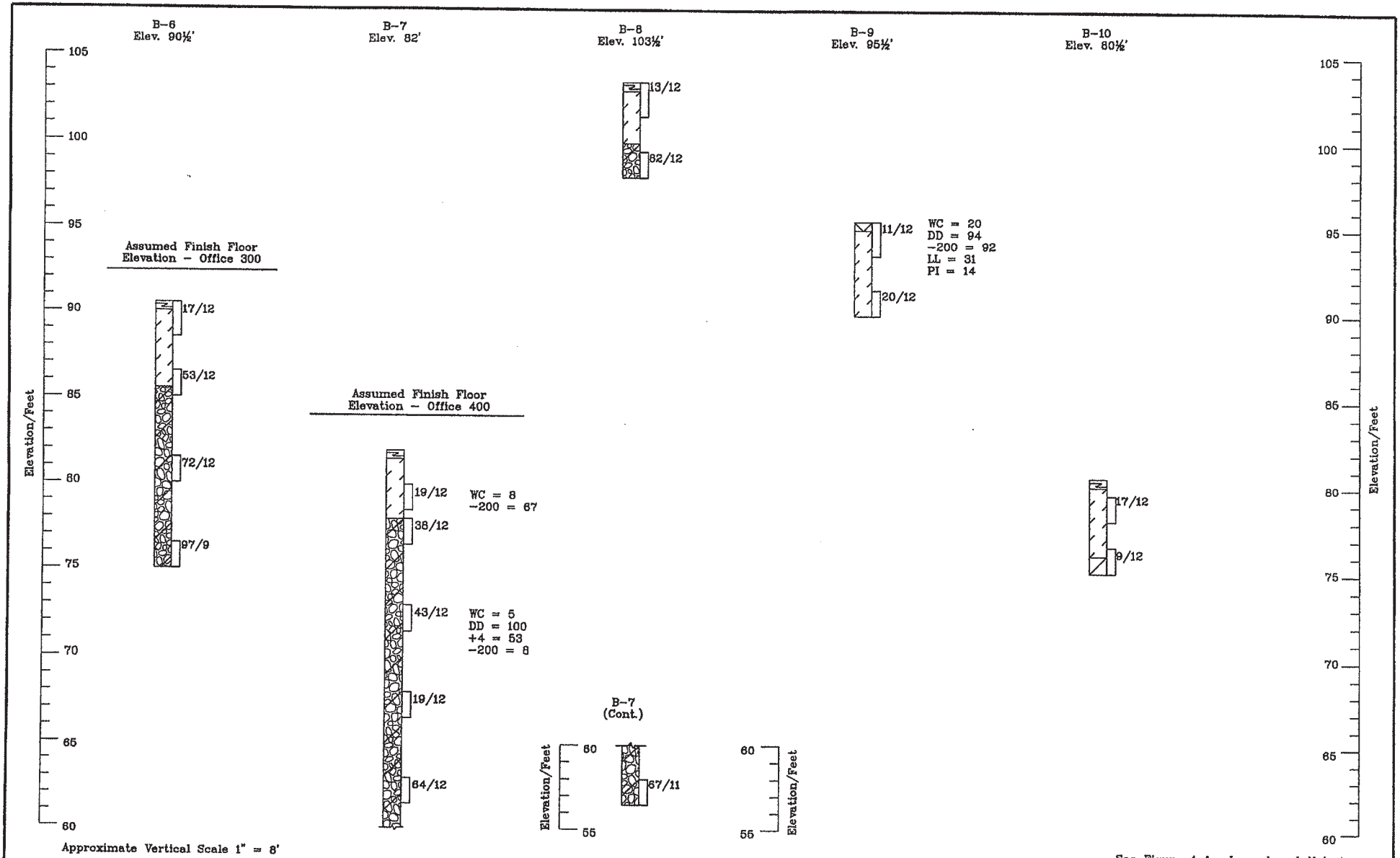
1000892	AGEC	Locations of Exploratory Borings	Figure 1



Approximate Vertical Scale 1" = 8'

See Figure 4 for Legend and Notes

1000892 | AGEC | Logs of Exploratory Borings | Figure 2

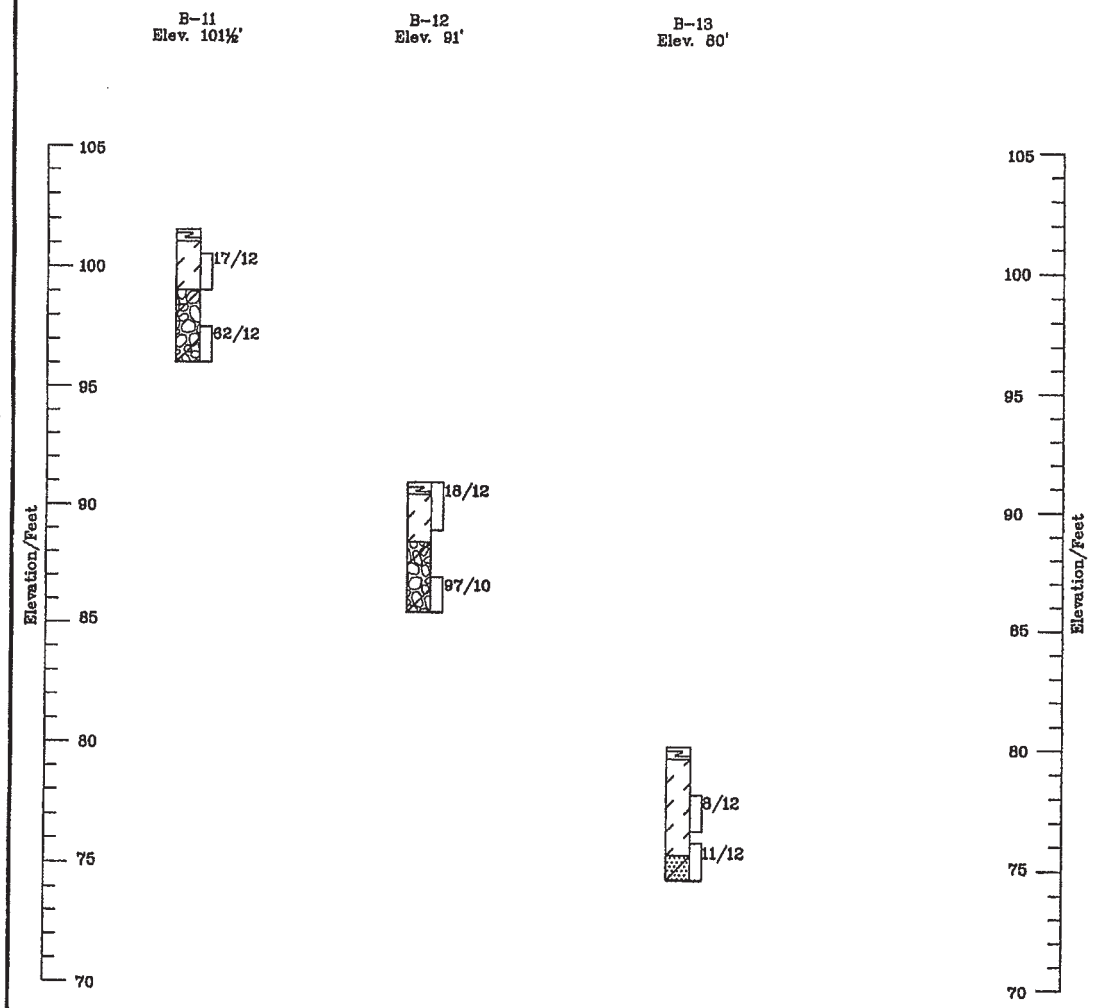


See Figure 4 for Legend and Notes

1000892

Logs of Exploratory Borings

Figure 3



Approximate Vertical Scale 1" = 8'

LEGEND:

- Fill; silty sand with gravel, moist, light brown.
- Topsoil; sandy lean clay, moist, brown to dark brown, roots.
- Lean Clay (CL); small to large amount of sand, medium to very stiff, slightly moist to moist, brown.
- Silt (ML); with sand, silty sand layers, loose to medium dense, slightly moist to moist, brown.
- Silty Sand (SM); silt layers, medium dense, slightly moist to moist, brown.
- Poorly to Well Graded Gravel with Silt and Sand (GP-GM) to (GW-GM); silty sand layers, some cobbles, dense to very dense, slightly moist to moist, brown.
- 10/12 California Drive sample taken. The symbol 10/12 indicates that 10 blows from a 140 pound automatic hammer falling 30 inches were required to drive the sampler 12 inches.

NOTES:

1. Borings were drilled on January 8, 9 and 10, 2001 with 8-inch diameter hollowstem auger.
2. Locations of borings were measured approximately by pacing from features shown on the site plan provided.
3. Elevations of borings were measured by automatic level and refer to the bench mark shown on Figure 1.
4. The boring locations and elevations should be considered accurate only to the degree implied by the method used.
5. The lines between the materials shown on the boring logs represent the approximate boundaries between material types and the transitions may be gradual.
6. No free water was encountered in the borings at the time of drilling.
7. WC = Water Content (%);
   DD = Dry Density (pcf);
   +4 = Percent Retained on the No. 4 Sieve;
   -200 = Percent Passing No. 200 Sieve;
   LL = Liquid Limit (%);
   PI = Plasticity Index (%);
   UC = Unconfined Compressive Strength (psf);
   WSS = Water Soluble Sulfates (ppm).

1000892	AGE	Logs, Legend and Notes of Exploratory Borings	Figure 4

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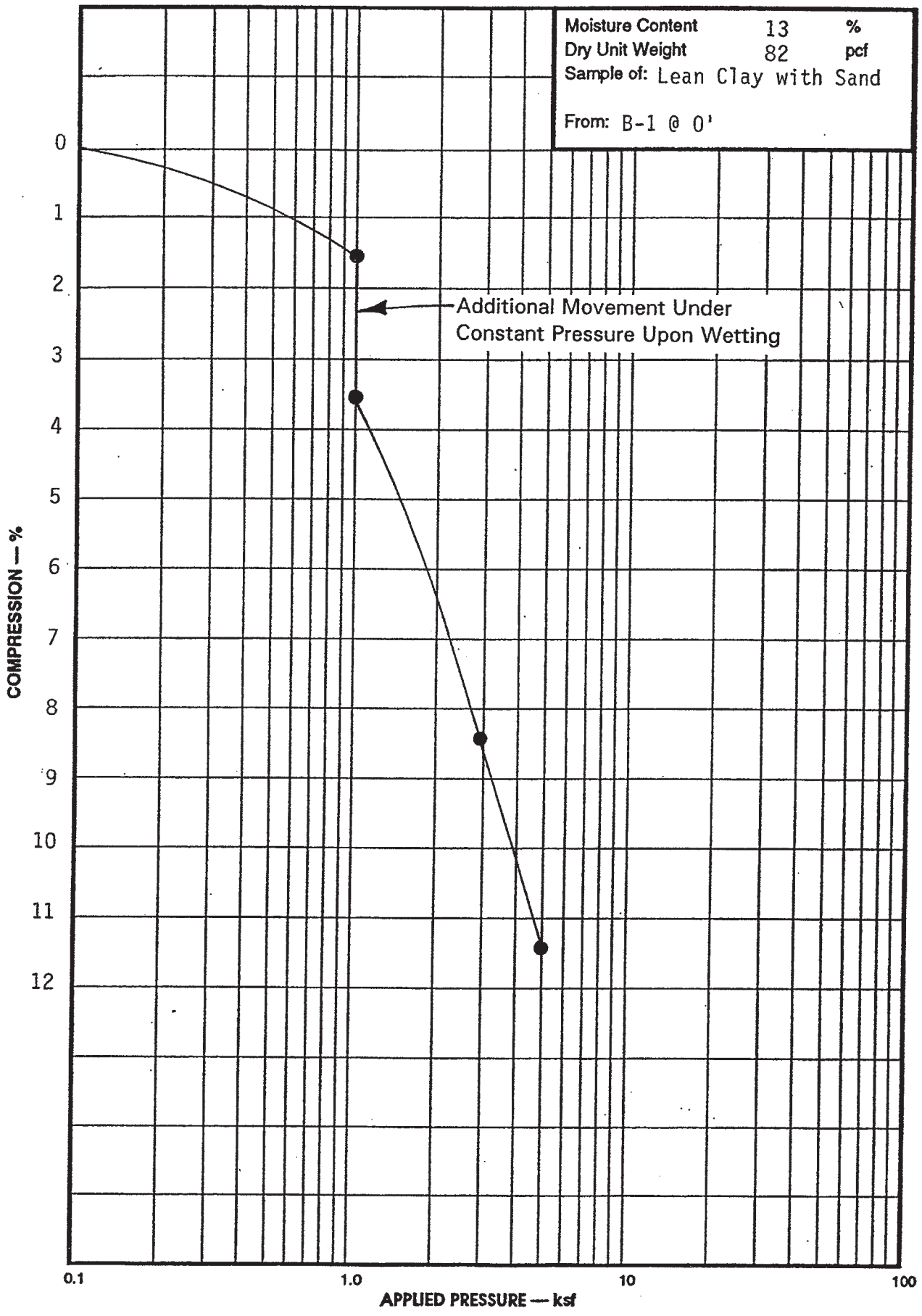
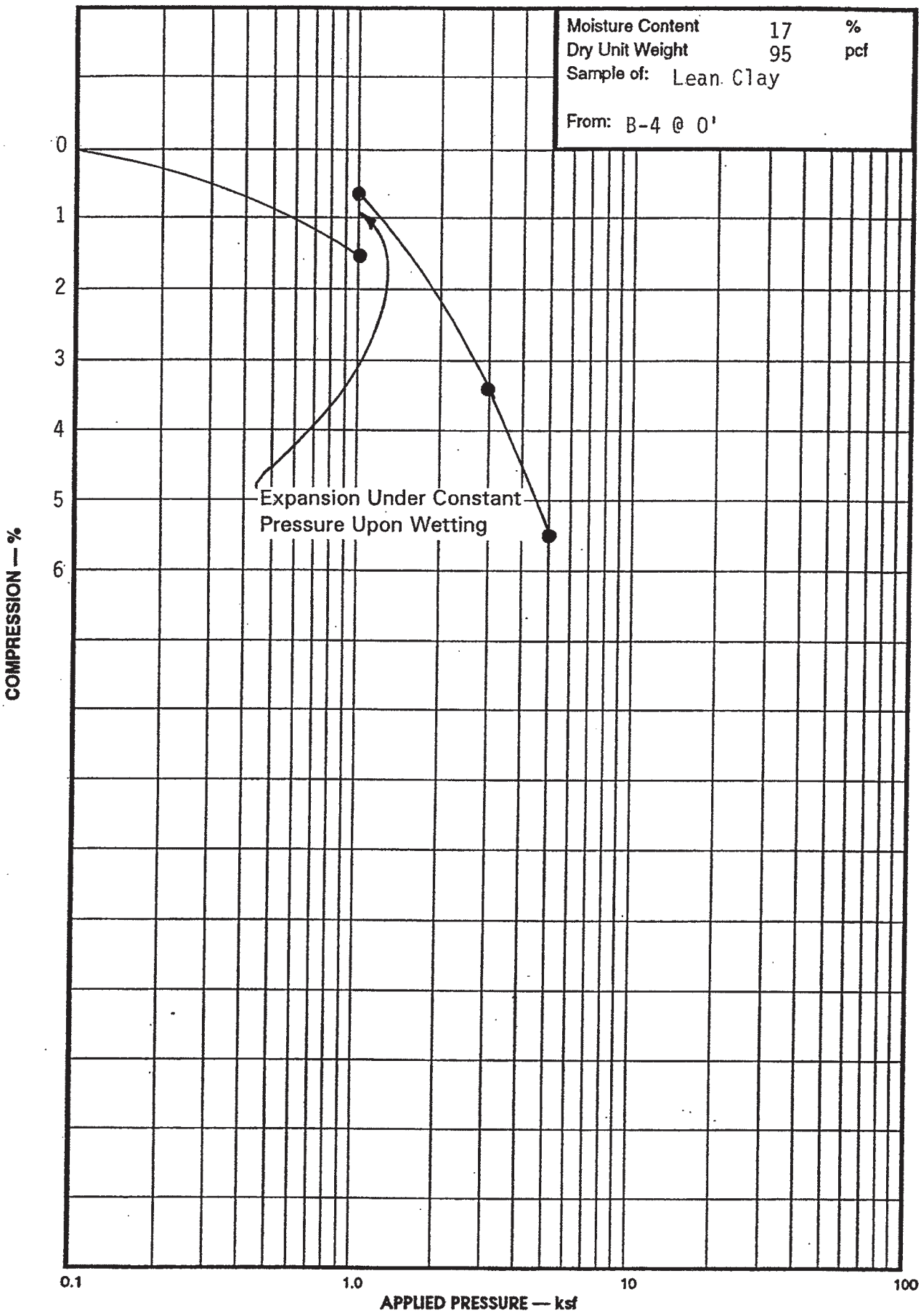


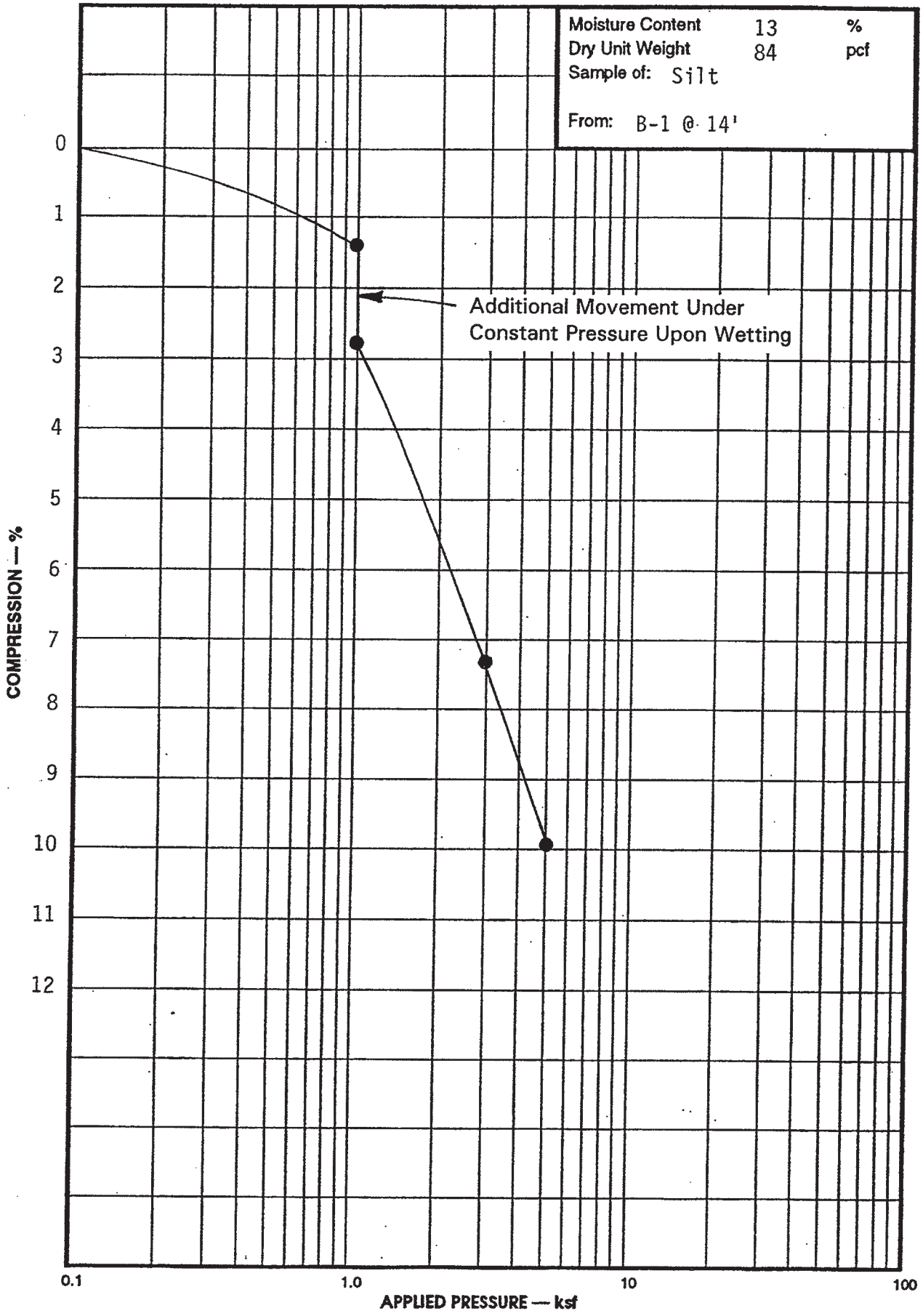
Project No. 1000892 **CONSOLIDATION TEST RESULTS** Figure 5

Applied Geotechnical Engineering Consultants, Inc.



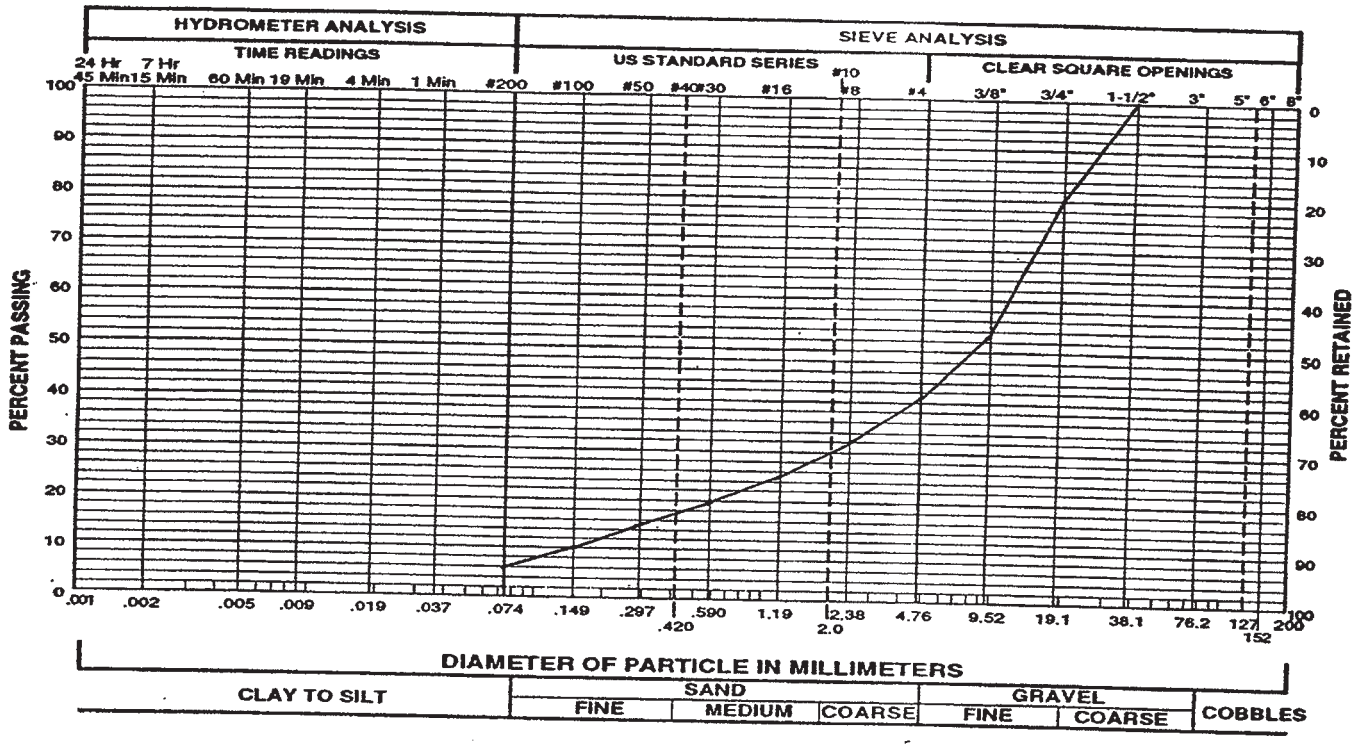
Project No. 1000892 **CONSOLIDATION TEST RESULTS** Figure 7

Applied Geotechnical Engineering Consultants, Inc.

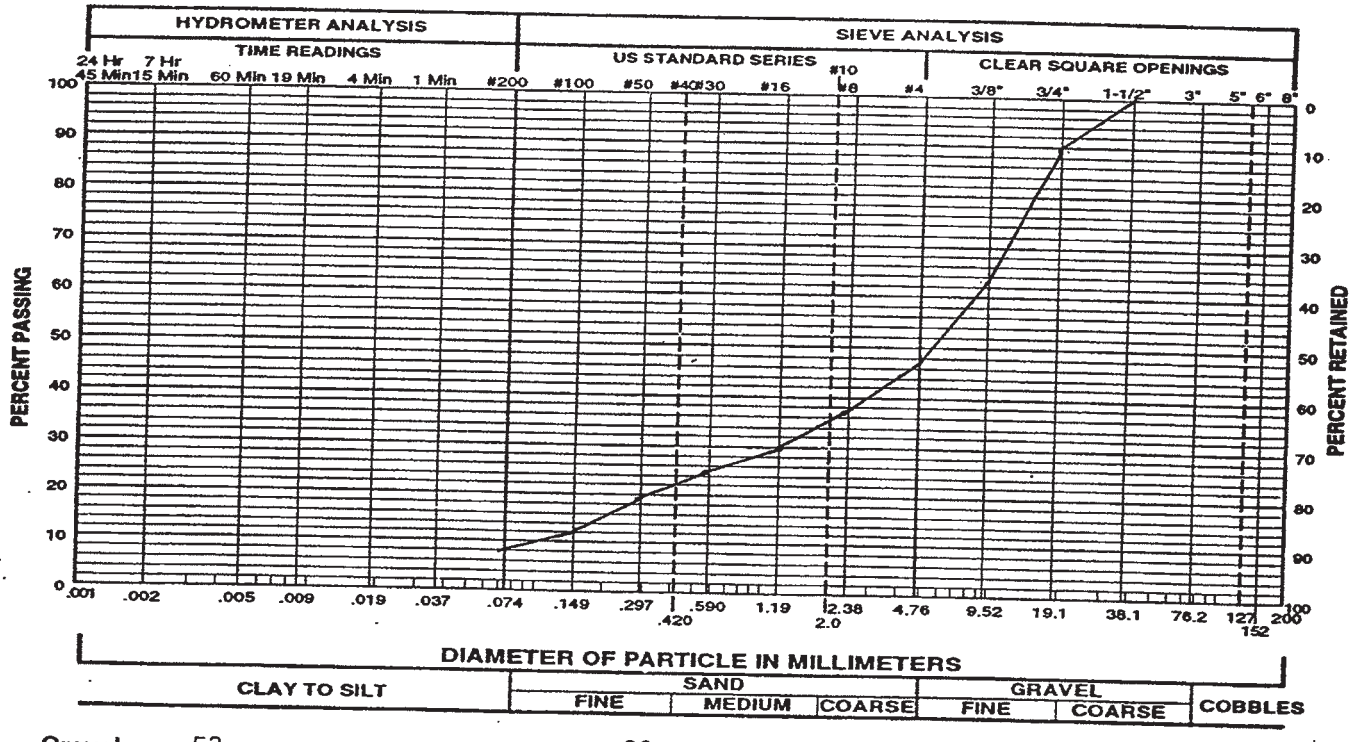


Project No. 1000892 **CONSOLIDATION TEST RESULTS** Figure 6

Applied Geotechnical Engineering Consultants, Inc.



Gravel 59 % Sand 35 % Silt and Clay 6 %
Liquid Limit ____ % Plasticity Index ____ %
Sample of Well-graded Gravel with Silt and Sand From B-5 @ 9'



Gravel 53 % Sand 39 % Silt and Clay 8 %
Liquid Limit ____ % Plasticity Index ____ %
Sample of Well-graded Gravel with Silt and Sand From B-7 @ 9'

Project No. 1000892 **GRADATION TEST RESULTS** Figure 8

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TABLE I

SUMMARY OF LABORATORY TEST RESULTS

PROJECT NUMBER 10008

SAMPLE LOCATION		NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (PCF)	GRADATION			ATTERBERG LIMITS		UNCONFINED COMPRESSIVE STRENGTH (PSF)	WATER SOLUBLE SULFATE (ppm)	SAMPLE CLASSIFICATION
BORING	DEPTH (FEET)			GRAVEL (%)	SAND (%)	SILT/ CLAY (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)			
B-1	0	13	82			83					Lean Clay with Sand
	14	13	84			91					Silt
B-3	1	9	91			59				135	Sandy Lean Clay
B-4	0	17	95			95					Lean Clay
B-5	9	5	105	59	35	6					Well Graded Gravel with Silt and Sand
B-7	2	8				67					Sandy Lean Clay
	9	5	100	53	39	8					Well Graded Gravel with Silt and Sand
B-9	0	20	94			92	31	14			Lean Clay

ENERGY CODE CERTIFICATION

PROJECT IDENTIFICATION: Tunex

PROJECT ADDRESS: Riverton, Utah

PROJECT OWNER:

PROJECT CERTIFICATION:

I, the undersigned registered engineer or architect, hereby certify that the information set forth in this document and supporting energy calculations are accurate and complete. The project described herein complies with the minimum requirements of the Energy Code for Commercial and High Rise Residential Buildings (ASHRAE 90.1–1989). The energy code requirements have been incorporated into the drawings submitted with the building permit application.

This is a certification of the envelope and mechanical only. It does not certify infiltration, electrical, or compliance of construction.

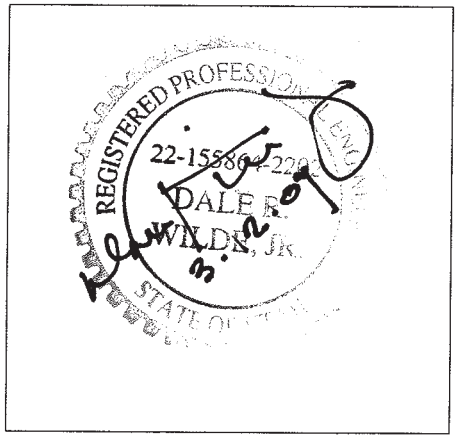
Name: Dale R Wilde Jr Firm: Dale R. Wilde Company

Title: President Address: 1106 E. 2700 S.

License Type: Mechanical City:: Salt Lake State: UT

Date: 3/12/09 Zip Code: 84106

Architect



Mechanical Engineer

Electrical Engineer

COM*check* Software Version 3.5.0
Envelope Compliance Certificate

2006 IECC

Report Date: 03/12/09

Data filename: C:\Program Files\Check\COMcheck\Tunex Riverton.cck

Section 1: Project Information

Project Title: Tunex

Construction Site:
Riverton, UT

Owner/Agent:
Nichols Naylor
1155 East Wilmington Avenue #250
Salt Lake City, UT 84103
487-3330

Designer/Contractor:
Dale R. Wilde Company
1106 East 2700 South
Salt Lake City, UT 84106
801-433-1125

Section 2: General Information

Building Location (for weather data):	**Riverton, Utah**
Climate Zone:	**5b**
Heating Degree Days (base 65 degrees F):	**6521**
Cooling Degree Days (base 50 degrees F):	**2486**
Project Type:	**New Construction**
Vertical Glazing / Wall Area Pct.:	**28%**

Activity Type(s)	Floor Area
Automotive Facility	7062

Section 3: Requirements Checklist

Envelope PASSES: Design 4% better than code.

Climate-Specific Requirements:

Component Name/Description	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor
Roof 1: Attic Roof with Wood Joists	6352	30.0	0.0	0.034	0.034
Exterior Wall 1: Wood-Framed, 16" o.c.	6019	19.0	0.0	0.067	0.089
Window 1: Metal Frame:Double Pane, Tinted, SHGC 0.52	1684	---	---	0.500	0.550
Floor 1: Slab-On-Grade:Unheated, Vertical 2 ft.	305	---	9.0	---	---

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

Air Leakage, Component Certification, and Vapor Retarder Requirements:

- ☐ 1. All joints and penetrations are caulked, gasketed or covered with a moisture vapor-permeable wrapping material installed in accordance with the manufacturer's installation instructions.
- ☐ 2. Windows, doors, and skylights certified as meeting leakage requirements.
- ☐ 3. Component R-values & U-factors labeled as certified.
- ☐ 4. Insulation installed according to manufacturer's instructions, in substantial contact with the surface being insulated, and in a manner that achieves the rated R-value without compressing the insulation.
- ☐ 5. No roof insulation is installed on a suspended ceiling with removable ceiling panels.
- ☐ 6. Stair, elevator shaft vents, and other outdoor air intake and exhaust openings in the building envelope are equipped with motorized dampers.
- ☐ 7. Cargo doors and loading dock doors are weather sealed.
- ☐ 8. Recessed lighting fixtures are: (i) Type IC rated and sealed or gasketed; or (ii) installed inside an appropriate air-tight assembly with a 0.5 inch clearance from combustible materials and with 3 inches clearance from insulation material.

☐ 9. Building entrance doors have a vestibule and equipped with closing devices.
Exceptions:

Building entrances with revolving doors.

Doors that open directly from a space less than 3000 sq. ft. in area.

☐ 10. Vapor retarder installed.

Section 4: Compliance Statement

Compliance Statement: The proposed envelope design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed envelope system has been designed to meet the 2006 IECC requirements in COM*check* Version 3.5.0 and to comply with the mandatory requirements in the Requirements Checklist.

Name - Title	Signature	Date

COM*check* Software Version 3.5.0
Mechanical Compliance Certificate

2006 IECC

Report Date: 03/12/09

Data filename: C:\Program Files\Check\COMcheck\Tunex Riverton.cck

Section 1: Project Information

Project Title: Tunex

Construction Site:
Riverton, UT

Owner/Agent:
Nichols Naylor
1155 East Wilmington Avenue #250
Salt Lake City, UT 84103
487-3330

Designer/Contractor:
Dale R. Wilde Company
1106 East 2700 South
Salt Lake City, UT 84106
801-433-1125

Section 2: General Information

Building Location (for weather data):	**Riverton, Utah**
Climate Zone:	**5b**
Heating Degree Days (base 65 degrees F):	**6521**
Cooling Degree Days (base 50 degrees F):	**2486**
Project Type:	**New Construction**

Section 3: Mechanical Systems List

Quantity	System Type & Description
1	HVAC System 1: Heating: Duct Furnace, Gas / Cooling: Split System, Capacity >=90 - <135 kBtu/h, Air-Cooled Condenser / Single Zone
1	HVAC System 2: Heating: Unit Heater, Gas
4	HVAC System 4: Heating: Radiant Heater, Gas / Single Zone

Section 4: Requirements Checklist

Requirements Specific To: HVAC System 1 :

☐ 1. Equipment minimum efficiency: Duct Furnace (Gas): 80% Ec
☐ 2. Equipment minimum efficiency: Split System: 10.1 EER
☐ 3. Cooling system provides a means to relieve excess outdoor air during economizer operation.
☐ 4. Integrated air economizer required

Requirements Specific To: HVAC System 2 :

☐ 1. Equipment minimum efficiency: Unit Heater (Gas): 80% Ec

Requirements Specific To: HVAC System 4 :

None

Generic Requirements: Must be met by all systems to which the requirement is applicable:

☐ 1. Load calculations per 2001 ASHRAE Fundamentals
☐ 2. Plant equipment and system capacity no greater than needed to meet loads
- Exception: Standby equipment automatically off when primary system is operating
- Exception: Multiple units controlled to sequence operation as a function of load

☐ 3. Minimum one temperature control device per system
☐ 4. Minimum one humidity control device per installed humidification/dehumidification system

☐ 5. Thermostatic controls has 5 degrees F deadband

- Exception: Thermostats requiring manual changeover between heating and cooling

☐ 6. Automatic Controls: Setback to 55 degrees F (heat) and 85 degrees F (cool); 7-day clock, 2-hour occupant override, 10-hour backup

- Exception: Continuously operating zones
- Exception: 2 kW demand or less, submit calculations

☐ 7. Outside-air source for ventilation; system capable of reducing OSA to required minimum

☐ 8. R-5 supply and return air duct insulation in unconditioned spaces R-8 supply and return air duct insulation outside the building R-8 insulation between ducts and the building exterior when ducts are part of a building assembly

- Exception: Ducts located within equipment
- Exception: Ducts with interior and exterior temperature difference not exceeding 15 degrees F.
- Exception: Continuously welded and locking-type longitudinal joints and seams on ducts operating at static pressures less than 2 inches w.g. pressure classification

☐ 9. Mechanical fasteners and sealants used to connect ducts and air distribution equipment

☐ 10. Ducts sealed - longitudinal seams on rigid ducts; transverse seams on all ducts; UL 181A or 181B tapes and mastics

☐ 11. Hot water pipe insulation: 1 in. for pipes <=1.5 in. and 2 in. for pipes >1.5 in. Chilled water/refrigerant/brine pipe insulation: 1 in. for pipes <=1.5 in. and 1.5 in. for pipes >1.5 in. Steam pipe insulation: 1.5 in. for pipes <=1.5 in. and 3 in. for pipes >1.5 in.

- Exception: Piping within HVAC equipment
- Exception: Fluid temperatures between 55 and 105 degrees F
- Exception: Fluid not heated or cooled
- Exception: Runouts <4 ft in length

☐ 12. Operation and maintenance manual provided to building owner

☐ 13. Balancing devices provided in accordance with IMC 603.15

☐ 14. Motorized, automatic shutoff dampers required on exhaust and outdoor air supply openings

- Exception: Gravity dampers acceptable in buildings <3 stories
- Exception: Gravity dampers acceptable in systems with outside or exhaust air flow rates less than 300 cfm where dampers are interlocked with fan

☐ 15. Stair and elevator shaft vents are equipped with motorized dampers

Section 5: Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2006 IECC requirements in COM*check* Version 3.5.0 and to comply with the mandatory requirements in the Requirements Checklist.

Name - Title	Signature	Date
		3/12/09

COM*check* Software Version 3.5.0
Mechanical Requirements Description

2006 IECC

Report Date:

Data filename: C:\Program Files\Check\COMcheck\Tunex Riverton.cck

The following list provides more detailed descriptions of the requirements in Section 4 of the Mechanical Compliance Certificate.

Requirements Specific To: HVAC System 1 :

1. The specified heating and/or cooling equipment is covered by the ASHRAE 90.1 Code and must meet the following minimum efficiency: Duct Furnace (Gas): 80% Ec
2. The specified heating and/or cooling equipment is covered by ASHRAE 90.1 Code and must meet the following minimum efficiency: Split System: 10.1 EER
3. Cooling system provides a means to relieve excess outdoor air during economizer operation to prevent overpressurizing the building.
4. An integrated air economizer is required for individual cooling systems over 65 kBtu/h in the selected climate. An integrated economizer allows simultaneous operation of outdoor-air and mechanical cooling.

Requirements Specific To: HVAC System 2 :

1. The specified heating and/or cooling equipment is covered by the ASHRAE 90.1 Code and must meet the following minimum efficiency: Unit Heater (Gas): 80% Ec

Requirements Specific To: HVAC System 4 :

None

Generic Requirements: Must be met by all systems to which the requirement is applicable:

1. Design heating and cooling loads for the building must be determined using procedures in the ASHRAE Handbook of Fundamentals or an approved equivalent calculation procedure.
2. All equipment and systems must be sized to be no greater than needed to meet calculated loads. A single piece of equipment providing both heating and cooling must satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.
   - Exception: The equipment and/or system capacity may be greater than calculated loads for standby purposes. Standby equipment must be automatically controlled to be off when the primary equipment and/or system is operating.
   - Exception: Multiple units of the same equipment type whose combined capacities exceed the calculated load are allowed if they are provided with controls to sequence operation of the units as the load increases or decreases.
3. Each heating or cooling system serving a single zone must have its own temperature control device.
4. Each humidification system must have its own humidity control device.
5. Thermostats controlling both heating and cooling must be capable of maintaining a 5 degrees F deadband (a range of temperature where no heating or cooling is provided).
   - Exception: Deadband capability is not required if the thermostat does not have automatic changeover capability between heating and cooling.
6. The system or zone control must be a programmable thermostat or other automatic control meeting the following criteria:a) capable of setting back temperature to 55 degrees F during heating and setting up to 85 degrees F during coolingb) capable of automatically setting back or shutting down systems during unoccupied hours using 7 different day schedulesc) have an accessible 2-hour occupant overrided) have a battery back-up capable of maintaining programmed settings for at least 10 hours without power.
   - Exception: A setback or shutoff control is not required on thermostats that control systems serving areas that operate continuously.
   - Exception: A setback or shutoff control is not required on systems with total energy demand of 2 kW (6,826 Btu/h) or less.
7. The system must supply outside ventilation air as required by Chapter 4 of the International Mechanical Code. If the ventilation system is designed to supply outdoor-air quantities exceeding minimum required levels, the system must be capable of reducing outdoor-air flow to the minimum required levels.
8. Air ducts must be insulated to the following levels:a) Supply and return air ducts for conditioned air located in unconditioned spaces (spaces neither heated nor cooled) must be insulated with a minimum of R-5. Unconditioned spaces include attics, crawl spaces, unheated basements, and unheated garages.b) Supply and return air ducts and plenums must be insulated to a minimum of R-8 when located outside the building.c) When ducts are located within exterior components (e.g., floors or roofs), minimum R-8 insulation is required only between the duct and the building exterior.

- Exception: Duct insulation is not required on ducts located within equipment.
- Exception: Duct insulation is not required when the design temperature difference between the interior and exterior of the duct or plenum does not exceed 15 degrees F.
- Exception: Continuously welded and locking-type longitudinal joints and seams on ducts operating at static pressures less than 2 inches w.g. pressure classification.

9. Mechanical fasteners and seals, mastics, or gaskets must be used when connecting ducts to fans and other air distribution equipment, including multiple-zone terminal units.
10. All joints, longitudinal and transverse seams, and connections in ductwork must be securely sealed using weldments; mechanical fasteners with seals, gaskets, or mastics; mesh and mastic sealing systems; or tapes. Tapes and mastics must be listed and labeled in accordance with UL 181A and shall be marked '181A-P' for pressure sensitive tape,'181A-M' for mastic or '181A-H' for heat-sensitive tape. Tapes and mastics used to seal flexible air ductsand flexible air connectors shall comply with UL 181B and shall be marked '181B-FX' for pressure-sensitive tape or'181B-M' for mastic. Unlisted duct tape is not permitted as a sealant on any metal ducts.
11. All pipes serving space-conditioning systems must be insulated as follows: Hot water piping for heating systems: 1 in. for pipes <=1 1/2-in. nominal diameter 2 in. for pipes >1 1/2-in. nominal diameter. Chilled water, refrigerant, and brine piping systems: 1 in. insulation for pipes <=1 1/2-in. nominal diameter 1 1/2 in. insulation for pipes >1 1/2-in. nominal diameter. Steam piping: 1 1/2 in. insulation for pipes <=1 1/2-in. nominal diameter 3 in. insulation for pipes >1 1/2-in. nominal diameter.
    - Exception: Pipe insulation is not required for factory-installed piping within HVAC equipment.
    - Exception: Pipe insulation is not required for piping that conveys fluids having a design operating temperature range between 55 degrees F and 105 degrees F.
    - Exception: Pipe insulation is not required for piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power.
    - Exception: Pipe insulation is not required for runout piping not exceeding 4 ft in length and 1 in. in diameter between the control valve and HVAC coil.
12. Operation and maintenance documentation must be provided to the owner that includes at least the following information:a) equipment capacity (input and output) and required maintenance actionsb) equipment operation and maintenance manualsc) HVAC system control maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions; desired or field-determined set points must be permanently recorded on control drawings, at control devices, or, for digital control systems, in programming commentsd) complete narrative of how each system is intended to operate.
13. Each supply air outlet or diffuser and each zone terminal device (such as VAV or mixing box) must have its own balancing device. Acceptable balancing devices include adjustable dampers located within the ductwork, terminal devices, and supply air diffusers.
14. Outdoor air supply and exhaust systems must have motorized dampers that automatically shut when the systems or spaces served are not in use. Dampers must be capable of automatically shutting off during preoccupancy building warm-up, cool-down, and setback, except when ventilation reduces energy costs (e.g., night purge) or when ventilation must be supplied to meet code requirements. Both outdoor air supply and exhaust air dampers must have a maximum leakage rate of 3 cfm/ft2 at 1.0 in w.g. when tested in accordance with AMCA Standard 500.
    - Exception: Gravity (non-motorized) dampers are acceptable in buildings less than three stories in height.
    - Exception: Systems with a design outside air intake or exhaust capacity of 300 cfm (140 L/s) or less that are equipped with motor operated dampers that open and close when the unit is energized and de-energized, respectively.
15. Stair and elevator shaft vents must be equipped with motorized dampers capable of being automatically closed during normal building operation and interlocked to open as required by fire and smoke detection systems. All gravity outdoor air supply and exhaust hoods, vents, and ventilators must be equipped with motorized dampers that will automatically shut when the spaces served are not in use. Exceptions: - Gravity (non-motorized) dampers are acceptable in buildings less than three stories in height above grade. - Ventilation systems serving unconditioned spaces.