ADDENDUM NO. 1

August 29, 2013

This addendum, applicable to work designated above, is an amendment to the proposal and specification documents and as such shall be a part of and included in the Contract. Acknowledge receipt of this addendum by entering the addendum number and issue date in the spaces provided on all submitted copies of the proposal.

A. Addendum Purpose

The purpose of this addendum is to inform on eligibility of respondents and issue revisions to the plans and specifications for the (DSP) Somerset Facility – High Service Pump Upgrades Project (SAWS Job No. 12-6101; SAWS Solicitation No. B-13-059-DD).

B. Mandatory Pre-Proposal Meeting and Site Visits

As outlined in the Invitation for Competitive Sealed Proposals, proposals will not be accepted from any company who was late or not represented at both the mandatory pre-proposal meeting and mandatory site visit on August 22, 2013 at 10:00 a.m. The following is a record of the represented firms that attended both events:

- All Materials Construction
- Alterman Electric
- Archer Western
- Austin Engineering
- Bosquez Electric
- Cunningham Constructors & Associates
- HJD Capital Electric
- Lambda Construction
- MGC Contractors
- Quest Civil Constructors Texas
- Pesado Construction, Co.
- Pronto Sandblasting & Coating and Oil Field Services
- Pump Solutions, Inc.
- Shannon Monk, Inc.
- Wastewater Solutions

C. Modifications to the Specifications

1. The Table of Contents is modified to include Appendix A, Geotechnical Report, Sections 02378 Drilled Concrete Piers; 05120 Structural Steel; 05310 Steel Roof Deck; and 07610 Metal Roofing
2. Geotechnical report entitled "Revised Geotechnical Engineering Report, Ground Storage Tank and Pump Station Somerset Road (FM 2790) North of Loop 1604. Somerset, Texas", dated August 13, 2009, prepared by Terracon Consultants, Inc. is incorporated into the specifications as Appendix A.
3. Sections 02378 Drilled Concrete Piers; 05120 Structural Steel; 05310 Steel Roof Deck; and 07610 Metal Roofing are incorporated in the specifications

D. Modifications to the Plans

1. Sheets S1, S2 and S3 representing the design of a steel canopy and other miscellaneous structural details, as prepared by the firm Bill Reiffert and Associates, Inc. and sealed August 27, 2013, are incorporated in the plans.

ACKNOWLEDGEMENT BY RESPONDENT

Each respondent is requested to acknowledge receipt of this Addendum No. 1 by his/her signature affixed hereto and to file same and attach with his/her proposal.

The undersigned acknowledges receipt of this Addendum No. 1 and the proposal submitted herewith is in accordance with the information and stipulations set forth.

Date

Signature

Tetra Tech, Inc.

Texas Registered Engineering Firm F-3924

700 N. Saint Mary's Street, Ste. 300

San Antonio, TX 78205

(DSP) Somerset Facility High Service Pump Upgrades Project
Pre-Proposal Meeting
22-Aug-13
10:00 AM

(1)

Name	Company	Phone Number	Email Address
Rod Lunkwitz	Archer Western	(817) 640-3898	rlunkwitz@walshgroup.com
George Garcia	Pronto Sandblasting	210) 633-2030	prontosandblasting@satx.rr.com
Damian Porter	Cunningham Constructors & Assoc	512-863-2131	cca017@ecpi.com
Wayland Simmons	Lambda Construction	830-629-5808	waylan@satx.rr.com
Nelson Fewbocsc	Alterman Electric	210-510-8150	NFewbocsc@goAltermn.com
Jose Lopez	Quest Civil Constructors Texas	512-336-2000	tjs@qcsw.com
Shannon Lucas	Quest Civil Constructors	619-405-8999	spl@qcsw.com
Tim A Matus	Itsu Energy, INC	(210) 913-6863	tim.matus@itsuenergy.com
Eddie Fischer	HJD Capital Electric	210-559-0705	efischer@HJDCapital.com
Fernando Roman	TETRA TECH	2102260252	fernando.roman@tetratech.com

TETRA TECH

(DSP) Somerset Facility High Service Pump Upgrades Project
Pre-Proposal Meeting
22-Aug-13
10:00 AM

(2)

Name	Company	Phone Number	Email Address
Scott Carter	Prime Controls	214-728-4790	S.carter@prime-controls.com
R.B. Green	Scruggs Co.	(210)896-1971	Dgreen@scruggsco.com
Bill Whatley	WASTEWATER Solution	512 201	2027 bill@wastewater-solutions.net
CARL WARNKE	SHANNON-MONK INC	210 688-9461	cwarnke@shannon-monk.com
JIM PEDRAZA	SAWS	210-233-3594	jpedraza@saws.org
Mike Watson	Pepper Lawson Waterworks	866-536-7992	waterworksbids@pepperlawson.com
Vicente J Garza	SAWS	210-233-3596	vgarza@saws.org
Daryl McKinney	All Materials Const LLC	830-515-6623	allmaterialsconstr@gmail.com
Henry Bosquez	Bosquez Electric	210-415-2276	hbosquez@bosquez.com
Nancy Turner	Tetra Tech	210 226.2923	nancy.turner@tetratech.com
Diana Dwyer	SAWS	210-233-3372	ddwyer@saws.org

(DSP) Somerset Facility High Service Pump Upgrades Project
Pre-Proposal Meeting
22-Aug-13
10:00 AM

3

Name	Company	Phone Number	Email Address
Charles Albert	AlterMAW	496-6888	calbert@go altermaw.com
Bob Grubb	Grubb Engineering	658-7250	bob@grubbengineering.com
Jimmy CLARK	EFI	354-223-2326	Jimmy@BRADgreenASSOC.com
Bridget DeLeon	Grubb Engineering	210-659-7250	bdeleon@grubbengineering.com
Mike Cox	Pesado Construction	210 651 4452	mcox@PesadoConstructionCo.com
Terry House	Odessa Pumps	5125692873	thouse@odessapumps.com
JAMES MANSFIELD	PUMP SOLUTIONS INC.	512-846-2600	JAMES@PUMPSOLUTIONS.NET
Travis Keller	Austin Engineering	512-327-4464	tkeller@austinengineering.com
Shawn Fanning		210-602-6582	SFANNING@BRANDTENG.COM DEEPSEA5311@GMAIL.COM
Stephen Nuson	MGC Contractors	830-515-6398	TXDOS@MGCCONTRACTORS.com

(DSP) Somerset Facility High Service Pump Upgrades Project
Pre-Proposal Meeting
22-Aug-13
10:00 AM

Site Visit ①

Name	Company	Phone Number	Email Address
Nancy Turner	Tetra Tech	210.226.2922	nancy.turner@tetratech.com
Rod Lunkwitz	Archer Western	817.640.3898	rlunkwitz@walshgroup.com
Shannon Lucas	Quest Civil Constructors	619-405-8999	spl@qusw.com
Jose Lopez	Quest Civil Constructors Texas	512-336-2000	tjs@qusw.com
Waylan Simmons	Lambda Construction	830-629-5808	waylan@satx.rr.com
Eddie Fischer	HJD Capital Electric	(210) 559-0705	efischer@HJD Capital.com
Damian Porter	Cunningham Constructors & Assoc	512-863-2131	cca027@ecpi.com
George Garcia	Pronto Sandblasting	210)633-2030	prontosandblasting@SATX.RR.com
Stephen Nuson	MGC Contractors	830-515-6398	TXBIDS@MGCCONTRACTORS.com
Bill Whatley	Wastewater Solutions	512-707-7027	bill@wastewater-solutions.net
Darryl McBride	All Materials Construct	830-515-6627	estimating@allmaterialsconstruct.com
Carl Waranke	Shannon-Monk, Inc	210-688-9[illegible]	cwarnke@shannon-monk.com
Travis Keller	Austin Engineering	512-327-1464	tkeller@aecci.net
[illegible]	Bosque Electric	210-416-22[illegible]	ldbosquez@ldbosquez.com
Nelson Froboese	Alterman Electric	210-510-8150	NFroboese@goAlterman.com
Mike Cox	Pesado Construction Co	210 631 4432	mcox@PesadoConstructionCo.com
James Mansfeld	Pump Solutions Inc.	512-809-2302	james@pumpsolutions.net

TETRA TECH

(2)

(DSP) Somerset Facility High Service Pump Upgrades Project
Pre-Proposal Meeting
22-Aug-13
10:00 AM

Site Visit

Name	Company	Phone Number	Email Address
Charles Albert	Alterman	496-6888	CAlbert@goAltermAN.com
Diana Dwyer	SAWS	233-3372	ddwyer@saws.org

REVISED

GEOTECHNICAL ENGINEERING REPORT

GROUND STORAGE TANK AND PUMP STATION
SOMERSET ROAD (FM 2790) NORTH OF LOOP 1604
SOMERSET, TEXAS

Terracon Project Nº 90095080A
August 13, 2009

Prepared For:

BEXARMET WATER DISTRICT
SAN ANTONIO, TEXAS

PREPARED BY:

TERRACON CONSULTANTS, INC.
SAN ANTONIO, TEXAS

August 13, 2009

Mr. Bobby Mengden, P.E
BexarMet Water District
2055 W. Malone
San Antonio, Texas 78225

Consulting Engineers & Scientists

Terracon Consultants, Inc.
6911 Blanco Road
San Antonio, Texas 78216-6164
Phone 210.641.2112
Fax 210.641.2124
www.terracon.com

SUBJECT:
Geotechnical Engineering Services
Ground Storage Tank and Pump Station
Somerset Road (FM 2790) North of Loop 1604
Somerset, Texas
Terracon Project Nº 90095080A

Dear Mr. Mengden:

Terracon Consultants, Inc. (Terracon) is pleased to submit the enclosed revised geotechnical engineering report for the design and construction of the proposed ground storage tank and pump station in Somerset Texas. This report addresses the procedures and findings of our geotechnical engineering study along with our recommendations that may be used to prepare the appropriate design and construction documents for this project.

We appreciate this opportunity to be of service to you on this phase of the project. We look forward to continuing our involvement in the project by providing field monitoring and materials testing services during construction. In order for us to effectively provide these services, we will need a complete set of plans and specifications for our use. In addition, we should be invited to the preconstruction meeting to address any construction issues before site work begins.

If you have any questions regarding our report, or if additional geotechnical engineering recommendations are needed, please do not hesitate to contact the undersigned or Mr. Chuck A. Gregory, P.E.

Sincerely,
Terracon Consultants, Inc.
(Firm Registration: TX F3272)

S. Rajpal

Sugandh Rajpal, E.I.T.
Project Manager
Geotechnical Engineering Division

Mike T. Ghazawi, P.E.
Principal

SR/MTG/set – 90095080A

Copies Submitted: (3) BexarMet Water District; Mr. Bobby Mengden, P.E.

Terracon

TABLE OF CONTENTS

REVISED
GEOTECHNICAL ENGINEERING REPORT

GROUND STORAGE TANK AND PUMP STATION
SOMERSET ROAD (FM 2790) NORTH OF LOOP 1604
SOMERSET, TEXAS

Terracon Project Nº 90095080A
August 13, 2009

INTRODUCTION

Terracon Consultants Inc. (Terracon) is pleased to submit this document which presents the results of our geotechnical engineering study for this project. The project involves the design and construction of a new ground storage tank and pump station at and existing facility located off of Somerset Road north of Loop 1604 in Somerset, Texas.

Mr. Bobby Mengden, P.E, with BexarMet Water District authorized this geotechnical engineering study on May 28, 2009 through issuing a work order no. 1 and BexarMet project# U8020C. The scope of services for this project is outlined in our Terracon Proposal Nº P90090347, dated April 29, 2009.

PROJECT DESCRIPTION

The project involves the design and construction of a new ground storage tank and pump station at and existing facility located off of Somerset Road north of Loop 1604 in Somerset, Texas. Based on the information provided to us, we understand that the new tank will have a capacity of 1 million gallon (MG) and will have a diameter of 75¼ feet and a 30 feet side water depth. We also understand that a perimeter drainage system around the proposed tank will be constructed. The new pump station will have an approximate dimension of 20 feet by 74 feet.

Existing grades information was provided to us Tetra Tech. The Finished Floor Elevation (FFE) is set at elevation 639.0 for the proposed tank and at elevation 637.5 for the perimeter drain. The Finished Floor Elevation (FFE) for the proposed pump station was not available to us at the time this report was prepared. The preferred foundation system being considered to support the tank is a reinforced concrete perimeter footing and slab. A Vicinity Map, Bore Location Plan and individual boring logs are presented in Appendix A of this report.

SITE EXPLORATION PROCEDURES

Field Exploration

Terracon personnel used the site plan provided by Tetra Tech to establish the bore locations in the field. Locations of the borings are shown on the attached "Bore Location Plan." A truck-mounted, rotary drill rig equipped with continuous flight augers was used to advance the boreholes. Soil samples were obtained by both thin-walled tube and split-barrel sampling procedures. In the thin-walled tube sampling procedure, a thin-walled, seamless tube with a sharp cutting edge is pushed hydraulically into the ground to obtain relatively undisturbed samples of cohesive or moderately cohesive soils. In the split-barrel sampling procedure, a standard 2-inch O.D. split-barrel sampling spoon is driven into the ground with a 140-pound hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the standard penetration resistance value. These values are indicated on the boring logs at the depths of occurrence. The samples were sealed and transported to our laboratory for testing and classification.

Our field representative prepared the field logs as part of the drilling operations. The field logs included visual classifications of the materials encountered during drilling and our field representative's interpretation of the subsurface conditions between samples. Each boring log included with this report represents the geologist's/engineer's interpretation of the field logs and include modifications based on visual observations and testing of the samples in the laboratory.

Laboratory Testing

Selected samples retrieved from the borings were tested for moisture content and gradation to aid in the soil classification and to provide input for our analysis. Atterberg limits tests were also performed on selected portions of the subsurface soils to aid in classifying the soils, evaluating their plasticity, and estimating their volume change potential with variations in moisture content. Unconfined compressive strength tests were also performed on selected samples to identify the compressive strength.

The results of these laboratory tests are shown on the boring logs adjacent to the respective sample location. As part of the testing program, a geologist/engineer examined the soil samples in the laboratory. Based on the laboratory test results and the material's texture and plasticity, the soil samples were described according to the General Notes and classified in accordance with the Unified Soil Classification System (USCS). The estimated group symbols for the USCS are shown in the appropriate column on the boring logs. The General Notes and a brief description of the USCS are presented in Appendix B of this report.

SITE CONDITIONS

Topographic information on the site plan provided by Tetra Tech shows the site slopes from south to north with an elevation of 644 feet to an elevation of 637 feet. The ground surface generally consists of seasonal grasses, weeds, and trees. The site is within an existing tank facility and is located off of Somerset Road north of Loop 1604 in Somerset, Texas.

SUBSURFACE CONDITIONS

Soil Conditions

Subsurface conditions were evaluated by drilling four borings within the planned limits of proposed tank construction and by drilling two borings within the planned limits of proposed pump station construction. Our generalization of the subsurface stratigraphy within the project limits, as interpreted from the data obtained during our field exploration activities and laboratory testing program, is as follows:

Stratum	Range in Depth, feet*	Range in Elevation, feet*	Stratum Description and Classification
I	0 – 4½	641.0 – 634.5	CLAYEY SAND (SC); brown, medium dense to dense, gravel and roots. Encountered in borings B-1, B-2, B-3 and B-4
II	2½ – 30	643.0 – 608.0	LEAN CLAY (CL); brown, light brown, gray, light gray and light tan, medium stiff to hard, some sand. Encountered in all borings.

* The strata thicknesses and depths to their interface are approximate. Our measurements are referenced from ground surface at the time of our drilling activities. Subsurface conditions may vary between the borings. Ground surface elevations at the boring locations were estimated from topographic information provided by others.

Laboratory tests indicate the Strata I CLAYEY SAND (SC) materials have a low to moderate potential for volumetric changes with fluctuations in moisture content. The Strata II LEAN CLAY (CL) materials have moderate plasticity however these materials presently are at dry condition and may exhibit a higher potential then anticipated herein for volumetric changes with fluctuations in moisture content.

Groundwater Conditions

Groundwater or subsurface water generally appears as either a permanent or temporary water source. Permanent subsurface water is generally present year round and fluctuates seasonally

with climatic changes. Temporary subsurface water is also referred to as a "perched" water source, which generally develops as a result of seasonal and climatic conditions. For the purposes of this report, we will simply refer to groundwater as subsurface water.

The borings were drilled to their full depths using dry drilling techniques to aid in the observation of subsurface water. Subsurface water was encountered in boring B-1 only at 28 feet (EL 611.0 feet) during or upon completion of our field operations. Specific information concerning subsurface water is noted on the boring logs presented in Appendix A of this report.

ENGINEERING RECOMMENDATIONS

Geotechnical Considerations

The Finished Floor Elevation (FFE) for the proposed tank is set at EL 639.0. We estimate that the finish tank pad elevation will be near EL 638.5. The Finished Floor Elevation (FFE) for pump station site was not available at the time of this report. However, we anticipate limited cuts and/or fill will be necessary. Accordingly our recommendations for the pump station are based on assuming a Finished Pad Elevation (FPE) at or near existing grade at the time of our field activities. If this information changes, we should be contacted to review and revise our recommendation as appropriate.

The foundations being considered to provide support for the planned tank and pump station structures must satisfy two completely independent engineering criteria with respect to the subsurface conditions encountered at the site. One criterion is the foundation system must be designed with an appropriate factor of safety to reduce the possibility of soil failure when subjected to axial and lateral load conditions. The other criterion is foundation movements, whether vertical, horizontal, or rotational, must be within allowable limits of the soil and within operational limits of the structure. The field and laboratory data acquired during this study indicate that the soils at this site have competent strength characteristics, but also have the potential to experience moderate volume change (expansion and contraction) during fluctuations in their moisture contents.

Considering the tank dimensions discussed previously in this report, the water pressure acting on the tank bottom is expected to be about 2,100 pounds per square foot (psf). The field and laboratory data also indicate that the soils at this site generally have competent strength characteristics, and thus, the criterion regarding bearing capacity can be satisfied for the tanks. However, due to the magnitude of sustained or permanent loads for the proposed tank, vertical movements associated with immediate and long-term settlement of the underlying soils must be considered during the foundation design.

We understand that a perimeter footing and slab foundation system is desired for the proposed tank. The suitability and performance of a soil supported foundation for a structure depends on many factors including the magnitude of soil movement expected, the type of structure, the

intended use of the structure, the construction methods available to stabilize the soils, and our understanding of the owner's expectations of the completed structure's performance.

Expansive Soil Considerations

Soils having low to moderate expansive potentials were encountered at the proposed tank site. Based upon the results of our field and laboratory programs, we estimate that the subsurface soil in the upper 15 feet within the area of the proposed tanks exhibits a Potential Vertical Rise (PVR) of about 1½ inches in its present condition. We also estimate that the subsurface soil in the upper 15 feet within the area of the proposed pump station exhibits a Potential Vertical Rise (PVR) of about 1 inch in its present condition The PVR was determined using the Texas Department of Transportation (TxDOT) Method TEX-124-E.

Measures should be taken to reduce the chances for the foundation soils to experience excessive wetting or drying. Water infiltration into the foundation soils can be created by exterior sources associated with the planned improvements. Such sources may include inadequate drainage around the structures, subsurface migration through backfill in utility trenches, from irrigation of landscaping, and leakage/spills from the tank.

All grades should provide effective drainage away from the structures foundations during and after construction. Water permitted to pond next to the structures foundations can result in greater soil movements than those discussed in this report. These greater movements can result in unacceptable differential movements, cracked foundations, and structural distress. Estimated movements described in this report are based on effective drainage for the life of the structures and cannot be relied upon if effective drainage is not maintained.

Exposed ground should be sloped at least 5 percent away from the tank foundations for at least 10 feet beyond the perimeter of the tanks. After the structures construction and landscaping, we recommend verifying final grades to document that effective drainage has been achieved. Grades around the structures should also be periodically checked and adjusted as necessary, as part of the structure's maintenance program.

Utility trenches are a common source of water infiltration and migration. All utility trenches that penetrate beneath the structures foundations should be effectively sealed to restrict water intrusion and flow through the trenches that could migrate into the prepared subgrade. We recommend constructing an effective clay "trench plug" that extends at least 5 feet out from the face of the tank foundation exterior that extends beyond the select fill into the clay. The plug material should consist of clay with PI of 15 to 25 percent that is moisture conditioned to between optimum moisture content and 4 percentage points above the optimum moisture content and compacted to at least 95 percent of ASTM D 698. The clay fill should be placed to completely surround the utility line. We recommend that utility backfill be placed in 6 inch compacted lifts that are compacted to at least 95 percent of ASTM D 698. As an alternative a flowable fill material may be considered. Flowable fill, or slurry, when properly designed can act

as a good moisture barrier and still be readily excavated if the utilities require repair or maintenance. In addition flowable fill does not need to be placed in lifts, compacted, or tested.

This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and cracking in the structure should be anticipated. The severity of cracking and other damage will probably increase if any modification of the site results in excessive wetting or drying of the expansive soils. The risks for soil movement can be reduced by modifying the tank and pump station subgrade soils below grade-supported foundations as recommended in the "Tank Pad Preparation" and "Pump Station Pad Preparation" sections of this report.

Tank Pad Preparation

The grade-supported tank structure will be sensitive to soil movements. We understand that a perimeter drainage system around the tank is planned at this site. This perimeter drainage system will reduce the magnitude of moisture infiltration beneath the tank pad. If the information regarding the perimeter drainage changes, Terracon should be contacted to further evaluate the recommendations provided in this section. Based upon the results of our field and laboratory programs, we estimate that the subsurface soil in the upper 15 feet within the area of the proposed tank exhibits a Potential Vertical Rise (PVR) of about 1½ inches in its present condition. We understand that a PVR value of ¾ inche is desired for the grade-supported tank structure. Eventough the soils have a low plasticity indices, the moisture content of these soils were low compared to the corresponding plastic limits, thus have a potential to absorb water and have a greater swell potential than the estimated in the PVR calcuations. Thereby we have provided the following subgrade preparation recommendations which are intended to reduce the magnitude of soil movements beneath the grade supported tank structures at this site to about ¾ inch. If a lower PVR value is desired, Terracon should be contacted to further evaluate our recommendations.

- Strip all existing vegetation, loose soil, existing foundation, concrete flatwork, buried utilities/structures and any other deleterious material from the structure areas. The structure area is defined as the area that extends at least 3 feet beyond the perimeter of the tank, including any flatwork that abuts the structure such as sidewalks. The removal of existing buried utilities/foundations is discussed in the "Earthwork" section of this report.

- Excavate the on-site soil to an elevation of 636.0 feet from the tank pad and stockpile for reuse in the tank pad.

- The exposed subgrade in the tank area should be proofrolled with at least a 20-ton roller, or equivalent equipment, to evidence any weak yielding zones. A Terracon geotechnical engineer or his/her representative should be present to observe proofrolling operations.

- Over-excavate any confirmed weak yielding zones, both vertically and horizontally, to expose competent soil. The excavated soil can be used to restore grade provided that the material is relatively free and clean of deleterious material or materials exceeding 3 inches in maximum dimension. The soil should be placed in loose lifts of no more than 8 inches; moisture conditioned to at least -2 to +3 percentage points of the optimum moisture content, and compacted to at least 95 percent of the maximum dry density determined in accordance with ASTM D 698.

- After proofrolling and replacement of weak yielding zones, scarify and moisture condition the top 6 inches of subgrade to at least -2 to +3 percentage points of the optimum moisture content, and compacted to at least 95 percent of the maximum dry density determined in accordance with ASTM D 698.

- The stockpiled on-site soils can be used to achieve the finished tank pad elevations (EL 638.9) provided that the material is relatively free and clean of deleterious material or materials exceeding 3 inches in maximum dimension. The soil should be placed in loose lifts of no more than 8 inches; moisture conditioned to at least -2 to +3 percentage points of the optimum moisture content, and compacted to at least 95 percent of the maximum dry density determined in accordance with ASTM D 698.

- If grades are to be raised further, select fill should then be used to achieve the finished tank pad elevations. Recommendations for select fill are included in the "Select Fill Materials" section of this report. Select fill should be placed in loose lifts of no more than 8 inches, moisture conditioned to between -2 and +3 percentage points of the optimum moisture content, and compact to at least 95 percent of the maximum dry density determined in accordance with ASTM D 698.

- To provide a more uniform slab support and create a more all-weather working surface, we recommend constructing the final 6 inches of the tank pad with granular base material. Lift thickness for select fill should not exceed 8 inches loose, to achieve about 6 inches compacted. Granular base material will be less prone to damage by rain, and thus, less weather related delays should be expected. Recommendations for granular base material are provided in the "Select Fill Materials" section of this report.

Pump Station Pad Preparation

The grade-supported pump station will be sensitive to soil movements. Based upon the results of our field and laboratory programs, we estimate that the subsurface soil in the upper 15 feet within the area of the proposed tanks exhibits a Potential Vertical Rise (PVR) of about 1 inch in its present condition. However the soils are in relatively dry conditions and some soil

modification is needed. we estimate that a design PVR of 1 inche is desired for the grade-supported tank structure. We have provided the following subgrade preparation recommendations which are intended to maintain the magnitude of soil movements beneath the grade supported pump station structure at this site to about 1 inch. If a lower PVR value is desired, Terracon should be contacted to further evaluate our recommendations.

- Strip all existing vegetation, loose soil, and any other deleterious material from the structure areas. The structure area is defined as the area that extends at least 3 feet beyond the perimeter of the tank, including any flatwork that abuts the structure such as sidewalks.

- Cut and balance grades in pump station pad area to an elevation within one (1) foot below the finish pump station pad elevation.

- Prior to the fill placement the exposed subgrade in the pump station should be proofrolled with at least a 20-ton roller, or equivalent equipment, to evidence any weak yielding zones. A Terracon geotechnical engineer or his/her representative should be present to observe proofrolling operations.

- Over-excavate any confirmed weak yielding zones, both vertically and horizontally, to expose competent soil. The excavated soil can be used to restore grade provided that the material is relatively free and clean of deleterious material or materials exceeding 3 inches in maximum dimension. The soil should be placed in loose lifts of no more than 8 inches; moisture conditioned to at least -2 to +3 percentage points of the optimum moisture content, and compacted to at least 95 percent of the maximum dry density determined in accordance with ASTM D 698.

- After proofrolling, replacement of weak yielding zones and balance grade operations, scarify and moisture condition the top 6 inches of subgrade to at least -2 to +3 percentage points of the optimum moisture content, and compacted to at least 95 percent of the maximum dry density determined in accordance with ASTM D 698.

- Select fill or excavated soil meeting the select fell requirements should be used to achieve the finished pump station pad elevations. Recommendations for select fill are included in the “Select Fill Materials” section of this report. Select fill should be placed in loose lifts of no more than 8 inches, moisture conditioned to between -2 and +3 percentage points of the optimum moisture content, and compact to at least 95 percent of the maximum dry density determined in accordance with ASTM D 698.

- To provide a more uniform slab support and create a more all-weather working surface, we recommend constructing the final 6 inches of the pump station pad with granular base material. Lift thickness for select fill should not exceed 8 inches loose, to achieve about 6 inches compacted. Granular base material will be less prone to damage by rain, and thus, less weather related delays should be expected. Recommendations for granular base material are provided in the "Select Fill Materials" section of this report.

Perimeter Footing and Slab

Design Considerations. As noted previously in this report, a perimeter footing and slab is the preferred foundation system planned to support the proposed tank structure. For this foundation type, the potential for settlement and expansive soil-related movements of the underlying soils will need to be addressed.

We recommend that the perimeter footing for the tank be designed to bear no shallower than about 24 inches below final exterior grade. The footing may be designed for a net allowable bearing pressure of 3,700 psf for total load, which includes a factor of safety of at least 2.

Using a water pressure of 2,100 psf, and considering the diameter of the structure, we estimate settlement at the center of the tank to be about 1 to 1½ inches. We estimate settlement of about ¾ to 1 inch along the perimeter footing of the tank foundation. Most of the settlement is expected to be complete after filling the tank.

If the estimated settlement and/or PVR values are not considered to be within tolerable limits for the proposed tank, we would be pleased to provide other foundation and/or subgrade modiication options.

Several design methods use the modulus of subgrade reaction, k, to account for soil properties in design of flat slabs-on-grade. The modulus of subgrade reaction is a spring constant that depends on the soil type, degree of compaction, and moisture content. Based on our recommendations in the "Tank Pad Preparation" section, a k-value of about 80 pci can be used for design of flat slab-on-grade for the tank.

Construction Considerations. The perimeter footing for the tank should preferably be neat-excavated with a smooth-mouthed bucket. If a toothed bucket is used, excavation with this bucket should be stopped 6 inches above final grade and the grade beam excavation completed with a smooth-mouthed bucket or by hand labor. Due to presence of sandy material, caving of the foundation sidewalls may occur. Therefore, the foundation contractor should be prepared to use forms.

Steel should be placed and the foundation poured the same day of excavation. If not, a seal/mud slab consisting of lean concrete should be poured to protect the exposed foundation

bearing surfaces. The bearing surfaces should be excavated with a slight slope to create an internal sump for runoff water collection and removal. If water in excess of 2 inches accumulates at the bottom of the excavations, it should be pumped out prior to concrete placement. Under no circumstances should water be allowed to adversely affect the quality of the bearing surfaces.

To achieve the final exterior grade, backfill above the foundation may consist of on-site soils or select fill soils meeting the requirements given in the "Select Fill Materials" section of this report. The backfill should be placed in thin, loose lifts not to exceed 8 inches. Backfill soils should be compacted to at least 95 percent of the maximum dry density as determined by the standard moisture/density test (ASTM D 698) at moisture contents ranging from -2 to +3 percentage points of the optimum moisture content.

All piping leading to the tank structures should be designed with flexible connections to reduce potential damage due to differential movements between the structure and the piping.

Mat Foundation

A mat may be considered for the planned structures at this site. The bearing depth of the mat may likely be controlled by the load requirements necessary to resist the overturning moment induced by wind loading. However, the mat should bear no shallower than 3 feet below current site grade and may be designed for a bearing (contact) pressure not to exceed 3,700 psf based on dead load plus long-term live loads. The indicated bearing pressure includes a factor of safety against a bearing capacity failure of at least 2. Contact stresses should be distributed so that yield does not occur. A subgrade modulus (k) of 80 pounds per cubic inch (pci) can be utilized for prepared subgrade as recommended in this report.

Overturning moments induced by wind loading should be considered during the foundation design. Uplift loading on the mat foundation can be resisted by the weight of the mat, the weight of structure, and any soil overlying the mat. Overturning should be analyzed for both empty and full tank conditions. A soil unit weight of 120 pounds per cubic foot (pcf) may be assumed for the onsite soils or select fill placed above the mat, provided the select fill is properly compacted as recommended in this report. Criteria for select fill are discussed in the "Select Fill Materials" section of this report. An ultimate coefficient of friction across the mat foundation base of 0.4 can be used to aid in the resistance of ground line shear.

Total settlements, both immediate and long-term, should be less than 1½ inches for a mat foundation designed for the indicated contact pressure. Differential settlements between the center and edge of the mat foundation should be on the order of ½ to ¾ of the total settlement. The indicated differential settlement was determined based on a minimum of 3 foot thick foundation. If the degree of movement indicated in this report is not tolerable, the mat foundation may be placed deeper and/or may be thickened to further increase its stiffness.

Construction Considerations. Mat foundations should preferably be neat excavated. Excavation should be accomplished with a smooth-mouthed bucket. If a toothed bucket is used, excavation with this bucket should be stopped 6 inches above the final excavation surface and the excavation completed with a smooth-mouthed bucket or by hand labor.

If the mat foundation is overexcavated and formed, the backfill around the foundation sides should be achieved with compacted select fill, lean concrete, compacted cement stabilized sand (two sacks cement to one cubic yard of sand) or flowable fill. Compaction of select fill should be as described later in this section of the report. Due to presence of sandy material, caving of the foundation sidewalls may occur. Therefore, the foundation contractor should be prepared to use forms.

Steel should be placed and the foundation poured the same day of excavation. If not, a seal slab consisting of lean concrete should be poured to protect the exposed foundation bearing surface. The bearing surface should be excavated with a slight slope to create an internal sump for runoff water collection and removal. If surface runoff water in excess of 2 inches accumulates at the bottom of the excavation, it should be pumped out prior to concrete placement. Under no circumstances should water be allowed to adversely affect the quality of the bearing surface.

If the mat is buried, backfill above the foundations should consist of select fill soils. Backfill soils should be compacted to at least 95 percent of the maximum dry density as determined by the standard moisture/density test (ASTM D 698). Moisture contents for select fill soil should range from -2 to +3 percentage points of optimum for select fill soils. The backfill should be placed in thin, loose lifts not to exceed 8 inches, with compacted thickness not to exceed 6 inches.

All piping leading to the elevated tank structure should be designed with flexible connections to reduce potential damage due to differential movements between the structure and the piping.

Slab Foundation

A slab and grade beam foundation system may be considered for the pump station structure. Parameters commonly used to design this type of foundation are provided on Table 1 at the end of this text. The slab foundation design parameters presented on Table 1 are based on the criteria published by the Building Research Advisory Board (BRAB) and the Post-Tensioning Institute (PTI) 3rd Edition. These are essentially empirical design methods and the recommended design parameters are based on our understanding of the proposed project, our interpretation of the information and data collected as a part of this study, our area experience, and the criteria published in the BRAB and PTI design manuals.

We recommend that the exterior perimeter grade beams bear at least 24 inches below final exterior grade. This recommendation is for proper development of bearing capacity for the continuous beam sections of the foundation system. These recommendations are not based on structural considerations. Grade beam depths may need to be greater than recommended

herein for structural considerations and should be properly evaluated and designed by the Structural Engineer. The grade beams or slab portions may be thickened and widened to serve as spread footings at concentrated load areas.

For a slab foundation system designed and constructed as recommended in this report, post construction settlements should be less than 1 inch. Settlement response of a select fill supported slab is influenced more by the quality of construction than by soil-structure interaction. Therefore, it is essential that the recommendations for foundation construction be strictly followed during the construction phases of the pumpstation pad and foundation.

Construction Considerations. Grade beams for the slab foundation should preferably be neat excavated. Excavation should be accomplished with a smooth-mouthed bucket. If a toothed bucket is used, excavation with this bucket should be stopped 6 inches above final grade and the grade beam excavation completed with a smooth-mouthed bucket or by hand labor. If neat excavation is not possible then the foundations should be horizontally overexcavated and formed. All loose materials should be removed from the overexcavated areas and filled with lean concrete or flowable fill. Steel should be placed and the foundation poured the same day of excavation. Due to presence of sandy material, caving of the foundation sidewalls may occur. Therefore, the foundation contractor should be prepared to use forms.

Debris or loose material in the bottom of the excavation should be removed before steel placement. The foundation excavation should be sloped sufficiently to create internal sumps for runoff collection and removal. If surface runoff water or groundwater seepage in excess of 1 inch accumulates at the bottom of the foundation excavation, it should be collected, removed, and not allowed to adversely affect the quality of the bearing surface. Terracon should check the grade beam bearing surfaces before concrete placement.

Seismic Design Criteria

The 2006 International Building Code (IBC) requires certain geotechnical seismic design criteria to aid the Structural Engineer in their analysis to develop a design response of the building to earthquake loading. These criteria include site spectral acceleration values and the seismic site class. The criteria pertaining to this are:

- Site Class D
- Maximum Considered Earthquake 0.2 second Spectral Acceleration (S_S) of 0.12g
- Maximum Considered Earthquake 1.0 second Spectral Acceleration (S_1) of 0.04g

The site class definition was determined using SPT N-values in conjunction with Table 1613.5.2 in the 2006 IBC. The Spectral Acceleration values were determined using publicly available information provided on the United States Geological Survey (USGS) website. The above

criteria can be used to determine the Seismic Design Category using Tables 1613.5.6 (1) and 1613.5.6 (2) in the 2006 IBC.

Earthwork

The comments and suggestions in this section are provided for planning and informational purposes so that project specifications can be prepared, and to indicate conventional methods that can be used to achieve the intent of our design recommendations. Details regarding excavation, dewatering, selection of equipment/machinery, trafficability, project site safety, shoring and other similar construction techniques that require "means and methods" to accomplish the work are the sole responsibility of the project contractor. It should be recognized that the comments contained in this report are based on the observations of small diameter boreholes and the performance of larger excavations may differ significantly as a result of the differences in sizes. Construction means and methods selected by the contractor may differ from those described in this report. Any variations may significantly impact the anticipated behavior of the subsurface conditions during the construction process.

Site Access. Proper site drainage should be maintained during the entire construction phase so ponding of surface runoff does not occur and cause construction delays and/or inhibit site access, particularly in cut areas. During construction, it is possible the surficial clay soils may become excessively wet as a result of inclement weather conditions. When the moisture content of these clay soils elevates above what is considered to be the optimum range of moisture for compaction operations, they can become difficult to handle and compact. If such conditions create a hindrance to compaction operations or site access, hydrated lime or portland cement may be mixed with these soils to improve their workability. The modifier can be mixed in general accordance with TxDOT Items 260 and 275. However, the purpose of the modifier is to dry out the subgrade and allow site workability. The strict requirements for curing and the actual modifier percentage can and should be at the discretion of the contractor. The modified subgrade, however, should be compacted to at least 95 percent of the maximum dry density as evaluated by ASTM D 698 at moisture contents between optimum and +4 percentage points of the optimum moisture content.

Tank and Pump Station Subgrade Preparation. Subgrade preparation and earthwork in the tank and pump station areas should be performed in accordance with the recommendations given subsequently and in the “Tank Pad Preparation” and “Pump Station Pad Preparation” sections of this report.

As a result of the existing site improvements, buried foundations and underground utilities may be located within the footprint of the proposed structures. Any debris, foundations, or utilities that are present should be removed After removing the existing foundations or utilities, the excavated on-site soils may be used to fill these excavated areas provided that there is sufficient space to prepare, place, and compact this soil as discussed in the following paragraphs.

After site stripping and excavating operations, the exposed subgrade should be proofrolled with appropriate construction equipment weighing at least 20 tons. The purpose of this recommendation is to check the subgrade for weak/soft zones prior to fill or base placement and compaction. This operation should be observed and evaluated by Terracon's qualified geotechnical personnel experienced in earthwork operations.

If weak or soft zones are evidenced during proofrolling operations, the weak material in the subject area should be removed to expose competent subgrade soils in both the horizontal and vertical limits. The excavated soil can be reused to restore grade at these isolated areas provided that the material is free and clean of any organic and other deleterious debris. The reused soil should be placed in loose lifts of no more than 8 inches, be moisture conditioned between -2 and +3 percentage points of the optimum moisture content, and then compacted to at least 95 percent of the maximum dry density determined in accordance with ASTM D 698.

Select Fill Materials. If grade adjustments are to be made for this project, it should be accomplished with non-expansive (inert) select fill materials such as a low plasticity clayey soil, clayey gravel, crushed stone base material or crushed concrete. All select fill soils should have a PI between 7 and 20 percent. The select fill materials should be relatively free of organic material and debris, and should not contain stones larger than 3 inches in maximum dimension.

For tank and pump station pad construction, granular select fill should consist of 2004 TxDOT Item 247, Type A or B, Grade 1 or 2 crushed limestone or gravel base material. Granular select fill can also consist of crushed concrete meeting the criteria specified in the 2004 TxDOT Item 247, Type D, Grade 1 or 2. It should be noted that gradation requirements for a Grade 1 or 2 materials are much more stringent than for a non-processed select fill. As a result, the stability of a non-processed material may be significantly less than that of a Grade 1 or 2 materials, especially in an unconfined condition. Therefore, the use of a non-processed material may result in more sloughing of the fill during trenching or excavations that may be necessary for utility "rough-in" and foundation installation. Additionally, a Grade 1 or 2 materials is generally more resistant to the effects of hard rain during construction than a non-processed material.

Select fill should be placed in loose lifts of no more than 8 inches, be moisture conditioned between -2 and +3 percentage points of the optimum moisture content, and then compacted to at least 95 percent of the maximum dry density determined in accordance with ASTM D 698.

Additional Design and Construction Considerations

The performance of the foundation system for the proposed structures will not only be dependent upon the quality of construction but also upon the stability of the moisture content of the soils underlying the foundations. We recommend that site drainage be developed so that ponding of surface runoff near the structures does not occur during or after construction. Accumulations of water near the structure foundations may cause significant moisture variations in the clayey soils adjacent to the foundations, greatly increasing their potential to undergo

expansion (swell), or weaken and lose bearing support, which can both result in differential vertical movements in the foundation.

When establishing final grade around the structures, we recommend that the slope of the ground surface away from the structure (if not covered with pavement) should be a minimum of 5 percent for a distance of at least 10 feet.

Preconstruction Meeting. Every project and construction site is unique, making it vitally important that all construction drawings, specifications, change orders, and related documents be reviewed by the respective design professionals participating in the project. The performance of the foundations for this project will depend on correct interpretation of our geotechnical engineering report and proper compliance of construction activities with regard to our geotechnical recommendations and to the construction drawings and specifications. We highly recommend that a preconstruction meeting be conducted. One of the purposes of the meeting is to discuss the Special Inspections required on the plan documents.

The following are among those that should be discussed at the meeting:

- Lines of Communication/Authority;
- Reporting (both verbal and written); and
- Special Inspections. In particular; what is required; who will perform the inspections; what are the specified frequencies; how should the inspections be scheduled; and, reporting requirements.

GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

TABLES

TABLE 1
SLAB FOUNDATION DESIGN PARAMETERS
GROUND STORAGE TANK AND PUMP STATION
SOMERSET ROAD (FM 2790) NORTH OF LOOP 1604
SOMERSET, TEXAS

Conventional Method	**Existing Condition**
Net Allowable Bearing Pressures**	
Total Load	3,000 psf
Dead Load	2,000 psf
Potential Vertical Rise (PVR)	about 1 inches
BRAB/PCI Methods:	
Design Plasticity Index (PI)***	20
Climatic Rating (C_w)	15
Unconfined Compressive Strength	1.0 tsf
Soil Support Index (C)	0.95
PTI Method 3rd Edition:	
Thornthwaite Moisture Index (I_m)	-30
Depth of Constant Soil Suction	9 feet
Constant Soil Suction	3.6 pF
Net Allowable Bearing Pressures**	
Total Load	3,000 psf
Dead Load	2,000 psf
Edge Moisture Variation Distance (e_m):	
Center Lift	9.0 feet
Edge Lift	5.0 feet
Differential Soil Movement (y_m):	
Center Lift	0.7 inches
Edge Lift	1.1 inches
Coefficient of Slab-Subgrade Friction (μ):	0.75 to 1.00

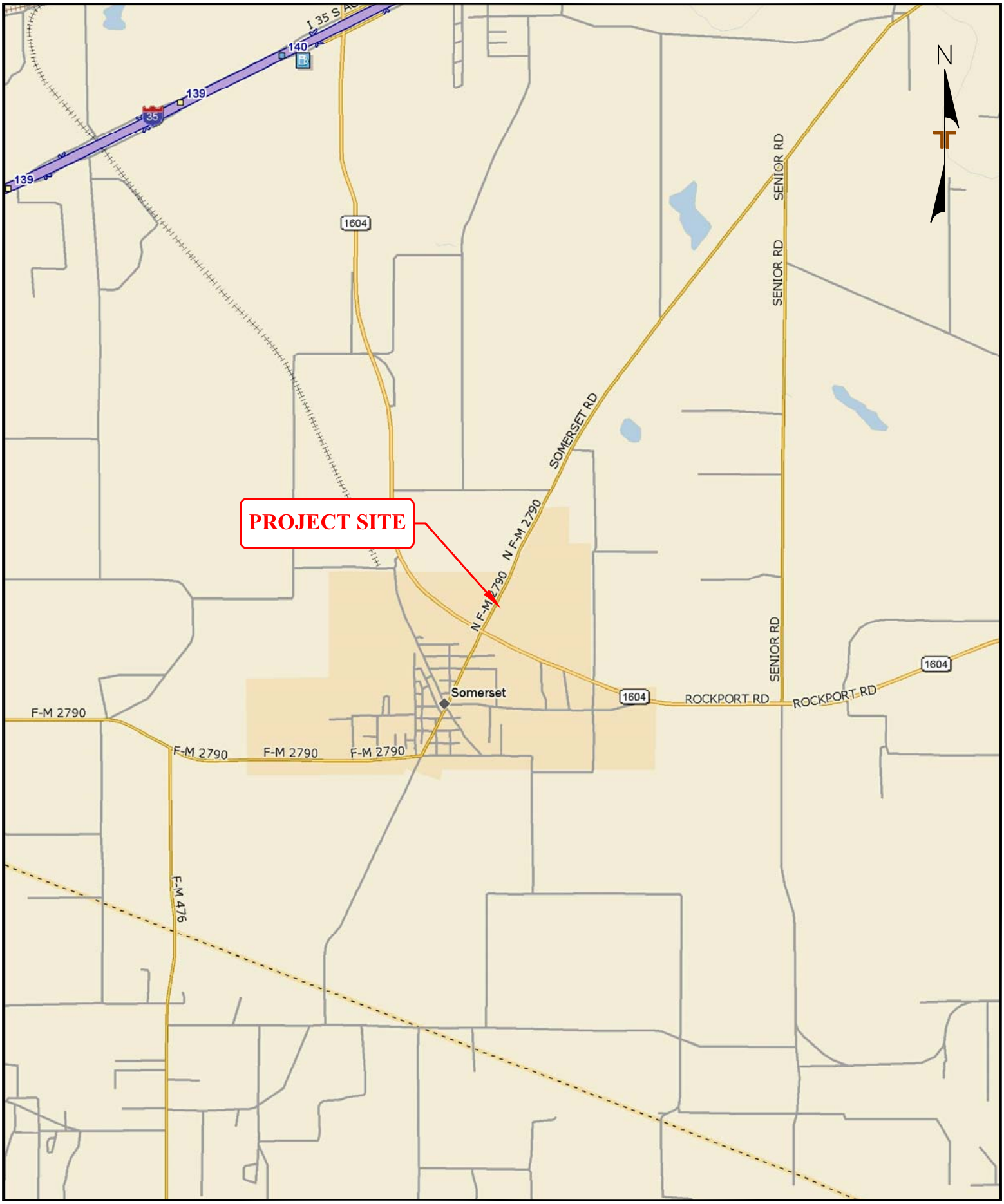
* Based on preparing the pads as discussed in the "Pump Station Pad Preparation" section of this report.

** The net allowable bearing pressures provided above include factors of safety of at least 2 and 3, respectively.

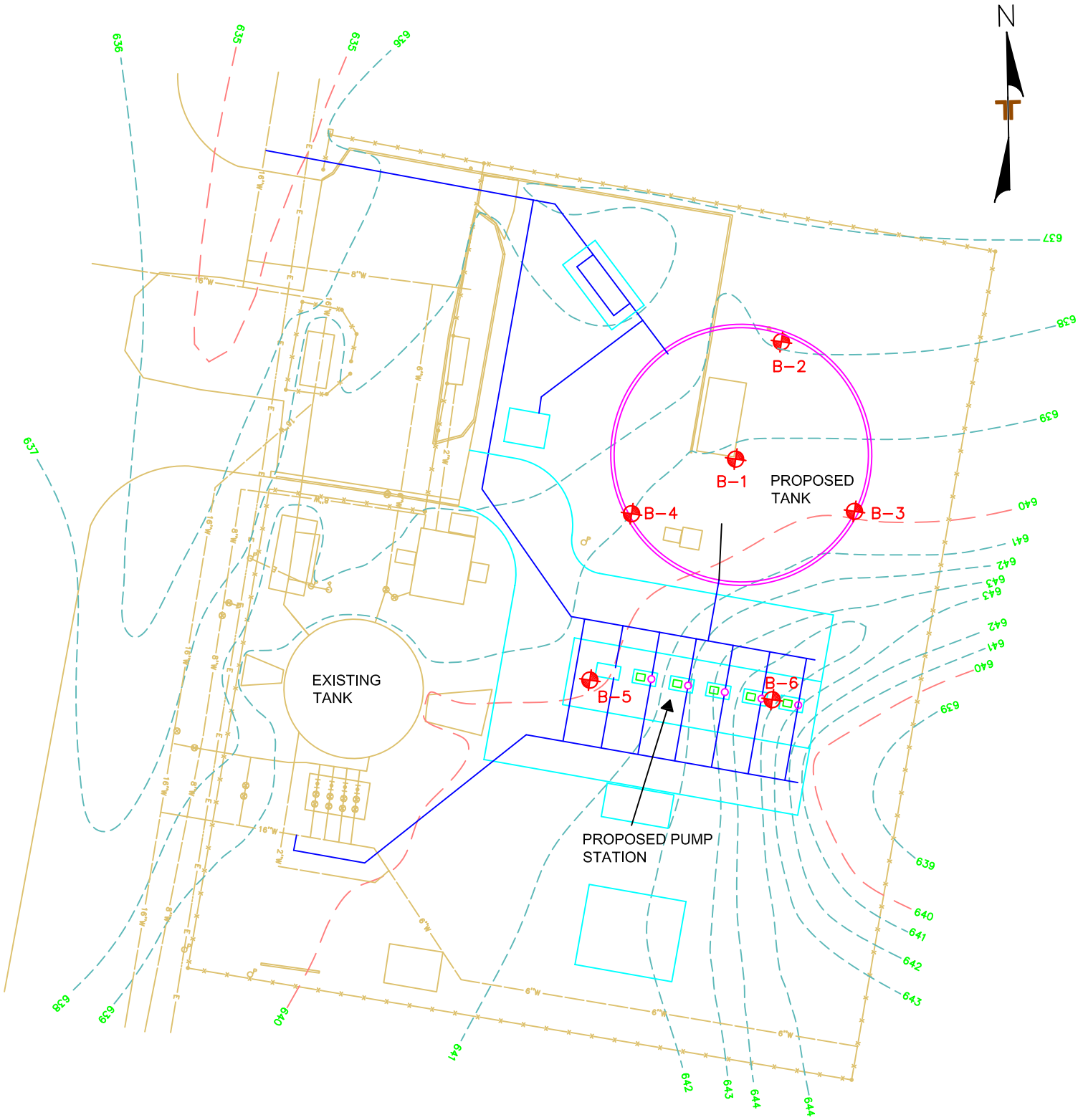
*** The BRAB effective PI is equal to the near surface PI if that PI is greater than all of the PI values in the upper 15 feet. The PCI effective PI is always the weighted average of the PI values in the upper 15 feet.

APPENDIX A

Vicinity Map
Bore Location Plan
Boring Logs



Project Mngr: SR	Project No. 90095080	Terracon Consulting Engineers and Scientists 6911 BLANCO ROAD SAN ANTONIO, TX 78216 PH. (210) 641-2112 FAX. (210) 641-2124	VICINITY MAP GROUND STORAGE TANK AND PUMP STATION SOMERSET ROAD (FM 27 90) NORTH OF LOOP 1604 SOMERSET, TEXAS
Drawn By: EM(90)	Scale: NTS		
Checked By: SR	File No. 90095080		
Approved By: SR	Date: 6-15-09		FIG. No. 1



- APPROXIMATE BORING LOCATIONS

Project Mngr:	SR
Drawn By:	EM(90)
Checked By:	SR
Approved By:	SR
Project No.	90095080
Scale:	NTS
File No.	90095080
Date:	6-15-09

Terracon
Consulting Engineers and Scientists
6911 BLANCO ROAD SAN ANTONIO, TX 78216
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BORE LOCATION PLAN

GROUND STORAGE TANK AND PUMP STATION
SOMERSET ROAD (FM 27 90) NORTH OF LOOP 1604
SOMERSET, TEXAS

FIG. No. 2

LOG OF BORING NO. B-1

CLIENT: **Bexar Metropolitan Water District San Antonio, Texas**

PROJECT: **Ground Storge Tank and Pump Station**

BORING LOCATION: **See Bore Location Plan**

SITE: **Somerset Road North of Loop 1604 Somerset, texas**

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	SAMPLES TYPE	SAMPLES N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT	TESTS MOISTURE CONTENT, %	TESTS DRY DENSITY, PCF	TESTS LIQUID LIMIT, %	TESTS PLASTIC LIMIT, %	TESTS PLASTICITY INDEX	TESTS MINUS #200 SIEVE, %	TESTS COMPRESSIVE STRENGTH, TSF	TESTS FAILURE STRAIN, %	TESTS CONFINING PRESSURE, PSI
	Approx. Surface Elevation: 639.0 feet													
	STRATUM I CLAYEY SAND; brown, gravel and roots		SC	SS	N=36	6								
	2.5 636.5													
	STRATUM II LEAN CLAY; brown			SS	N=37	5		36	16	20	62			
	- turns light gray and calcareous between 4½ and 6½ feet	5		SS	N=46	12		30	23	7	85			
	- turns light gray and brown between 6½ and 8½ feet			SS	N=45	18								
		10		SS	N=36	20		32	23	9				
	- turns light tan between 13½ and 23 feet			SS	N=56	22								
		15	CL											
				SS	N=54	23					69			
		20												
	- turns light brown and brown belwo 23 feet			ST	P=3.5	27								
		25												
	▽			ST	P=4.5+	29	92					1.5	4	
	30.0 609.0	30												
	Boring Terminated at about 30 feet.													

This Log is not valid if seperated from original report.

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

Remarks - The boring was backfilled with cuttings after completion of the subsurface water level observations.

WATER LEVEL OBSERVATIONS	
▽ **28 ft**	▼
▼	▼

Terracon

DATE DRILLED 6/5/2009

PROJECT NUMBER 90095080

FIGURE NO. 3

LOG OF BORING NO. B-2

CLIENT:	**Bexar Metropolitan Water District San Antonio, Texas**	PROJECT:	**Ground Storge Tank and Pump Station**
BORING LOCATION:	**See Bore Location Plan**	SITE:	**Somerset Road North of Loop 1604 Somerset, texas**

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	SAMPLES TYPE	SAMPLES N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT	TESTS MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, TSF	FAILURE STRAIN, %	CONFINING PRESSURE, PSI
	Approx. Surface Elevation: 638.0 feet													
	STRATUM I CLAYEY SAND; brown, gravel and roots		SC	SS	N=31	4								
	2.5 635.5													
	STRATUM II LEAN CLAY; light gray			SS	N=30	11								
		5		SS	N=40	11								
	- turns brown with ferrous stains between 6½ and 8½ feet			SS	N=37	21		42	22	20				
	- turns light gray between 8½ and 18½ feet			SS	N=21	27					90			
		10												
				ST	P=4.5+	23		38	25	13	55			
		15	CL											
	- turns light brown and brown below 18½ feet			SS	N=40	26								
		20												
				SS	N=58	31					72			
		25												
				SS	N=68/11"	24								
	30.0 608.0	30												
	Boring Terminated at about 30 feet.													

This Log is not valid if seperated from original report.

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

Remarks - Subsurface water was not encountered either during or upon completion of the drilling operations. The boring was backfilled with cuttings after completion of the subsurface water level observations.

WATER LEVEL OBSERVATIONS		Terracon	DATE DRILLED	Page 1 of 1
▽	▼		6/5/2009	FIGURE NO.
▼	▼		PROJECT NUMBER	4
FREE WATER WAS NOT OBSERVED DURING OUR DRILLING OPERATIONS			90095080	

LOG OF BORING NO. B-3

CLIENT: **Bexar Metropolitan Water District San Antonio, Texas**

PROJECT: **Ground Storge Tank and Pump Station**

BORING LOCATION: **See Bore Location Plan**

SITE: **Somerset Road North of Loop 1604 Somerset, texas**

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	SAMPLES TYPE	SAMPLES N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT	TESTS MOISTURE CONTENT, %	TESTS DRY DENSITY, PCF	TESTS LIQUID LIMIT, %	TESTS PLASTIC LIMIT, %	TESTS PLASTICITY INDEX	TESTS MINUS #200 SIEVE, %	TESTS COMPRESSIVE STRENGTH, TSF	TESTS FAILURE STRAIN, %	TESTS CONFINING PRESSURE, PSI
	Approx. Surface Elevation: 641.0 feet													
	STRATUM I CLAYEY SAND; brown, gravel and roots		SC	SS	N=54	6					41			
	2.5 638.5			SS	N=31	8		42	18	24				
	STRATUM II LEAN CLAY; light gray			SS	N=66	11					82			
	- turns light gray between 4½ and 6½ feet	5		SS	N=81/4"	13		48	20	28				
	- turns light brown and gray between 6½ and 13 feet			SS	N=56	14								
		10												
	- turns brown and light gray below 13 feet			ST	P=4.5+	22		48	21	27	67			
		15	CL											
				SS	N=ref/2"	18								
		20												
				SS	N=42	24					84			
		25												
				SS	N=ref/3"	11								
	30.0 611.0	30												
	Boring Terminated at about 30 feet.													

This Log is not valid if seperated from original report.

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

Remarks - Subsurface water was not encountered either during or upon completion of the drilling operations. The boring was backfilled with cuttings after completion of the subsurface water level observations.

WATER LEVEL OBSERVATIONS	
▽	▼
▼	▼

FREE WATER WAS NOT OBSERVED DURING OUR DRILLING OPERATIONS

Terracon

DATE DRILLED 6/5/2009

PROJECT NUMBER 90095080

FIGURE NO. 5

LOG OF BORING NO. B-4

CLIENT: **Bexar Metropolitan Water District San Antonio, Texas**

PROJECT: **Ground Storge Tank and Pump Station**

BORING LOCATION: **See Bore Location Plan**

SITE: **Somerset Road North of Loop 1604 Somerset, texas**

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	SAMPLES TYPE	SAMPLES N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT	TESTS MOISTURE CONTENT, %	TESTS DRY DENSITY, PCF	TESTS LIQUID LIMIT, %	TESTS PLASTIC LIMIT, %	TESTS PLASTICITY INDEX	TESTS MINUS #200 SIEVE, %	TESTS COMPRESSIVE STRENGTH, TSF	TESTS FAILURE STRAIN, %	TESTS CONFINING PRESSURE, PSI
	Approx. Surface Elevation: 639.0 feet													
	STRATUM I CLAYEY SAND; brown, gravel and roots		SC	SS	N=28	1		24	16	8				
				SS	N=21	10								
	4.5 634.5	5		SS	N=23									
	STRATUM II LEAN CLAY; brown and light gray			SS	N=21	24		45	20	25				
				SS	N=24	25					88			
		10		ST	P=4.5	25					65			
		15	CL											
	- turns light tan below 18 feet			ST	P=4.5	24		50	26	24	61			
		20												
				ST	P=1.5	24					29			
		25												
				SS	N=75	22								
	30.0 609.0	30												
	Boring Terminated at about 30 feet.													

This Log is not valid if seperated from original report.

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

Remarks - Subsurface water was not encountered either during or upon completion of the drilling operations. The boring was backfilled with cuttings after completion of the subsurface water level observations.

WATER LEVEL OBSERVATIONS	
▽	▼
▼	▼

FREE WATER WAS NOT OBSERVED DURING OUR DRILLING OPERATIONS

Terracon

DATE DRILLED 6/5/2009

PROJECT NUMBER 90095080

FIGURE NO. 6

LOG OF BORING NO. B-5

CLIENT: **Bexar Metropolitan Water District San Antonio, Texas**

PROJECT: **Ground Storge Tank and Pump Station**

BORING LOCATION: **See Bore Location Plan**

SITE: **Somerset Road North of Loop 1604 Somerset, texas**

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	SAMPLES TYPE	SAMPLES N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT	TESTS MOISTURE CONTENT, %	TESTS DRY DENSITY, PCF	TESTS LIQUID LIMIT, %	TESTS PLASTIC LIMIT, %	TESTS PLASTICITY INDEX	TESTS MINUS #200 SIEVE, %	TESTS COMPRESSIVE STRENGTH, TSF	TESTS FAILURE STRAIN, %	TESTS CONFINING PRESSURE, PSI
	Approx. Surface Elevation: 640.0 feet													
	STRATUM II LEAN CLAY; brown, sand and roots			SS	N=49	5								
				SS	N=40	8		34	15	19				
		5		SS	N=80	6					57			
	- turns light brown between 6½ and 8½ feet			SS	N=47	17		35	21	14				
	- turns light brown and brown below 8½ feet			SS	N=81/11"	16								
		10	CL											
				SS	N=29	26					89			
		15												
	20.0 620.0			SS	N=43	23								
	Boring Terminated at about 20 feet.	20												

This Log is not valid if seperated from original report.

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

Remarks - Subsurface water was not encountered either during or upon completion of the drilling operations. The boring was backfilled with cuttings after completion of the subsurface water level observations.

WATER LEVEL OBSERVATIONS	
▽	▼
▼	▼

FREE WATER WAS NOT OBSERVED DURING OUR DRILLING OPERATIONS

Terracon

DATE DRILLED 6/5/2009

PROJECT NUMBER 90095080

FIGURE NO. 7

LOG OF BORING NO. B-6

CLIENT: **Bexar Metropolitan Water District San Antonio, Texas**

PROJECT: **Ground Storge Tank and Pump Station**

BORING LOCATION: **See Bore Location Plan**

SITE: **Somerset Road North of Loop 1604 Somerset, texas**

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	SAMPLES TYPE	SAMPLES N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT	TESTS MOISTURE CONTENT, %	TESTS DRY DENSITY, PCF	TESTS LIQUID LIMIT, %	TESTS PLASTIC LIMIT, %	TESTS PLASTICITY INDEX	TESTS MINUS #200 SIEVE, %	TESTS COMPRESSIVE STRENGTH, TSF	TESTS FAILURE STRAIN, %	TESTS CONFINING PRESSURE, PSI
	Approx. Surface Elevation: 643.0 feet													
	STRATUM II LEAN CLAY; brown, sand and roots			SS	N=20	7		26	17	9				
				SS	N=22	6					58			
		5		SS	N=33	11		29	18	11				
	- turns light brown between 6½ and 8½ feet			SS	N=43	11					54			
	- turns light brown and brown below 8½ feet			SS	N=85	9								
		10	CL											
				SS	N=34	23					86			
		15												
	20.0 623.0			SS	N=60	19								
	Boring Terminated at about 20 feet.	20												

This Log is not valid if seperated from original report.

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

Remarks - Subsurface water was not encountered either during or upon completion of the drilling operations. The boring was backfilled with cuttings after completion of the subsurface water level observations.

WATER LEVEL OBSERVATIONS	
▽	▼
▼	▼

FREE WATER WAS NOT OBSERVED DURING OUR DRILLING OPERATIONS

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DATE DRILLED 6/5/2009

PROJECT NUMBER 90095080

FIGURE NO. 8

APPENDIX B

Laboratory Test Program
General Notes
Unified Soil Classification System

LABORATORY TEST PROGRAM

The laboratory testing program was directed towards evaluating the physical and engineering properties of the subsoils. Tests were performed in general accordance with the following standards.

Laboratory Test	Applicable Test Standard
Moisture Content	ASTM D 2216
Liquid Limit, Plastic Limit and Plasticity Index of Soil	ASTM D 4318
Amount of Material In-Soil Finer than the No 200 Mesh (75-µ) Sieve	ASTM D 1140
Unconfined Compressive Strength	ASTM D 2166

The laboratory test results are tabulated either adjacent to the corresponding sample depths on the individual boring logs in Appendix A or on attached sheets that may be provided in this Appendix. Laboratory test results were used to classify the soils encountered in substantial accordance with the Unified Soil Classification System.

Sample Disposal

All samples were returned to our laboratory. The samples not tested in the laboratory will be stored for a period of 30 days subsequent to submittal of this report and will be discarded after this period, unless other arrangements are made prior to the disposal period.

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-3/8" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	<2	Very Soft
500 – 1,000	2-3	Soft
1,001 – 2,000	4-6	Medium Stiff
2,001 – 4,000	7-12	Stiff
4,001 – 8,000	13-26	Very Stiff
8,000+	26+	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 49	Dense
50+	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

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UNIFIED SOIL CLASSIFICATION SYSTEM

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

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

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

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

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

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

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

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

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

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

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

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

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

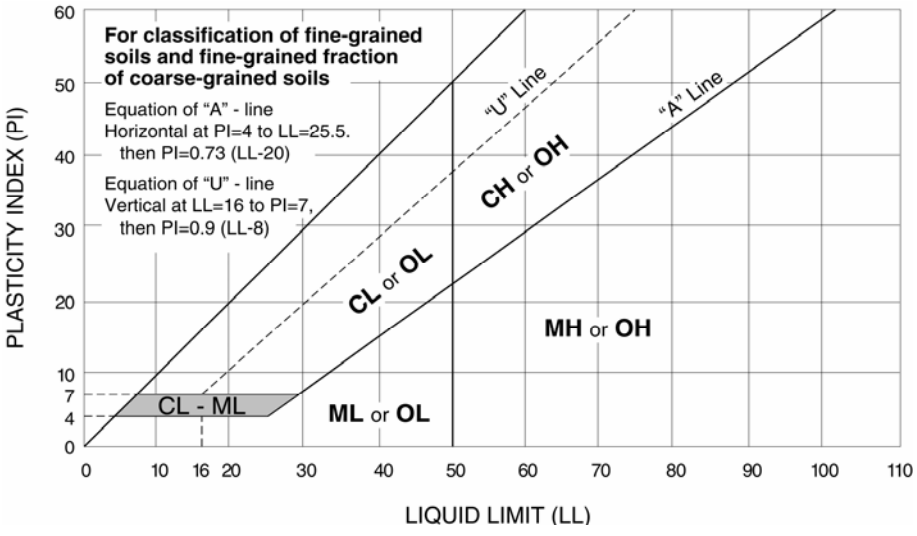
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

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

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

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

[Q] PI plots below "A" line.



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ASFE INFORMATION

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. *No one except you* should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one—not even you*—should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, *do not rely on a geotechnical engineering report* that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions *only* at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an *opinion* about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject To Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce such risks, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations", many of these provisions indicate where geotechnical engineers responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Rely on Your Geotechnical Engineer for Additional Assistance

Membership in ASFE exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
8811 Colesville Road Suite G106 Silver Spring, MD 20910
Telephone: 301-565-2733 Facsimile: 301-589-2017
email: info@asfe.org www.asfe.org

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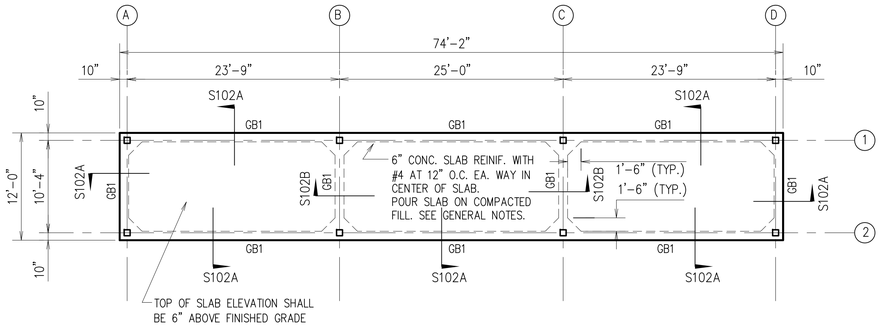


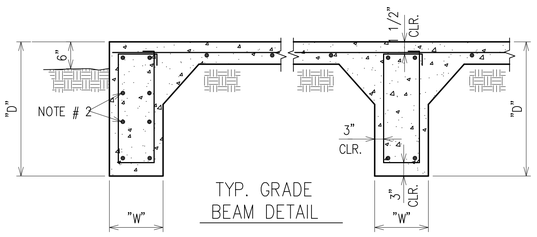
SOMERSET CANOPY FOUNDATION PLAN S101

SCALE: 1/8" = 1'-0"

NOTE: ALL COLUMNS SHALL BE TS 8 X 8 X 3/8

FIELD VERIFY ALL DIMENSIONS

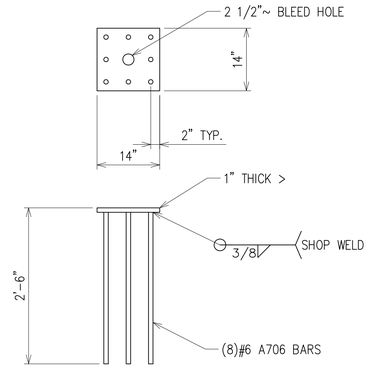
S101



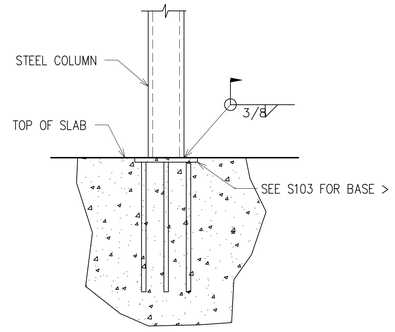
GRADE BEAM SCHEDULE			
MARK	"W" X "D"	MAIN REINFORCING	TIES
GB1	12" X 42"	(2) #7 TOP & BOTTOM	#3 AT 30"

NOTES :
1. SCHEDULED BEAM DEPTHS ARE MINIMUM ON PERIMETER. INCREASE SCHED. BEAM DEPTH AS REQUIRED FOR SOFFIT TO BEAR 3'-0" MIN. BELOW EXISTING GRADE.
2. WHERE BEAM DEPTH EXCEEDS 36", ADD # 4 @ 12" CTRS. HORIZ. IN EACH FACE OF BEAM.
3. SEE PLAN FOR SLAB REINFORCING.
4. ALL INTERIOR GRADE BEAMS SHALL BE "GB1" (U.N.O.).

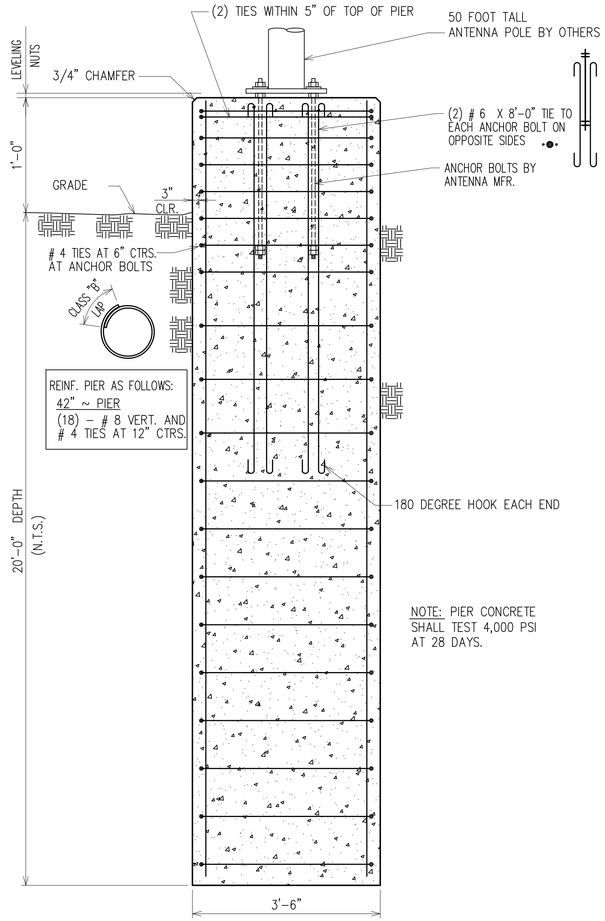
S102



TYP. COLUMN BASE > DETAIL S103



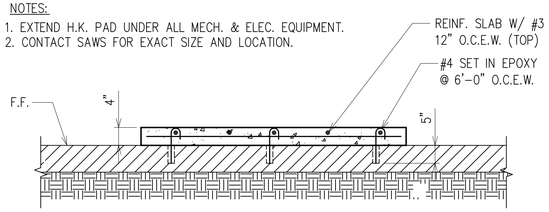
TYP. COLUMN BASE CONNECTION S104



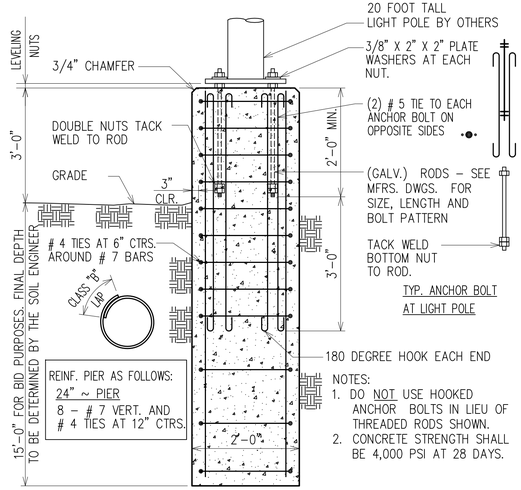
NOTE: PIER CONCRETE SHALL TEST 4,000 PSI AT 28 DAYS.

ANTENNA MONOPOLE FOUNDATION DETAIL S106

NOTES:
1. EXTEND H.K. PAD UNDER ALL MECH. & ELEC. EQUIPMENT.
2. CONTACT SAWS FOR EXACT SIZE AND LOCATION.



TYPICAL HOUSEKEEPING PAD AT SLAB ON GRADE S107



NOTES:
1. DO NOT USE HOOKED ANCHOR BOLTS IN LIEU OF THREADED RODS SHOWN.
2. CONCRETE STRENGTH SHALL BE 4,000 PSI AT 28 DAYS.

TYPICAL LIGHT POLE DETAIL S105

STRUCTURAL SHEET INDEX	
SHEET NO.	SHEET TITLE
S1	FOUNDATION PLAN
S2	CANOPY ROOF FRAMING PLAN AND DETAILS
S3	GENERAL NOTES AND TESTING AND INSPECTION

BILL REIFFERT AND ASSOC., INC.
TEXAS ENGINEERING FIRM LICENSE # 2021
136 Sagecrest Phone (210) 366-9313
San Antonio, TX. 78232 Fax (210) 366-9318
B.R.A.I. JOB NO. – 13-010
STRUCTURAL ENGINEERS

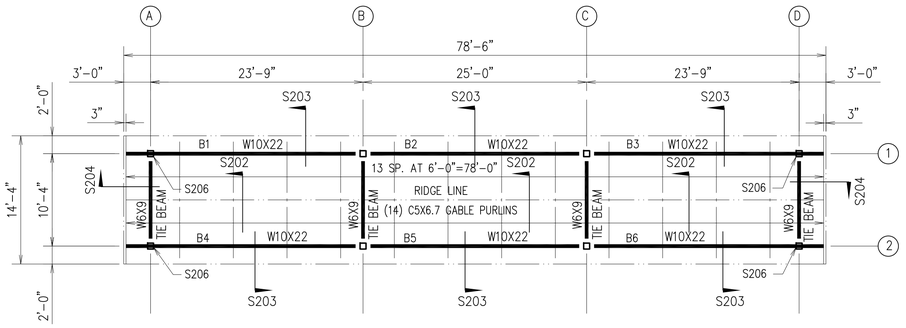
(DSP) SOMERSET FACILITY
HIGH SERVICE PUMP
UPGRADES PROJECT

8-27-13

STATE OF TEXAS
WILLIAM C. REIFFERT
42606
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY WILLIAM C. REIFFERT P.E. # 42606

DEVELOPER:
CONT. —— BUDGET PROJ. 12-6101
SUBMITTED
APPROVED
MAP No.
SECT. No.——
DR. KR CK. WCR JOB No.
SHEET S1 OF 3



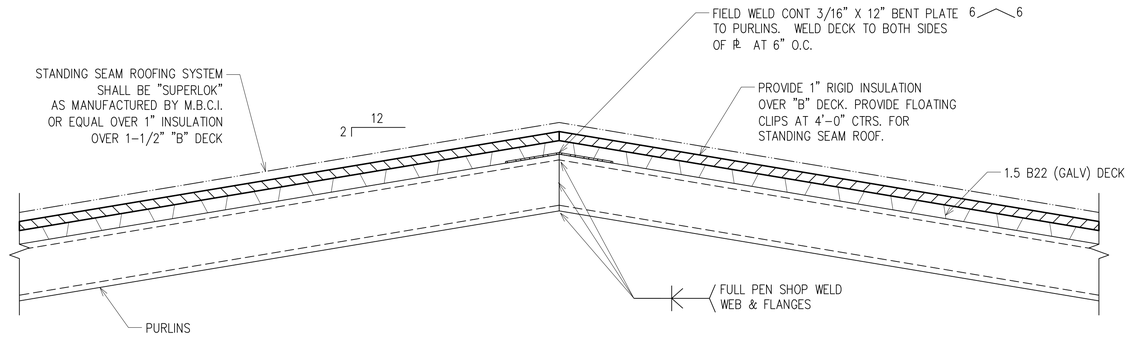
SOMERSET CANOPY FRAMING PLAN S201

SCALE: 1/8" = 1'-0"

NOTE:
W6X9 TIE BEAMS ARE STRAIGHT HORIZONTAL MEMBERS THAT DO NOT SUPPORT ROOF DECK. TOP OF W6 TIE BEAM SHALL MATCH TOP OF W10 BEAMS.

FIELD VERIFY
ALL DIMENSIONS

S201



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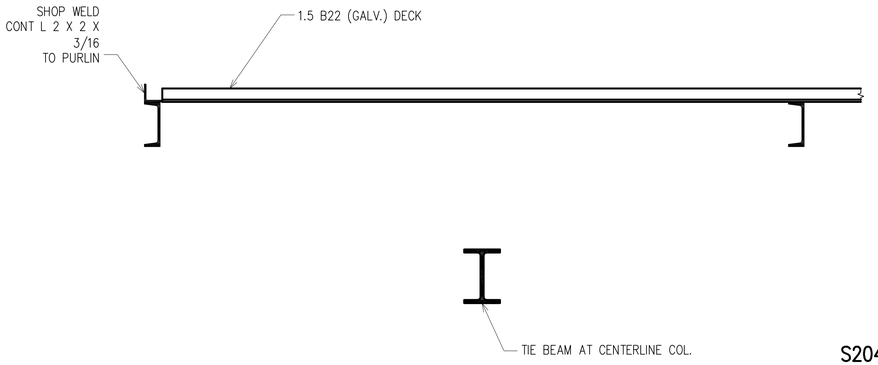
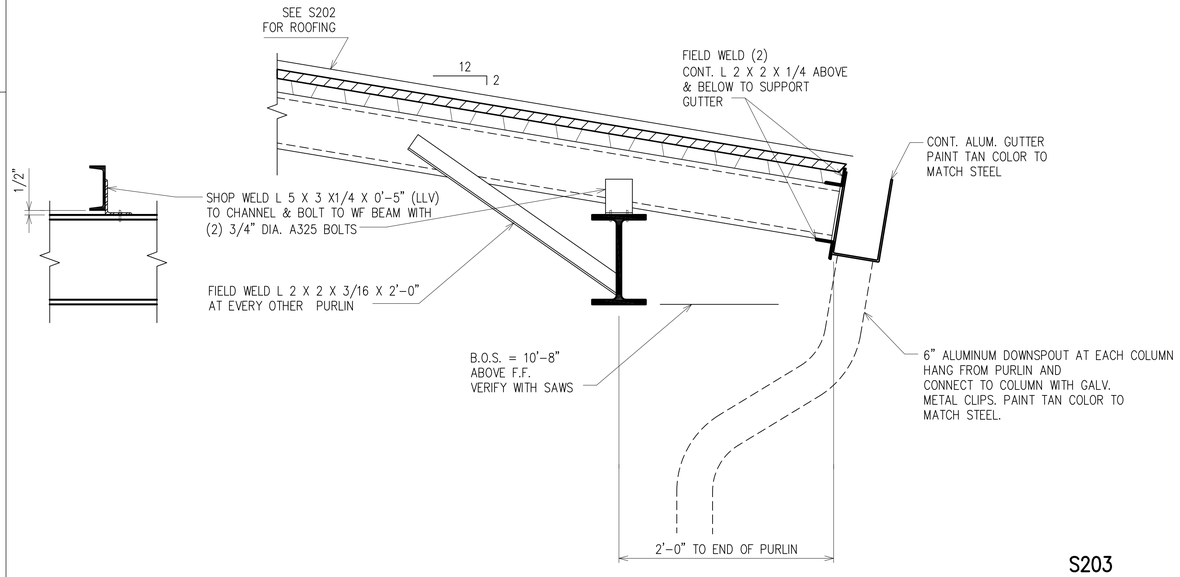


S204



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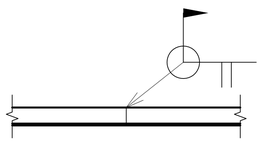
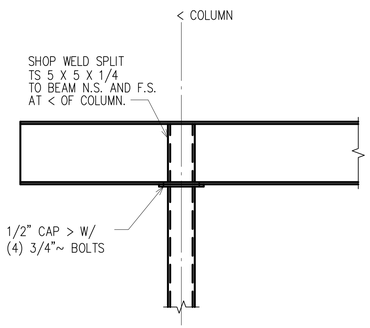


TYP. SPLICE DETAIL AT EDGE ANGLE AT EDGE OF METAL DECK

S205



TYP. DETAIL AT CANTILEVER BEAM

S206

ROOF DECK SHALL BE ATTACHED AS FOLLOWS :
SUPPORTS = 5/8" PUDDLE WELDS ON A 36 / 7 PATTERN.

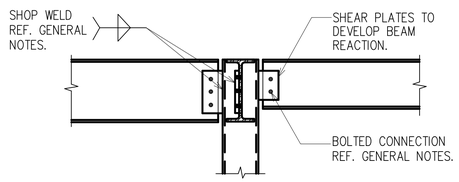
SIDELAPS = CONNECT ADJACENT SHEETS WITH # 10 TEKS @ 6" CTRS. MAX.

PERIMETER = 5/8" PUDDLE WELDS @ 6" CTRS.

NOTES :
1. ALL SCREWS SHALL BE INSPECTED BY THE TESTING LAB.
2. LAP DECK 2" MIN. AT ENDS.

TYPICAL ROOF DECK CONNECTION DETAIL

S207



TYPICAL DETAIL
STEEL WIDE FLANGE BEAM CONNECTION
TO TUBE OR PIPE COLUMNS

S208

8-27-13

STATE OF TEXAS
WILLIAM C. REIFFERT
42606
REGISTERED PROFESSIONAL ENGINEER

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STRUCTURAL ENGINEERS

(DSP) SOMERSET FACILITY
HIGH SERVICE PUMP
UPGRADES PROJECT

DEVELOPER:
CONT. —— BUDGET PROJ. *12-6101*
SUBMITTED
APPROVED
MAP No.
SECT. No. ——
DR. *KR* CK. *WCR* JOB No.
SHEET *S2* OF *3*

GENERAL NOTES

GENERAL

GC-1 LOCATE ALL EXISTING UTILITY LINES PRIOR TO BEGINNING WORK.

GC-2 THE CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE, AND, EXCEPT WHERE SPECIFICALLY SHOWN, DO NOT INDICATE THE METHOD OR MEANS OF CONSTRUCTION. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, PROCEDURES, TECHNIQUES, AND SEQUENCE.

GC-3 THE ENGINEER SHALL NOT HAVE CONTROL OR CHARGE OF, AND SHALL NOT BE RESPONSIBLE FOR, CONSTRUCTION MEANS, METHODS TECHNIQUES, SEQUENCES, OR PROCEDURES FOR SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK, FOR THE ACTS OR OMISSION OF THE CONTRACTOR, SUBCONTRACTOR, OR ANY OTHER PERSONS PERFORMING ANY OF THE WORK, OR FOR THE FAILURE OF ANY OF THEM TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

GC-4 GENERAL CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS, GRADE CONDITIONS, (BOTH NEW AND EXISTING) REPORTING ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH ANY PHASE OF THE WORK AS HE WILL BE RESPONSIBLE FOR ALL WORK FITTING AS INTENDED BY THE DRAWINGS AND SPECIFICATIONS.

GEOTECHNICAL REPORT

GR-1 FOUNDATION DESIGN IS BASED ON THE GEOTECHNICAL INVESTIGATION BY ARIAS, INC. DATED AUG. 21, 2013. AND SUPPLEMENTAL LETTER DATED AUG. 26, 2013.

GR-2 THE GENERAL CONTRACTOR SHALL OBTAIN A COPY OF THE SOILS REPORTS FROM SAWS AND STRICTLY FOLLOW RECOMMENDATIONS IN REPORT.

SUBGRADE AND UNDERFLOOR FILL PREPARATION

UF-1 THE SUBGRADE AND UNDERFLOOR FILL SHALL BE PREPARED TO A POINT THAT EXTENDS 5 FT. MINIMUM BEYOND THE LIMITS OF THE FOUNDATION . SEE SOILS REPORT.

UF-2 THE SUBGRADE AND UNDERFLOOR FILL SHALL BE PREPARED IN STRICT ACCORDANCE WITH THE GEOTECHNICAL REPORT RECOMMENDATIONS PROVIDED BY THE GEOTECHNICAL ENGINEER. SEE SOILS REPORT.

UF-3 GENERAL REQUIREMENTS ARE AS FOLLOWS:

MINIMUM UNDERCUT DEPTH AT SOMERSET = 3.5 FEET
PROVIDE 3.5 FT OF SELECT FILL BELOW SLAB
UNDERCUT EXTENT: BELOW ALL SLAB AREAS AND AT LEAST 5 FEET BEYOND THE SLAB PERIMETER AND ANY FEATURES THAT MAY BE SENSITIVE TO MOVEMENT INCLUDING BUT NOT LIMITED TO FLATWORK, CANOPY SLABS, CURBS, AND OTHER FEATURES ADJACENT TO FOUNDATION.

EXPOSED SUBGRADE TREATMENT: SCARIFY, MOISTURE CONDITION AND COMPACT EXISTING MATERIALS TO 12 INCHES BELOW BASE OF UNDERCUT DEPTH

SELECT FILL MINIMUM THICKNESS = DISTANCE FROM BOTTOM OF UNDERCUT TO BOTTOM OF SLAB

SELECT FILL MATERIAL = LEAN CLAY (CL) WITH LIQUID LIMIT LESS THAN 45 PERCENT, PI = 12 TO 20, #200 GREATER THAN 50 PERCENT, 3" MAXIMUM PARTICLE SIZE

VAPOR RETARDER MATERIAL = MINIMUM 10-MIL CONFORMING TO ASTM E1745, CLASS C OR BETTER AND WITH A MINIMUM WATER VAPOR PERMEANCE OF 0.044 PERMS (ASTM E96) SUCH AS A 10 MIL STEGO WRAP BY STEGO INDUSTRIES LLC OR OTHER SIMILAR PRODUCT

MAXIMUM LOOSE LIFT THICKNESS (ALL MATERIALS) = 8 INCHES

MAXIMUM ELAPSED TIME BETWEEN SUBGRADE PREPARATION AND FILL (SELECT OR RECONDITIONED) PLACEMENT = 48 HOURS

UF-4 COMPACTION REQUIREMENTS:

SUBGRADE SOIL AT BASE OF EXCAVATION: COMPACT FROM 93 TO 98 PERCENT AT PLUS 1 TO PLUS 5 PERCENT OF OPTIMUM MOISTURE CONTENT IN ACCORDANCE WITH ASTM D698 STANDARD PROCTOR. PROVIDE 1 COMPACTION TEST MINIMUM PER 5,000 S.F. WITH A MINIMUM OF 3 TESTS PER LIFT.

RECONDITIONED ONSITE SOILS: COMPACT FROM 94 TO 98 PERCENT AT PLUS 1 TO PLUS 5 PERCENT OF OPTIMUM MOISTURE CONTENT IN ACCORDANCE WITH ASTM D698 STANDARD PROCTOR. PROVIDE 1 COMPACTION TEST MINIMUM PER 5,000 S.F. WITH A MINIMUM OF 3 TESTS PER LIFT.

SELECT FILL: COMPACT AT GREATER THAN OR EQUAL TO 95 PERCENT AT MINUS 1 TO PLUS 3 PERCENT OF OPTIMUM MOISTURE CONTENT IN ACCORDANCE WITH ASTM D698 STANDARD PROCTOR. PROVIDE 1 COMPACTION TEST MINIMUM PER 5,000 S.F. WITH A MINIMUM OF 3 TESTS PER LIFT.

CRUSHED LIMESTONE BASE: COMPACT AT GREATER THAN OR EQUAL TO 98 PERCENT AT MINUS 2 TO PLUS 3 PERCENT OF OPTIMUM MOISTURE CONTENT IN ACCORDANCE WITH ASTM D698 STANDARD PROCTOR. PROVIDE 1 COMPACTION TEST MINIMUM PER 5,000 S.F. WITH A MINIMUMOF 3 TESTS PER LIFT.

UF-5 PERFORM ALL EARTHWORK BEFORE TRENCHING FOR GRADE BEAMS OR MECHANICAL LINES.

UF-6 MAINTAIN SUBGRADE AND THE FILL AT OPTIMUM INSITU MOISTURE CONTENT AFTER COMPLETION OF STRUCTURAL FILL PLACEMENT. THE ORIGINAL GEOTECHNICAL ENGINEER SHALL BE CONSULTED FOR MEANS AND METHODS OF PREPARING THE SUBGRADE THROUGHOUT THE CONSTRUCTION PHASE UNTIL THE FOUNDATION CONCRETE HAS BEEN CAST. THIS MAY INCLUDE DRYING OR WETTING PROCESSES DEPENDING ON THE INTRODUCTION OR EVAPORATION OF MOISTURE DUE TO THE WEATHER AND CONSTRUCTION CONDITION. CONTRACTOR SHALL MAKE ALL CORRECTIVE WORK REQUIRED TO IMPROVE THE SUBGRADE AND STRUCTURAL FILL AREAS WHICH ARE NOT ACCEPT ABLE TO THE GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF CONCRETE.

UF-7 THE FINISH GRADING AROUND THE FOUNDATION SHALL BE GRADED TO ENSURE ADEQUATE DRAINAGE OF SURFACE WATER AWAY FROM THE BUILDING.

UF-8 DO NOT POUR CONCRETE ON THE DAY FOLLOWING A RAIN DAY.

DRILLED PIERS AT LIGHT POLE AND AT ANTENNA MONOPOLE

DRILLED PIERS SHALL BE AUGERED AND CONSTRUCTED IN A CONTINUOUS MANNER. CONCRETE SHALL BE PLACED IN THE PIER EXCAVATIONS FOLLOWING DRILLING AND EVALUATION FOR PROPER BEARING STRATUM, EMBEDMENT, AND CLEANLINESS. THE PIERS SHALL NOT BE ALLOWED TO REMAIN OPEN OVERNIGHT BEFORE CONCRETE PLACEMENT. SURFACE RUNOFF OR GROUNDWATER SEEPAGE ACCUMULATING IN THE EXCAVATION SHALL BE PUMPED OUT AND THE CONDITION OF THE BEARING SURFACE SHALL BE EVALUATED IMMEDIATELY PRIOR TO PLACING CONCRETE.

ZONES OF SLOUGHING SOILS AND/OR GROUNDWATER INFLOW ARE A POSSIBILITY DURING PIER CONSTRUCTION. CASING SHALL BE PROVIDED AS NECESSARY TO CONTROL SLOUGHING AND/OR GROUNDWATER SEEPAGE DURING PIER CONSTRUCTION SHOULD IT OCCUR.

CONCRETE SHALL BE READILY AVAILABLE ON SITE AND SHALL BE PLACED AS SOON AS POSSIBLE AFTER ALL LOOSE MATERIAL HAS BEEN REMOVED, THE PIER EXCAVATION INSPECTED AND REINFORCING STEEL INSTALLED. A RELATIVELY HIGH SLUMP CONCRETE MIX (6 TO 7 INCHES) SHALL BE USED TO MINIMIZE AGGREGATE SEGREGATION CAUSED BY THE REINFORCING STEEL. FREE FALL OF CONCRETE INTO THE PIER EXCAVATION IS PERMITTED PROVIDED THE CONCRETE CAN BE PLACED INTO THE PIER EXCAVATION WITHOUT STRIKING THE SIDES OF THE EXCAVATION OR HITTING THE REBAR.

IF IT IS IMPOSSIBLE FOR THE CONCRETE TO FALL FREELY WITHOUT STRIKING THE REBAR CAGE OR SIDES OF THE PIER EXCAVATION THE FREE FALL SHALL BE LIMITED TO 10 FEET, OR PLACED WITH A TREMIE. PIER EXCAVATIONS SHALL NOT BE ALLOWED TO STAY OPEN OVERNIGHT.

IF CASING IS UTILIZED, REMOVAL OF THE CASING SHALL BE PERFORMED WITH EXTREME CARE AND UNDER PROPER SUPERVISION TO MINIMIZE MIXING OF THE SURROUNDING SOIL AND WATER WITH THE FRESH CONCRETE. CONCRETE SHALL BE POURED WITH A TREMIE AND SHALL EXHIBIT A SIX-INCH SLUMP WITH A ± ONE INCH TOLERANCE. UNDER NO CIRCUMSTANCES SHALL LOOSE SOIL BE PLACED IN THE SPACE BETWEEN THE CASING AND THE PIER SIDEWALLS.

STRUCTURAL DESIGN CRITERIA

SD-1
A. LIVE LOADS:

ROOF = 20 PSF (REDUCIBLE PER CODE)

B. WIND LOADS PER ASCE 7-10:

BASIC WIND SPEED (3 SECOND GUST) = 110 MPH
EXPOSURE CLASSIFICATION = "C"
OCCUPANCY CATEGORY = III
IMPORTANCE FACTOR = 1.15

C. GROUND SNOW LOAD Pg = 5 PSF

SD-2 APPLICABLE CODES:

A. 2009 INTERNATIONAL BUILDING CODE AS ADOPTED BY THE CITY OF SAN ANTONIO
B. ASCE 7-10
C. ACI 318-2005
D. AISC 9TH EDITION 1989 AND 13TH EDITION 2005 (ASD)
E. AWS D1. 01-02

SPECIAL WATER CURING OF CONCRETE SLAB

WC-1 CONCRETE SHALL BE KEPT CONTINUALLY MOIST FOR 7 DAYS TO REDUCE CRACKING. AFTER INITIAL SET OF CONCRETE HAS OCCURRED PERFORM THE FOLLOWING:

WC-2 THE CONTRACTOR SHALL PLACE "GARDEN SOAKER HOSES" SPACED AT 10 FEET ON CENTER ON TOP OF THE SLAB FOR THE ENTIRE LENGTH OF THE SLAB, THEN COVER THE ENTIRE SLAB WITH POLYETHYLENE SHEETING. THE HOSES SHALL BE TURNED ON TO SLOWLY DRIP WATER AND KEEP THE SLAB MOIST FOR 7 DAYS MINIMUM. DO NOT FLOOD SITE WITH WATER.

CONCRETE

CC-1 ADMIXTURES CONTAINING CALCIUM CHLORIDE, CHLORIDE IONS, NITRATES OR OTHER SUBSTANCES THAT ARE CORROSIVE SHALL NOT BE USED IN CONCRETE MIX.

CC-2 THE REQUIRED 28 DAY STRENGTH OF CONCRETE SHALL BE AS FOLLOWS:
SLAB ON GRADE = 3,000 PSI
PIERS = 4,000 PSI

CC-3 CONCRETE SHALL HAVE THE FOLLOWING MINIMUM AMOUNT OF CEMENTIOUS MATERIALS:
3,000 PSI MIX – 5 SACKS MINIMUM
4,000 PSI MIX – 6 SACKS

MAXIMUM FLYASH ALLOWED = 20 PERCENT BY WEIGHT.

THERE SHALL BE NO CONSTRUCTION JOINTS IN CONCRETE POURS.

ALL CONCRETE SHALL BE POURED FROM READY MIX TRUCKS. JOBSITE MIXING OF CONCRETE NOT ALLOWED.

REINFORCING STEEL

RF-1 ALL REINFORCING STEEL SHALL BE GRADE 60 AND SHALL CONFORM TO THE ASTM SPECIFICATION A615. DETAILING OF REINFORCING STEEL SHALL CONFORM TO THE AMERICAN CONCRETE INSTITUTE DETAILING MANUAL. LAP CONTINUOUS UNSCHEDULED REINFORCING BARS WITH CLASS "B" SPLICE.

RF-2 ALL REINFORCING STEEL TO BE WELDED SHALL CONFORM TO ASTM SPECIFICATION A706.

RF-3 PROVIDE 1-#6 X 4'-0" L-SHAPED BAR TOP AND BOTTOM OF EXTERIOR FACE OF GRADE BEAMS AT CORNERS.

RF-4 HOOK ALL TOP BARS IN GRADE BEAMS AT DISCONTINUOUS ENDS OF BEAMS.

RF-5 REINFORCING STEEL COVERAGE SHALL BE AS FOLLOWS:

A. GRADE BEAMS =1-1/2" TOP, 3" BOTTOM, 3" SIDES
B. PIERS = 3"

RF-6 FOR GRADE SUPPORTED SLABS, SLAB AND BEAM REINFORCING SHALL BE HELD IN PLACE BY BAR SUPPORTS AND SPACED A MAXIMUM OF 4'-0" O.C. BOTH WAYS. HALF BRICKS ARE ACCEPTABLE FOR SLABS ON GRADE.

STRUCTURAL STEEL

ST-1 STRUCTURAL STEEL SHALL BE DETAILED FABRICATED AND ERECTED IN ACCORDANCE WITH THE AISC SPECIFICATIONS AND CODES OF THE LATEST ADOPTION.

ST-2 STEEL MATERIALS SHALL CONFORM TO THE FOLLOWING STANDARDS:

WIDE FLANGE SHAPES AND TEES – ASTM A992 GR50
SQUARE OR RECTANGULAR TUBE SHAPES – ASTM A500, GRADE B (FY = 46 KSI)
PLATES, ANGLES AND CHANNELS – ASTM A36

BOLTS FOR STRUCTURAL CONNECTIONS – 3/4" A325N BOLTS

WELDING ELECTRODES – E70XX

ANCHOR RODS FOR LIGHT POLES – ASTM A1554 (GR36) AT LIGHT POLES

ANCHOR RODS AT ANTENNA TOWER TO BE SUPPLIED BY TOWER MANUFACTURER

HEADED CONCRETE ANCHORS – ASTM A108 FY=60 KSI
(AUTOMATICALLY WELDED)

DEFORMED BAR ANCHORS – GRADE 60 ASTM A496
(AUTOMATICALLY WELDED)

REBAR TO BE WELDED – ASTM A706 GR60

ST-3 ALL STRUCTURAL STEEL SHALL BE PRIMED IN THE SHOP.

ST-4 SPLICING OF STRUCTURAL STEEL IS PROHIBITED WITHOUT PRIOR APPROVAL OF THE ENGINEER AS TO LOCATION AND TYPE OF SPLICE TO BE MADE.

ST-5 ALL WELDING SHALL BE PERFORMED BY AWS CERTIFIED WELDERS AND SHALL CONFORM TO THE LATEST AWS CODE.

ST-6 CONTINUOUS WELD ALL CAP PLATES AND BASE PLATES TO COLUMNS.

ST-7 ALL BEAM CONNECTIONS SHALL HAVE BOLTS AT 3" ON CENTER FOR FULL DEPTH OF MEMBER AS A MINIMUM. PROVIDE WEB CONNECTIONS FOR STEEL BEAMS AT COLUMNS UNLESS NOTED OTHERWISE.

THE REACTIONS FOR EACH END OF BEAM SHALL BE DESIGNED USING 1/2 OF THE TABULATED ALLOWABLE LOAD FOR THE GIVEN SPAN AS TABULATED IN PART 2 OF THE AISC MANUAL OF STEEL CONSTRUCTION.

USE 3/8" THICK PLATES MINIMUM AT CONNECTIONS.

ST-8- PROVIDE ULTRASONIC INSPECTION FOR ALL PENETRATION WELDS.

ST-9- REINFORCING BARS SHALL NOT BE WELDED WITHIN TWO INCHES OR TWO BAR DIAMETERS OF A BEND TO AVOID POTENTIAL CRYSTALLIZATION AND THE ASSOCIATED BRITTLE BEHAVIOR. STOP WELD 2" FROM BEND IN BAR.

ST-10 -WELDING OF DIAGONAL ANGLES TO PURLINS SHALL BE DONE AFTER ALL DEAD LOAD HAS BEEN APPLIED TO ROOF BEING SUPPORTED BY PURLINS.

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STEEL ERECTOR NOTE

ALL COLUMNS BEARING ON EMBED PLATES ARE CLASSIFIED AS "POSTS" AND ARE NOT DESIGNED FOR ECCENTRIC LOAD OR ERECTION PERSONNEL. DO NOT CLIMB ON POSTS SUPPORTED BY EMBED PLATES OR STRUCTURAL MEMBERS SUPPORTED BY POSTS UNTIL THEY ARE FULLY WELDED TO EMBED PLATES. ERECTOR SHALL BRACE POSTS WITH ROD "X" BRACING IN 2 DIRECTIONS UNTIL POSTS ARE FULLY WELDED AT BASE.

ROOF DECK

RD-1 ROOF DECK OVER CANOPIES SHALL BE 1.5" DEEP 22 GAGE WIDE RIB GALVANIZED (G60) METAL DECK TYPE 1.5B22 AS MANUFACTURED BY VULCRAFT OR APPROVED EQUAL. DECK SHALL CONFORM TO SDI STANDARDS AND SHALL HAVE THE FOLLOWING PROPERTIES:
I = 0.169 IN4/FT
SP = 0.186 IN3/FT
SN = 0.192 IN3/FT
FY = 33 K.S.I.

MINIMUM STEEL THICKNESS BEFORE COATING = 0.0295 IN. LAP ENDS OF DECK 2" AT SUPPORTS. ATTACH ROOF DECK TO SUPPORTS IN ACCORDANCE WITH THE TYPICAL DETAIL ON THE PLANS.

STANDING SEAM ROOF AND ACCESSORIES

SSM-1 SEE SPECIFICATIONS FOR STANDING SEAM ROOF. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL ROOFING MATERIALS AND ACCESSORIES TO PRODUCE A WATER-TIGHT ROOFING SYSTEM. SUBMIT SHOP DRAWINGS FOR APPROVAL. ROOFING SHALL BE WHITE IN COLOR AND SHALL BE APPROVED BY SAWS.

FIELD PAINTING

FP-1 STRUCTURAL STEEL, PURLINS, BRIDGING, MISCELLANEOUS ANGLES, GUTTERS, DOWNSPOUTS, AND UNDERSIDE OF 1.5B22 ROOF DECK SHALL BE FIELD PAINTED TO A TAN COLOR USING ZINC RICH RUST INHIBITIVE PAINT. (RUSTOLEUM OR EQUAL) SUBMIT TAN COLOR FOR APROVAL BY SAWS.

FIELD WELD INSPECTION

FW-1 THE OWNER SHALL EMPLOY A QUALIFIED TESTING LAB (AWS CERTIFIED WELD INSPECTOR) TO PERFORM VISUAL WELD INSPECTIONS ON ALL FIELD WELDS. ALL WELDS FAILING INSPECTIONS SHALL BE REINSPECTED UNTIL THEY PASS. THE LAB SHALL SUBMIT WRITTEN REPORTS OF ALL INSPECTIONS TO SAWS AND TO THE STRUCTURAL ENGINEER.

APPLICABILITY OF TYPICAL DETAILS

TD-1 TYPICAL DETAILS SHALL APPLY TO ALL SUCH SITUATIONS AND CONDITIONS WHICH ARE SIMILAR TO THE CONDITION SHOWN ON THE DETAIL OR VERBALLY DESCRIBED IN THE TITLE OF THE DETAIL OR NOTES ON THE DETAIL.

TD-2 TYPICAL DETAILS SHALL APPLY REGARDLESS OF WHETHER OR NOT THE DETAIL SECTION MARK IS CUT ON THE PLANS.

MISCELLANEOUS

M-1 DO NOT INSTALL PLUMBING PIPES IN GRADE BEAM TRENCHES. DO NOT PENETRATE GRADE BEAM WITHOUT ENGINEER'S APPROVAL.

M-2 CHANGES SHALL NOT BE MADE TO THE DRAWINGS WITHOUT WRITTEN APPROVAL OF THE ENGINEER.

M-3 SHOP DRAWINGS SHALL BE SUBMITTED FOR ALL STRUCTURAL ITEMS INCLUDING REBAR, STRUCTURAL STEEL AND METAL DECK. SHOP DRAWINGS SHALL BE SUBMITTED IN A TIMELY MANNER ALLOWING A MINIMUM OF 10 WORKING DAYS FOR REVIEW BY STRUCTURAL ENGINEER.

M-4 REBAR SHALL NOT BE HEATED WITH A TORCH IN THE FIELD.

M-5 EMBED PLATES MUST BE SET IN THE FORM BEFORE POURING CONCRETE, NOT INTO TOP OF WET CONCRETE.

M-6 DO NOT HANG ANYTHING FROM THE METAL DECK.

M-7 THE TESTING LAB SHALL VISUALLY INSPECT ALL SHOP WELDS OF REBAR TO EMBED PLATES.

M-8 CONTRACTOR SHALL SCHEDULE AND COORDINATE ALL INSPECTIONS REQUIRED BY THE IBC CODE. ALL INSPECTIONS SHALL BE PAID FOR BY THE OWNER.

SITE OBSERVATION BY THE STRUCTURAL ENGINEER

SV-1 PERIODIC SITE OBSERVATIONS BY FIELD REPRESENTATIVES OF BILL REIFFERT AND ASSOCIATES ARE SOLELY FOR THE PURPOSE OF DETERMINING IF THE WORK OF THE CONTRACTOR IS PROCEEDING IN GENERAL ACCORDANCE WITH THE STRUCTURAL CONTRACT DOCUMENTS. THESE LIMITED SITE OBSERVATIONS SHOULD NOT BE CONSTRUED AS EXHAUSTIVE OR CONTINUOUS TO CHECK THE QUALITY OR QUANTITY OF THE WORK, BUT RATHER PERIODIC IN AN EFFORT TO GUARD THE OWNER AGAINST DEFECTS OR DEFICIENCIES IN THE WORK OF THE CONTRACTOR.

SV-2 THE CONTRACTOR SHALL NOTIFY THE ENGINEER 48 HOURS IN ADVANCE OF ANY MAJOR CONCRETE POUR.

SV-3 THE CONTRACTOR SHALL NOT POUR ANY CONCRETE UNTIL ALL REINFORCING STEEL PLACEMENT HAS BEEN REVIEWED BY THE STRUCTURAL ENGINEER AND ALL CORRECTIONS MADE BY THE CONTRACTOR. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL CORRECTIONS HAVE BEEN MADE.

SV-4 DO NOT COVER UP STRUCTURAL FRAMING UNTIL IT HAS BEEN REVIEWED BY THE ENGINEER.

REPRODUCTION NOTE

R-1 THE USE OF REPRODUCTIONS OF THESE CONTRACT DRAWINGS BY ANY CONTRACTOR, SUBCONTRACTOR, ERECTOR, FABRICATOR, OR MATERIAL SUPPLIER IN LIEU OF PREPARATION OF SHOP DRAWINGS SIGNIFIES HIS ACCEPTANCE OF ALL INFORMATION SHOWN HEREON AS CORRECT, AND OBLIGATES HIMSELF TO ANY JOB EXPENSE, REAL OR IMPLIED, ARISING DUE TO ANY ERRORS THAT MAY OCCUR HEREON.

TESTING & INSPECTION REQUIREMENTS

Required Inspection Verification, or Test	*Applicability for project*	*Verification Monitoring Frequency*	*Type and/or Frequency of Testing*	*IBC Section & Reference Criteria*	*Inspector Qualifications*	*Contact for Testing / Inspection*
1. CONCRETE CONSTRUCTION						
A. Reinforcing Steel		Periodic	Provide periodic inspection of reinforcing sizes, spacing, grade of rebar; and placement at the following frequency: Columns: 100% Beams: 30% Joist: 25% Other members: randomly @ 20%	IBC 1704.4 ACI 318: Ch. 3.5, 7.1–7.7; Concrete and Reinforcing General Notes.	* Qualifications based on ASTM E329	
B. Reinforcing steel welding			No field welding permitted.	AWS D1.4 ACI 318: 3.5.2	CWI or Associate CWI	
C. Verify use of concrete mix design		Periodic	Each Concrete Pour	ACI 318 – Ch. 4, 5.2 – 5.4	* Qualifications based on ASTM C1077	
D. Sampling of fresh concrete		Continuous Each Concrete Pour;	1. All concrete testing is to be made after water, if any, is added at site. 2. Provide a set of (4) four cylinders to be taken for every 75 cubic yards of concrete, or fraction thereof, by testing lab. 3. Monitor slump and air content of concrete and notify delivery driver if slump deviates more than plus or minus 1 inch from recommended value. Contact supplier for further directions.	ACI 318 – Ch. 5.6, 5.8	* Qualifications based on ASTM C1077	

Required Inspection Verification, or Test	*Applicability for project*	*Verification Monitoring Frequency*	*Type and/or Frequency of Testing*	*IBC Section & Reference Criteria*	*Inspector Qualifications*	*Contact for Testing / Inspection*
2. STEEL CONSTRUCTION						
A. Welding: of Structural Steel		Continuous	1. Complete & partial penetration groove welds.	IBC 1704.3.1; Structural Steel General Notes	CWI and ASNT	
		Continuous	2. Multipass fillet welds	AWS D1.1	CWI and ASNT or licensed Engineer	
		Continuous	3. Single-pass fillet welds > 5/16"			
		Periodic	4. Single pass fillet welds ≤ 5/16"			
		Periodic	5. Floor and deck welds	AWS D1.3		

3. INSPECTION OF FABRICATORS FOR STRUCTURAL STEEL						
Fabrication & Implementation Procedures		Periodic	Fabrication and implementation procedures. The special inspector shall verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards. The special inspector shall review the procedures for completeness and adequacy relative to the code requirements for the fabricator's scope of work. Exception: Special Inspections shall NOT be required where the work is done on the premises of a fabricator that is enrolled in a nationally accepted inspections program acceptable to the registered design professional in responsible charge. At completion of fabrication, the approved fabricator shall submit a certificate of compliance to building official upon request and to the registered design professional in responsible charge stating that the work was performed in accordance with the approved construction documents.	IBC 1704.2.1 IBC 1704.2.2	CWI, ASNT, Licensed Engineer	
SEE SPECS AND GENERAL NOTES FOR INSPECTION OF ALL FOUNDATIONS						

CITY OF SAN ANTONIO – Determination of Required Special Inspections
Section 1704 of the International Building Code, as amended by the City of San Antonio, has been reviewed.
The following is a list of the required special inspections applicable for this project.

IBC Section	Structural Special Inspections	Applicable	Not Applicable
1704.2	Inspection of fabricators	X	
1704.3	Steel construction	X	
1704.4	Concrete construction	X	
1704.5	Masonry construction		X
1704.6	Wood construction		X
1704.7	Soils	X	
1704.8	Driven deep foundations		X
1704.9	Cast-in-place deep foundations	X	
1704.10	Helical pile foundations		X
1704.11	Vertical masonry foundation elements		X

8/27/13

STATE OF TEXAS
WILLIAM C. REIFFERT
42606
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY WILLIAM C. REIFFERT P.E. # 42606

BILL REIFFERT AND ASSOC, INC.
TEXAS ENGINEERING FIRM LICENSE # 2021
136 Sagecrest Phone (210) 366-9313
San Antonio, TX. 78232 Fax (210) 366-9318
B.R.A.I. JOB NO. - 13-010
STRUCTURAL ENGINEERS

(DSP) SOMERSET FACILITY
HIGH SERVICE PUMP
UPGRADES PROJECT

DEVELOPER:
CONT. BUDGET PROJ. 12-6101
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. KR CK. WCR JOB No.
SHEET S3 OF 3

SECTION 02378

DRILLED CONCRETE PIERS (STRAIGHT SHAFTS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Information concerning a sub-surface soil investigation by an independent testing laboratory is available and will be furnished by the Owner upon request. The data included therein may be used by the contractor for his general information only. The Engineer will not be responsible for the accuracy or applicability of the data therein.

A previous land use study has not been performed for the project. Buried structures and caves that may affect pier and/or anchor installation may be present.

1.2 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, services, equipment (including temporary casings where required) and shall install all piers at the locations and depths shown on the drawings or as otherwise directed by the Owner's Geotechnical Engineer.

B. The Contractor shall furnish and place all reinforcing steel, dowels, and anchor bolts as shown on the drawings and as required by pole manufacturer.

1.3 QUALIFICATIONS

Drilled piers shall be installed by a specialty Contractor with suitable equipment, competent personnel, and a reputation of satisfactorily performing the work. The Contractor shall have a minimum of 5 years successful experience and a minimum of 5 successful installations on projects of a similar size and scope to this project. Evidence of compliance with this section shall be submitted to the Engineer prior to entering into a contract for the work.

1.4 QUALITY ASSURANCE

The Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers.

A. Codes and Specifications:

The Contractor shall comply with all provisions of the following specifications:

1. "Standard Specification for End Bearing Drilled Piers", ACI 336.1, as published by the American Concrete Institute.

2. "Standards and Specifications for the Foundation Drilling Industry", as published by the Association of Drilled Shaft Contractors.

In addition, all applicable building code and local regulations shall be followed. In case of conflict, the strictest interpretation shall govern.

B. Survey Work:

1. The Contractor shall employ a qualified surveyor to perform all surveys, layouts and measurements for drilled pier work. The surveyor shall conduct the layout work for each drilled pier to the lines and levels required prior to beginning excavation and shall make actual in-place measurements of each drilled pier plan location, shaft diameter, bottom and top elevations and deviations from specified tolerances.

2. The surveyor shall record and submit all information pertinent to each drilled pier and cooperate with other testing and inspection personnel to provide data for all required reports.

C. Testing Laboratory Requirements:

The Contractor shall cooperate with all testing and inspection personnel employed to perform field quality control tests and inspections. See Testing Laboratory section of the specifications for required tests and inspections to be performed by the Owner's Testing Laboratory and Geotechnical Engineer.

Inspection or testing by the Owner does not relieve the Contractor of his responsibility to perform the Work in accordance with the Contract Documents.

1.5 JOB CONDITIONS

A. Site Information:

1. Data on indicated subsurface conditions are not intended as representations or warranties of continuity of such conditions. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. The data are made available for the convenience of the Contractor.

2. Additional test borings and other exploratory operations may be made by the Contractor at no additional cost to the Owner. Notify and obtain approval from Owner prior to drilling borings.

1.6 SUBMITTALS

A. Concrete Mix Design:

Submit concrete mix designs suitable for method of concrete placement for Engineer and Owner's Testing Laboratory approval prior to pier installation.

B. Drilling Records:

The Contractor and the Owner's Geotechnical Engineer or other authorized inspector shall each submit copies of the drilling record for each pier to the Architect/Engineer immediately after drilling. The reports shall indicate the name of the job, name of Contractor, and name of drilling superintendent. For each pier installed, the report shall indicate the following information:

1. Pier number and location
2. Pier shaft diameter
3. Bottom elevation
4. Top elevation
5. Pier length
6. Theoretical volume of concrete in pier
7. Actual volume of concrete placed
8. Reinforcing steel size and depth actually placed
9. Drilling start and finish time
10. Concreting start and finish time
11. Variation from specified tolerances including location and plumbness
12. Construction method (dry method, casing method, or slurry displacement method)
13. Groundwater conditions (rate of water infiltration and depth of water in hole prior to concreting for dry piers; water elevation in hole for wet piers)
14. Elevation of top and bottom of any casing left in place
15. Description of temporary or permanent casing (including purpose, diameter, wall thickness and length)
16. Description and elevation of any obstructions encountered and whether removal was obtained
17. Description of pier bottom including amount and extent of loose material
18. Method of concrete placement
19. Any difficulties encountered in drilling or concreting operations
20. Any deviations from specifications

For piers founded in rock, also record elevation at which rock was encountered, depth of socket, and record of any rock core samples made.

Reports prepared by the Owner's Geotechnical Engineer or authorized inspector shall be compiled and signed by a registered professional engineer in the state where the project is located. Reports prepared by the Contractor shall be compiled and signed by the drilling superintendent.

C. Shop Drawings:

1. Reinforcing Steel:

   Submit shop drawings for all drilled pier and pier cap reinforcing steel.

2. Installation Method:

   Submit detailed procedures of the installation method, including (where applicable) type and number of drilling rigs and equipment, casing size and length, casing removal method, drilling fluid type, dewatering method, concrete placement, and reinforcing steel securing and placement.

3. Steel Casings:

   Submit shop drawings for size and grade of steel casings required. Show all splices and methods of splicing.

D. Alternates:

The Contractor shall submit his bid based on the specifications as written without exceptions. He may submit bids for alternates to the specifications or modifications to the design, load test program, or installation specifications for consideration by the Architect/Engineer and the Owner.

PART 2 - PRODUCTS

2.1 CONCRETE

Concrete shall be as specified in the "Cast-in-Place Concrete" section of the specifications and on the drawings, with the additional requirements specified below:

A. Maximum Aggregate Size:

Provide maximum aggregate size of one-third of minimum clear spacing between individual reinforcing bars or bundles of bars, with 1-inch maximum.

B. Air Entraining Admixture:

Use air entraining admixtures in concrete at manufacturers prescribed rate to result in concrete at point of placement having 4% to 6% air content.

C. Water Reducing Admixtures:

Where required by mix design, use water-reducing admixtures in strict compliance with manufacturer’s directions. Admixtures to increase cement dispersion, or provide increased workability for low-slump concrete may be used at contractor's option. Use admixtures in the amounts as recommended by manufacturer for climatic conditions prevailing at time of placing concrete. Adjust quantities of admixtures as required to maintain quality control.

D. Slump Limits:

Proportion concrete to have a slump that is suitable for the placement process used. Provide a minimum 6-inch slump concrete with retarder for cased piers at time of pulling casing. Provide a minimum 6-inch slump concrete with retarder for piers placed using the slurry displacement method.

E. Retarding Admixture:

The type and amount of retarder used shall be consistent with the amount of time needed to transport and place the concrete using the method adopted for shaft concreting. Reference concrete specifications for retarding admixture requirements.

2.2 REINFORCING STEEL

See "Concrete Reinforcing Steel" section of the specifications.

2.3 STEEL CASING:

A. Steel casing shall conform to ASTM A 252, Grade 2 or A 36.

B. Corrugated steel casing shall conform to ASTM A 444.

2.4 CONCRETE MIXING

A. Ready Mix Concrete:

Comply with the requirements of ASTM C94.

B. Hot Weather Concreting:

The maximum acceptable concrete temperature at the truck discharge point shall be 95°F. Refer to Hot Weather Concreting Practices specified in "Cast-in-Place Concrete" section of the specifications for required hot weather concreting practices.

C. Cold Weather Concreting Practices:

Concrete should not be placed on any day when the outside air temperature is 40°F or less and falling unless cold weather concreting practices are followed as specified in the "Cast-in-Place Concrete" section of the specifications.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Requirements:

Excavate holes for drilled piers to the required bearing strata or elevation as shown on the drawings unless directed otherwise in the field by the Owner's Geotechnical Engineer. Excavate holes for closely spaced piers and those occurring in fragile or sand stratas only after adjacent holes are filled with concrete and allowed to set a minimum of 6 hours or longer as required for concrete to harden.

Drilled pier design dimensions and depths shown on the drawings shall be considered minimums. The design of drilled piers is based on bearing and/or friction in assumed soil strata. If bearing stratum is not capable of maintaining capacity assumed, foundation system shall be revised as directed by the Owner's Geotechnical Engineer and Architect/Engineer. Revisions will be paid for in accordance with contract conditions relative to changes in the work.

B. Equipment:

1. Provide adequate equipment so work is expedited to the fullest extent possible. Use equipment fully capable of excavating shafts to depths, diameters, and sizes indicated, and within the specified tolerances. Maintain equipment in satisfactory operating condition and provide sufficient quantity of equipment to maintain the projected schedule of the Work.

2. Using bits or augers with a power driven rotary type rig, a shaft of a diameter specified on the drawings shall be excavated from the ground surface to a depth

as specified on the drawings or as ordered by the Owner's Geotechnical Engineer.

C. Excavated Material:

1. Deposit and spread excavated material off site, unless otherwise approved by SAWS.

3.2 DRILLING METHOD

The following drilling methods may be considered for use on this project:

A. Dry Method:

The excavation shall be made using bits or augers without the use of water or drilling mud. Unless rock or obstructions are encountered, the excavation shall be completed in a continuous operation and the concrete shall be placed immediately prior to completing the day's work.

When casing conditions are encountered or where excess water begins seeping into the hole at a rate greater than 1/4 inch rise per minute in the bottom of the shaft, no further drilling will be allowed until the Contractor selects a method of placement to prevent ground movement and/or water flow.

B. Casing Method:

Where caving conditions are encountered or excess water seeps into the excavation greater than acceptable for a dry pier as specified above, the Contractor shall use a temporary casing placed by an appropriate means.

The casing shall be sealed in a stratum of soil that will not cave or admit excessive water. The pier excavation shall then be completed in the approved soil stratum. Vibratory methods of casing placement and removal shall not damage surrounding structures or previously placed piers.

C. Dewatering Method:

When ground water conditions are encountered such that a temporary casing cannot be installed in an impervious stratum to cut off water infiltration, a dewatering system shall be installed which will permit proper excavation, inspection, and concreting of the shaft.

Should the dewatering system employed involve pumping inside the pier, extreme caution shall be used to prevent an unbalanced water head from causing a "blowout", bottom heave, or "quick" condition that could disturb the proposed bearing stratum or surrounding soil strata.

The dewatering method shall be submitted for review and approval of the Owner's Geotechnical Engineer.

The Contractor's bid price shall include installation of all drilled piers as shown on the drawings by whatever method is required to obtain the final result intended. A price shall be given for each method and the minimum number of shafts appropriate for the price submitted.

3.3 CONSTRUCTION TOLERANCES

A. Plan Location:
The tolerance on plan location for the top of the drilled pier shall not be more than 1/24 of the pier diameter or 3" in any direction, whichever is less.

B. Plumbness:
Permissible tolerance for plumbness shall be 1.0% of the length, 12.5% of the shaft diameter, or 15" at the bottom, whichever is less.

C. Bottom Area:
The bottom of the pier shall be essentially horizontal with the area of the bottom bearing not less than 98% of that specified on the drawings.

D. Top Area:
The Contractor shall remove excess concrete at the top of the pier beyond the limits of the pier diameter. The pier top diameter shall be the same diameter as the shaft below. Piers extending above the ground surface shall be formed.

E. Concrete Cut-Off Elevation:
Concrete cut-off elevation at the pier top shall be plus one inch to minus three inches.

If any of the above tolerances are exceeded, the Architect/Engineer shall immediately be notified to evaluate the eccentricity in the pier and recommend corrective measures. The cost of re-engineering and corrective construction shall be borne by the Contractor.

3.4 INFILTRATION OF GROUNDWATER

A. Dry Pier: Water rise at a rate of less than 1/4 inch per minute at the bottom of the pier shall be considered a dry pier and concrete may be placed by buckets, chutes, or trunks in such a manner so as not to cause segregation. The total height of water in the bottom of the pier shall not exceed two inches at the time of concrete placement.

B. Wet Pier: Infiltration of groundwater exceeding 1/4 inch per minute at the bottom of the shaft shall be considered a wet pier and concrete shall be placed by an approved tremie method.

C. Dewatering: Provide and maintain pumping equipment where required to keep excavations free of water before placing concrete. If excessive water is encountered and drilling operations must be halted, consult with Architect/Engineer before using alternate methods of construction. Conduct water to general site run-off ditches and disposal areas with discharge lines. Provide ditching as required to conduct water to site drainage facilities.

3.5 TEMPORARY STEEL CASINGS

A. Requirement: Temporary casings will be required at locations where the soil will not stand without support or where, because of subsurface ground water conditions, sloughing of the sides of shafts may seriously delay or endanger the satisfactory completion of excavation and placement of concrete. The Contractor shall have immediately available for use on the job an ample supply of casing for each size which will be required for use and shall provide additional amounts, if required, to ensure orderly progress of the job. Such casing shall have jointing devices where required of

sufficient strength that assembled sections of casing may be pulled complete as concrete is placed, or immediately thereafter. Provide casing of sufficient strength to withstand handling stresses, concrete pressure, and surrounding earth and/or fluid pressures. Make diameter of excavation in relation to diameter of casing such as to create a minimum of void space outside of casing. Provide casing with a minimum outside diameter equal to nominal outside diameter of drilled foundations except where excavation extends below bottom of casing, in which case, the casing shall be sized to provide no less than the specified pier diameter.

B. Unless otherwise approved by the Engineer, all temporary casing shall be removed from shafts as concrete is placed or immediately thereafter, and in such a manner as to prevent sloughing material from dropping to the bottoms of shafts or falling on top of freshly placed concrete.

3.6 DRILLED PIERS IN ROCK

A. Requirement: Provide drilled piers socketed into rock as shown on the drawings or as directed by the Owner's Geotechnical Engineer.

B. Classification of Rock: Rock is defined as material which cannot be drilled with a conventional earth auger or underreaming tool, and requires use of special rock augers, core barrels, air tools, blasting, or other methods of hand excavation. Earth seams, rock fragments, and voids included in rock excavation area will be considered rock for full volume of shaft from initial contact with rock for pay purposes.

3.7 REINFORCING STEEL PLACEMENT

A. Before placing, clean reinforcing steel and dowels of loose rust, scale, dirt, grease and other material which could reduce or destroy bond.

B. Fabricate and erect reinforcing cages in shafts as one continuous unit using inner ring reinforcing guide. Place reinforcement cage accurately and symmetrically about axis of hole and hold securely in position during concrete placement. The Contractor shall verify depths of drilled piers prior to cutting and tying reinforcing steel cages. Reinforcing steel shall be delivered to the site in standard 60-foot lengths and cut as required. Splice no more than 50% of the bars at any one location alternating spliced and unspliced bars in a symmetrical pattern. Splices shall be 50 bar diameter compression splices for bars #11 and smaller and mechanical end bearing compression splices for #14 and #18 bars unless noted otherwise on the drawings. See drawings for additional splice information. The Contractor shall be responsible for adding additional reinforcing steel ties or spirals as required to ensure stability of cage and maintenance of shape and configuration as required for proper lifting, handling, and placement.

C. Use templates to set anchor bolts, leveling plates and other accessories furnished under work of other sections. Provide spacers (capable of sliding on any temporary casings required), blocking and holding devices to maintain required position during concrete placement.

D. The Contractor shall protect exposed ends of dowels and anchor bolts from mechanical damage and exposure to weather by wrapping and taping with polyethylene or other suitable material.

3.8 CONCRETE PLACEMENT

A. General:

1. Fill drilled piers with concrete immediately after inspection and approval by the Geotechnical Engineer or other authorized inspector. Use protection sheets (cut out to receive concrete) over excavation openings, extending at least 12" beyond edge.

2. Place concrete continuously and in a smooth flow without segregating the mixed materials. Provide mechanical vibration for consolidation of at least top five feet of each shaft but only after any temporary casing is pulled or when casing is permanent.

3. Place concrete by means of bottom discharge bucket, flexible drop chute, elephant trunk hopper, or tremie. Free fall of concrete may be used if provided for in concrete mix design to prevent segregation and provided it is directed through a hopper or chute such that fall is down center of shaft without contacting sides of shaft or reinforcing steel.

4. Place concrete in-the-dry unless placing underwater is acceptable to Engineer. If water occurs, and it is impracticable to dewater drilled pier excavation, and reasonable attempts to seal off water flow have failed, allow water level to attain its normal level and place concrete by tremie method. Control placement operations to ensure that tremie is not broken during continuous placing from bottom to top. Other methods of depositing concrete underwater may be used, if approved by Engineer.

5. Maintain a sufficient head of concrete to prevent reduction in diameter of drilled pier shaft by earth pressure and to prevent extraneous material from mixing with fresh concrete. Coordinate withdrawal of temporary casings with concrete placement operations to maintain a head of concrete approximately five feet above casing bottom. During casing extraction upward movement of the reinforcing steel should not exceed 6". Downward movement should not exceed 6" per 20 feet of shaft length. When casing is left in place, fill void space between casing and shaft excavation with fluid grout by means of grout pipe and pump pressure as required.

6. Casings shall be pulled in a single continuous smooth operation without sudden jerks or impact. No casing shall be vibrated after concrete is installed.

7. Stop concrete placement at cut-off elevation shown, screed level, and apply a scoured, rough finish. Where cut-off elevation is above ground elevation, form top section above grade and extend shaft to required elevation.

8. Interrupted placing operations of over one hour duration will require a cold joint installation as follows. Leave resulting shaft surface approximately level. At resumption of concrete placing, clean off surface laitance and slush with a 1-to-1 cement grout or commercial bonding agent before remainder of concrete is placed. Intentional cold joints will not be permitted.

9. Concrete shall not be placed in adjacent drilled piers located within three center to center shaft diameters of each other until concrete has cured a minimum of 6 hours.

10. Aluminum pipe or equipment shall not be used for placing concrete.

B. Hot and Cold Weather Placement:

Refer to Part II.

3.9 INSPECTIONS AND TESTS FOR DRILLED PIER EXCAVATIONS

A. Verification of Design: Bottom elevations, bearing and/or skin friction capacities and lengths of drilled piers as shown on the drawings are estimated from available soil data. Actual elevations, pier lengths, and bearing and/or skin friction capacities will be determined by the Geotechnical Engineer from conditions found in the excavations.

For piers bearing on rock, a rock core shall be taken for a depth equal to one pier diameter below the bottom of the pier for observation and possible testing by the Geotechnical Engineer to confirm rock quality below the bearing elevation.

B. Notification of Engineer: If field conditions differ from the data and design recommendations outlined in the Geotechnical Report, the Geotechnical Engineer shall notify the Architect/Engineer immediately.

C. Additional Tests: Additional tests may be required by the Geotechnical Engineer to determine new design criteria. Such tests shall be made as quickly as possible so as not to delay the concreting operations any longer than absolutely required.

D. Observation Requirements: Each drilled pier shall be inspected by the authorized inspector and approved prior to placement of concrete.

E. Cooperation with Testing and Inspection Personnel: The Contractor shall provide facilities as required to assist in the inspection and testing of the excavations, and cooperate with the inspecting and testing personnel to expedite the work.

F. Notification of Observer: The Contractor shall notify the authorized observer at least twelve hours prior to the time the excavation will be ready for inspection. Drilled shaft installation shall not proceed without the authorized observer on site.

G. Personnel Safety: The Contractor shall provide gas testing equipment, protective cage, or temporary casing or shoring of proper diameter, length, and thickness, and all other safety equipment required by law for inspection and testing of drilled piers and to protect workmen and inspectors during hand belling or other operations necessitating entry into shaft.

3.10 APPROVAL BY THE GEOTECHNICAL ENGINEER

Approval by the Owner's Geotechnical Engineer is required on all pier installation criteria and his decision and judgment on pier length, rejection of piers, additional piers required, and all other pier installation and capacity questions shall be final.

3.11 CONTRACT BASIS

A. Basis of Bids:

Bids shall be based on number of drilled piers, design length from top elevation to bottom of shaft and diameter of shaft, as shown on drawings. The bid price shall include cost for temporary casing of excavation that may be required.

B. Basis for Payment:

Payment for drilled piers will be made on actual net volume of drilled piers in place and accepted. The actual length and shaft diameter may vary to coincide with elevation where satisfactory bearing or friction strata is encountered, and with actual bearing value of bearing strata determined by testing services, and with stability and characteristics of soil strata. Adjustments will be made on net variation of total quantities, based on design dimensions for shafts.

1. There will be no additional compensation for excavation, concrete fill, reinforcing, casings, or other costs due to unauthorized overexcavating shafts. Overexcavated piers will be measured and paid for in accordance with required design or authorized depth. No payment will be made for rejected drilled piers.

2. Prices quoted shall include full compensation for labor, temporary casing, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete, and other items for complete installation.

C. Unit Prices:

Unit prices for the following items, as set forth in contract conditions, will apply in event additions to or deductions from work are required and authorized by written order from Engineer to Contractor.

Soil excavation (including temporary casing if required)	per cu. yd.
Rock excavation	per cu. yd.
Reinforcing steel and dowels, installed	per lb.
Concrete	per cu. yd.

END OF SECTION 02378

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of structural steel work is shown on drawings including schedules, notes and details which show size and location of members, typical connections, and type of steel required. Furnish all labor, materials, services, equipment and appliances required in conjunction with or related to the furnishing, fabrication, delivery, and erection of all structural steel defined below. Include all supplementary parts, members and connections necessary to complete the structural steel work, regardless of whether all such items are specifically shown or specified on the drawings.

B. Structural steel shall be defined as that work prescribed in Section 2.1 of the AISC Code of Standard Practice and the following items: shelf angles, angle frames for openings in floors and roofs, cooling tower grillage, support frames for elevator machines not otherwise furnished by the elevator manufacturer, steel floor framing supporting elevator equipment, all steel supports for elevator guide rails, steel crane rails and stops, miscellaneous metal deck support and edge angles, shop welded metal studs, all connection material, temporary construction bracing, and all other structural steel shown or specified on the drawings to be part of the work. Labor shall include shop painting as specified, field touch-up painting, and grouting of base plates and bearing plates.

C. Miscellaneous metal fabrications, architecturally exposed structural steel, metal stairs, steel joists, and metal deck are specified elsewhere in these Specifications.

1.3 QUALIFICATIONS

1. Fabricator: The structural steel fabricator shall have not less than 10 years experience in the successful fabrication of structural steel similar to this project. Evidence of compliance with this section shall be submitted to the Architect/Engineer.

2. Erector: The structural steel erector shall have not less than 5 years successful experience in the erection of structural steel of a similar nature to this project. Evidence of compliance with this section shall be submitted to the Architect/Engineer.

1.4 QUALITY ASSURANCE

The Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers.

A. Codes and Standards:

Comply with provisions of the following, except as otherwise indicated:

1. All federal (OSHA), state and local laws which govern safety requirements for steel erection and other requirements if more stringent than the codes and standards enumerated below.

2. AISC "Code of Standard Practice for Steel Buildings and Bridges", 13th edition.

3. AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings", latest edition.

4. AISC "Specification for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation (Research Council on Structural Connections), latest edition.

5. AWS D1.1 "Structural Welding Code - Steel".

6. "Steel Structures Painting Manual", Volumes 1 and 2, Steel Structures Painting Council.

B. Qualifications for Welding Work:

Qualify welding processes and welding operators in accordance with AWS "Structural Welding Code - Steel".

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

2. If recertification of welders is required, retesting will be Contractor's responsibility.

C. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests in the mill, shop, and field by the Owner's testing laboratory. Such inspections and tests will not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. The Contractor shall promptly remove and replace materials or fabricated components which do not comply.

D. Question about Contract Documents: The Contractor shall promptly notify the Architect/Engineer whenever design of members and connections for any portion of the structure are not clearly indicated or when other questions exist about the Contract Documents. Such questions shall be resolved prior to the submission of shop drawings.

E. Testing Laboratory Services: See Structural Drawings for required testing. Inspection or testing by the Owner does not relieve the Contractor of his responsibility to perform the Work in accordance with the Contract Documents.

1.5 SUBMITTALS

A. Shop Drawings:

1. General Requirements: Submit shop drawings including complete details and schedules for fabrication and assembly of structural steel members, and details, schedules, procedures and diagrams showing sequence of erection. Shop drawings not complying with the above requirements will not be reviewed. Structural steel shop drawings shall include the following minimum information:

a. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld. Holes, flange cuts, slots and openings shall be made as required by the structural drawings, all of which shall be properly located by means of templates.

2. The fabricator alone shall be responsible for all errors of detailing, fabrication, and for the correct fitting of the structural members.

3. All fabricated material and connections shall fit within architectural constraints.

4. Structural steel members for which shop drawings have not been reviewed and approved shall not be fabricated.

5. The omission from the shop drawings of any materials required by the Contract Documents shall not relieve the Contractor of the responsibility of furnishing and installing such materials, even though the shop drawings may have been reviewed and approved.

B. Test Reports: Submit copies of reports of tests conducted on all field-welded connections that are inspected. Include data on type(s) of tests conducted and test results.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time so as not to delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration. Do not store materials on structure in a manner that might exceed allowable loads on or cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed by Architect/Engineer.

D. Furnish all fuel, maintenance, and equipment required for hoisting and placement of materials under this contract.

E. Process, pay for and maintain all permits and certificates of on-site inspection required for derricks, cranes and hoisting equipment. No derrick, crane or hoisting equipment shall be operated without a certificate of operation and a certificate of on-site inspection, as required by governing authorities.

1. Wherever the erection equipment is supported by the structure, the Contractor shall be responsible for the retention of a licensed professional engineer to determine the adequacy of the member supporting the erection equipment in relation to the loads imposed thereon. The Contractor shall submit to the Architect/Engineer, for review, the loads which will be imposed by the erection equipment on the building structure. Where the imposed load exceeds the allowable stresses, the Contractor shall be responsible for any additional materials, supports, bracing, connections and similar measures required to support the imposed load of the equipment while in use, subject to review by the Architect/Engineer.

2. In addition to the above, all hoisting equipment shall be installed, operated and maintained in accordance with all applicable regulations of authorities having jurisdiction.

3. Street storage and sidewalk crossing permits shall be furnished by the Contractor.

1.7 JOB CONDITIONS

The Contractor shall coordinate the fabrication and erection of all structural steel work with the work of other trades. The contractor shall verify existing conditions prior to beginning work. The contractor shall verify all dimensions shown on the drawings with existing job conditions prior to beginning work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel: All hot rolled steel plates, shapes, sheet piling, and bars shall be new steel conforming to ASTM Specification A6 "Standard Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use".

Structural steel shall comply with the provisions of the following ASTM Specifications as appropriate for the grades and types, and at the locations as specified on the drawings:

1. Structural Steel Shapes, Plates and Bars - Carbon Steel, ASTM A992 GR50 "Standard Specification for Structural Steel."

2. Pipe Columns - ASTM A53 (Type E or S) Grade B, or ASTM A501.

3. Tube Sections - ASTM A500 Grade B. FY = 46 KSI

4. Connection Material: All connection material except as noted otherwise on the drawings including bearing plates, gusset plates, stiffener plates, filler plates, angles, etc. shall be A36 steel unless a higher or matching grade of steel with the members connected is required by strength or stiffness calculations and provided the resulting sizes are compatible with the members connected.

B. Structural Bolts and Threaded Fasteners: Structural bolts and threaded fasteners shall comply with the following ASTM Specifications as appropriate for the types and at the locations as specified on the drawings:

1. ASTM A325 Type 1, "High-Strength Bolts for Structural Steel Joints".

2. Bolts and Nuts, High Strength Bolts: Bolts and nuts for all high strength bolts shall be heavy hex head conforming to ANSI Standards B18.2.1 and B18.2.2 respectively. Nuts shall conform to ASTM A563, "Standard Specification for Carbon and Alloy Steel Nuts".

3. Washers: All washers shall be circular, flat and smooth and shall conform to the requirements of Type A washers in ANSI Standard B23.1. Washers for high strength bolts shall be hardened and conform to ASTM F436, Specification for Hardened Steel Washers. Beveled washers for American Standard Beams and channels shall be square or rectangular, shall taper in thickness (16 2/3% slope)

with an average thickness of 5/16". When an outer face of a bolted part has a slope greater than 1:20 with respect to a plane normal to the bolt axis, a beveled washer shall be used.

4. Bolt Lubrication: All bolts shall be well lubricated at time of installation. Dry, rusty bolts will not be allowed. Bolts or nuts shall be wax dipped by the bolt supplier or "Johnson's Stick Wax 140" shall be used with all bolts in the shop or field.

5. New Bolts: All bolts shall be new and shall not be reused.

C. Electrodes for Welding: Comply with AWS D1.1, "Structural Welding Code - Steel". Electrodes for various welding processes shall be as specified below:

1. SMAW: E70XX low hydrogen
2. SAW: F7X-EXXX
3. GMAW: ER70S-X
4. FCAW: E7XT-X
5. Weathering Steel Electrodes shall conform to Table 4.1.4 of the AWS D1.1 Manual.

Electrodes shall be compatible with parent metal joined.

D. Structural Steel Primer Paint: Primer paint shall be one of the following types with the indicated surface preparation:

Red Oxide Shopcoat Primer AKP563
Manufacturer: INSULATE – (845) 786-5000

Product Information:
Colors: Gray Oxide
Finish: Low sheen
Coating Type: Modified Alkyd Resin
Mixing Ratio: Single Component
VOC 2.78 lbs/gallon (334 grams per liter)
Solids by Volume: 53%
Recommended Dry Film: 1.5 – 2.5 mils
Coverage (Theoretical): 340-566 SF/gallon
Drying Time: 2-4 hours to touch; 12 hours to recoat
Dry heat resistance: 225 degrees F (107 degrees C)
Viscosity: 65-75 KU
Weight per Gallon: 12.31 lbs/gallon (1.3 kg/liter)
Pot Life: Not applicable
Shelf Life: More than one year

1. Physical Properties:

a. Flash point 72 degrees F (22 degrees C) Setaflash

2. Limitations:

a. Do not use on galvanized metal or under epoxy topcoats.

3. Surface Preparation:

All surfaces must be sound, dry, clean and free of oil, grease, dirt, mildew, form release agents, curing compounds, loose and flaking paint and other foreign substances.
New Surfaces: Steel – For best results, abrasive blast to a commercial blast (SSPC-SP-6). For mild conditions, a hand or power tool cleaning (SSPC-SP-2) may be satisfactory, but performance is dependent on the degree of cleaning.
Previously Painted Surfaces: Wash and rinse any areas that may have oil or grease residue. Dull glossy areas by light sanding. Remove sanding dust. Remove loose paint. All areas that are rusting, blistering, cracking or peeling must be cleaned to bare metal. If more than 25% of the surface is involved, sandblast the entire surface to a commercial blast and prime. If less than 25% of the surface is involved, clean soiled areas and spot prime.

4. Application:

Paint should be stirred to a uniform consistence prior to application. Thinning is usually not required or desired; however, small amount (5% or less) of mineral spirits may be added depending on local VOC and air quality regulations. Do not apply if air or surface temperature is below 45 degrees F. Relative humidity should be below 90%. Apply by brush, roller or spray.

5. Clean Up:

Clean all equipment with TH-0201 Reducer promptly after use.

6. Safety Information

See the Material Safety Data Sheet and the product label for complete safety and precaution requirements.

2.2 FABRICATION

A. Shop Fabrication and Assembly:

1. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specification and as indicated on approved final shop drawings. Fabricator shall coordinate joint fit-up procedures with erector. Provide camber in structural members where indicated. The General Contractor shall coordinate provision of all erection bolts, lifting lugs or other devices required for erection with the fabricator and the erector.

2. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

3. Clearly mark the grade of steel on each piece, distinguishable in the field from floor surfaces, for purpose of field inspection and confirmation of grade of steel.

B. Dimensional Tolerances: Dimensional tolerances of fabricated structural steel shall conform to Section 6.4 of the AISC Code of Standard Practice.

C. Splices in Structural Steel: Splicing of structural steel members in the shop or the field is prohibited without prior approval of the Engineer. Any member having a splice not shown and detailed on approved shop drawings will be rejected.

D. Cutting: Manual oxygen cutting shall be done only with a mechanically guided torch. An unguided torch may be used provided the cut is not within 1/8 inch of the finished dimension and final removal is completed by means such as chipping or grinding to produce a smooth surface quality free of notches or jagged edges. All corners shall be smooth and rounded to a minimum 1/2" radius.

2.3 WELDING

A. Code: All shop and field welding shall conform to all requirements in the "Structural Welding Code - Steel", ANSI/AWS D1.1, as published by the American Welding Society (AWS).

B. Welder Certification: All shop and field welders shall be certified according to AWS procedures for the welding process and welding position used. Submit certification certificates to the Architect for record purposes.

C. Minimum Size and Strength:

1. Fillet Welds: Minimum size of fillet welds shall be as specified in Table 1.17.2A in the AISC Manual of Steel Construction.

2. Minimum Strength of Welded Connections: Unless noted otherwise on the drawings, all shop and field welds shall develop the full tensile strength of the member or element joined. All members with moment connections, noted on the drawings with "MC", shall be welded to develop the full flexural capacity of the member, unless noted otherwise on the drawings.

D. Filler Metal Requirements: Weld metal shall be as specified in AISC Manual of Steel Construction Table 1.5.3.

E. Welding Procedures:

1. Welds not specified shall, if possible, be continuous fillet welds developing the minimum strength, as specified above, using not less than the minimum fillet welds as specified by AISC.

2.4 BOLTING

A. Minimum Bolt Diameter: Minimum bolt diameter shall be 3/4 inch.

B. Connection Type: Unless noted otherwise on the drawings or in the General Notes, all bolted connections shall be bearing type connections using standard holes (hole diameter nominally 1/16 inch in excess of nominal bolt diameter) with threads included in the shear planes.

C. Simple Beams: Simple shear connections shall be capable of end rotations of unrestrained beams as specified in Section 1.15.4 of the AISC Specification.

D. Allowable Working Stresses: The allowable working stresses of bolts shall be as specified in the AISC Specification Table 1.5.2.1 and Tables 2 and 3 of the high strength bolting specification previously cited.

E. Washers: Washers under the bolt head and/or nut shall be used as required by the bolt specification previously cited.

F. New Bolts: All bolts shall be new and shall not be reused.

G. Minimum Strength of Bolted Connections: Unless noted otherwise on the drawings, all shop and field bolted connections shall develop, as applicable, the full tensile or compressive strength of the member. All members with bolted moment connections, noted on the drawings with "MC", shall be bolted to develop the full flexural capacity of the member, unless noted otherwise on the drawings.

2.5 CONNECTIONS

A. Typical connection details are indicated on the drawings.

B. Design Procedure: Exception is taken to the second sentence of Section 4.2.1 of the AISC Code of Standard Practice for Bridges and Buildings, and the following provisions shall be substituted and made a binding part of the project specifications:

1. Connection types to be used are Type 2 "Simple".

C. Type 2 Simple Beam Connections:

1. All typical beam simple connections shall be standard double angle or single angle framed beam connections using bolts as specified.

2. Single plate "shear tab" connections may be used provided there is no axial force in the beam and they are designed strictly according to the procedure outlined in "Engineering for Steel Construction" as published by AISC and the paper appearing in the 3rd Quarter, 1984 Engineering Journal "Single Plate Framing Connections with Grade 50 Steel and Composite Construction" as published by AISC.

3. Simple Beam Design Capacity: Unless a larger reaction is shown otherwise on the plans, minimum design forces shall be as follows:

a. Non Composite Beams: Support a reaction R equal to one half the total uniform load capacity from the table of Uniform Load Constants in the AISC Manual Part 2 for given shape, span, and grade of steel.

D. Struts and Braces:

1. Connections for all struts, hangers, and braces shall have connections designed to develop the full allowable tensile strength of the member.

2.6 SURFACE PREPARATION AND PAINTING

A. Specification: Surface preparation, paint, and painting practices shall conform to the "Steel Structures Painting Manual", Volumes 1 and 2, as published by the Steel Structures Painting Council (SSPC).

B. Scope: Shop paint all steel.

C. Surface Preparation and Primer Paint - Shop Painted Steel: All structural steel specified to be shop primed shall have paint applied in strict accordance with manufacturer's instructions using prescribed surface preparation but not less than specified. Paint shall be applied immediately after surface preparation at a rate to provide a uniform dry film thickness of not less than 1.5 mils. Painting methods shall be used which result in full

coverage of joints, corners, edges, and all exposed surfaces. Two coats shall be applied to surfaces which are inaccessible after assembly or erection. The color of the second coat shall be changed to distinguish it from the first coat.

Coordinate shop primer paint requirements with architectural drawings and specifications.

PART 3 - ERECTION

3.1 ERECTION

A. Inspection: Erector shall examine areas and conditions under which structural steel work is to be installed and notify the Contractor and the Architect/Engineer in writing of conditions detrimental to proper and timely completion of the work.

B. Erection Tolerances: Erection tolerances of anchor bolts, embedded items, and all structural steel shall conform to the AISC Code of Standard Practice.

C. Field Assembly of Structural Steel:

1. As erection of the steel progresses, the work shall be fastened securely to take care of all dead load, wind and erection stresses. Particular care shall be exercised to ensure straightness and tautness of bracing immediately upon raising a steel column.

2. Provide temporary planking and working platforms as necessary to effectively complete work.

3. Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment. Level and plumb individual members of structure within specified AISC tolerances. The Contractor shall coordinate with Erector and Fabricator regarding possible discrepancies in member lengths between temperature at time of fabrication and temperatures during erection, and shall make necessary adjustments to ensure plumbness within AISC tolerances at 60°F. Compensate for cumulative welding draw, construction loadings, sequential applications of dead loads, or any other predictable conditions that could cause distortions to exceed tolerance limitations.

4. On exposed welded construction, remove erection bolts, fill holes with plug welds or filler and grind smooth at exposed surfaces.

5. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces receiving field welds.

6. Comply with all bolting and welding requirements of Part 2 of this specification section.

7. Remove and replace existing finish materials as required to accomplish all work. The contractor shall comply with all fire codes when performing welding of steel or metal studs.

D. Field Modifications to Structural Steel: Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and structural fitting of parts shall be reported immediately to the Architect/Engineer, and approval of the method of correction shall be obtained. Approved corrections shall be made at no additional cost to the Owner. Do not use cutting torches, reamers, or other devices in the field for unauthorized correction of fabrication errors.

E. Miscellaneous Framing: Provide supplemental structural steel support framing for metal deck where normal deck bearing is interrupted by column flange plates or other framing members and other floor openings whether shown or not on either the architectural, mechanical, or structural drawings.

F. Removal of Erection Aids and Devices: The erector shall remove all erection aids and devices that interfere with architectural finish or MEP requirements.

G. Touch-Up Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas that have been shop painted. Apply paint to exposed areas using same material and surface preparation as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

2. All field welded galvanized connections shall have welds protected with "Z.R.C. Cold Galvanizing Compound" as manufactured by Z.R.C. Products Company.

3. Steel Plates Embedded in Concrete:

a. Studs shall be welded using automatically timed stud welding equipment to develop the full capacity of the stud.

b. Plates must be unpainted and free of heavy rust, mill scale, dirt, sand or other foreign material which will interfere with the welding operation. Shop prime all plates and studs after welding unless plates are exposed to the outside in which case the assembly shall be hot dip galvanized after welding.

H. Clean Up: Clean up all debris caused by the Work of this Section, keeping the premises neat and clean at all times. Replace and repair to like new condition, all damaged areas of the interior and exterior of the building.

END OF SECTION 05120

SECTION 05310

STEEL ROOF DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 - Specification sections, apply to work of this section.

1.2. SCOPE OF WORK

A. Supplier: The metal deck supplier shall furnish all metal deck materials and accessories indicated on the Architectural, Structural, and Mechanical Drawings required to produce a complete job including but not necessarily limited to deck units, cover plates, pour stops, metal deck edge closures, cell closures, cant strips, sump pans, and all related accessories.

B. Erector: The Subcontractor responsible for erecting the metal deck shall provide all labor and equipment as required to place all metal deck components and accessories as described above.

1.3 QUALIFICATIONS

The metal deck supplier shall be a manufacturer with a minimum of two years successful experience and with a minimum of two successful jobs of a comparable size and scope to this project.

1.4 QUALITY ASSURANCE

The Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers.

A. Codes and Standards: Comply with provisions of the following codes and standards except as otherwise indicated or specified:

1. "Design Manual for Composite Decks, Form Decks, and Roof Decks", as published by the Steel Deck Institute (SDI).

2. "Specification for the Design of Cold Formed Steel Structural Members", as published by the American Iron and Steel Institute (AISI).

3. "Structural Welding Code - Steel", as published by the American Welding Society (AWS).

B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with AWS procedures.

1.5 SUBMITTALS

A. Product Certification: Submit manufacturer's specifications and installation instructions for each type of deck specified. Also submit a certificate of product compliance with SDI Standards as specified.

B. Shop Drawings: Submit detailed shop drawings showing type of deck, complete layout, attachment details, closures, edge strips, supplementary framing, and all other accessories.

C. Insurance Certification: Assist Architect and Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire, windstorm, and extended coverage insurance.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. See General Notes on the drawings for the location, depth, design thickness, section properties, and suggested manufacturer for all required roof decks.

B. Acceptable manufacturers include:

Vulcraft
Wheeling
S.M.I.

Other manufacturers may be used only with Architect/Engineer approval.
Steel Deck from Mexico is not allowed.

2.2 GRADES OF STEEL

Steel deck shall be manufactured from steel conforming to ASTM Designation A611 Grades C, D, or E for painted deck or A446 Grades A, B, C, D, E or F for galvanized deck or Engineer approved equal, having a minimum yield strength of 33,000 PSI.

2.3 SEE GENERAL NOTES

2.4 ROOF DECK ACCESSORIES

Provide minimum 20 gauge ridge and valley plates, minimum 20 gauge cant strips, minimum 14 gauge sump pans, minimum 20 gauge inside or outside closure channels, minimum 20 gauge butt strips at change of deck directions, minimum 20 gauge filler sheets, and rubber closures as required to provide a finished surface for the application of insulation and roofing.

2.5 FABRICATION

A. Metal Deck Spans: Metal deck spans shall not exceed the maximum center-to-center spans as required by SDI criteria. Where possible, all metal deck shall extend over three or more supports.

B. Metal Closure Strips: Fabricate metal closure strips of not less than 0.071" minimum (14 gage) cold-formed sheet steel. Form to provide tight fitting closures at open ends of cells or flutes and sides of decking. Provide sheet metal closures at all slab edges, columns, walls, and openings unless steel angles or bent plates are specified in details on the

drawings. Also, provide wherever deck stops or changes direction. Weld closures at edge supports with 1" long weld at 12" maximum centers unless shown otherwise on the drawings. Provide minimum 2" bearing over steel support. Closures and support welds shall be designed to support a 200 pound concentrated load at the roof edge without exceeding a stress of 0.8 Fy.

2.6 ROOF OPENINGS

Roof openings less than 6" square or diameter require no reinforcement. Openings 6" to 10" inclusive shall be reinforced with a 20 gauge galvanized plate welded to the deck at each corner and 6" maximum centers with a 5/8" diameter puddle weld or sheet metal screws. Unless indicated otherwise on the drawings, openings over 10" wide or diameter shall be reinforced with an angle 2 1/2 x 2 1/2 x 1/4 framing each side of the opening and spanning between supports for spans 4'-0" or less and L 3 x 3 x 1/4 for spans greater than 4'-0" but less than 6'-0". Larger openings shall be referred to the Engineer for framing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install deck units as accessories in accordance with manufacturers recommendations and approved shop drawings, and as specified herein:

1. Place deck units on supporting framework and adjust to final position with ends accurately aligned and bearing 2" minimum on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.

2. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.

3. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.

4. Do not place deck units on concrete supporting structure until concrete has cured and is dry.

5. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.

6. Do not use roof deck units for storage or working platforms until permanently secured.

B. Attachment of Roof Deck:

1. Welding:

a. Typical Requirements: Roof deck units shall be welded to each structural support member using 5/8" diameter puddle welds at spacing shown on Typical Detail on plans. Weld metal shall penetrate all layers of deck material at end laps and side joints and shall have good fusion to the supporting members.

b. Side Laps: Side laps of adjacent units shall be fastened by sheet metal screws at spacing shown on Typical Detail on plans.

c. Welding Washers: Welding washers shall be used only when welding steel deck less than 0.028" thickness.

2. Minimum Bearing: Provide a minimum end bearing of 2" over supports.

3. End Laps: End laps of sheets shall be a minimum of two inches and shall occur over supports. Roofs having a slope of 1/4 inch or more in 12 inches shall be erected beginning at the low side to insure that end laps are shingle fashion.

C. Welding Requirements: Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

D. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking.

E. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength continuity of decking and support of other work shown on the drawings.

F. Hanger Slots or Clips: Provide UL approved punched hanger slots between cells or flutes of lower element where roof deck units are to receive hangers for support of ceiling construction, air ducts, diffusers, or lighting fixtures.

1. Hanger clips designed to clip over male side lap joints of roof deck units may be used instead of hanger slots.

2. Locate slots or clips at not more than 14" o.c. in both directions, not over 9" from walls at ends, and not more than 12" from walls at sides, unless otherwise shown.

3. Provide manufacturer's standard hanger attachment devices.

4. Loads hanging from metal deck slabs shall not exceed 100 pounds unless specifically detailed otherwise on the drawings.

G. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of deck units, except where taped joints are specified.

3.2 TOUCH-UP PAINTING

After deck installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.

Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.

Touch-up painted surfaces with same type of shop paint used on adjacent surfaces.

In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

3.3 INSPECTION

Welded decking in place is subject to inspection and testing by the Owner's Testing Laboratory. Expense of removing and replacing portions of decking for testing purposes will be borne by Owner if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work. Cost of such removal and replacement shall be borne by the Contractor.

END OF SECTION 05310

SECTION 07610
Metal Roofing

PART 1 - GENERAL

1.01 DESCRIPTION – Roofing System shall be “SuperLok” as manufactured by MBCI or approved equal.

A. General:

1. Furnish all labor, material, tools, equipment and services for all preformed roofing.
2. Completely coordinate with work of all other trades.
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
4. See Division 1 for General Requirements.

B. Related Work Specified Elsewhere:

1. Structural steel: Section 05100.
2. Steel joists: Section 05200.

1.02 QUALITY ASSURANCE

A. Applicable Standards:

1. SMACNA: "Architectural Sheet Metal Manual", Sheet Metal and Air Conditioning Contractors National Association, Inc.
2. LGSI: “Light Gage Structural Institute”
3. AISC: "Steel Construction Manual", American Institute of Steel Construction.
4. AISI: "Cold Form Steel Design Manual", American Iron and Steel Institute (1996 Edition).
5. UL580: " Tests for Uplift Resistance of Roof Assembles", Underwriters Laboratories, Inc.
6. FM: “Test Requirements for Class 1 panel roofs”, Factory Mutual Research Corporation.
7. UL2218: Class 4 Impact Resistance Rating
8. Dade County (Florida) Acceptance Report Numbers 01-0814.04 (Dated 12/10/06) and 00-0501.08.
9. ICBO: Evaluation Report No. ER-5409, ICBO Evaluation Service, Inc.
10. ASTM E 1592-95: "Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference", American Society for Testing and Materials.
11. ASTM E 1680-95: "Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems, American Society for Testing and Materials.
12. ASTM E 1646-95: "Standard Test Method for Water Penetration Through Exterior Metal Roof Panel Systems, American Society for Testing and Materials.
13. ASTM A 792-83-AZ50 (Painted) & ASTM A792-83-AZ55 (Bare Galvalume Plus®): "Specifications for Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot Dip Process, General Requirements (Galvalume®)", American Society for Testing and Materials.
14. ASTM E 1514-93: "Standard Specification for Structural Standing Seam Steel Roof Panel Systems", American Society for Testing and Materials.
15. ASTM E 408-71: Standard Test Method for Total Normal Remittance of Surfaces Using Inspection- Meter Techniques. (Energy Star® for Roof Products).
16. ASTM E 903-96 Standard Test Method for Solar Absorptions, Using Integrating Spheres. (Energy Star® for Roof Products)

B. Manufacturer's Qualifications:

1. Manufacturer has a minimum of five years experience in manufacturing metal roof systems of this nature. Panels specified in this section shall be produced in a factory environment (not with a portable roll former) with fixed-base roll forming equipment and in line leveling, assuring the highest level of quality control. A letter from the manufacturer certifying compliance will accompany the product material submittals.

C. Installation Contractor's Qualifications:

1. Installation contractor shall be an approved installer, certified by the manufacturer before the beginning of installation of the metal roof system, specifically for MBCI’s **SuperLok®** metal roof system, Certification by manufacturer must include the following:
   a. Maintain $250,000 minimum general liability insurance coverage. Maintain statutory limits of worker's compensation coverage as mandated by law.
   b. Have no viable claims pending regarding negligent acts or defective workmanship on previously performed or current projects.
   c. Has not filed for protection from creditors under any state or federal insolvency or debtor relief statutes or codes.

d. Project foreman is the person having received certification by the manufacturer specific training in the proper installation of the selected metal roof system and will be present to supervise whenever material is being installed. Specific certified installer program shall include the following:
   1. The instructor must have a minimum of 10 years' experience in the application of metal roof systems.
   2. A formal syllabus for the classroom and hands-on training.
   3. Classroom instruction with review and thorough understanding of the specific product's technical manual.
   4. Hands-on mock-up instruction with a review and thorough understanding of the specific product's details.
   5. The installation contractor must pass a written and oral exam.

e. Provide five references from five different architects or building owners for projects that have been in service for a minimum of two years, stating satisfactory performance by the installation contractor.

f. Provide certification letter that installation contractor has a minimum of three years' of metal product installation experience immediately preceding the date upon which work is to commence.

D. Pre-Installation Conference:

1. Prior to installation of roofing system, conduct a pre-installation conference at the project site.
2. Attendance: Owner, Architect, Contractor, Project Superintendent, and Certified Installer
3. Agenda:
   a. Roofing details and agenda
   b. Critical work sequencing and review of phasing plan
   c. Inspection sequencing

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. Performance Testing:

1. Metal roof system must be tested in accordance with **Underwriters Laboratories, Inc. (UL) Test Method 580** "Tests for Uplift Resistance of Roof Assemblies".
2. Metal roof system must be installed in accordance with UL Construction method **#238B** (min. 1" thick rigid insulation and min. 22 gauge Type A, B, F or N metal deck with low floating clips 4’-0” on center)
3 Metal roof system must be tested in accordance with ASTM E 1592-95 for negative loading. Determine panel bending and clip-to-panel strength by testing in accordance with ASTM E 1592-95 procedures. Capacity for gauge, span or loading other than those tested may be determined by interpolating between test values only.
4. Metal roof system must meet the water penetration requirements of ASTM E 1646-95 when tested with a 12.00 PSF pressure differential with no uncontrollable water leakage when five gallons per hour of water is sprayed per square foot of roof area.
5. Metal Roof Panels shall be high reflectance and high emittance. Initial Reflectance (Galvalume Only) shall be at least 0.68 when tested to ASTM E - 903. The three year aged reflectance shall be at least 0.57, when tested in accordance with ASTM E-1918 (Measured As Solar Reflectivity, Not Visible Reflectance).

1.04 DESIGN REQUIREMENTS

A. Roof Design Loads:

1. Design criteria shall be in accordance with the most current version of IBC building code.
2. Dead Loads
   a. The dead load shall be the weight of the SSMR system. Collateral loads, such as sprinklers, mechanical and electrical systems, and ceilings shall not be attached to the panels.
3. Live Loads
   a. The panels and concealed anchor clips shall be capable of supporting a minimum uniform live load of 20 psf.
4. Roof Snow Loads
   a. The design roof snow loads shall be as shown on the contract drawings.
5. Wind Loads
   a. The design wind uplift pressure for the roof system shall be as shown on the contract drawings. The design uplift force for each connection assembly in shall be that pressure given for the area under consideration, multiplied by the tributary load area of the connection assembly. The safety factor listed below shall be applied to the design force and compared against the ultimate capacity. Prying shall be considered when calculating fastener design loads.
      aa. Single fastener in each connection:.....3.00
      bb. Two or more fasteners in each connection:.....2.25
6. Thermal Loads Roof panels shall be free to move in response to the expansion and contraction forces resulting from a total temperature range of 90 degrees F during the life of the structure.

B. Framing Members Supporting the SSSMR System

1. Any additions/revisions to framing members supporting the SSMR system to accommodate the manufacturer/fabricator's design shall be the Contractor's responsibility and shall be submitted for review and approval. New or revised framing members and their connections shall be designed in accordance AISC design specifications. Maximum deflection under applied live load, snow or wind load shall not exceed L/240 of the span length.

1.05 SUBMITTALS

A. Shop drawings:

1. Submit complete shop drawings and erection details, approved by the metal roofing manufacturer, to the engineer for review. Do not proceed with manufacture of roofing materials prior to review of shop drawings and field verification of all dimensions. Do not use drawings prepared by the engineer for shop or erection drawings.
2. Shop drawings show methods of erection, roof and wall panel layout, sections and details, anticipated loads, flashings, sealants, interfaces with all materials not supplied and proposed identification of component parts and their finishes.

B. Performance Tests:

1. Submit certified test results by a recognized testing laboratory or manufacturer's lab (witnessed by a professional engineer) in accordance with specified test methods for each panel system.

C. Calculations:

1. Submit engineering calculations defining all cladding loads for all roof areas based on design criteria listed in Para 1.04 Design Requirements, allowable clip loads and required number of fasteners to secure the panel clips to the designated substructure.
2. Compute uplift loads on clip fasteners with full recognition of prying forces and eccentric clip loading.
3. Calculate holding strength of fasteners in accordance with submitted test data provided by the fastener manufacturer based on length of embedment and properties of materials.
4. Submit thermal calculations and details of floating clip, flashing attachments, and accessories certifying the free movement in response to the expansion/ contraction forces resulting from a total temperature differential of 110 degrees F.

D. Samples:

1. Submit samples and color chips for all proposed finishes.
   a. Submit one 8-inch long sample of panel, including clips.
   b. Submit two 3 inches x 5 inch color chip samples in color selected by the architect (owner).

E. Warranties:

Metal roof system manufacturer shall submit specimen copy of the warranty upon final acceptance for project, furnish a warranty

1. **Finish Warranty:**
   a. Covering bare metal against rupture, structural failure and perforation due to normal atmospheric corrosion exposure for a period of 20 years.
   b. Covering panel finish against cracking, checking, blistering, peeling, flaking, chipping, chalking and fading for a period of twenty (20) years for roof panels (Signature 200- premium thermoset silicone polyester).
2. **Weathertightness Warranty:**
   Metal roof system manufacturer shall submit specimen copy of manufacturer's: Weathertightness Warranty, including evidence of application for warranty and manufacturer's acceptance of the applicator and warranty conditions.
   a. Standard Warranty

F. Test Reports:

1. Submit Test Reports showing that metal panels have been tested in accordance with the Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference of ASTM E 1592-95.
2. Metal roof system must meet the air infiltration requirements of ASTM E 1680-95 when tested with a 6.24 PSF pressure differential. The resulting air infiltration leakage rate will be a minimum of 16" SuperLok®-(.007 cfm/sq. ft.).
3. Submit Test Reports showing that metal panels meet the water penetration requirements of ASTM E 1646-95 when tested with a 12.00 PSF pressure differential with no uncontrollable water leakage when five gallons per hour of water is sprayed per square foot of roof area.
4. Submit Evaluation Report No. ER-5409 showing that metal panel system details, engineering calculations, computer printouts, and data have been examined by the ICBO Evaluation Service, Inc. and have been found to comply with the 1997 Uniform Building Code.

G. Metal Roof System Fabrication Certification:

1. Submit a letter from the metal roof system manufacturer certifying the **SuperLok®** panels have been produced in a factory environment (not job site roll formed) with fixed-base roll forming equipment and in line leveling

H. Certified Installers Qualifications:

1. Submit certificate from manufacturer certifying that installer of the metal roof system has met all of the criteria outlined in "1.02 C. Installer's qualifications" and is an authorized installer certified by the manufacturer.
2. Submit the formal syllabus for the classroom and hands-on training.
3. Submit five references from five different architects or building owners for projects that have been in service for a minimum of two years, stating satisfactory performance by the installation contractor.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery:
1. Deliver metal roof system to job site properly packaged to provide protection against transportation damage.

B. Handling:
1. Exercise extreme care in unloading, storing and erecting metal roof system to prevent bending, warping, twisting and surface damage.

C. Storage:
1. Store bundled sheets off the ground sufficiently high enough to allow air circulation beneath bundle and to prevent rising water from entering bundle. Slightly elevate one end of bundle. Prevent rain from entering bundle by covering with tarpaulin, making provision for air circulation between draped edges of tarpaulin and the ground. **Prolonged Storage of sheets in a bundle is not recommended**. If conditions do not permit immediate erection, extra care should be taken to protect sheets from staining or water marks.

1.07 WEATHERTIGHTNESS WARRANTY

A. The Contractor shall provide to the Owner, a Standard warranty signed by the roofing manufacturer of the Standing Seam Roof System as outlined below:

B. Standard Warranty:
1. For a period of twenty (20) years from the date of substantial completion, the roofing manufacturer WARRANTS to the Building Owner ("Owner"): that the roofing manufacturer's furnished roof panels, flashing, and related items used to fasten the roof panels and flashing to the roof structure ("Roof System") will not allow intrusion of water from the exterior of the roofing manufacturer's Roof System into the building envelope, when exposed to ordinary weather conditions and ordinary wear and usage. The date of substantial completion is the date that is certified by the Architect, Owner, or Owner's Representative, when the roofing manufacturer's Roofing System is completed and accepted by or on behalf of the Owner.
2. The Roofing Installer shall have the sole and exclusive obligation for all warranty work commencing on the date of substantial completion up to and until the roof system has performed leak free for (24) consecutive months. The sole and exclusive obligation for all warranty work commencing on the date the roof has been leak free for (24) consecutive months and under all circumstances terminates [# insert # of years]. Year anniversary of the date certified as substantial completion of the roofing manufacturers roof system.
3. **Roofing Manufacturer's Liability**
   The total liability of the roofing manufacturer under **Standard warranty is Standard II,** limited solely to the Invoice Amount for the roof system (panels, fasteners, trim and accessories) to its customer. (No structural material, freight or taxes included)

PART 2 - PRODUCTS

SuperLok architectural structural standing seam metal roof system; minimum slope of 2:12.

2.01 MATERIALS

A. Metal Roof System Profile:
1. 2 inch high x 3/8" to 1/2" inch wide rib x 16 inch wide, striated panel.

B. Metal Roof System Style:
1. Vertical leg, concealed fastener, standing seam, utilizing male and female rib configurations, with factory applied hot-melt mastic in female rib, continuously locked together by an electrically powered mechanical seaming device during installation.

C. Gauge:
1. 24 gauge

D. Substrate:
1. Galvalume® steel sheet, minimum yield of 50,000 PSI.

E. Clip:
1. One piece fixed clip, 22 gauge, with factory-applied mastic (# UL-90 rated - Underwriters Laboratories).

F. Texture:
1. Smooth with striations.

G. Finish:
1. Galvalume Plus® (20 year warranty).

H. Color:
1. Selected from Energy Star® Rated metal roof system manufacturer's standard offering.

I. Acceptable Manufacturer:
1. MBCI - Houston, TX - (281) 445-8555.

2.02 MISCELLANEOUS MATERIALS

A. Fasteners:
1. All self-tapping/self-drilling fasteners, bolts, nuts, self-locking rivets and other suitable fasteners shall be designed to withstand specified design loads.
2. Use long life fasteners for all interior and exterior metal roof system applications.
3. Provide fasteners with a factory applied coating in a color to match metal roof system application.
4. Provide neoprene washers under heads of exposed fasteners.
5. Locate and space all exposed fasteners in a true vertical and horizontal alignment. Use proper torque settings to obtain controlled uniform compression for a positive seal without rupturing the neoprene washer.

B. Accessories:
1. Provide all components required per the metal roof system manufacturer's approved shop drawings for a complete metal roof system to include panels, panel clips, trim/flashing, fascias, ridge, closures, sealants, fillers and any other required items.
   a. All outside closures will be fabricated from Galvalume Plus® or Pre-Painted Galvalume® sheet steel of the same gauge, finish and color as the panels.
   b. All tape seal is to be a pressure sensitive, 100 percent solids, polyisobutylene compound sealing tape with a release paper backing. Provide permanently elastic, non-sagging, non-toxic, non-staining tape seal approved by the metal roof system manufacturer.
   c. All joint sealant is to be a one-part elastomeric polyurethane sealant approved by the metal roof system manufacturer.

2.03 FABRICATION

A. Material shall be in-line leveled prior to roll forming panel profile.
B. Where possible, roll form panels in continuous lengths, full length of detailed runs.
C. Standard panel length shall be no more than 50 feet long (for longer length availability, contact manufacturer).
D. Fabricate trim/flashing and accessories to detailed profiles.
E. Fabricate trim/flashing from same material as panel.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Examination:
1. Inspect installed work of other trades and verify that such work is complete to a point where this work may continue.
2. Verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions. This specifically includes verifying that secondary structural members and/or decking are installed to meet UL and building code requirements. Coordinate with metal roof system manufacturer to insure that reduced clip spacings at eave, rake, ridge and corner areas are accommodated.

B. Discrepancies:
1. In event of discrepancy, notify the engineer or owner.
2. Do not proceed with installation until discrepancies have been resolved.

3.02 INSTALLATION

A. Install metal roof system so that it is weathertight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction.
B. Install metal roof system in accordance with manufacturer's instructions and shop drawings.
C. Provide concealed anchors at all panel attachment locations.
D. Install panels plumb, level and straight with seams and ribs parallel, conforming to design as indicated.

3.03 ROOF CURB INSTALLATION

A. Comply with metal roof system manufacturer's shop drawings, instructions and recommendations for installation of roof curbs. Refer to metal roof system manufacturer's standard installation details. Anchor curbs securely in place with provisions for thermal and structural movement.

3.04 CLEANING, PROTECTION

A. Dispose of excess materials and remove debris from site.
B. Clean work in accordance with manufacturer's recommendations.
C. Protect work against damage until final acceptance. Replace or repair to the satisfaction of the architect (owner), any work that becomes damaged prior to final acceptance.
D. Touch up minor scratches and abrasions with touch up paint supplied by the metal roof system manufacturer.
E. **Do not allow panels or trim to come in contact with dissimilar metals such as copper, lead or graphite. Water run-off from these materials is also prohibited. This specifically includes condensate from roof to top A/C units.**

END OF SECTION