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# **Midwestern State University**

New Residence Hall  
Site Improvements – BP01  
3410 Taft Blvd.  
Wichita Falls, TX 76308

## **Site Improvements – BP 01 Volume I of I**

Date: June 10, 2016

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JUNE 2016

NEW RESIDENCE HALL  
SITE IMPROVEMENTS - BP01  
MIDWESTERN STATE UNIVERSITY

PROFESSIONAL CERTIFICATIONS

PART 1 - ARCHITECTURAL

PART 2 - I hereby certify that the documents intended to be authenticated by my seal are limited to: Specification Sections in Division 01, Divisions 02 through 14, and Drawing Sheet G001. The various parts to which their individual responsibilities apply are limited those identified above their seal.

  
JOHN W. PETRELLI - TX Architectural License No.: 5552



14 JUN 16

JUNE 2016

NEW RESIDENCE HALL  
SITE IMPROVEMENTS - BP01  
MIDWESTERN STATE UNIVERSITY

PROFESSIONAL CERTIFICATIONS

PART 1 - CIVIL ENGINEERING

PART 2 - I hereby certify that the documents intended to be authenticated by my seal are limited to: Specification Sections 31 1000, 31 2000, 32 1313, 33 4100, and Drawing Sheets C100- C103. The various parts to which their individual responsibilities apply are limited those identified above their seal.

*Michelle L. Wood*

Michelle L. Wood – TX Professional Engineering License No.: 104860



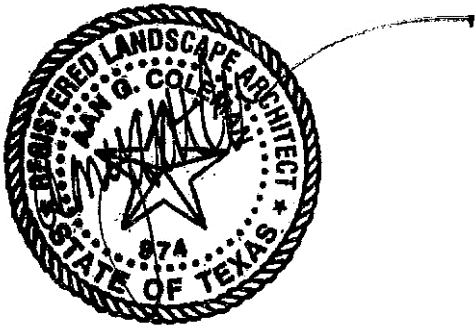
*Michelle L. Wood*  
05/23/2016

DOCUMENT 00 01 05.09 – LANDSCAPE ARCHITECT CERTIFICATION PAGE

1.01 DESIGN PROFESSIONALS OF RECORD

A. Landscape Architect:

1. Aan G. Coleman under contract as a consultant to the Architect
2. Texas License Number 974
3. Responsible for Drawings with "L and IR" prefix.
4. Responsible for the following Division 32 Sections of the Specifications:  
..... 01-56-36, 12-93-00, 32-84-00, 32-92-00, 32-93-00,



END OF DOCUMENT 00 01 05.09

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**MIDWESTERN STATE UNIVERSITY**  
**RESIDENCE HALL**  
**WICHITA FALLS, TEXAS**  
**APEX PROJECT NO. 114-220**  
**FINAL**

The seal appearing on this document was authorized by  
Joshua L. Hubbard, P.E. 106069 on January 16, 2015.



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**Expires 1/31/2016**

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## **1.0 INTRODUCTION**

### **1.1 Project Authorization & Progress**

Apex has completed a subsurface exploration and evaluation of the soil conditions for the site of the proposed Midwestern State University Residence Hall in Wichita Falls, Texas. Formal authorization to perform the work was provided by Mr. Martin Litteken Jr., P.E. with Proven Cornerstone Engineering, LLP (client), by accepting Apex Proposal No. P1401-698 dated August 27, 2014. The Proposal was signed by the Client on September 10, 2014 and received by Apex on September 11, 2014. Field activities were initiated on October 16, 2014 and completed on October 21, 2014. The preliminary report was issued to the design team on November 20, 2014.

Final recommendations provided herein are based on final layout and loading information provided by the design team.

### **1.2 Purpose**

The purpose of this report is to provide the structural engineer, architect, civil engineer, and other design team professionals with preliminary recommendations for the design and construction of the proposed project. The scope of services for this project included:

1. Determine the various soil profile components;
2. Define the engineering characteristics of the subsurface materials encountered;
3. Observe the groundwater conditions at the site; and
4. Summarize foundation design parameters and construction considerations in a geotechnical investigation report.

This report also briefly outlines the testing procedures and describes the site and subsurface conditions.

### **1.3 Report Limitation**

Although this report may be used to produce design concepts and does provide various earthwork and foundation, this report should not be used by contractors in lieu of project specifications. The findings and recommendations in this report are intended to be interpreted by professional architectural, structural engineering, and civil engineering consultants.

## **2.0 PROJECT DESCRIPTION**

### **2.1 Project Description**

Based on the information provided by the design team, the proposed student residence hall is expected to be a five (5) story facility with both concrete and wood framing. The footprint area of the proposed structure is currently unknown; however, it is expected to be located within the footprint of the existing parking lots southeast of the Comanche Trail and Louis J. Rodriguez Drive intersection (south of McCullough-Trigg Hall). A common floor level is planned throughout the proposed facility. Below grade walls may be required to accommodate elevator pit features. Evaluation of parking and drive areas was not requested as part of this assessment.

### **2.2 Loading Criteria**

For the purpose of this report, Apex has assumed the following load criteria:

- Maximum column loads will not exceed approximately 650 kips;
- Maximum continuous wall loads will be approximately 7.5 to eight (8) kips per linear foot; and
- Maximum uniform and isolated concentrated floor loads are expected to be 175 psf and five (5) kips, respectively.

If differing structural loading conditions are anticipated, these should be discussed with our geotechnical engineer prior to finalizing design.

### **2.3 Allowable Movement Criteria**

For the purpose of this report, unless otherwise stated herein, Apex has assumed a maximum total vertical movement tolerance of one (1) inch. Vertical movement of foundations, covered herein, specifically addresses movements which may result from either potential settlement or consolidation of underlying soils under load, or potential shrinkage or heaving conditions resulting from active clay conditions known to be present in certain regions of Texas and surrounding states.

The assumed total vertical movement tolerance was selected based on the standard of care established in the region, for similar projects. Based on past experience, if one (1) inch of movement fully develops, foundation movements may yield visible distress to elements such as drywall, floor tile, exposed concrete surfaces, masonry, doorframes, and other features may occur over the life of the building. However, historically such movements do not yield a structural failure of the foundation system. Although this degree of movement invokes some risk to the owner, this degree of movement represents a widely-accepted balance between the risk of distress related to foundation

movement, and costs related to controlling such movement (i.e. site preparation, site mitigation, foundation design and construction).

If different tolerances for vertical movement should be evaluated, these should be discussed with our geotechnical engineer prior to finalizing design.

#### **2.4    *Grade Changes***

Planned grading or topographic survey information was not provided for review at the time of this report. Grade changes are expected to be a nominal two (2) to three (3) feet maximum. If significantly different grade changes are anticipated, these should be discussed with our geotechnical engineer prior to finalizing design.

#### **2.5    *Information Note***

Other than as assumed and stated above, detailed information on structural systems and planned grading was not available to Apex at the time this report was prepared. If any of this information should change significantly or be in error, it should be brought to the attention of Apex so that a review of the provided recommendations can be made.

## **3.0 TESTING PROCEDURES**

### **3.1 Field Operations**

**Field Activities.** Subsurface conditions in the vicinity of the proposed student housing development were explored by drilling a total of six (6) borings. Four (4) borings were drilled to an approximate depth of 40 feet and two (2) borings were drilled to an approximate depth of 60 feet. Borings were located at the project site by the drilling crew with the assistance of the client, by measuring approximate distances from existing features as shown on the Plan of Borings included in the Appendix of this report.

**Drilling.** The borings were advanced using a drill rig equipped with a rotary head and continuous flight augers. Drilling and sampling activities were performed in general accordance with referenced ASTM procedures or other accepted methods.

**Soil Sampling and Penetration Resistance Testing.** Split-spoon sampling procedures (Standard Penetration Test) performed in general accordance with ASTM Standard Method D 1586, were used to collect disturbed soil samples and monitor penetration resistance. Samples were obtained at selected depths in the test boring by driving a standard two (2) inch OD split-spoon sampler 18 inches (where possible) into the subsurface materials using an automatic falling hammer. The penetration resistance or "N-Value" is related to the number of hammer blows required to drive the sampler the final 12 inches, and when properly evaluated, can be used as an index for cohesion for clays, and relative density for sands.

Soil samples were generally obtained from the ground surface to a depth of about 10 feet using semi-continuous sampling techniques and at maximum five (5) foot intervals thereafter.

**Groundwater Observations.** Water level information was obtained during drilling and after completion of drilling activities.

**Boring Logs.** Boring logs which include soil descriptions, water level information, laboratory test data, stratifications, penetration resistance, classifications based on the Unified Soil Classification System (USCS) and sample types and depths are included in the Appendix. A key to descriptive terms and symbols used on the boring logs is also presented in the Appendix.

### **3.2 Laboratory Testing**

The soil samples obtained during the field exploration were transported to the laboratory and examined by qualified geotechnical personnel. Representative samples were selected and tested to determine classification properties and particular engineering characteristics. Tests were

performed in general accordance with referenced ASTM procedures or with other accepted laboratory methods. The results of these tests are presented on the boring logs, at the corresponding sample depths, included in the Appendix. Laboratory tests performed for this investigation included the following:

<b>LABORATORY TESTING PROGRAM</b>	
<b>Laboratory Test</b>	<b>Test Designation</b>
Atterberg Liquid Limit and Plastic Limit Determination	ASTM D 4318
Percentage Soil Passing No. 200 Sieve	ASTM D 1140
Moisture Content Determination	ASTM D 2216
Linear Bar Shrinkage	TEX 107 E

### **3.3 Sample Retention**

Soil samples not altered by laboratory testing will be retained for 60 days from the date of this report and then discarded unless Apex is otherwise instructed in writing.

## **4.0 SITE AND SUBSURFACE CONDITIONS**

### **4.1 Site Description**

The site of the proposed residence hall is located within an existing student parking area southeast of the Comanche Trail and Louis J. Rodriguez Drive intersection on the Midwestern State University campus, in Wichita Falls, Texas. The aforementioned parking lots are south of the McCullough-Trigg Hall. The location of Boring No. 1 was estimated to be N 33° 52' 29.8" and W 98° 31' 24.5". The degree of accuracy of this location is within approximately 50 feet.

The site was noted to be relatively flat, with only nominal elevation differences. At the time of field activities, ground cover generally consisted of both asphalt and Portland cement concrete paving, and a median separating the two (2) parking lot areas. After coordinating with onsite representatives, the drilling rig experienced no difficulty maneuvering about the site.

### **4.2 Subsurface Conditions**

The stratification of the soils encountered during field drilling operations is presented on the boring logs in the Appendix. The stratification of the subsurface materials shown on the boring logs represents the subsurface conditions encountered at the actual boring locations and variations may occur across the site. The lines of demarcation represent the approximate boundary between the soil types at the boring locations, but the actual transition may be gradual. The following subsurface descriptions are of a generalized nature to highlight the major stratification features. The boring logs should be reviewed for more detailed information. The borings generally encountered the following soil strata beneath the surface:

**Sandy Lean Clay, Lean Clay with Sand, Lean Clay (CL);  
Silty Sand (SM);  
Clayey Gravel (GC);  
Silty Clay (CL-ML); and  
Weathered Shale.**

Weathered shale was generally encountered at depths of approximately 40 to 45 feet below grade during drilling. Hard lean clay (CL)/highly weathered shale was encountered at depths of approximately 20 to 25 feet below existing grade. It is possible that shallow outcrops of weathered shale could be encountered during construction activities.

### **4.3 Groundwater Conditions**

Water level observations were made during and after the completion of drilling activities. Based upon the available information, groundwater seepage was initially encountered at depths of

approximately 18 to 20 feet below existing grade at the time of field activities. Final groundwater elevations were measured approximately 16 to 18 feet below existing upon completion of drilling. Borehole caving was noted at the Boring Nos. 2, 3, 5 and 6. If more detailed water level information is required, observation wells or piezometers could be installed at the site, and water levels could be monitored over time. It should be noted that groundwater level fluctuations may occur due to seasonal and climatic variations, alteration of drainage patterns, leaking utilities, land usage, and ground cover.



## 5.0 FOUNDATION RECOMMENDATIONS

### 5.1 General

**Expansive Soil Conditions.** With the exception of Boring No. 5, a Potential Vertical Rise (PVR) value of less than one (1) inch was estimated for this site using the Texas Department of Transportation method (Test Procedure TEX-124-E). At the location of Boring No. 5, the estimated PVR was approximately 1 ½ to 1 ¾ inches. One (1) inch of PVR is generally accepted as the maximum allowable value for design and construction in the geographical area. The surficial soils encountered by the borings are considered to have low to moderate expansive potential.

Underlying lean clay (CL) soils, similar to those encountered in the vicinity of Boring No., 5, if subjected to excessive disturbance or moisture fluctuations, may cause vertical movements in excess of those estimated herein. This is of particular concern in areas requiring significant cut otherwise exposing these soil conditions. Although recommendations provided herein are intended to minimize the impact of heaving soil conditions, construction activities should be controlled to prevent excessive moisture fluctuations in subgrade soils during construction activities as deeper deposits of these soils may exist at other locations onsite. Further, positive drainage should be provided away from the structure to prevent pooling of surface runoff against the foundation and also limit intrusion of moisture into supporting subgrade soils.

**Bearing Capacity.** The bearing capacity of the naturally occurring soil was evaluated from the results of the field penetration test, laboratory testing, and properties of soils as classified by the Unified Soil Classifications System (USCS). These test results indicate that fine-grained, surficial soils have a medium stiff to very stiff consistency and coarse grained soils have medium dense relative density. Hard lean clay (CL) soils were encountered at an approximate depth 20 to 25 feet below existing grade, and weathered shale was encountered at an approximate depth 40 feet below existing grade. The observed soil conditions can generally be expected to provide good bearing capacity based on shear strength indicators.

**Settlement.** Excessive foundation movements from settlement are not expected to occur in foundations designed and constructed in accordance with recommendations contained herein. Total settlement is estimated to be on the order of one (1) inch or less for foundation units designed in accordance with recommendations provided herein. Differential settlements are estimated to be on the order of ½ inch or less. Customary measures should be taken to minimize moisture variations beneath the structure to preclude loss of shear strength of foundation soils.

**Recommended Foundation System.** Based on the findings of this evaluation and assumed loading conditions discussed herein, a deep foundation system using either drilled shafts or auger cast-in-

place (ACIP) piles, constructed in conjunction with recommended earthwork and with the finished floor elevated a nominal distance above final site grades, is believed to be the most practical and economical means of support.

The use of an on-grade slab system does appear feasible. As mentioned, some moderately expansive soils were encountered at this site. The use of an on-grade slab in conjunction with deep foundations, if rigidly connected, may result in doming of the slab between deep foundations. Although subgrade preparations presented herein are intended to reduce the estimated PVR to one (1) inch or less, this limited amount of movement may be noticeable in the slab areas. Additional discussion is provided herein.

The surest way to restrict foundation movement is to support and isolate the entire floor slab and structure above grade on properly designed deep foundation elements (i.e. drilled shafts, ACIP piles). Although superior, this option may be cost-prohibitive when compared with cost (and subsequent risks) associated with the use of on-grade slab systems. Should the owner wish to consider using a deep foundation system to structurally support the structure and slab system, this option is provided herein for evaluation.

Refer to the following text for recommendations concerning the design and implementation of the aforementioned foundation system components.

## **5.2 Foundation Subgrade Preparation**

**Demolition.** The demolition and removal of existing features, including portions of existing pavements, light standards, concrete curbs and existing utilities will be required as part of site preparation and construction activities. It is expected that the demolition process will disturb the upper surficial soils zone; therefore an evaluation should be performed by a qualified soils technician to determine the extent of the soil disturbance. Depending on the disturbance and any planned grading on site, additional remediation may be required to prepare the disturbed area prior to foundation construction. The soils technician should verify whether the subgrade conditions are consistent with soils observed during this evaluation. Conditions not similar to those represented in the attached boring logs may require additional evaluation and geotechnical information.

**Subgrade Preparations for Support of On-Grade Slabs.** To mitigate the moderately expansive surficial soil conditions, after required demolition and site clearing is complete, Apex recommends that the existing surficial soil should be excavated (prior to placement of fill) to a minimum depth of three (3) feet and replaced with moisture and density controlled select fill. After soils underlying the structure area are excavated, the exposed subgrade should be proof rolled, scarified and compacted to a minimum 95% Standard Proctor, and the excavation back-

filled with moisture and density controlled select fill material to the desired finished grade elevation. A minimum select fill thickness of three (3) feet is required beneath all areas of the floor slab. Additional fill may be required to achieve final grade elevation. The following guidelines are provided as recommended foundation subgrade preparations.

- Surficial soils should be stripped of any vegetation, organic materials and remnant construction debris.
- The site should be cut as required by grading plans and as required to remove the surficial three (3) feet of existing soil as required herein.
- Prior to fill activities, the stability of the exposed subgrade should be verified by proof rolling the foundation area.
- Areas failing or rutting during proof roll should be mitigated accordingly.
- After verification and necessary mitigation of the exposed subgrade soil, the surficial subgrade area, extending a minimum of five (5) feet beyond the boundary of building area, should be scarified and compacted.
- Moisture and density controlled select fill should be used to achieve the desired final grade. A minimum of three (3) feet of select fill is recommended below all areas of the slab. Additional fill may be required to achieve final grade elevation. Placed select fill should extend a minimum of five (5) feet beyond the building area, unless structurally retained.

The finished floor should be elevated a nominal distance above final site grades to ensure positive drainage away from the foundation; Apex recommends a minimum of six (6) inches. Additional fill can be used to elevate the building pad so that positive drainage is provided away from the building. Where feasible, elevating the building pad with fill is generally desirable because this aids in providing positive drainage away from the floor slab and foundations and helps prevent water from collecting in the filled area. Perimeter subsurface drainage systems may also be incorporated around the outside of the foundation system to further prevent moisture from collecting in placed fills.

If not otherwise covered by non-permeable flatwork, areas of exposed select fill around the perimeter of structure should be capped with a clay backfill material (or clay cap). Clay backfill material should consist of a lean clay (CL) soil with a liquid limit of 40 percent or less, and a plasticity index (PI) between 10 and 20. A minimum cap thickness of two (2) feet is recommended. Clay cap backfill material should be compacted to a minimum 92% of the Standard Proctor maximum dry density and not exceeding 98%, at a moisture content between one percentage point (+1%) to four percentage points above (+4%) the Standard Proctor optimum moisture content. Measures should be taken to prevent desiccation of clay cap soils both during and after construction. Grass vegetation may be added to help prevent desiccation of clay fill soils.

It should be noted that principal loads of the facility should be supported by deep foundation elements and a minimum six (6) inch void should be provided below all areas of the supporting perimeter beams. Recommended removal and replacement is recommended to limit estimated PVR to approximately one (1) inch.

As mentioned, subgrade preparations provided herein are intended to reduce the estimated potential vertical rise (PVR) to approximately one (1) inch. It should be noted that in some instances using a deep foundation system in conjunction with an on-grade slab rigidly connected to the exterior grade beams has resulted in “doming” in slab sections between columns. Although preparations are intended to reduce the estimated PVR as noted herein, this degree of movement may still be noticeable. Some applications use a “floating slab” (not dowelled into grade beams) to provide the slab structure with some degree of flexibility. However, if heave does occur, and the floor slab is not connected to the grade beams, tripping hazards may develop in doorways or halls unless a transition slab is used in such areas. This is of particular concern for soil conditions identified in the vicinity of Boring No. 5; however similar conditions may be encountered at other locations onsite not disclosed by the borings presented herein.

**Foundation Preparation for Suspended Slab.** If the floor slab and supporting foundation elements is suspended above grade, a minimum void space of six (6) inches is recommended below all areas of the slab, including perimeter grade beams and slabs. Provisions should be made to ensure that the void space is permanently maintained. Further, the area should be graded for positive drainage.

If a crawl space is provided, the design of the crawl space should include adequate ventilation and access for future inspection. The presence of free water below the slab can potentially lead to failure of flooring, seepage into the interior of the facility, or development of fungi (mold).

During subgrade preparations, all areas below the slab should be cleared of surficial organic material or soft soils. It is recommended that during grading, surficial soils be prepared and compacted so that a stable working platform is prepared for further construction activities and proper drainage during service. Some applications may require a thin mud or “seal” slab to be placed over the surface of the crawl space excavation to provide a working platform during construction, as well as a means to preserve base of the crawl space after the structure goes into service.

**Cut and Fill Considerations.** Although precluded by the recommendations, constructing foundation elements, including the floor slab, partially on cut and partially on fill is **not recommended**. If fill is required beneath the structure then the depth of fill should be somewhat

consistent beneath the entire structure to minimize differential settlement. Structures constructed partially on cut and partially on fill typically may exhibit differential movements in excess of normal due to the fill portion of the building settling more rapidly and a greater amount than that portion of the structure constructed on a cut area.

Depending upon the required site grading, it may be practical to remove the soil to a specified depth to accommodate the overexcavation across the entire building pad and replace it with select fill in a density controlled manner as described in a subsequent section of this report. The minimum fill thickness should be one-third the maximum fill required, or the minimum select fill thickness of three (3) feet, whichever is greater. In lieu of providing the maximum 1/3 of the maximum fill in areas where deeper fill is required, the transition slope between differing fill depths should be 1 on 10 (vertical on horizontal) or flatter. Select fill material specifications, and placement and compaction procedures are detailed in a subsequent section of this report.

**Settlement of Controlled Fill.** Fill areas will be required to provide a level building pad for the building. These fill areas should be composed of density-controlled select fill (compacted in accordance with recommendations provided herein). These constructed fills, even though placed in a density controlled and monitored manner, can be expected to settle between 0.5% and 1.5% throughout the fill thickness. This contribution to settlement can be significant on sites with constructed fill depths exceeding several feet, and should be accounted for in the design of the building. Usually the most effective means to reduce and control deleterious effects of this settlement is to simply provide a relatively constant fill thickness, or accommodate a gradual transition from cut to fill, as recommended subsequently below.

**Perimeter Drainage Systems.** Subsurface or surface drainage systems may also be utilized around the perimeter of the structure(s). Subsurface drains would assist with collecting surface runoff and conveying water away from the structure(s), thus precluding moisture from entering or ponding near constructed fills.

Subsurface drainage designs may include a French drain system adjacent to or below foundations which would intercept and channel water away to a discharge location. Subsurface drainage should be designed with adequate fall so that collected moisture may be either day-lighted to an acceptable location away from the structure, or to a collection point such as a sump location for discharge. Gradient of drainage system should not be less than one percent (1%).

### **5.3 Drilled Pier Foundation**

**General.** Based on the loading conditions assumed herein, drilled shafts or piers, founded at a minimum depth 30 feet below the existing grade (at the time of field activities), may be used to

support the principal loads of the proposed structure. Given the prominence of weathered shale and groundwater, it is recommended straight-sided drilled shafts should be used.

The required minimum pier depth should be evaluated by the structural engineer to determine if the provided embedment will sufficiently resist design axial, lateral and overturning forces. The actual depth of piers may be deeper than the minimum, depending on the depth to the bearing stratum, shaft configuration and the structural load requirements. If the designed pier extends below 60 feet (below existing grade at the time of field activities) then Apex should be consulted for further assistance. The recommended design parameters for drilled piers are tabulated in the table herein.

<b>DRILLED PIER DESIGN PARAMETERS</b>		
<b>Design Parameter</b>	<b>Design Value</b>	<b>Remarks</b>
Minimum Bearing Depth <sup>1</sup>	30 ft	Below existing grade at the time of field activities.
Bearing Material	Lean Clay (CL)/Highly Weathered Shale, Weathered Shale	See boring logs for in-situ material descriptions. Weathered shale was identified approximately 40 to 45 feet below existing grade, at the time of field activities.
Net Allowable Bearing Pressures <sup>6</sup>	10,000 psf	Factor of Safety = 3
Skin or Side Friction <sup>2</sup>	2,000 psf	Factor of Safety = 3
Lateral Resistance <sup>3</sup>	100 psf / ft of depth	Factor of Safety = 3
Minimum Pier Spacing	Two (2) base diameters	Measured center-to-center
Pier Reinforcement <sup>5</sup>	Area of steel minimum of 1.0%, or based on structural design	Extend the full depth of the shaft.
<b>NOTES:</b> <ol style="list-style-type: none"> <li>1. Recommended depth of embedment is a minimum. Apex has not evaluated uplift or overturning forces for the given structure. Pier should be embedded a minimum one (1) shaft diameter into the bearing stratum. A deeper embedment or penetration may be required depending on the final drilled shaft configuration and loading conditions.</li> <li>2. The recommended side friction is applicable to the portion of the drilled shaft socketed within the underlying weathered shale. Contribution of softer overburden soils should be neglected.</li> <li>3. Recommended to neglect the upper five (5) feet for soil resistance (additional comments provided in the text). The lateral capacity suggested above is a generalized or nominal value based on codes and general soil type and condition.</li> <li>4. Minimum diameter for inspection purposes is 18 inches.</li> <li>5. Apex recommends a minimum of 1.0% steel reinforcement for the piers. However, the final decision as to reinforcing steel should be left to the structural engineer.</li> <li>6. Give the anticipated foundations loads, shaft embedment to 40 feet or beyond may be required. The allowable end bearing for shafts bearing within the underlying weathered shale (i.e. stratum approximately 40 feet below existing grade), the allowable end bearing pressure for drilled shafts may be increased to 15,000 psf.</li> </ol>		

An impenetrable rock stratum was not encountered during field activities, therefore if auger refusal is encountered during pier excavation, boring logs should be reviewed and the excavation

should be monitored closely to validate that piers are not terminated prematurely. The soil drilling rig was able to penetrate all strata to the planned termination depth of the borings; therefore, premature termination depth of any drilled shaft, due to refusal, is not anticipated with proper pier drilling equipment.

**Adhesion Uplift.** Consideration should be given to potential uplift generated through soil-to-pier adhesion of expansive clay soils within the active zone. Although these conditions may vary with location and soil conditions at the time of placement, it may be assumed for design purposes that the active zone extends approximately 10 feet below the existing ground surface, and the average adhesive stress acting upward on the exterior surface of the drilled shaft throughout this zone is approximately 500 psf. Portions of the shaft in contact with placed select fill, within the upper 10 feet may be neglected in the uplift calculations. Resistance to uplift will be provided by side friction developed below the active zone, deadweight of the drilled shaft element.

**Drilled Shaft Considerations.** Apex recommends that the design and construction of drilled piers should generally follow methods outlined in the manual titled Drilled Shafts: Construction Procedures and Design Methods (Publication No: FHWA-IF-99-025, August 1999). Although certain key requirements are outlined below, the design and construction of the drilled shafts incorporate those listed in the referenced publication.

**Inspection and Monitoring.** Detailed inspection of drilled shaft construction should be made to verify that the shafts are vertical and founded in the proper bearing stratum and to verify that all loose materials have been removed prior to concrete placement.

All drilled pier excavations should be inspected by qualified personnel to insure that they rest in firm, undisturbed native soil strata. Free water and/or loose material at the base of excavations should be removed prior to placement of concrete.

Apex emphasizes that close engineering supervision is essential during installation of the drilled pier foundations in order to assure that construction is performed in accordance with the plans and specifications. Also, to insure proper construction of the drilled piers at this site, close coordination between the drilling and concreting operations is considered to be of great importance.

**Accumulated Water.** Accumulated water, if significant (i.e., more than about six (6) inches), should be removed prior to the placement of concrete. A hopper and tremie should be utilized during concrete placement to control the maximum free fall of the wet concrete to less than eight (8) feet.

**Concrete.** Concrete should be placed within the shafts as soon as possible upon completion of the excavation activities, including the underream. For any given drilled shaft, excavation, placement of steel and concrete should be completed within the same workday.

**Cased Piers.** Based on the observed groundwater seepage and borehole caving encountered during field activities, it is anticipated that casing of the piers will be necessary to prevent borehole sloughing and excessive groundwater intrusion. If conditions are present at the time of construction which requires the use of casing, piers should be constructed so that an adequate seal between temporary casing and the excavation sidewalls can be achieved, thereby allowing the concrete for the pier to be placed in the dry. Slight water intrusion at the founding depth is acceptable only if essentially dry concrete placement techniques can still be employed. Accordingly, and in light of the significant variations that are possible in groundwater conditions, contract documents should provide for cased excavations for construction of piers as an add/deduct item.

Construction of all foundation units should be monitored by personnel familiar with the construction techniques required to install concrete piers under external hydrostatic head. Where an adequate seal between temporary casing and the foundation stratum can be achieved, the pier excavation may be dewatered and concrete placed in the dry. Careful examination of the pier base should be performed by trained personnel prior to the actual concrete placement.

In the case where a sufficient seal cannot be achieved for cased piers, Apex should be contacted for assistance in the development of an appropriate procedure for construction of piers. Placement of quality concrete through the use of a tremie to float any excess water to the surface should be employed as necessary. In addition, concrete placement must be controlled in such a manner so as to maintain a sufficient "head" of plastic concrete in the casing during extraction.

**Concrete Placement, Slumps, and Strength.** Concrete should be placed at each drilled pier location as soon as practicable after the completion of drilling. Concrete placed in uncased drilled piers should be placed at slumps of  $6 \pm 1$  inch. Concrete placed in cased drilled piers should be placed at slumps of  $7 \pm 1$  inch. Concrete used in piers should be designed to achieve a minimum of 3,000 psi in 28 days at the higher slumps referenced herein.

Concrete in cased piers with a lower slump, especially "rocky" mixes, may arch against the side of the casing during withdrawal. This can preclude casing removal or, with extraordinary effort to "pull" the casing, may result in lifting and separating the column of fresh concrete, allowing intrusion of soil in the pier.



**Tension Reinforcement.** Tension steel extending to the bottom of the shaft will be required in each pier shaft to withstand a net force equal to the uplift force minus the sustained compressive load carried by the pier. We recommend that each pier be reinforced with tension steel to withstand this net force. Although Apex has recommended a minimum value of 1.0% steel reinforcing, some practitioners use 0.5% of the cross sectional area of the shaft. It should be noted that the tensile reinforcement may be significantly greater than either 0.5% or 1% if loading conditions warrant. In any case, the structural engineer should designate the percentage of steel based upon loading conditions and other factors.

**Drilled Shaft Efficiency.** Drilled shafts in a group and the soil in between interact in a very complex fashion. The capacity of the group is not necessarily equal to the capacity of a single isolated pile multiplied by the number of piles. The axial load capacity of the pile groups where the center to center spacing is less than six (6) shaft diameters should be evaluated using a group efficiency factor,  $\eta$ , which can be determined using the criteria provided in the following table.

PIER GROUP EFFICIENCY FACTORS		
Pier Spacing Criteria (Pier Diameters, C-C)	Cohesive Soils	Cohesionless Soils
2.5	0.65	0.65
4.0	0.80	1.00
6.0	1.00	1.00
<b>NOTES:</b> For intermediate pier spacing, group efficiency factor ( $\eta$ ) should be linearly interpolated.		

The reduction in capacity for the pier group can be calculated using the following relationship:

$$P_{ag} = \eta N(P_e + P_s)$$

Where:

- $P_{ag}$  = Net allowable capacity of pile or pier group
- $\eta$  = Group efficiency factor
- $N$  = Number of piles in group
- $P_e$  = Allowable end bearing capacity of single isolated pile or pier
- $P_s$  = Allowable skin friction capacity of single isolated pile or pier

The formula utilizes allowable end bearing and skin friction capacity of a single isolated pile or pier that is already factored by an appropriate factor of safety. For additional information regarding the application of pier group efficiency factors, consult the AASHTO LRFD Bridge Design Manual.

#### **5.4 Auger Cast-in-Place (ACIP) Pile Foundation**

**General.** The use of auger cast-in-place (ACIP) piles may be used in lieu of cased, drilled shafts, if it is anticipated that caving or water intrusion may restrict or hinder construction of conventional drilled shaft foundations. ACIP piles are constructed by pumping high strength grout through hollow stem auger drilled the pile's embedment depth, effectively filling the void space left by the auger as the auger is being retracted from the ground.

**ACIP Pile Design.** ACIP piles may be proportioned using the design criteria provided in the DRILLED PIER DESIGN PARAMETERS table provided above. Design methods used are empirical in nature, and actual pile capacities may differ from those derived using the recommended design parameters. It is recommended that a full scale load test be specified to verify pile capacities in the field. Additional information regarding load testing is provided herein.

Typical ACIP pile diameters range from 18 to 36 inches, with larger diameters being possible. Further, due to the relatively small end area, ACIP piles are usually designed as friction piles. The end bearing may be utilized for larger diameter piles and piles bearing within a significant bearing stratum.

When evaluating the use of ACIP foundation elements, the designer should consider the required depth of pier embedment for a given pier sizing and the ability to embed a similar ACIP pile within the underlying material (as discussed herein) prior to encountering refusal (see additional comments herein regarding refusal during installation). If ACIP piles are utilized, it is suggested that the piling contractor be consulted to evaluate feasibility of installation and equipment requirements prior to construction.

Depending on loading conditions and capability to install ACIP piles of a certain diameter to a given depth, it may be necessary to support structural loads using a grouping of ACIP piles under a single a pile cap. Applicable group efficiency factors should be utilized.

**ACIP Pile Placement.** ACIP pile foundations are installed by rotating a continuous flight hollow-shaft auger into the ground to a predetermined depth. High strength mortar is then pumped with sufficient pressure to ensure that as the auger is withdrawn, the high strength mortar, or small-aggregate concrete, fills the excavation (preventing hole collapse) and causes densification of sidewall soils by forcing the mortar or concrete into the soils.

It is common, and expected, that the volume of mortar or concrete within the ACIP Pile will be somewhat greater than the volume of the drilled excavation because of the effect of placing the mortar or concrete under pressure. The mortar-grout or concrete "take" (amount of mixture

placed into the excavation) can be as little as five percent (5%) to over 150 to 200% over the calculated excavation volume.

All ACIP piles shall be installed by an experienced Piling Contractor who shall submit evidence of having a minimum of five (5) years of experience in the successful installation of ACIP Piling, including an on-site supervisor with a minimum of three (3) years of similar experience.

The installation of ACIP Piling shall also include the furnishing and placing of all reinforcing steel as specified by the design. The proposed mortar, grout, or concrete, mix shall be submitted with evidence of prior tests for approval. A mix design or mix confirmation shall be conducted prior to construction.

**ACIP Pile Design Mix.** The design mix used to fill the augered holes should consist of a mixture of Portland cement, fluidifier, small coarse aggregate (typically 3/8-inch diameter) and water, proportioned and mixed to provide a mix (mortar or concrete) capable of maintaining the solids in suspension without appreciable water gain, yet which may be placed using normal ACIP techniques, and which will laterally penetrate and fill any voids in the foundation material. The materials shall be so proportioned as to provide a hardened mix having a compressive strength of 4,000 psi at 28 days. Typical slump values for ACIP grout range between seven (7) and nine (9) inches.

Fluidifier shall be a compound possessing characteristics that will increase the fluidity of the mixture, reduce bleeding, assist in the dispersal of cement grains and neutralize the setting shrinkage of the high strength mixture (cement mortar).

Water shall be potable, fresh, and clean. If non-potable water is allowed, it shall be free from detectable and injurious amounts of sewage, oil, acid, alkali, salts, and organic matter.

**Reinforcing Steel.** Reinforcing steel shall be deformed bars conforming to ASTM A615, Grade 60, except that Grade 40 may be used for No. 3 ties or as determined by a professional structural engineer. Piling Contractor shall furnish proper spacers to retain reinforcing in specified position shown on the Drawings.

Reinforcement shall be placed while the grout is fluid. The continuous center bar shall be placed through the center hole as the pile is grouted. The upper reinforcement cage shall be placed once the auger is removed. Contractor shall ensure the reinforcement is set with the proper projection.

**Auger Flights and Leads.** The auger flights shall be continuous from the auger cutting head to the top of the auger with no gaps or other breaks. The pitch of the auger flight shall not exceed

nine (9) inches. Augers over 40 feet in length shall contain a middle guide. Drill rigs used should be able to generate sufficient torque to maintain desired auger rotation speed and penetration rates.

The auger piling leads should be prevented from rotating by the stabilizing arm. The leads should be fixed to the crane.

The ACIP pile is installed by advancing a continuous flight auger to the required design depth. The rate of rotation is crucial to proper installation. If the rotation rate exceeds the minimum rate required to advance the auger, soil will be mined up the auger flights and conveyed to the surface causing the side walls of the excavation to collapse inward toward the auger, thus loosening the soil which interfaces with the finished pile wall. The end result of over rotation is a side friction value less than anticipated resulting in less overall shaft capacity. Rigs with inadequate power and varying soil profiles are common causes for improper rotation rates.

Auger refusal is typically reached when less than one (1) foot of penetration can be achieved in one (1) minute with appropriate and adequately powered equipment. Auger refusal should not be used to determine pile tip elevation. If auger refusal is met prior to the target installation depth, the geotechnical engineer should be notified immediately. As indicated on the boring logs in the Appendix of this report, very dense soils were encountered and will require the appropriate sizing of equipment by the contractor.

**Installation Recommendations.** The ACIP piles shall be located as shown on the Project Drawings or as otherwise directed by the Owner's representative. Pile centers shall be located to an accuracy of within three (3) inches from plan center of the pile when referenced to the cutoff elevation. Deviation from vertical shall not be more than two percent (2%) and two (2) inches (+) from plan cutoff elevation.

Adjacent piles shall not be placed closer than six (6) feet center to center until the "mortar" in the ACIP pile has set for a minimum of eight (8) hours. Depending on the mix design, this minimum may have to be increased to 24 or more hours.

Where the ACIP pile cutoff is near the surface or above the top of the excavation, metal sleeves or casing of the proper diameter and at least 18 inches in length shall be placed around the pile tops. Special conditions may require metal sleeves of additional length. Piles may be poured to the top of the ground and the excessive mortar removed to the cutoff elevation prior to initial set. If the hole will not stand open, the Contractor may elect to return after the final set and the excavation for the pile cap is complete to remove excessive "mortar" to cutoff elevation.

**Obstructions.** Should any obstruction (including gravel beds) be encountered which prevent placing the pile to the depth required, or cause the pile to drift from the required location, the Contractor shall immediately notify the Owner's representative for instructions before proceeding with the additional piles in the immediate area.

**Testing Requirements.** A pile load testing program (as determined by the design team) should be implemented by the contractor to verify pre-production piles. At a minimum, we recommend at least one (1) pile load test and one (1) load test per varying pier depths and diameters. Pile load tests should be witnessed by Apex. The cost of the test pile, anchor piles and all equipment necessary to perform the pile load test, and the cost of witnessing by Apex shall be provided by the contractor unless otherwise noted in the contract documents. Load testing of pre-production piles shall be performed in accordance with ASTM D1143, Standard Test Methods for Deep Foundations Under Static Axial Compressive Load. The use of either static or dynamic load testing methods may be used during construction to verify production piles. If findings from pier load testing program warrants revision of the pier design(s), additional pier load testing will be required to verify modifications in design.

Pile integrity testing, such as downhole tomography or impact echo response testing, should also be performed at completion to insure that piles do not possess discontinuities caused by caving (or "pinching") soil conditions. If required, a qualified party or individual should be retained to implement and interpret the results of integrity testing on the project.

**Other ACIP Pile Foundation Considerations.** Additional information regarding the design and construction of ACIP piles may be found in the FHWA Geotechnical Engineering Circular No. 8: Design and Construction of Continuous Flight Auger Piles.

### **5.5 Floor Slab and Grade Beam Considerations**

**Modulus of Subgrade Reaction.** Construction of select fill as specified herein beneath the building should result in the development of a modulus of subgrade reaction ( $k_s$ ) of approximately 125 pounds per cubic inch based upon empirical equations that estimate the results of a plate load test.

**Subgrade.** A permeable dry subgrade, with a smooth, low-friction surface should be provided beneath the slab. The slab should not be constructed on a saturated subgrade; and the slab should not be constructed on a subgrade with standing water.

**Leveling Sand.** If leveling sand is used, Apex recommends limiting the thickness to the sand to a maximum of four (4) inches. If crushed stone is used as a sub-slab working platform, the upper surface of the crushed stone should be "choked off" with crusher fines or similar crushed stone

material to provide a smooth surface that will allow the slab on grade to shrink with minimum restraint.

**Concrete.** Also, the floor slab placement conditions should ensure a uniform thickness of concrete; otherwise, “off-joint” cracking will occur where thickness varies. The subgrade should be free of frost before concreting begins.

**Reinforcement and Control Joints.** Adequate reinforcement and control joints should be provided to limit cracking of the floor slab resulting from any differential movement or shrinkage. Sawed joints for concrete should be spaced two (2) to three (3) times (in feet) the slab thickness in inches. (For example, for a five [5] inch thick slab, use a center-to-center spacing of 10 to 15 feet.) Depth of the sawed joints should be at least 1/4 (1/3 preferred) the slab thickness. Sawed joints should be cut as soon as the concrete will bear the weight of the cutting equipment, and should be sealed with a high quality joint sealant in accordance with current industry standards and practice.

**Utilities Through Slab.** Utilities which project through the slab on grade should be designed with either some degree of flexibility or with sleeves. Such design features will help reduce damage to utility lines if vertical movements occur.

#### **5.6 Structurally-Suspended Floor System Considerations**

Combined with a drilled pier foundation system, a structurally suspended slab would provide a stable floor system which would not be influenced by potential movement caused by shrinking or swelling soils. Should this option be selected, structurally supported slab and grade beams should be isolated from the subgrade soils by providing a minimum six (6) inches positive void beneath the slab and the grade beams. Using cardboard carton forms or polystyrene forms specially manufactured for this purpose can produce these voids for concrete slabs. Care should be exercised so that the forms are not crushed, damaged, or saturated prior to placement of the concrete. In addition, barriers that will not rapidly decay should be placed or constructed along the sides of the cardboard carton forms to prevent soil intrusion into the void after the carton forms decay. Appropriate means should be implemented to ensure that the intended voids remain permanent. If a crawl space design is provided, the design should require adequate ventilation of the crawl space, and require measures to preclude any ponding beneath the floor.

If exterior brick veneer (or other rigid veneering) is desired, then the supporting beam should span between drilled shafts, and be isolated from the ground using void boxes as outlined previously herein. Apex recommends that all placed soil be controlled and compacted, even if below suspended floors. Otherwise, the fill can potentially settle, resulting in loss of the grading configuration, and

undesirable accumulation of runoff. Further, underground plumbing or other lines could potentially be distorted or damaged by settlement in the soil.

### **5.7 Flatwork**

Flatwork elements, including sidewalk areas and paving, are subject to distress resulting from aforementioned potential vertical soil movements. Unless the treatment of soils extends beyond the building pad areas, encompassing flatwork elements, some movement related to soil heave and/or shrinkage can be expected. Heaving of isolated flatwork sections may cause tripping hazards, preclude free opening of doors, and create drainage conditions which do not promote free movement of runoff away from the structure. It is recommended that joints between flatwork and structures be completely filled with an elastomeric material. Adequate drainage should be provided so that runoff is not allowed to collect near flatwork areas.

If flatwork is not constructed over the prepared building pad, flatwork should be placed over verified, stable subgrade. Weak or yielding areas should be removed and replaced with a minimum eight (8) inches of moisture and density controlled select fill. Further, it is recommended that flatwork be evaluated periodically to assess condition, and designate appropriate repairs and or modifications.

### **5.8 OSHA Soil Classifications**

The intercepted soils have different classifications in accordance with OSHA guidelines (CFR 29, Part 1926.650 to .652, Sub-Part P- Excavations). For temporary excavations, the following OSHA type classifications are recommended:

Lean Clay (CL)	OSHA Type B Soil
Silty Clay (CL-ML)	OSHA Type B Soil
Silty Clayey Sand (SC-SM)	OSHA Type C Soil
Silty Sand (SM)	OSHA Type C Soil
Clayey Gravel (GC)	OSHA Type C Soil
Weathered Shale	OSHA Type A Soil

Slopes for long term conditions should apply to the excavations; excavations will probably remain open for a period in excess of 24 hours. Soils previously disturbed by construction or similar activities should be considered to be OSHA Classification Type C Soils.

### **5.9 IBC Seismic Site Coefficient**

Based on the soil stratigraphy, a site classification of “C”, as classified by the International Building Code, 2009 Edition is estimated. This assumes that subgrade conditions below the 60 foot level explored during this investigation are similar to that encountered within the upper 60

feet. If additional information or verification is required, then an additional boring to a minimum depth of 100 feet or shear wave velocity testing will be required. Applicable coefficients for the mapped spectral response acceleration at short periods and at one (1) second periods are provided in the referenced publication.



## 6.0 CONSTRUCTION CONSIDERATIONS

These guidelines and considerations are advisory and are provided for review and consideration prior to incorporation into project specifications. Not all will be necessarily be applicable to each project; they reflect generally-accepted construction practices, and are presented for possible use.

### 6.1 Site Preparation

To prepare for foundation and soil supported floor slab construction, we recommend that all topsoil, vegetation, roots, and any soft soils in the building area be stripped from the site and either properly disposed or stockpiled for later use in landscaping. Utilities should be located and rerouted as necessary.

**Proof Roll Verification.** After stripping and undercutting, as required by the grading plan and overexcavation as required herein, the building area should be proof rolled with a heavy, loaded pneumatic-tired vehicle such as a 20 to 25 ton loaded dump truck or scraper. It is recommended that all areas beneath the floor slab be proof rolled to identify loose or soft soils. All proof rolling and undercutting activities should be witnessed by Apex and should be performed during a period of dry weather. Any weak areas which yield under proof roll, or any areas with a tendency to pump, should be mitigated. Such mitigation may include:

- Overexcavation and backfilling,
- Reprocessing to remove moisture,
- Chemical modification with lime or cementitious admixtures, or
- Installation of geosynthetics.

In the event such mitigation is required, the geotechnical engineer should be contacted to design an appropriate procedure.

**Scarification.** After stripping, excavating where required, and proof rolling but prior to placing fill, the exposed soils should be scarified and then processed to a moisture content between one percentage point below (-1%) to three percentage points above (+3%) the Standard Proctor optimum. The subgrade soils should be recompact to a dry density of at least 95% of the Standard Proctor (ASTM D 698) maximum dry density for a depth of at least eight (8) inches below the surface.

### 6.2 Select Fill

After the subgrade has been prepared and inspected, fill placement may begin. Select fill material should have the following characteristics:

- Free of organic or other deleterious materials,
- Homogeneous mixture,
- Maximum particle size of three (3) inches,
- Liquid limit less than 35,
- Plasticity index between seven (7) and 18,
- A maximum of 70% passing the No. 200 sieve, and
- Consist of silty-clayey sands (SC-SM), low plasticity sandy clays (CL), or clayey sands (SC) as defined by the Unified Soil Classification System.

If a fine-grained material is used for fill, very close moisture content control will be required to achieve the recommended degree of compaction.

**Use of Onsite Material as Select Fill.** Based on the results of the laboratory analysis, the onsite surficial material does not comply with the select fill criteria and is not recommended for reuse in select fill applications. For on-site soils meeting the criteria for select fill as outlined in this report and intended for reuse, it is imperative to provide close engineering supervision during grading and/or excavation activities to properly segregate approved soils from deleterious materials and soils that do not meet select fill criteria. Soils intended for select fill should be verified through laboratory analysis and approved prior to reuse. Contract documents should include the associated costs of using an approved imported select fill material.

**Select Fill Compaction.** Fill should be placed in maximum lifts of eight (8) inches of loose materials. Select fill thicknesses less than four (4) feet should be compacted within the range of two percentage points below (-2%) to two percentage points above (+2%) the optimum moisture content value and a minimum of 95% of the maximum density as determined by the Standard Proctor (ASTM D 698) test. If water must be added, it should be uniformly applied and thoroughly mixed into the soil by diskings or scarifying.

Select fill thicknesses greater than four (4) feet should be compacted at a minimum of 98% of the maximum density as determined by the Standard Proctor (ASTM D 698) test, under similar moisture conditions as listed in the preceding paragraph. It is not recommended that portions of the site with fill thicknesses less than four (4) feet be compacted to a lesser compaction level than other portions of the site with thicknesses greater than four (4) feet which are compacted to a greater compaction level. If any portion of the fill beneath the building exceeds four (4) feet then the entire select fill pad should be compacted to the 98% compaction level.

**Select Fill Testing Frequency.** Each lift of compacted soil should be tested and inspected by the soils engineer or his representative prior to placement of subsequent lifts. As a guideline, it is

recommended that field density tests be taken at a frequency of not less than one (1) test per 2,500 square feet of surface area per lift or a minimum of four (4) tests per lift for each tested area for the building area.

**Clay Cap Fill Criteria.** Clay cap fill material should have the following characteristics:

- Free of organic or other deleterious materials,
- Homogeneous mixture,
- Maximum particle size of three (3) inches,
- Liquid limit less than 40,
- Plasticity index between 10 and 20,
- A maximum of 75% passing and minimum of 50% passing the No. 200 sieve, and
- Consist of Lean Clay (CL) as defined by the Unified Soil Classification System.

Very close moisture content control will be required to achieve the recommended degree of compaction.

The select clay backfill should be compacted to a minimum 92% of the Standard Proctor maximum dry density but not exceeding 98% maximum dry density, at a moisture content between one percentage point above (+1%) to four percentage points above (+4%) the Standard Proctor optimum.

### **6.3 Safety Considerations**

Prior to the commencement of construction, the owner and the contractor should make themselves aware of and become familiar with applicable local, state, and federal safety regulations, including the current Occupational Safety and Health Association (OSHA) Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing this information solely as a service to our client. Under no circumstances should the information provided herein be construed that Apex is assuming responsibility for construction site safety of the contractor's activities. Such responsibility is not being implied and should not be inferred.

### **6.4 Worker Safety - Excavations and Slopes**

After excavating, footings should be inspected and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. If it is required that footing excavations be left open for more than one (1) day, they should be protected to reduce evaporation or entry of moisture. Adequate protection against sloughing of soil should be provided for workers and inspectors entering the footing excavations and undercut areas.

The contractor should be aware that slope height, slope inclination, or excavation depths (including utility trench excavations) should in no case exceed those specified in local, state, or federal safety regulations, e.g., OSHA Standards for Excavations, Title CFR 29, Part 1926.650 to .652 – Subpart P - Excavations, successor regulations as well as other building code requirements. Such regulations are strictly enforced and, if not followed, the owner, contractor, and earthwork and utility subcontractors could be liable for substantial penalties.

If any excavations, including a utility trench, are extended to a depth of more than 20 feet (including the spoil pile if placed in close proximity to the excavation), it will be required to have the side slopes designed by a professional engineer registered in the State of Texas.

### **6.5     *Drainage***

Water should not be allowed to collect near the foundations or floor slab area of the project either during or after construction. Undercut or excavated areas should be sloped toward a sump area to facilitate removal of any collected groundwater or surface runoff. Drainage should be designed to preclude accumulation of water above the backfill, to avoid infiltration into the backfill.

Excessive foundation or slab movement should not occur if customary measures are taken to reduce and control moisture variations beneath the structure to preclude loss of shear strength of foundation soils.

- Proper surface drainage should be maintained, and landscape irrigation systems should be located and operated in a manner to completely avoid wetting of building foundations.
- After installation, the irrigation system should be pressure tested, any leaks repaired, and water spray systems directed away from the building(s).
- Positive drainage away from the building(s) should be provided at all times, including during construction.

If positive drainage is not provided, water will pond around or below the structure and excessive total and differential movements may occur.

### **6.6     *Weather Considerations***

The soils encountered in the surficial zone at this site are expected to be relatively sensitive to disturbances caused by construction traffic when wet. The contractor should be aware of the importance of proper maintenance of surface drainage. Depending on weather-related ground conditions, contractor's maintenance of drainage during construction, and other factors, some difficulty may be encountered by the contractor in achieving compaction on initial lifts of fill

placed on loose or soft subgrade. This will be exacerbated by wet weather, particularly if the contractor allows surface drainage to enter and pond in the excavations.

**Fine-Grained Soil.** Fine-grained soils are expected to be relatively sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support characteristics. In addition, soil which becomes wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather. Earthwork activities performed during cooler, wetter months may certainly offer more difficulties than if performed during warmer, drier periods.

**Wet Conditions.** If construction is performed during wet conditions, work platforms can be created for earthwork by mixing fly ash, hydrated lime, cement, cement kiln dust (CKD), or commercial combination of these additives. Quick lime may also be used in areas where dusting is of concern, if proper worker safety considerations are observed. Pumping subgrades are possible at the site and it is recommended that bid documents incorporate this possibility into the bid schedule.

**Geosynthetics.** The use of geotextiles and geogrids may be warranted in situations where the subgrade is very wet and highly unstable, if such use is necessary to maintain a mandatory construction schedule during wet weather.

## 6.7 Groundwater Control

Due to potential variations in groundwater levels, difficulty during excavation and construction of the proposed foundation is possible. Groundwater was encountered at this site; and it is reasonable to anticipate that groundwater conditions may vary as noted previously. It is suggested that contract documents address the need for maintaining controls to preclude water from draining into excavations.

Some dewatering through shaping of work areas to shed water, and construction of temporary ditches with sumps and pumping may be necessary to remove the loose soils and allow placement of imported select fill in a dry manner. Excavated soils intended for re-use as select fill may require special methods in order to dry the soil to a suitable moisture content prior to replacing the soil as select fill.

## 6.8 General Slope Stability

Analysis and evaluation of the stability of slopes is beyond the scope of this investigation. Such analyses typically involve more extensive field investigation and sampling, specialized testing,

and advanced analysis using computational techniques in combination with experienced engineering judgment.

For general information, earth slopes higher than about six (6) feet can be of concern due to steepness, water accumulation in the slope, presence of seeps and springs, and surcharge loadings at or near the top of the slope. In general, earth slopes should be no steeper than 1 (vertical) on 3 (horizontal) and may require further flattening depending upon site conditions. Foundations near the top of slopes should be placed a minimum distance from the top of slope equivalent to the greater of five (5) feet or the height of the slope. Otherwise, properly designed and constructed retaining structures are advised. Apex will be pleased to conduct any required slope stability analysis under a supplemental agreement.

#### **6.9 Protection of Work**

Subgrade areas, base courses, and lifts of fill that have been successfully moisture conditioned, processed, and compacted in lifts to the required density, successfully proof rolled, and approved must be protected from changes in moisture and other influences. Satisfactorily completed areas may be adversely affected by prolonged exposure to dry weather, precipitation, equipment traffic, or by excavations and uncontrolled backfilling for utilities, and other disturbances rendering such areas unsatisfactory. Such areas should be reworked prior to continuing with subsequent construction.

#### **6.10 Membrane Under Slab**

The decision as to whether a synthetic membrane (polyethylene or HDPE sheeting, etc.) is required below the slab should be made by the architect and structural engineer based on planned floor coverings, proximity of groundwater, planned site grading and drainage patterns, tolerance for curling, local custom, weather conditions at the time of construction, and other pertinent considerations. Generally, if adhesive-type (“glued-down”) floor coverings are planned, a synthetic membrane is advised to control, or retard, slab moisture. Otherwise, the moisture levels may exceed the upper limit for the floor manufacturer to warranty the installation.

If the concrete floor is to remain exposed, reducing the potential for curling of the concrete slab may be an important consideration.

To reduce and control curling and finish problems on floor slabs, Apex emphasizes the importance of designing a concrete mix that has minimum voids for paste (cement and water). This will require a well-graded, combined aggregate gradation.

## 6.11 Soil Stabilization

**General.** The following section is provided in the event that stabilization of encountered soils becomes necessary in areas of the building pad. As noted herein, it is recommended that Apex be contacted in the event that unstable conditions are encountered and mitigation is necessary. If determined applicable, the following information may be used as a guideline for stabilization of unstable subgrade soils with lime or cementitious additive. Guidelines are provided for information purposes only, and do not constitute a design requirement, unless otherwise stated herein or in supplemental documents provided by Apex.

**Lime Stabilization.** Clayey soils with excessive plasticity are subject to loss in support value with increases in moisture, as well as volumetric changes (shrinking and swelling) accompanying moisture changes. These soils generally chemically react with hydrated lime, becoming more stable. If present, clayey soils should be free of organics and other deleterious materials. If provided, lime stabilization should be performed in accordance with the applicable provisions of TxDOT Item 260, "Lime Treatment for Materials Used as Subgrade (Road Mixed)", Texas Department of Transportation, Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, 2004 edition.

In addition to gradation requirements outlined in TxDOT Item 260, the lime stabilized clay should also have a minimum of 85 percent (85%), on a dry weight basis, of the stabilized soil passing a  $\frac{3}{4}$  inch sieve at a moisture content at, or above, optimum. The lime stabilized clay soil should have a plasticity index equal to 15 or less based on a dry method of sample preparation per ASTM D 421. If the plasticity index cannot be reduced to less than 15, the geotechnical engineer should be contacted for further recommendations.

A minimum of five percent (5%) lime by dry weight of soil should be used for lean clays and eight percent (8%) lime by dry weight for fat clays, even if a lesser percentage appears feasible based on the test data. In addition, consideration should be given to the potential for non-uniformity of soils, spillage, and other losses such as dusting when selecting the percentage lime required for stabilization.

The lime-stabilized clay should be placed in maximum eight (8) inch loose lifts and compacted at a moisture content not less than optimum, nor more than four percent (4%) above the optimum as defined by ASTM D 698 (Standard Proctor). Compaction should be at least 95 percent (95%) of the maximum dry density defined by this standard. The required moisture content and density of the compacted material should be maintained until construction is complete.

**Lime-Fly Ash Stabilization.** If provided, lime-fly ash stabilization should be performed in accordance with the applicable provisions of TxDOT Item 265, "Lime-Fly Ash (LFA) Treatment

for Materials Used as Subgrade (Road Mixed)", Texas Department of Transportation, Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, 2004 edition.

Available as TRU-BLN®, we recommend a 70-30 mixture (70% fly ash and 30% lime) be used for lean clays, sandy clays, clayey sands, silty clayey sands, and silty sand soils.

**Cement Stabilization.** If provided, Portland cement stabilization should be performed in accordance with the applicable provisions of TxDOT Item 275, "Portland Cement Treatment for Materials (Road Mixed)", Texas Department of Transportation, Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, 2004 edition.

A minimum of six percent (6%) cement by dry weight of soil should be used for silty sands, clayey sands, and silty clayey sands. For clays, the effectiveness of additives depends greatly on the contractor's success in pulverizing the clay. Rate should be determined based on laboratory test series, and must assume that pulverization (gradation) is achievable.

**Lime or Soil-Cement Series.** Apex should be allowed to perform, depending on the stabilization method, either a lime or soil-cement series prior to stabilization activities, to determine the optimum amount of additive. As mentioned previously, consideration should be given to the potential for non-uniformity of soils, spillage, and other losses such as dusting when selecting the percentage additive required for stabilization.

**Stabilization Precaution.** Some clay soils, particularly in areas of the Eagle Ford formation, if high in sulfates, are known to react adversely with lime, and may not feasibly be stabilized using lime. These soils are typically located in a band that extends through Central Texas and into North Texas and southern Oklahoma. The occurrence of sulfate-reactive soils over a given site is typically not consistent. In some areas, for example, the sulfate reactivity may manifest itself as localized "boils" of limited size where the lime reacts adversely. In other areas, sulfate reactivity may be so widespread that alternative methods of stabilization may need to be implemented. Although encountering such conditions is not anticipated, the above information is provided as a precaution.

#### **6.12 Vertical Movement Wall Joints**

It is suggested that vertical movement joints be provided in exterior masonry or EIFS walls, typically through windows or other wall openings.

- The spacing of these joints should be as specified by the structural engineer, typically 15 to 20 feet.



- The gap should be kept free of mortar and other debris, and sealed with a pliable compound.

### **6.13 Landscaping and Trees**

The effects of evapotranspiration from nearby trees can adversely affect the foundation soils by removing moisture during dry periods through their extensive root systems, resulting in shrinkage or subsidence of the subgrade in the tree-structure proximity.

Therefore, Apex recommends the following:

- Trees around the structures be no closer than 50 percent (50%) of the mature height of the tree;
- Trees should not be positioned within the vertical projection of mature tree canopies or drip lines; and
- If trees and large bushes are placed within closer proximity of the structures, vertical root barriers to a depth of at least four (4) feet below ground should be installed to inhibit the movement of the tree's roots systems under the floor slab and/or foundations.

## **7.0 GENERAL COMMENTS**

The exploration and analysis of the foundation conditions reported herein are considered sufficient in detail and scope to form a reasonable basis for the foundation design. The recommendations submitted are based on the available soil information and preliminary design details furnished for the proposed project. Any revision of the plans for the proposed facility from those enumerated in this report should be brought to our attention so that we may determine if changes in the foundation recommendations are required. If deviations from the noted subsurface conditions are encountered during construction, Apex should be retained to determine if changes in foundation recommendations are required. If Apex is not retained to perform these functions, we will not be responsible for the performance of the structure.

The findings, recommendations, specifications, or professional advice contained herein have been made after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology. No other warranties are implied or expressed.

**Limitations.** The scope of services did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors, or unusual or suspicious items or conditions are strictly for the information of the client. Prior to purchase or development of this site, an environmental assessment is advisable.

The scope of services did not include a geologic investigation to address any faults, large scale subsidence, or other macro geologic features not specifically addressed in this report or the agreement between Apex and the client.

**Project Review.** After the plans and specifications are more complete, it is recommended that the soils and foundation engineer be provided the opportunity to review the final design and specifications in order that the earthwork and foundation recommendations may be properly interpreted and implemented. At that time, it may be necessary to submit supplementary recommendations.

**Report Preparation.** This report has been prepared for the exclusive use of our client for the specific application to the referenced project. Apex cannot be responsible for interpretations, opinions, or recommendations made by others based on the data contained in this report. Apex should be retained to perform construction monitoring and materials testing services sufficient to

determine compliance with its recommendations. If Apex is not so retained, it will not accept any responsibility for the performance of the facility.

This report was prepared for design purposes only and may not be sufficient for purposes of preparing an accurate bid for construction. Contractors reviewing this report are advised that the discussions and recommendations contained herein were provided exclusively to and for use by the project owner.

## **APPENDIX**



NORTH



This modified image is generalized in nature and is only intended to show relative boring locations. Aerial image provided by Google Earth.

## PLAN OF BORINGS

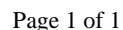
PROJECT NO.: 114-220

DATE DRILLED: October 16-21, 2014

SCALE: Not to Scale



Proven Cornerstone Engineering, PLLC  
Midwestern State University  
Residence Hall  
Wichita Falls, Texas



Additional Remarks/Comments: Seepage noted at 18 ft. during drilling. Water level at 18 ft. upon completion, and at final check.

Project Number <b>114-220</b>	Project Location <b>Wichita Falls, Texas</b>	Project Name <b>MSU Residence Hall</b>	Boring Number <b>2</b>
Logger <b>B. Dews</b>	Completion Depth <b>60 ft</b>	Date Drilling Started <b>10/21/2014</b>	Date Drilling Completed <b>10/21/2014</b>
GPS Coordinates <b>Lat: See Plan of Borings</b> <b>Long:</b>	Surface Elevation <b>- feet</b>	Stratification lines represent approximate strata boundaries.	
			Borehole Diameter <b>4-6 inches</b>

























Sample				Soil/Rock Description And/Or Geologic Origin	USCS	Graphic Log	Well Diagram	Soil Properties						
Sampling Method	Pocket Penetrometer, TSF	Blow Counts	Depth, feet					Unconfined Compression, TSF	% Passing No. 200 Sieve	Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight, lb/cu ft.

			0.0											
			5	Medium stiff, brown, LEAN CLAY WITH SAND.	CL				79	20				
			4											
			7						80	19	29	16	13	
			15	Medium dense, red, reddish brown, CLAYEY SAND	SC									
			15											
			15						49	15	23	15	8	
			20	Medium dense, brown, reddish brown, SILTY SAND, with pea gravel	SM									
			20											
			51	Hard, gray, reddish brown, LEAN CLAY, shaley, with brown silty sand	CL									
			51											
			83											
			42											
			79											
			80/11.5											
			45.0	Gray, dark red, WEATHERED SHALE, with brown silty sand	Shale									
			50/4"											
			50.0											
			50/4.5"											
			55.0											
			50/4"											
			60.0											
				Boring terminated at 60 ft.										

Additional Remarks/Comments: Seepage noted at 18 ft. during drilling. Water level at 18 ft. upon completion. Caved to 36 ft. at final check.

Project Number <b>114-220</b>	Project Location <b>Wichita Falls, Texas</b>	Project Name <b>MSU Residence Hall</b>	Boring Number <b>3</b>
Logger <b>B. Dews</b>	Completion Depth <b>40 ft</b>	Date Drilling Started <b>10/21/2014</b>	Date Drilling Completed <b>10/21/2014</b>
GPS Coordinates <b>Lat: See Plan of Borings</b> <b>Long:</b>	Surface Elevation <b>- feet</b>	Stratification lines represent approximate strata boundaries.	
			Borehole Diameter <b>4-6 inches</b>

Sample				Soil/Rock Description And/Or Geologic Origin	USCS	Graphic Log	Well Diagram	Soil Properties						
Sampling Method	Pocket Penetrometer, TSF	Blow Counts	Depth, feet					Unconfined Compression, TSF	% Passing No. 200 Sieve	Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight, lb/cu ft.

			0.0	Very stiff, light brown, brown, SANDY SILTY CLAY	CL-ML										
			15		CL										
			10												
			14	Stiff, brown, LEAN CLAY WITH SAND	CL										
			16												
			10.0	Very stiff, red, SANDY LEAN CLAY	CL										
			14												
			15.0	-stiff at 13 ft.											
			22		SC-SM										
			20.0	Medium dense, reddish brown, SILTY CLAYEY SAND, with pea gravel											
			45		CL										
			25.0	Hard, gray, reddish brown, LEAN CLAY, shaley											
			63												
			30.0												
			76												
			35.0												
			94/10"												
			40.0	Boring terminated at 40 ft.											
			45.0												
			50.0												

Additional Remarks/Comments: Seepage noted at 18 ft. during drilling. Water level at 18 ft. upon completion. Caved to 28 ft. at final check.



Project Number <b>114-220</b>	Project Location <b>Wichita Falls, Texas</b>	Project Name <b>MSU Residence Hall</b>		Boring Number <b>4</b>
Logger <b>B. Dews</b>	Completion Depth <b>40 ft</b>	Date Drilling Started <b>10/17/2014</b>	Date Drilling Completed <b>10/17/2014</b>	Drilling Method <b>Flight Auger</b>
GPS Coordinates <b>Lat: 33° 52' 27.7"</b> <b>Long: -98° 31' 23.3"</b>	Surface Elevation <b>- feet</b>	Stratification lines represent approximate strata boundaries.		Borehole Diameter <b>4-6 inches</b>

Sample				Soil/Rock Description And/Or Geologic Origin	USCS	Graphic Log	Well Diagram	Soil Properties						
Sampling Method	Pocket Penetrometer, TSF	Blow Counts	Depth, feet					Unconfined Compression, TSF	% Passing No. 200 Sieve	Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight, lb/cu ft.

			0.0	3 in. Asphalt	CL				90	17	32	20	12	
			8	Stiff, dark brown, LEAN CLAY	CL				74	14				
			12	Very stiff, red, reddish brown, LEAN CLAY WITH SAND										
			15	-brown, and red at 8 ft.										
			15											
			10	Medium stiff, red, reddish brown, SANDY SILTY CLAY, with some gravel	CL-ML				53	16			4	
			15	-very stiff at 18 ft.										
			20											
			32	-hard at 23 ft.					75	17				
			25											
			62	Hard, gray, reddish brown, brown, LEAN CLAY, shaley	CL									
			52											
			89	Boring terminated at 40 ft.										
			40											
			45											
			50											
			55											
			60											

Additional Remarks/Comments: Seepage noted at 20 ft. during drilling. Water level at 18 ft. upon completion and at final check.

Project Number <b>114-220</b>	Project Location <b>Wichita Falls, Texas</b>	Project Name <b>MSU Residence Hall</b>		Boring Number <b>5</b>
Logger <b>B. Dews</b>	Completion Depth <b>40 ft</b>	Date Drilling Started <b>10/16/2014</b>	Date Drilling Completed <b>10/16/2014</b>	Drilling Method <b>Flight Auger</b>
GPS Coordinates <b>Lat: 33° 52' 26.6"</b> <b>Long: -98° 31' 22.2"</b>	Surface Elevation <b>- feet</b>	Stratification lines represent approximate strata boundaries.		Borehole Diameter <b>4-6 inches</b>

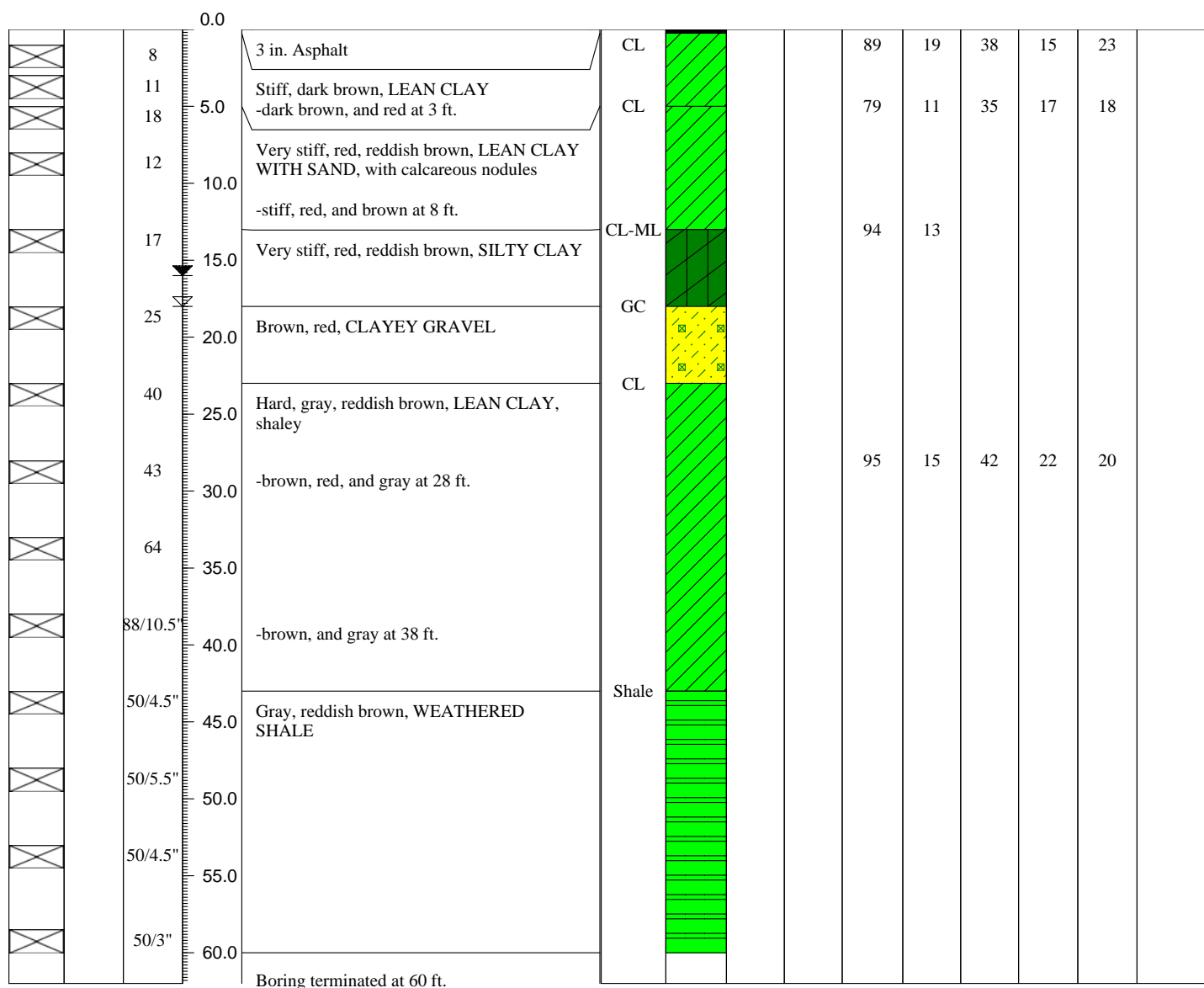
Sample				Soil/Rock Description And/Or Geologic Origin	USCS	Graphic Log	Well Diagram	Soil Properties						
Sampling Method	Pocket Penetrometer, TSF	Blow Counts	Depth, feet					Unconfined Compression, TSF	% Passing No. 200 Sieve	Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight, lb/cu ft.

			0.0	3 in. Asphalt	CL									
			10	Stiff, dark brown, LEAN CLAY					92	17	41	16	25	
			11	-medium stiff, with calcareous nodules at 5 ft.	CL				86	16	38	14	24	
			7	Very stiff, red, dark red, LEAN CLAY										
			16	Medium stiff, red, dark red, SANDY LEAN CLAY	CL									
			5	-very stiff at 18 ft.					57	10				
			20	Brown, red, CLAYEY GRAVEL	GC									
			20	Hard, gray, reddish brown, LEAN CLAY, shaley	CL									
			70											
			89/11.5						98	16				
			82/11"	Boring terminated at 40 ft.										
			40.0											
			45.0											
			50.0											
			55.0											
			60.0											

Additional Remarks/Comments: Seepage noted at 20 ft. during drilling. Water level at 18 ft. upon completion. Caved to 38 ft. at final check.

Project Number <b>114-220</b>	Project Location <b>Wichita Falls, Texas</b>	Project Name <b>MSU Residence Hall</b>	Boring Number <b>6</b>
Logger <b>B. Dews</b>	Completion Depth <b>60 ft</b>	Date Drilling Started <b>10/16/2014</b>	Date Drilling Completed <b>10/16/2014</b>
GPS Coordinates <b>Lat: 33° 52' 26.5"</b> <b>Long: -98° 31' 24.6"</b>	Surface Elevation <b>- feet</b>	Stratification lines represent approximate strata boundaries.	
			Borehole Diameter <b>4-6 inches</b>

Sample				Soil/Rock Description And/Or Geologic Origin	USCS	Graphic Log	Well Diagram	Soil Properties						
Sampling Method	Pocket Penetrometer, TSF	Blow Counts	Depth, feet					Unconfined Compression, TSF	% Passing No. 200 Sieve	Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Unit Dry Weight, lb/cu ft.



Additional Remarks/Comments: Seepage noted at 18 ft. during drilling. Water level at 16 ft. upon completion. Caved to 49 ft. at final check.

# SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPH	LETTER		
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS  (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	
		GRAVELS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES	
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	
	MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS  (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
					SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
					SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
					CH	INORGANIC CLAYS OF HIGH PLASTICITY
					OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
				HIGHLY ORGANIC SOILS		

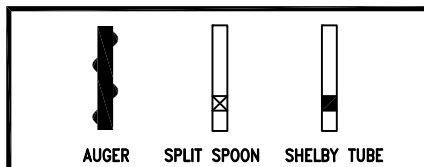
## RELATIVE DENSITY - GRANULAR SOILS

CONSISTENCY	N-VALUE (BLOWS/FOOT)
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

## CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	SHEAR STRENGTH (KSF)
VERY SOFT	0 - 0.25
SOFT	0.25 - 0.50
MEDIUM STIFF	0.50 - 1.00
STIFF	1.00 - 2.00
VERY STIFF	2.00 - 4.00
HARD	4.00 +

## SAMPLER TYPES



TERMS AND SYMBOLS

Apex geoscience inc.



**2005 Uniform General Conditions**

The background of the page features a large, faint, circular seal of the State of Texas. The seal contains a five-pointed star in the center, surrounded by a wreath. The words "THE STATE OF TEXAS" are inscribed around the perimeter of the seal.

# **Uniform General Conditions for Construction Contracts**

**August 17, 2005**

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## Uniform General Conditions



## 2005 Edition Uniform General Conditions

### Article 1. Definitions

Unless the context clearly requires another meaning, the following terms have the meaning assigned herein.

- 1.1 *Architect/Engineer (A/E)* means a person registered as an architect pursuant to Tex. Occ. Code Ann., Chapter 1051, as a landscape architect pursuant to Tex. Occ. Code Ann., Chapter 1052, a person licensed as a professional engineer pursuant Tex. Occ. Code Ann., Chapter 1001 and/or a firm employed by Owner or Design-Build Contractor to provide professional architectural or engineering services and to exercise overall responsibility for the design of a Project or a significant portion thereof, and to perform the contract administration responsibilities set forth in the Contract.
- 1.2 *Change Order* means a written modification of the Contract between the Owner and Contractor, signed by the Owner, the Contractor and the Architect/Engineer.
- 1.3 *Change Order Proposal* means a Contractor-generated document in response to a Change Order Request (COR).
- 1.4 *Change Order Request (COR)* means a document which informs the contractor of a proposed change in the Work, and appropriately describes or otherwise documents such change.
- 1.5 *Close-out documents* means the product brochures, product/equipment maintenance and operations instructions, manuals, and other documents/warranties, as-built record documents, affidavit of payment, release of lien and claim, and as may be further defined, identified, and required by the Contract Documents.
- 1.6 *Contract* means the entire agreement between the Owner and the Contractor, including all of the Contract Documents.
- 1.7 *Contract Date* is the date when the agreement between the owner and the contractor becomes effective.
- 1.8 *Contract Documents* means those documents identified as a component of the agreement (contract) between the owner and the contractor. These may include, but are not limited to, Drawings, Specifications, General, Supplementary and Special Conditions, and all pre-bid and/or pre-proposal addenda.
- 1.9 *Contractor* means the individual, corporation, company, partnership, firm or other entity contracted to perform the Work, regardless of the type of construction contract used, so that the term as used herein includes a Construction Manager-at-Risk or a Design-Build firm as well as a

## Uniform General Conditions

General or Prime Contractor. The contract documents refer to *Contractor* as if singular in number.

- 1.10 *Contract Sum* means the total compensation payable to the Contractor for completion of the Work in accordance with the terms of the contract.
- 1.11 *Contract Time* means the period between the Start Date identified in the Notice to Proceed with Construction and the Substantial Completion date identified in the Notice to Proceed or as subsequently amended by Change Order.
- 1.12 *Date of Commencement* means the date designated in the Notice to Proceed for the Contractor to commence the Work.
- 1.13 *Day* means a calendar day, unless otherwise specifically stipulated.
- 1.14 *Drawings* means that product of the Architect/Engineer which graphically depicts the Work.
- 1.15 *Final Completion* means the date determined and certified by the Architect/Engineer and Owner on which the Work is fully and satisfactorily complete in accordance with the Contract.
- 1.16 *Owner* means the State of Texas and any Agency of the State of Texas, acting through the responsible entity of the State of Texas identified in the Contract as the Owner.
- 1.17 *Owner's Designated Representative (ODR)* means the individual assigned by the Owner to act on its behalf, and to undertake certain activities as specifically outlined in the Contract. The ODR is the only party authorized to direct changes to the scope, cost, or time of the contract.
- 1.18 *Project* means all activities necessary for realization of the Work. This includes design, contract award(s), execution of the Work itself, and fulfillment of all contract and warranty obligations.
- 1.19 *Samples* means representative physical examples of materials, equipment or workmanship, used to confirm compliance with requirements and/or to establish standards for use in execution of the Work.
- 1.20 *Schedule of Values* means the detailed breakdown of the cost of the materials, labor and equipment necessary to accomplish the Work as described in the Contract Documents, submitted by Contractor for approval by Owner and Architect/Engineer.
- 1.21 *Shop Drawings* means the drawings, diagrams, illustrations, schedules, performance charts, brochures and other data prepared by the Contractor or its agents, which detail a portion of the Work.
- 1.22 *Site* means the geographical area of the location of the Work.
- 1.23 *Special Conditions* means the documents containing terms and conditions, which may be unique to the project. Special Conditions are a

## Uniform General Conditions

part of the Contract Documents and have precedence over the Uniform General Conditions.

- 1.24 *Specifications* means the written product of the Architect/Engineer that establishes the quality and/or performance of products utilized in the Work and processes to be used, including testing and verification for producing the Work.
- 1.25 *Subcontractor* means a business entity that enters into an agreement with the Contractor to perform part of the Work or to provide services, materials or equipment for use in the Work.
- 1.26 *Substantial Completion* means the date determined and certified by the Contractor, Architect/Engineer and Owner when the Work or a designated portion thereof is sufficiently complete, in accordance with the Contract, so as to be operational and fit for the use intended.
- 1.27 *Supplementary General Conditions* means procedures and requirements that modify the Uniform General Conditions. Supplementary General Conditions, when used, have precedence over the Uniform General Conditions.
- 1.28 *Unit Price Work* means Work or a portion of the Work paid for based on incremental units of measurement.
- 1.29 *Unilateral Change Order (ULCO)* means a Change Order issued by the Owner without the agreement of the Contractor.
- 1.30 *Work* means the administration, procurement, materials, equipment, construction and all services necessary for the Contractor, and/or its agents, to fulfill the Contractor's obligations under the Contract.

## **Article 2. Laws Governing Construction**

- 2.1. Environmental Regulations. The Contractor shall conduct activities in compliance with applicable laws and regulations and other requirements of the Contract relating to the environment, and its protection at all times. Unless otherwise specifically determined, the Owner is responsible for obtaining and maintaining permits related to stormwater run-off. The Contractor shall conduct operations consistent with stormwater run-off permit conditions. Contractor is responsible for all items it brings to site, including hazardous materials, and all such items brought to the site by its subcontractors and suppliers, or by other entities subject to direction of the Contractor. The Contractor shall not incorporate hazardous materials into the Work without prior approval of Owner, and shall provide an affidavit attesting to such in association with request for Substantial Completion inspection..
- 2.2. Wage Rates. The Contractor shall not pay less than the wage scale of the various classes of labor as shown on the "Prevailing Wage Schedule" provided by the Owner. The specified wage rates are minimum rates only. The Owner is not bound to pay any claims for additional compensation made by any Contractor because the Contractor pays wages in excess of the applicable minimum rate contained in the Contract. The "Prevailing Wage Schedule" is not a representation that qualified labor adequate to perform the Work is available locally at the prevailing wage rates.
- 2.2.1 Notification to Workers. The Contractor shall notify each worker, in writing, of the following as they commence work on the contract: the worker's job classification, the established minimum wage rate requirement for that classification, as well as the worker's actual wage. The notice must be delivered to and signed in acknowledgement of receipt by the employee and must list both the wages and fringe benefits to be paid or furnished for each classification in which the worker is assigned duties. When requested by the Owner, the Contractor shall furnish evidence of compliance with the Texas Prevailing Wage Law.
- 2.2.1.1 Submit a copy of each worker wage-rate notification to the ODR with the application for progress payment for the period during which the worker was engaged in activities on behalf of the project.
- 2.2.1.2 The "Prevailing Wage Schedule" is determined by the Owner in compliance with Tex. Gov't Code, Chapter 2258. Should the Contractor at any time become aware that a particular skill or trade not reflected on the Owner's Prevailing Wage Schedule will be or is being employed in the Work, whether by the Contractor or by a subcontractor, the Contractor shall promptly inform the ODR of the proposed wage to be paid for the skill along with a justification for same. The Contractor is responsible for determining the most appropriate wage for a particular skill in relation to similar skills or trades identified on the Prevailing Wage

Schedule. In no case shall any worker be paid less than the wage indicated for Laborers.

2.2.1.3 Penalty for Violation. The Contractor and any Subcontractor will pay to the State a penalty of sixty dollars (\$60) for each worker employed for each calendar day, or portion thereof, that the worker is paid less than the wage rates stipulated in the Prevailing Wage Schedule.

2.2.1.4 Complaints of Violations

2.2.1.4.1 Owner's Determination of Good Cause. Upon receipt of information concerning a violation of Tex. Gov't Code, Chapter 2258, the Owner will, within 31 days, make an initial determination as to whether good cause exists that a violation occurred. The Owner will send documentation of the initial determination to the Contractor against whom the violation was alleged, and to the worker involved. Upon making a good-cause finding, the Owner will retain the full amounts claimed by the claimant or claimants as the difference between wages paid and wages due under the Prevailing Wage Schedule and any supplements thereto, together with the applicable penalties, such amounts being subtracted from successive progress payments pending a final decision on the violation.

2.2.1.4.2 If the Contractor and claimant worker reach an agreement concerning the claim, the contractor shall promptly notify the Owner in a written document countersigned by the worker.

2.2.1.4.3 Arbitration Required. If the violation is not resolved within 14 days following initial determination by the Owner, the Contractor and the claimant worker must participate in binding arbitration in accordance with the Texas General Arbitration Act, Tex. Civ. Prac. & Rev. Code, Chapter 171. For a period not to exceed 10 days, after which, if no agreement reached, a district court may be petitioned by any of the parties to the arbitration to appoint an arbitrator whose decision will be binding on all parties.

2.2.1.4.4 Arbitration Award. If an arbitrator assesses an award against the Contractor, the Contractor shall promptly furnish a copy of said award to the Owner. The Owner may use any amounts retained under Article 2.2.1.4.1 to pay the worker the amount as designated in the arbitration award. If the retained funds are insufficient to pay the worker in accordance with the arbitration award, the worker has a right of action against the Contractor, and/or the surety to receive the amount owed, plus attorneys' fees and court costs. The Owner has no duty to release any funds to either the claimant or the Contractor until

it has received the notices of agreement or the arbitration award.

2.2.1.4.5 No Extension of Time. If the Owner's determination proves valid that good cause existed to believe a violation had occurred, the Contractor is not entitled to an extension of time for any delay arising directly or indirectly from of the arbitration procedures set forth herein.

2.3. Venue for Suits. The venue for any suit arising from this contract will be in a court of competent jurisdiction in Travis County, Texas, or as may otherwise designated in the Supplementary General Conditions.

2.4. Licensing of Trades. The Contractor shall comply with all applicable provisions of state law related to license requirements for skilled tradesmen, contractors, suppliers and or laborers, as necessary to accomplish the Work. In the event the Contractor, or one of its Subcontractors, loses its license during the term of performance of the Contract, the Contractor shall promptly hire or contract with a licensed provider of the service at no additional cost to the Owner.

2.5. Royalties, Patents & Copyrights. The Contractor shall pay all royalties and license fees, defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof.

2.6. State Sales and Use Taxes. The Owner qualifies for exemption from certain State and Local Sales and Use Taxes pursuant to the provisions of Tex. Tax Code, Chapter 151. The Contractor may claim exemption from payment of applicable State taxes by complying with such procedures as prescribed by the State Comptroller of Public Accounts.

### **Article 3. General Responsibilities of Owner & Contractor**

- 3.1. Owner's General Responsibilities. The Owner is the entity identified as such in the Contract and referred to throughout the Contract Documents as if singular in number.
  - 3.1.1 Preconstruction Conference. Prior to, or concurrent with, the issuance of Notice to Proceed with Construction, a conference will be convened for attendance by the Owner, Contractor, Architect/Engineer (AE) and appropriate Subcontractors. The purpose of the conference is to establish a working understanding among the parties as to the Work, the operational conditions at the project site, and general administration of the Project. Topics include communications, schedules, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, maintaining required records and all other matters of importance to the administration of the Project and effective communications between the project team members.
  - 3.1.2 Owner's Designated Representative. Prior to the start of construction, Owner will identify the Owner's Designated Representative (ODR), who has the express authority to act and bind the Owner to the extent and for the purposes described in the various Articles of the Contract, including responsibilities for general administration of the Contract.
    - 3.1.2.1 Unless otherwise specifically defined elsewhere in the contract documents, the ODR is the single point of contact between the Owner and Contractor. Notice to the ODR, unless otherwise noted, constitutes notice to the Owner under the Contract.
    - 3.1.2.2 All directives on behalf of the Owner will be conveyed to the Contractor by the ODR in writing.
  - 3.1.3 Owner Supplied Materials and Information.
    - 3.1.3.1 The Owner will furnish to the Contractor those surveys describing the physical characteristics, legal description, limitations of the site, site utility locations, and other information used in the preparation of the Contract Documents.
    - 3.1.3.2 The Owner will provide information, equipment, or services under the Owner's control to the Contractor with reasonable promptness.
  - 3.1.4 Availability of Lands. The Owner will furnish, as indicated in the Contract, all required rights to use the lands upon which the Work occurs. This includes rights-of-way and easements for access and

such other lands that are designated for use by the Contractor. The Contractor shall comply with all Owner identified encumbrances or restrictions specifically related to use of lands so furnished. The Owner will obtain and pay for easements for permanent structures or permanent changes in existing facilities, unless otherwise required in the Contract Documents.

3.1.5 Limitation on Owner's Duties

3.1.5.1 The Owner will not supervise, direct, control or have authority over or be responsible for Contractor's means, methods, technologies, sequences or procedures of construction or the safety precautions and programs incident thereto. The Owner is not responsible for any failure of Contractor to comply with laws and regulations applicable to the Work. The Owner is not responsible for the failure of Contractor to perform or furnish the Work in accordance with the Contract Documents. Owner are not responsible for the acts or omissions of Contractor, or any of its subcontractors, suppliers or of any other person or organization performing or furnishing any of the Work on behalf of the Contractor.

3.1.5.2 The Owner will not take any action in contravention of a design decision made by the AE in preparation of the Contract Documents, when such actions are in conflict with statutes under which the AE is licensed for the protection of the public health and safety.

3.2 Role of Architect/Engineer. Unless specified otherwise in the Contract between the Owner and the Contractor, the AE shall provide general administration services for the Owner during the construction phase of the project. Written correspondence, requests for information, and shop drawings/submittals shall be directed to the AE for action. The AE has the authority to act on behalf of the Owner to the extent provided in the Contract Documents, unless otherwise modified by written instrument, which will be furnished to the Contractor by the ODR, upon request.

3.2.1 Site Visits

3.2.1.1 The AE will make visits to the site at intervals as provided in the AE's contract agreement with the Owner, to observe the progress and the quality of the various aspects of Contractor's executed Work and report findings to the Owner.

3.2.1.2 The AE has the authority to interpret Contract Documents and inspect the Work for compliance and conformance with the Contract. Except as referenced in Article 3.1.5.2, the Owner retains the sole authority to accept or reject Work and issue direction for correction, removal, or replacement of Work.

3.2.2 Clarifications and Interpretations. It may be determined that clarifications or interpretations of the Contract Documents are



necessary. Upon direction by the ODR such clarifications or interpretations will be provided by the AE consistent with the intent of the Contract Documents. The AE will issue these clarifications with reasonable promptness to the Contractor as Architect's Supplemental Instruction (ASI) or similar instrument. If Contractor believes that such clarification or interpretation justifies an adjustment in the Contract Sum or the Contract Time, the Contractor shall so notify the Owner in accordance with the provisions of Article 11.

3.2.3 Limitations on Architect/Engineer Authority. The AE is not responsible for:

- 3.2.3.1 The Contractor's means, methods, techniques, sequences, procedures, safety, or programs incident to the Project nor will the AE supervise, direct, control or have authority over the same.
- 3.2.3.2 The Failure of Contractor to comply with laws and regulations applicable to the furnishing or performing the Work.
- 3.2.3.3 The Contractor's failure to perform or furnish the Work in accordance with the Contract Documents.
- 3.2.3.4 Acts or omissions of the Contractor, or of any other person or organization performing or furnishing any of the Work.

3.3 Contractor's General Responsibilities. The Contractor is solely responsible for implementing the Work in full compliance with all applicable laws and the contract documents and shall supervise and direct the Work using the best skill and attention to assure that each element of the Work conforms to the Contract requirements. The Contractor is solely responsible for all construction means, methods, techniques, safety, sequences, coordination and procedures.

- 3.3.1 Project Administration. The Contractor shall provide project administration for all subcontractors, vendors, suppliers, and others involved in implementing the Work and shall coordinate administration efforts with those of the AE and ODR in accordance with these General Conditions and provisions of Division 1 Specifications, and as outlined in the Pre-construction Conference.
- 3.3.2 Contractor's Superintendent. Employ a competent resident superintendent who will be present at the Project Site during the progress of the Work. The superintendent is subject to the approval of the ODR. Do not change approved superintendents during the course of the project without the written approval of the ODR unless the superintendent leaves the employ of the Contractor.
- 3.3.3 Labor. Provide competent, suitably qualified personnel to survey, lay-out, and construct the Work as required by the Contract Documents. Maintain good discipline and order at the Site at all times.

- 3.3.4 Services, Materials, and Equipment. Unless otherwise specified, provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities, incidentals, and services necessary for the construction, performance, testing, start-up, inspection and completion of the Work.
- 3.3.5 Non-Compliant Work. Should the AE and/or the ODR identify Work as non-compliant with the Contract Documents, the ODR will communicate the finding to the Contractor and the Contractor will correct such Work at its expense. The approval of Work by either the AE or ODR does not relieve the Contractor from the obligation to comply with all requirements of the Contract Documents.
- 3.3.6 Subcontractors. Do not employ any Subcontractor, supplier or other person or organization, whether initially or as a substitute, against whom the Owner may have reasonable objection. The Owner will communicate such objections in writing. The Contractor is not required to employ any Subcontractor, supplier or other person or organization to furnish any of the work to whom the Contractor has reasonable objection. The Contractor will not substitute Subcontractors without the acceptance of the Owner.
- 3.3.6.1 All Subcontracts and supply contracts shall be consistent with and bound to the terms and conditions of the Contract Documents including provisions of the Agreement between the Contractor and the Owner.
- 3.3.6.2 The Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with the Contractor. Require all Subcontractors, suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with Owner only through the Contractor. Furnish to the Owner a copy of each first-tier subcontract promptly after its execution. The Contractor agrees that the Owner has no obligation to review or approve the content of such contracts and that providing the Owner such copies in no way relieves the Contractor of any of the terms and conditions of the Contract, including, without limitation, any provisions of the Contract which require the subcontractor to be bound to the Contractor in the same manner in which the Contractor is bound to the Owner.
- 3.3.7 Continuing the Work. Carry on the Work and adhere to the progress schedule during all disputes, disagreements or alternative resolution processes with the Owner. Do not delay or postpone any Work

because of the pending resolution of any disputes, disagreements or processes, except as the Owner and the Contractor may agree in writing.

- 3.3.8 Cleaning. At all times, keep the Site and the Work clean and free from accumulation of waste materials or rubbish caused by the construction activities under the Contract. The Contractor shall ensure that the entire Project is thoroughly cleaned prior to requesting Substantial Completion Inspection and, again, upon completion of the Project prior to the final inspection.
- 3.3.9 Acts and Omissions of Contractor, its Subcontractors and Employees. The Contractor is responsible for acts and omissions of his employees and all its subcontractors, their agents and employees. The Owner may, in writing, require the Contractor to remove from the Project any of Contractor's or its subcontractor's employees that the ODR finds to be careless, incompetent, or otherwise objectionable.
- 3.3.10 Indemnification of Owner. The Contractor covenants and agrees to FULLY INDEMNIFY and HOLD HARMLESS, the Owner and the elected officials, employees, officers, directors, volunteers, and representatives of the Owner, individually or collectively, from and against any and all costs, claims, liens, damages, losses, expenses, fees, fines, penalties, proceedings, actions, demands, causes of action, liability and suits of any kind and nature, including but not limited to, personal or bodily injury, death and property damage, made upon the Owner directly or indirectly arising out of, resulting from or related to Contractor's activities under this Contract, including any acts or omissions of Contractor, any agent, officer, director, representative, employee, consultant or the Subcontractor of Contractor, and their respective officers, agents, employees, directors and representatives while in the exercise of performance of the rights or duties under this Contract. The indemnity provided for in this paragraph does not apply to any liability resulting from the negligence of the Owner, officers or employees, separate Contractors or assigned contractors, in instances where such negligence causes personal injury, death or property damage. IN THE EVENT CONTRACTOR AND OWNER ARE FOUND JOINTLY LIABLE BY A COURT OF COMPETENT JURISDICTION, LIABILITY WILL BE APPORTIONED COMPARATIVELY IN ACCORDANCE WITH THE LAWS OF THE STATE OF TEXAS, WITHOUT WAIVING ANY GOVERNMENTAL IMMUNITY AVAILABLE TO THE STATE UNDER TEXAS LAW AND WITHOUT WAIVING ANY DEFENSES OF THE PARTIES UNDER TEXAS LAW.
- 3.3.10.1 The provisions of this Indemnification are solely for the benefit of the parties hereto and not intended to create or grant any rights, contractual or otherwise, to any other person or entity.

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- 3.3.10.2 Promptly advise the Owner in writing of any claim or demand against the Owner or the Contractor known to the Contractor related to or arising out of the Contractor's activities under this Contract.
- 3.3.11 Ancillary Areas. Operate and maintain operations and associated storage areas at the site of the Work in accordance with the following:
  - 3.3.11.1 Confine all Contractor operations, including storage of materials and employee parking upon the Site of Work, to areas designated by the Owner.
  - 3.3.11.2 The Contractor may erect, at its own expense, temporary buildings that will remain its property. Remove such buildings and associated utility service lines upon completion of the Work, unless the Contractor requests and the Owner provides written consent that it may abandon such buildings and utilities in place.
  - 3.3.11.3 Use only established roadways or construct and use such temporary roadways as may be authorized by the Owner. Do not allow load limits of vehicles to exceed the limits prescribed by appropriate regulations or law. Provide protection to road surfaces, curbs, sidewalks, trees, shrubbery, sprinkler systems, drainage structures and other like existing improvements to prevent damage and repair any damage thereto at the expense of the Contractor.
  - 3.3.11.4 The Owner may restrict the Contractor's entry to the site to specifically assigned entrances and routes.
- 3.3.12 Separate Contracts. Additional Contractor responsibilities when the Owner awards separate Contracts
  - 3.3.12.1 The Owner reserves the right to award other contracts in connection with other portions of the Project under these or similar contract conditions.
  - 3.3.12.2 The Owner reserves the right to perform operations related to the Project with the Owner's own forces.
  - 3.3.12.3 Under a system of separate contracts, the conditions described herein continue to apply except as may be amended by change order.

## **Article 4. Historically Underutilized Business (HUB) Subcontracting Plan**

- 4.1. General Description. The purpose of the Historically Underutilized Business (HUB) Program is to promote equal business opportunities for economically disadvantaged persons (as defined by Tex. Gov't Code, Chapter 2161) to contract with the State of Texas in accordance with the goals specified in the State of Texas Disparity Study. The HUB Program annual procurement utilization goals per 1 Texas Administrative Code (TAC) §111.13 are: 11.9 percent for heavy construction other than building contracts, 26.1 percent for all building construction, including general contractors and operative builders contracts, 57.2 percent for all special trade construction contracts, 20 percent for professional services contracts, 33 percent for all other services contracts and 12.6 percent for commodities contracts.
- 4.1.1 State agencies are required by statute to make a good faith effort to assist HUBs in participating in contract awards issued by the State. 1 TAC §111.11-111.28, outline the state's policy to encourage outreach to and potential utilization of HUBs in state contracting opportunities through race, ethnic and gender neutral means.
- 4.1.2 A Contractor who contracts with the State in an amount of \$100,000 is required to make a good faith effort to award subcontracts to HUBs in accordance with 1 TAC §111.14 by submitting a HUB Subcontracting Plan at the time of bidding and complying with the HUB Subcontracting Plan after it is accepted by the Owner and during the term of the contract.
- 4.2. Compliance with Approved HUB Subcontracting Plan. Contractor, having been awarded this Contract in part by complying with the HUB Program statute and rules, hereby covenants to continue to comply with the HUB Program as follows:
- 4.2.1 Prior to substituting a Subcontractor, promptly notify the Owner in the event a change is required for any reason to the accepted HUB Subcontracting Plan.
- 4.2.2 Conduct the good faith effort activities required and provide the Owner with necessary documentation to justify approval of a change to the approved HUB Subcontracting Plan.
- 4.2.3 Cooperate in the execution of a Change Order or such other approval of the change in the HUB Subcontracting Plans as the Contractor and Owner may agree to.
- 4.2.4 Maintain and make available to Owner upon request business records documenting compliance with the accepted HUB Subcontracting Plan.
- 4.2.5 Upon receipt of payment for performance of Work, submit to Owner a compliance report, in the format required by the Owner that demonstrates Contractor's performance of the HUB Subcontracting Plan.

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- 4.2.6 Promptly and accurately explain and provide supplemental information to Owner to assist in the Owner's investigation of the Contractor's good faith effort to fulfill the HUB Subcontracting Plan and the requirements under 1 TAC §111.14.
- 4.3. Failure to Demonstrate Good Faith Effort. Upon a determination by Owner that Contractor has failed to demonstrate a good faith effort to fulfill the HUB Subcontracting Plan or any contract covenant detailed above, the Owner may, in addition to all other remedies available to it, report the failure to perform to the Texas Building and Procurement Commission Vendor Performance and may bar the Contractor from future contracting opportunities with the Owner.

## Article 5. Bonds & Insurance

### 5.1. Construction Bonds.

The Contractor is required to tender to Owner, prior to commencing the Work, performance and payment bonds, as required by Tex. Gov't Code, Chapter 2253.

- 5.1.1. A Performance Bond is required if the Contract Price is in excess of \$100,000. The Performance Bond is solely for the protection of the Owner. The Performance Bond is to be for the Contract Sum to guarantee the faithful performance of the Work in accordance with the Contract Documents. The form of the bond shall be approved by the Attorney General of Texas. The Performance Bond shall be effective through the Contractor's warranty period.
- 5.1.2. A Payment Bond is required if the Contract Price is in excess of \$25,000. The payment bond is to be for the Contract Sum and is payable to the Owner solely for the protection and use of payment bond beneficiaries who have a direct contractual relationship with the Contractor or a Subcontractor. The form of the bond shall be approved by the Attorney General of Texas.
- 5.1.3. Bond Requirements. Each bond shall be executed by a corporate surety or sureties authorized to do business in the State of Texas and acceptable to the Owner, on the Owner's form, and in compliance with the relevant provisions of the Texas Insurance Code. If any bond is for more than 10 percent of the surety's capital and surplus, the Owner may require certification that the company has reinsured the excess portion with one or more reinsurers authorized to do business in the State. A reinsurer may not reinsure for more than 10 percent of its capital and surplus. If a surety upon a bond loses its authority to do business in the State, the Contractor shall, within thirty (30) days after such loss, furnish a replacement bond at no added cost to the Owner.
- 5.1.4. Power of Attorney. Each bond shall be accompanied by a valid Power-of-Attorney (issued by the surety company and attached, signed and sealed with the corporate embossed seal, to the bond) authorizing the attorney in fact who signs the bond to commit the company to the terms of the bond, and stating any limit in the amount for which the attorney can issue a single bond.
- 5.1.5. Bond Indemnification. The process of requiring and accepting bonds and making claims thereunder shall be conducted in compliance with Tex. Gov't Code, Chapter 2253. IF FOR ANY REASON A STATUTORY PAYMENT OR PERFORMANCE BOND IS NOT HONORED BY THE SURETY, THE CONTRACTOR SHALL FULLY INDEMNIFY AND HOLD THE OWNER HARMLESS OF AND FROM ANY COSTS, LOSSES, OBLIGATIONS OR LIABILITIES IT INCURS AS A RESULT.

- 5.1.6. Furnishing Bond Information. Owner shall furnish certified copies of the payment bond and the related Contract to any qualified person seeking copies who complies with Tex. Gov't Code, §2253.026.
- 5.1.7. Claims on Payment Bonds. Claims on payment bonds must be sent directly to the Contractor and his surety in accordance with Tex. Gov't Code § 2253.041. All Payment Bond claimants are cautioned that no lien exists on the funds unpaid to the Contractor on such Contract, and that reliance on notices sent to the Owner may result in loss of their rights against the Contractor and/or his surety. The Owner is not responsible in any manner to a claimant for collection of unpaid bills, and accepts no such responsibility because of any representation by any agent or employee.
- 5.1.8. Payment Claims when Payment Bond not Required. The rights of Subcontractors regarding payment are governed by Tex. Prop. Code, §§53.231 – 53.239 when the value of the Contract between the Owner and the Contractor is less than \$25,000.00. These provisions set out the requirements for filing a valid lien on funds unpaid to the Contractor as of the time of filing the claim, actions necessary to release the lien and satisfaction of such claim.
- 5.1.9 Sureties shall be listed on the US Department of the Treasury's Listing Approved Sureties stating companies holding Certificates of Authority as acceptable sureties on Federal Bonds and acceptable reinsuring companies (Department Circular 570).

5.2. Insurance Requirements.

The Contractor shall carry insurance in the types and amounts indicated in this Article for the duration of the Contract. The required insurance shall include coverage for Owner's property in the care, custody and control of Contractor prior to construction, during construction and during the warranty period. The insurance shall be evidenced by delivery to the Owner of certificates of insurance executed by the insurer or its authorized agent stating coverages, limits, expiration dates and compliance with all applicable required provisions. Upon request, the Owner, and/or its agents, shall be entitled to receive without expense, copies of the policies and all endorsements. The Contractor shall update all expired policies prior to submission for monthly payment. Failure to update policies shall be reason for withholding of payment until renewal is provided to the Owner.

- 5.2.1. The Contractor shall provide and maintain the insurance coverage with the minimum amounts described below until the end of the warranty period unless otherwise stated in Supplementary General Conditions. Failure to maintain insurance coverage, as required, is grounds for Suspension of Work for Cause pursuant to Article 14. The Contractor will be notified of the date on which the Builder's Risk insurance policy may be terminated through Substantial Completion Notices, Acceptance Notices and/or other means as deemed appropriate by the Owner.



- 5.2.2. Coverage shall be written on an occurrence basis by companies authorized and admitted to do business in the State of Texas and rated A- or better by A.M. Best Company or otherwise acceptable to Owner.

5.2.2.1. Insurance coverage required includes:

- 5.2.2.1.1. Workers' Compensation. Insurance with limits as required by the Texas Workers' Compensation Act, with the policy endorsed to provide a waiver of subrogation as to the Owner, Employer's Liability insurance of not less than:

\$100,000 each accident

\$100,000 disease each employee

\$500,000 disease policy limit

- 5.2.2.1.2. Commercial General Liability Insurance. Including Independent Contractor's liability, Products and Completed Operations and Contractual Liability, covering, but not limited to, the liability assumed under the indemnification provisions of this contract, fully insuring Contractor's (or Subcontractors) liability for bodily injury and property damage with a combined bodily injury (including death) and property damage minimum limit of :

\$1,000,000 per occurrence

\$1,000,000 general aggregate

\$1,000,000 products and completed operations aggregate

Coverage shall be on an "occurrence" basis.

The policy shall include coverage extended to apply to completed operations and explosion, collapse, underground hazards. The policy shall include endorsement CG2503 Amendment-Aggregate Limits of Insurance (Per Project) or its equivalent.

- 5.2.2.1.3. Asbestos Abatement Liability Insurance, including coverage for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos containing materials. \*This requirement applies if the Work or the Project includes asbestos containing materials.

The Combined single limit for bodily injury and property damage will be a minimum of \$1,000,000 per occurrence.

\*Specific Requirement for Claims-Made Form: Required period of coverage will be determined by the following formula: Continuous coverage for life of the contract, plus one (1) year (to provide coverage for the warranty period),

and an extended discovery period for a minimum of five (5) years which shall begin at the end of the warranty period.

If this contract is for asbestos abatement only, the All-Risk Builder's Risk or All-Risk Installation Floater (e) is not required.

- 5.2.2.1.4. Comprehensive Automobile Liability Insurance, covering owned, hired, and non-owned vehicles, with a combined bodily injury (including death) and property damage minimum limit of \$1,000,000 per occurrence. No aggregate shall be permitted for this type of coverage.

Such insurance is to include coverage for loading and unloading hazards.

- 5.2.2.1.5. All Risk Builder's Risk Insurance (or All Risk Installation Floater for instances in which the project involves solely the installation of equipment). Coverage shall be All-Risk, including, but not limited to, Fire, Extended Coverage, Vandalism and Malicious Mischief, Flood, Earthquake, Theft and damage resulting from faulty workmanship, design or materials. If Builder's Risk, limit shall be equal to 100 percent of the contract. If Installation Floater, limit shall be equal to 100 percent of the contract cost. The policy shall be written jointly in the names of the Owner, the Contractor, Subcontractors and, Subcontractors shall be named as additional insured. The policy shall have endorsements as follows:

5.2.2.1.5.1. This insurance shall be specific as to coverage and not contributing insurance with any permanent insurance maintained on the property.

5.2.2.1.5.2. This insurance shall not contain an occupancy clause suspending or reducing coverage should the Owner occupy, or begin beneficial occupancy before the Owner has accepted final completion.

5.2.2.1.5.3. Loss, if any, shall be adjusted with and made payable to the Owner as Trustee for the insureds as their interests may appear; the right of subrogation under the Builder's Risk policy shall be waived as to the Owner. The Owner shall be named as Loss Payee. For renovation projects or projects that involve portions of work contained within an existing structure, refer to Special Conditions for possible additional Builder's Risk insurance requirements.

- 5.2.2.1.6. "Umbrella" Liability Insurance. The Contractor shall obtain, pay for and maintain umbrella liability insurance during the contract term, insuring the Contractor (or Subcontractor) for

an amount of not less than amount specified in the Supplementary General Conditions or Special Conditions that provides coverage at least as broad as and applies in excess and follows form of the primary liability coverages required hereinabove. The policy shall provide "drop down" coverage where underlying primary insurance coverage limits are insufficient or exhausted.

If this contract is for asbestos abatement only, the "Umbrella" Excess Liability is not required

5.2.3. Policies must include the following clauses, as applicable:

5.2.3.1. This insurance shall not be canceled, materially changed, or non-renewed until after thirty (30) days prior written notice has been given to the Owner.

5.2.3.2. It is agreed that the Contractor's insurance shall be deemed primary with respect to any insurance or self insurance carried by the Owner for liability arising out of operations under the Contract with the Owner.

5.2.3.3. The Owner, its officials, directors, employees, representatives, and volunteers are added as additional insureds as respects operations and activities of, or on behalf of the named insured performed under contract with the Owner. The additional insured status must cover completed operations as well. This is not applicable to the workers' compensation policy.

5.2.3.4. The workers' compensation and employers' liability policy will provide a waiver of subrogation in favor of the Owner.

5.2.4. Without limiting any of the other obligations or liabilities of the Contractor, the Contractor shall require each Subcontractor performing work under the Contract, at the Subcontractor's own expense, to maintain during the term of the Contract, the same stipulated minimum insurance including the required provisions and additional policy conditions as shown above. As an alternative, the Contractor may include its Subcontractors as additional insureds on its own coverage as prescribed under these requirements. The Contractor's certificate of insurance shall note in such event that the Subcontractors are included as additional insureds and that Contractor agrees to provide Workers' Compensation for the Subcontractors and their employees. The Contractor shall obtain and monitor the certificates of insurance from each Subcontractor in order to assure compliance with the insurance requirements. The Contractor must retain the certificates of insurance for the duration of the Contract plus 5 years and shall have the responsibility of enforcing these insurance requirements among its subcontractors. The Owner shall be entitled, upon request and without expense, to receive copies of these certificates.

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- 5.2.5. Workers' Compensation Insurance Coverage must meet the statutory requirements of the Tex. Lab. Code, §401.011(44) and specific to construction projects for public entities as required by Tex. Lab. Code, §406.096.

## **Article 6. Contract Documents**

### **6.1. Drawings and Specifications**

- 6.1.1 Copies Furnished. The Contractor will be furnished, free of charge, the number of complete sets of the Drawings and Specifications as provided in the Supplementary General Conditions or Special Conditions. Additional complete sets of Drawings and Specifications, if requested, will be furnished at reproduction cost to the one requesting such additional sets.
- 6.1.2 Ownership of Drawings and Specifications. All Drawings, Specifications and copies thereof furnished by the AE are to remain A/E's property. These documents are not to be used on any other project, and with the exception of one Contract set for each party to the Contract, are to be returned to the Architect/Engineer, upon request, following completion of the Work.
- 6.1.3 Interrelation of Documents. The Contract Documents as referenced in the Agreement between the Owner and the Contractor are complimentary, and what is required by one shall be as binding as if required by all.
- 6.1.4 Resolution of Conflicts in Documents. Where conflicts may exist between and/or within the Contract Documents, the higher quality, greater quantity, more restrictive, and/or more expensive requirement shall be the basis of Contractor pricing, and the Contractor shall notify the AE and the ODR for resolution of the issue prior to executing the work in question.
- 6.1.5 Contractor's Duty to Review Contract Documents. In order to facilitate its responsibilities for completion of the Work in accordance with and as reasonably inferable from the Contract Documents, prior to pricing or commencing the Work, the Contractor shall examine and compare the Contract Documents, information furnished by the Owner, relevant field measurements made by the Contractor and any visible or reasonably anticipated conditions at the site affecting the Work. This duty extends throughout the construction phase prior to commencing each particular work activity and/or system installation.
- 6.1.6 Discrepancies and Omissions in Drawings and Specifications
  - 6.1.6.1 Promptly report to the ODR and to the AE the discovery of any apparent error, omission or inconsistency in the Contract Documents prior to execution of the Work.
  - 6.1.6.2 It is recognized that the Contractor is not acting in the capacity of a licensed design professional, unless it is performing as a Design-Build firm.
  - 6.1.6.3 It is further recognized that the Contractor's examination of contract documents is to facilitate construction and does not create an

affirmative responsibility to detect errors, omissions or inconsistencies or to ascertain compliance with applicable laws, building codes or regulations, unless it is performing as a Design-Build firm or a Construction Manager-at-Risk.

- 6.1.6.4 When performing as a Design-Build firm, the Contractor has sole responsibility for discrepancies, errors, and omissions in the drawings and specifications.
- 6.1.6.5 When performing as a Construction Manager-at-Risk, the Contractor has a shared responsibility for discovery and resolution of discrepancies, errors, and omissions in the Contract Documents. In such case, the Contractor's responsibility pertains to review, coordination, and recommendation of resolution strategies within budget constraints, but does not establish a liability for design.
- 6.1.6.6 The Contractor has no liability for errors, omissions, or inconsistencies unless the Contractor knowingly failed to report a recognized problem to the Owner or the Work is executed under a Design-Build or Construction Manager-at-Risk contract as outlined above. Should the Contractor fail to perform the examination and reporting obligations of these provisions, the Contractor is responsible for avoidable costs, direct, and/or consequential damages.

## 6.2 Requirements for Record Documents

Maintain at the Site one copy of all Drawings, Specifications, addenda, approved Submittals, Contract modifications, and all Project correspondence. Keep current and maintain Drawings and Specifications in good order with postings and markings to record actual conditions of Work and show and reference all changes made during construction. Provide Owner and AE access to these documents.

- 6.2.1 Maintain this record set of Drawings and Specifications which reflect the "As Constructed" conditions and representations of the Work performed, whether it be directed by addendum, Change Order or otherwise. Make available all records prescribed herein for reference and examination by the Owner and its representatives and agents.
- 6.2.2 Update the "As-Constructed" Drawings and Specifications monthly prior to submission of periodic partial pay estimates. Failure to maintain such records constitutes cause for denial of a progress payment otherwise due.
- 6.2.3 Prior to requesting Substantial Completion Inspection by the ODR and AE, furnish a complete set of the marked up "As-Constructed" set maintained at the site and one photocopy of same. Concurrently with furnishing these record drawings, furnish a preliminary copy of each operating and maintenance manual (O&M) required by the Contract Documents, for review by the AE and the ODR.

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- 6.2.4 Once determined acceptable, provide mylar prints of professionally drafted "As-Constructed" drawings, along with electronic copy on CD, "As-Constructed" specifications in bound volume(s) along with electronic copy on CD, two sets of photocopies or prints of the mylar "As-Constructed" drawings, two sets of operating and maintenance manuals, two sets of approved submittals, and other record documents as required elsewhere in the Contract Documents.

## **Article 7. Safety**

- 7.1. General. It is the duty and responsibility of the Contractor and all of its Subcontractors to be familiar with, enforce and comply with all requirements of Public Law 91-596, 29 U.S.C. §§651 et. seq., the Occupational Safety and Health Act of 1970, (OSHA) and all amendments thereto. The Contractor shall prepare a Safety Plan specific to the Project and submit it to the ODR and AE prior to commencing Work. In addition, the Contractor and all of its Subcontractors shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property to protect them from damage, injury or loss and erect and maintain all necessary safeguards for such safety and protection.
- 7.2. Notices. The Contractor shall provide notices as follows:
- 7.2.1 Notify owners of adjacent property including those that own or operate utility services and/or underground facilities, and utility owners, when prosecution of the Work may affect them or their facilities, and cooperate with them in the protection, removal, relocation and replacement, and access to their facilities and/or utilities.
  - 7.2.2 Coordinate the exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the site in connection with laws and regulations. Maintain a complete file of MSDS for all materials in use on site throughout the construction phase and make such file available to the Owner and its agents as requested.
- 7.3. Emergencies. In any emergency affecting the safety of persons or property, the Contractor shall act to minimize, mitigate, and prevent threatened damage, injury or loss.
- 7.3.1 Have authorized agents of Contractor respond immediately upon call at anytime of day or night when circumstances warrant the presence of Contractor to protect the Work or adjacent property from damage or to take such action pertaining to the Work as may be necessary to provide for the safety of the public.
  - 7.3.2 Give the ODR and AE prompt notice of all such events.
  - 7.3.3 If Contractor believes that any changes in the Work or variations from Contract Documents have been caused by its emergency response, promptly notify the Owner within 72 hours of the emergency response event.
  - 7.3.4 Should Contractor fail to respond, Owner is authorized to direct other forces to take action as necessary and Owner may deduct any cost of remedial action from funds otherwise due the Contractor.
- 7.4. Injuries. In the event of an incident or accident involving outside medical care for an individual on or near the Work, Contractor shall notify the ODR



and other parties as may be directed within twenty-four (24) hours of the event.

- 7.4.1 Record the location of the event and the circumstances surrounding it, by using photography or other means, and gather witness statements and other documentation which describes the event.
- 7.4.2 Supply the ODR and AE with an incident report no later than 36 hours after the occurrence of the event. In the event of a catastrophic incident (one fatality or three workers hospitalized), barricade and leave intact the scene of the incident until all investigations are complete. A full set of incident investigation documents, including facts, finding of cause, and remedial plans shall be provided within one week after occurrence, unless otherwise directed by legal counsel. Contractor shall provide the ODR with written notification within one week of such catastrophic event if legal counsel delays submission of full report.
- 7.5. Environmental Safety. Upon encountering any previously unknown potentially hazardous material, or other materials potentially contaminated by hazardous material, Contractor shall immediately stop work activities impacted by the discovery, secure the affected area, and notify the ODR immediately.
  - 7.5.1 Bind all Subcontractors to the same duty.
  - 7.5.2 Upon receiving such notice, the ODR will promptly engage qualified experts to make such investigations and conduct such tests as may be reasonably necessary to determine the existence or extent of any environmental hazard. Upon completion of this investigation, the ODR will issue a written report to the Contractor identifying the material(s) found and indicate any necessary steps to be taken to treat, handle, transport or dispose of the material.
  - 7.5.3 The Owner may hire third-party contractors to perform any or all such steps.
  - 7.5.4 Should compliance with the ODR's instructions result in an increase in the Contractor's cost of performance, or delay the Work, the Owner will make an equitable adjustment to the Contract price and/or the time of completion, and modify the Contract in writing accordingly.
- 7.6. Trenching Plan. When the project requires excavation which either exceeds a depth of four feet, or results in any worker's upper body being positioned below grade level, the Contractor is required to submit a trenching plan to the ODR prior to commencing trenching operations. The plan is required to be prepared and sealed by a professional engineer registered in the State of Texas, and employed by the Contractor. Said engineer cannot be anyone who is otherwise either directly or indirectly engaged on this project

## **Article 8. Quality Control**

8.1. Materials & Workmanship. The Contractor shall execute Work in a good and workmanlike manner in accordance with the Contract Documents. The Contractor shall develop and provide a Quality Control Plan specific to this project and acceptable to the Owner. Where Contract Documents do not specify quality standards, complete and construct all Work in compliance with generally accepted construction industry standards. Unless otherwise specified, incorporate all new materials and equipment into the Work under the Contract.

### 8.2. Testing

8.2.1 Contractor Testing. The Contractor is responsible for coordinating and paying for all routine and special tests required to confirm compliance with quality and performance requirement of the Contract Documents. This “quality control” testing shall include any particular testing required by the Specifications and the following general tests.

8.2.1.1. Any test of basic material or fabricated equipment included as part of a submittal for a required item in order to establish compliance with the Contract Documents.

8.2.1.2 Any test of basic material or fabricated equipment offered as a substitute for a specified item on which a test may be required in order to establish compliance with the Contract Documents.

8.2.1.3 Routine, preliminary, start-up, pre-functional and operational testing of building equipment and systems as necessary to confirm operational compliance with requirements of the Contract Documents.

8.2.1.4 All subsequent tests on original or replaced materials conducted as a result of prior testing failure.

8.2.2 Owner Testing. The Owner reserves the right to subject materials and systems incorporated into the Project to routine tests as may be specified or as deemed necessary by the ODR or the AE to insure compliance with the quality and/or performance requirements of the Contract Documents and/or with laws, ordinances, rules, regulations and/or orders of any public authority having jurisdiction. The results of such “quality assurance” testing will be provided to the Contractor and, to the extent provided, the Contractor may rely on findings.

8.2.3 All testing shall be performed in accordance with standard test procedures by an accredited laboratory, or special consultant as appropriate, acceptable to the Owner. Results of all tests shall be provided promptly to the ODR, Architect/Engineer and the Contractor.

8.2.4 Non-Compliance (Test Results). Should any of the tests indicate that a material and/or system does not comply with the contract requirements, the burden of proof remains with the Contractor, subject to:

- 8.2.4.1 Contractor selection and submission of the laboratory for Owner acceptance.
- 8.2.4.2 Acceptance by the Owner of the quality and nature of tests.
- 8.2.4.3 All tests taken in the presence of the Architect/Engineer and/or ODR, or their representatives.
- 8.2.4.4 If tests confirm that the material/systems comply with Contract Documents, the Owner will pay the cost of the test.
- 8.2.4.5 If tests reveal noncompliance, the Contractor will pay those laboratory fees and costs of that particular test and all future tests, of that failing Work, necessary to eventually confirm compliance with Contract Documents.
- 8.2.4.6 Proof of noncompliance with the Contract Documents will make the Contractor liable for any corrective action which the ODR determines appropriate, including complete removal and replacement of non-compliant work or material.
- 8.2.5 Notice of Testing. The Contractor shall give the ODR and the AE timely notice of its readiness and the date arranged so the ODR and AE may observe such inspection, testing or approval.
- 8.2.6 Test Samples. The Contractor is responsible for providing samples of sufficient size for test purposes and for coordinating such tests with their Work Progress Schedule to avoid delay.
- 8.2.7 Covering Up Work - If the Contractor covers up any Work without providing the Owner an opportunity to inspect, the Contractor shall, if requested by ODR, uncover and recover the work at Contractor's expense.

### 8.3 Submittals

- 8.3.1 Contractor's Submittals. Submit with reasonable promptness consistent with the Project Schedule and in orderly sequence all Shop Drawings, Samples, or other information required by the Contract Documents, or subsequently required by Change Order. Prior to submitting, the Contractor shall review each submittal for compliance with Contract Documents and certify by approval stamp affixed to each copy. Submittal data presented without the Contractor's certification will be returned without review or comment, and any delay resulting from such certification is the Contractor's responsibility.
  - 8.3.1.1 Within twenty-one (21) calendar days of the effective date of the Notice To Proceed with construction, submit to the ODR, and the AE, a submittal schedule/register, organized by specification section, listing all items to be furnished for review and approval by the Architect/Engineer and Owner. The list shall include shop drawings, manufacturer's literature, certificates of compliance,

materials samples, materials colors, guarantees, and all other items identified throughout the specifications.

- 8.3.1.2 Indicate the type of item, contract requirements reference, and Contractor's scheduled dates for submitting the item along with the requested dates for approval answers from the Architect/Engineer and Owner. The submittal register shall indicate the projected dates for procurement of all included items and shall be updated at least monthly with actual approval and procurement dates. Show and allow a minimum of thirty (30) calendar days duration after receipt by the Architect/Engineer and ODR for review and approval. If re-submittal required, allow a minimum of an additional fifteen (15) calendar days for review. Submit the updated submittal register with each request for progress payment. The Owner may establish routine review procedures and schedules for submittals at the preconstruction conference and/or elsewhere in the Contract Documents.
- 8.3.1.3 Coordinate the submittal register with the Work Progress Schedule. Do not schedule Work requiring a submittal to begin prior to scheduling review and approval of the related submittal. Revise and/or update both schedules monthly to ensure consistency and current project data. Provide to the ODR the updated submittal register and schedule with each application for progress payment. Refer to requirements for the Work Progress Schedule for inclusion of procurement activities therein. Regardless, the submittal register shall identify dates submitted and returned and shall be used to confirm status and disposition of particular items submitted, including approval or other action taken and other information not conveniently tracked through the Work Progress Schedule.
- 8.3.1.4 By submitting Shop Drawings, Samples or other required information, the Contractor represents and certifies that they have determined and verified all applicable field measurements, field construction criteria, materials, catalog numbers and similar data; and has checked and coordinated each Shop Drawing and Sample with the requirements of the Work and the Contract Documents.
- 8.3.2 Review of Submittals. AE and ODR review is only for conformance with the design concept and the information provided in the Contract Documents. Responses to submittals will be in writing. The approval of a separate item does not indicate approval of an assembly in which the item functions. The approval of a submittal does not relieve the Contractor of responsibility for any deviation from the requirements of the Contract unless the Contractor informs the AE and ODR of such deviation in a clear, conspicuous, and written manner on the submittal transmittal and at the time of submission, and obtains the Owner's written specific approval of the particular deviation. -

- 8.3.3 Correction and Resubmission. Make any corrections required to a submittal and resubmit the required number of corrected copies promptly so as to avoid delay, until submittal approval. Direct attention in writing to the AE and the ODR, when applicable, to any new revisions other than the corrections requested on previous submissions.
- 8.3.4 Limits on Shop Drawing Approvals. The Contractor shall not commence any Work requiring a submittal until approval of the submittal. Construct all such work in accordance with approved submittals. Approval of Shop Drawings and Samples is not authorization to Contractor to perform extra work or changed work unless authorized through a Change Order. The AE's and ODR's approval, if any, does not relieve Contractor from responsibility for defects in the Work resulting from errors or omissions of any kind on the submittal, regardless of any approval action.
- 8.3.5 No Substitutions Without Approval. The ODR and the AE may receive and consider the Contractor's request for substitution when the Contractor agrees to reimburse the Owner for review costs and satisfies 8.3.5.1, 8.3.5.2, and 8.3.5.3 in combination with one or more of the items in 8.3.5.4 through 8.3.5.11 of the following conditions, as determined by the Owner. If the Contractor does not satisfy these conditions, the ODR and AE will return the request without action except to record noncompliance with these requirements. The Owner will not consider the request if the Contractor cannot provide the product or method because of failure to pursue the Work promptly or coordinate activities properly.
- 8.3.5.1 The Contract Documents do not require extensive revisions.
  - 8.3.5.2 Proposed changes are in keeping with the general intent of the Contract Documents and the design intent of the AE and do not result in an increase in cost to the Owner.
  - 8.3.5.3 The request is timely, fully documented, and properly submitted.
  - 8.3.5.4 The Contractor cannot provide the specified product, assembly or method of construction within the Contract Time.
  - 8.3.5.5 The request directly relates to an "or-equal" clause or similar language in the Contract Documents.
  - 8.3.5.6 The request directly relates to a "product design standard" or "performance standard" clause in the Contract Documents.
  - 8.3.5.7 The requested substitution offers the Owner a substantial advantage in cost, time, energy conservation or other considerations, after deducting additional responsibilities the Owner must assume.
  - 8.3.5.8 The specified product or method of construction cannot receive necessary approval by an authority having jurisdiction, and the ODR can approve the requested substitution.

- 8.3.5.9 The Contractor cannot provide the specified product, assembly or method of construction in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
- 8.3.5.10 The Contractor cannot coordinate the specified product, assembly or method of construction with other materials and where the Contractor certifies they can coordinate the proposed substitution.
- 8.3.5.11 The specified product, assembly or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
- 8.3.6 Unauthorized Substitutions at Contractor's Risk. The Contractor is financially responsible for any additional costs or delays resulting from using materials, equipment or fixtures other than those specified. The Contractor shall reimburse the Owner for any increased design or contract administration costs resulting from such unauthorized substitutions.
- 8.4 Field Mock-up
  - 8.4.1 Mockups shall be constructed prior to commencement of a specified scope of work to confirm acceptable workmanship.
    - 8.4.1.1 As a minimum, field mock-ups shall be constructed for roofing systems, exterior veneer / finish systems, glazing systems, and any other Work requiring a mock-up as identified throughout the Contract Documents. Mockups for systems not part of the project scope shall not be required.
    - 8.4.1.2 Mock-ups may be incorporated into the Work if allowed by the Contract Documents and if acceptable to the ODR. If mock-ups are freestanding, they shall remain in place until otherwise directed by the Owner.
    - 8.4.1.3 The Contractor shall include field mock-ups in their Work Progress Schedule and shall notify the ODR and Architect/Engineer of readiness for review sufficiently in advance to coordinate review without delay.
- 8.5 Inspection During Construction
  - 8.5.1 The Contractor shall provide sufficient, safe, and proper facilities, including equipment as necessary for safe access, at all reasonable times for observation and/or inspection of the Work by the Owner and its agents.
  - 8.5.2 The Contractor shall not cover up any work with finishing materials or other building components prior to providing the Owner and its agents an opportunity to perform an inspection of the Work.

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- 8.5.2.1 Should corrections of the Work be required for approval, do not cover up corrected Work until the Owner indicates approval.
- 8.5.2.2 Provide notification of at least five (5) working days or otherwise as mutually agreed, to the ODR of the anticipated need for a cover up inspection. Should the ODR fail to make the necessary inspection within the agreed period, the Contractor may proceed with cover up Work, but is not relieved of responsibility for Work to comply with requirements of the Contract Documents.

## Article 9. Construction Schedules

- 9.1. Contract Time. TIME IS AN ESSENTIAL ELEMENT OF THE CONTRACT. The Contract Time is the time between the dates indicated in the Notice to Proceed for commencement of the Work and for achieving Substantial Completion and Final Completion. The Contract Time can be modified only by Change Order. Failure to achieve Substantial Completion within the Contract Time, Final Completion within thirty (30) days following Substantial Completion or as otherwise agreed to in writing will cause damage to the Owner and may subject the Contractor to Liquidated Damages as provided in the Contract Documents.
- 9.2. Notice to Proceed. The Owner will issue a Notice to Proceed which shall state the dates for beginning Work and for achieving Substantial Completion and Final Completion of the Work.
- 9.3. Work Progress Schedule. Refer to Special Conditions and Division 1 General Administration Specifications for additional schedule requirements. Unless indicated otherwise in those documents, Contractor shall submit their initial Work Progress Schedule for the Work in relation to the entire Project not later than twenty-one (21) days after the effective date of the Notice to Proceed to the ODR and the AE. . Unless otherwise indicated in the Contract Documents, the Work Progress Schedule shall be computerized Critical Path Method (CPM) with full reporting capability. This initial schedule shall indicate the dates for starting and completing the various aspects required to complete the Work, including mobilization, procurement, installation, testing, inspection, and acceptance of all the Work of the Contract. When acceptable to the Owner, the initially accepted schedule shall be the Baseline Schedule for comparison to actual conditions throughout the contract duration.
- 9.3.1 Schedule Requirements. Submit electronic and paper copy of the initial Work Progress Schedule reflecting accurate and reliable representations of the planned progress of the Work, the Work to date if any, and of the Contractor's actual plans for its completion. Organize and provide adequate detail so the Schedule is capable of measuring and forecasting the effect of delaying events on completed and uncompleted activities.
- 9.3.1.1 Re-submit initial Schedule as required to address review comments from AE and ODR until such Schedule is accepted as the Baseline Schedule.
- 9.3.1.2 Submittal of a schedule, schedule revision or schedule update constitutes the Contractor's representation to the Owner of the accurate depiction of all progress to date and that the Contractor will follow the schedule as submitted in performing the Work.
- 9.3.2 Schedule Updates. Update the Work Progress Schedule and the Submittal Schedule monthly, as a minimum, to reflect progress to date



and current plans for completing the Work, and submit paper and electronic copy of the update to the AE and ODR as directed. The Owner has no duty to make progress payments unless accompanied by the updated Work Progress Schedule. Show the anticipated date of completion reflecting all extensions of time granted through Change Order as of the date of the update. The Contractor may revise the Progress Schedule logic only with the Owner's concurrence when in the Contractor's judgment it becomes necessary for the management of the Work. Identify all proposed changes to schedule logic to Owner and to the AE via an Executive Summary accompanying the updated schedule for review prior to implementation of revisions.

9.3.3 The Work Progress Schedule is for the Contractor's use in managing the Work and submittal of the Schedule, and successive updates or revisions, is for the information of the Owner and to demonstrate that the Contractor has complied with requirements for planning the Work. The Owner's acceptance of a schedule, schedule update or revision constitutes the Owner's agreement to coordinate its own activities with the Contractor's activities as shown on the schedule.

9.3.3.1 Acceptance of the Work Progress Schedule, or update and/or revision thereto does not indicate any approval of the Contractor's proposed sequences and duration.

9.3.3.2 Acceptance of a Work Progress Schedule update or revision indicating early or late completion does not constitute the Owner's consent, alter the terms of the Contract, or waive either the Contractor's responsibility for timely completion or the Owner's right to damages for the Contractor's failure to do so.

9.3.3.3 The Contractor's scheduled dates for completion of any activity or the entire Work do not constitute a change in terms of the contract. Change Orders are the only method of modifying the completion Date(s) and Contract time.

9.4. Ownership of Float. Unless indicated otherwise in the Contract Documents, the Contractor shall develop the schedule and their execution plan to provide a minimum of 10 percent total float at the project level at acceptance of the Baseline Schedule. Float time contained in the Work Progress Schedule is not for the exclusive benefit of the Contractor or the Owner, but belongs to the Project and may be consumed by either party as needed on a first-used basis.

9.5. Completion of Work. The Contractor is accountable for completing the Work in the time stated in the Contract, or as otherwise amended by Change Order.

9.5.1 If, in the judgment of the Owner, the work is behind schedule and the rate of placement of work is inadequate to regain scheduled progress to insure timely completion of the entire work or a separable portion thereof, the Contractor, when so informed by the Owner, shall immediately take action to increase the rate of work placement by:

- 9.5.1.1 An increase in working forces.
  - 9.5.1.2 An increase in equipment or tools.
  - 9.5.1.3 An increase in hours of work or number of shifts.
  - 9.5.1.4 Expedite delivery of materials.
  - 9.5.1.5 Other action proposed if acceptable to Owner.
- 9.5.2 Within ten (10) calendar days after such notice from the ODR, the Contractor shall notify the ODR in writing of the specific measures taken and/or planned to increase the rate of progress. Include an estimate as to the date of scheduled progress recovery and an updated Work Progress Schedule illustrating the Contractor's plan for achieving timely completion of the project. Should the ODR deem the plan of action inadequate, take additional steps or make adjustments as necessary to its plan of action until it meets with the ODR's approval.

9.6 Modification of the Contract Time

- 9.6.1 Delays and extension of time as hereinafter described are valid only if executed in accordance with provisions set forth in Article 11.
- 9.6.2 When a delay defined herein as excusable prevents the Contractor from completing the Work within the Contract Time, the Contractor is entitled to an extension of time. The Owner will make an equitable adjustment and extend the number of calendar days lost because of excusable delay, as measured by the Contractor's progress schedule. All extensions of time will be granted in calendar days. In no event, however, will an extension of time be granted for delays that merely extend the duration of non-critical activities, or which only consume float without delaying the project completion date.
  - 9.6.2.1 "A Weather Day" is a day on which the Contractor's current schedule indicates Work is to be done, and on which inclement weather and related site conditions prevent the Contractor from performing seven continuous hours of Work between the hours of 7:00 a.m. and 6:00 p.m. Weather days are excusable delays. When weather conditions at the site prevent work from proceeding, immediately notify the ODR for confirmation of the conditions. At the end of each calendar month, submit to the ODR and AE a list of Weather Days occurring in that month along with documentation of the impact on critical activities. Based on confirmation by the ODR, any time extension granted will be issued by Change Order. If the Contractor and Owner cannot agree on the time extension, the Owner may issue a ULCO for fair and reasonable time extension.

- 9.6.2.2 Excusable Delay. The Contractor is entitled to an equitable adjustment of time, issued via change order, for delays caused by the following:
- 9.6.2.2.1 Errors, omissions and imperfections in design which the AE corrects by means of changes in the drawings and specifications.
  - 9.6.2.2.2 Unanticipated physical conditions at the Site which the AE corrects by means of changes to the drawings and specifications or for which the ODR directs changes in the Work identified in the Contract Documents.
  - 9.6.2.2.3 Changes in the Work that effect activities identified in the Contractor's schedule as "critical" to completion of the entire Work, if such changes are ordered by the ODR or the AE.
  - 9.6.2.2.4 Suspension of Work for unexpected natural events (sometimes called "acts of God"), civil unrest, strikes or other events which are not within the reasonable control of the Contractor.
  - 9.6.2.2.5 Suspension of Work for convenience of the ODR, which prevents Contractor from completing the Work within the Contract Time.
- 9.6.3 The Contractor's relief in the event of such delays is the time impact to the critical path as determined by analysis of the Contractor's schedule. In the event that the Contractor incurs additional direct costs because of the delay, they are to be determined pursuant to the provisions of Article 11.
- 9.7 No Damages for Delay. The Contractor has no claim for monetary damages for delay or hindrances to the work from any cause, including without limitation any act or omission of the Owner.
- 9.8 Concurrent Delay. When the completion of the Work is simultaneously delayed by an excusable delay and a delay arising from a cause not designated as excusable, the Contractor may not be entitled to a time extension for the period of concurrent delay
- 9.9 Other Time Extension Requests. Time extensions requested in association with changes to the Work directed or requested by the Owner shall be included with the Contractor's proposed costs for such change. Time extensions requested for inclement weather are covered by paragraph 9.6.2.1 above. If the Contractor believes that the completion of the Work is delayed by a circumstance other than for changes directed to the Work or weather, they shall give the ODR written notice, stating the nature of the delay and the activities potentially affected, within five (5) calendar days after the onset of the event or circumstance giving rise to the excusable delay. Provide sufficient written evidence to document the delay. In the case of a continuing cause of delay, only one claim is necessary. State claims for extensions of time in numbers of whole or half calendar days.

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- 9.9.1 Within ten (10) calendar days after the cessation of the delay, the Contractor shall formalize its request for extension of time in writing to include a full analysis of the schedule impact of the delay and substantiation of the excusable nature of the delay. All Changes to the Contract Time or made as a result of such claims is by Change Order, as set forth in Article 11.
- 9.9.2 No extension of time releases the Contractor or the Surety furnishing a performance or payment bond from any obligations under the contract or such a bond. Those obligations remain in full force until the discharge of the Contract.
- 9.9.3 Contents of Time Extension Requests. Provide with each Time Extension Request a quantitative demonstration of the impact of the delay on project completion time, based on the Work Progress Schedule. Include with Time Extension Requests a reasonably detailed narrative setting forth:
  - 9.9.3.1 The nature of the delay and its cause; the basis of the Contractor's claim of entitlement to a time extension.
  - 9.9.3.2 Documentation of the actual impacts of the claimed delay on the critical path indicated in the Contractor's Work Progress Schedule, and any concurrent delays.
  - 9.9.3.3 Description and documentation of steps taken by the Contractor to mitigate the effect of the claimed delay, including, when appropriate, the modification of the Work Progress Schedule.
- 9.9.4 Owner's Response. The Owner will respond to the Time Extension Request by providing to the Contractor written notice of the number of days granted, if any, and giving its reason if this number differs from the number of days requested by the Contractor.
  - 9.9.4.1 The Owner will not grant time extensions for delays that do not affect the Contract Completion Date.
  - 9.9.4.2 The Owner will respond to each properly submitted Time Extension Request within fifteen (15) calendar days following receipt. If the Owner cannot reasonably make a determination about the Contractor's entitlement to a time extension within that time, the Owner will notify the Contractor in writing. Unless otherwise agreed by the Contractor, the Owner has no more than fifteen (15) additional calendar days to prepare a final response. If the Owner fails to respond within forty-five (45) calendar days from the date the Time Extension Request is received, the Contractor is entitled to a time extension in the amount requested.
- 9.10 Failure to Complete Work Within the Contract Time. **TIME IS OF THE ESSENCE OF THIS CONTRACT.** The Contractor's failure to substantially complete the Work within the Contract Time or to achieve final completion as required will cause damage to the Owner. These damages are liquidated

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by agreement of the Contractor and the Owner, as set forth in the Contract Documents. -

- 9.11 Liquidated Damages. The Owner may collect Liquidated Damages due from the Contractor directly or indirectly by reducing the contract sum in the amount of Liquidated Damages stated in the Contract Documents.

## Article 10. Payments

10.1. Schedule of Values. The Contractor shall submit to the ODR and the AE for acceptance a Schedule of Values, or Work Breakdown, accurately itemizing material and labor for the various classifications of the Work based on the organization of the specification sections and using the same activity names and terms as the Work Progress Schedule. The accepted Schedule of Values will be the basis for the progress payments under the Contract.

10.1.1 No progress payments will be made prior to receipt and acceptance of the Schedule of Values, provided in such detail as required by the ODR, and submitted not less than twenty-one calendar (21) days prior to the first request for payment. The Schedule of Values shall follow the order of trade divisions of the specifications and include costs for general conditions, fees, contingencies, and Owner cash allowances, if applicable, so that the sum of the items will equal the contract price. As appropriate, assign each item labor and/or material values, the subtotal thereof equaling the value of the work in place when complete.

10.1.2 The Contractor shall retain a copy of all worksheets used in preparation of its bid or proposal, supported by a notarized statement that the worksheets are true and complete copies of the documents used to prepare the bid or proposal. Make the worksheets available to the ODR at the time of Contract execution. Thereafter grant the Owner during normal business hours access to said notarized copy of worksheets at any time during the period commencing upon execution of the Contract and ending one year after final payment.

10.2. Progress Payments. The Contractor will receive periodic progress payments for Work performed, materials in place, suitably stored on site, or as otherwise agreed to by the Owner and the Contractor. Payment is not due until receipt by the ODR or his designee of a correct and complete Pay Application in electronic and/or hard copy format as set forth in Supplementary General Conditions, Special Conditions or Division 1 Specifications, and certified by the AE. Progress payments are made provisionally and do not constitute acceptance of work not in accordance with the Contract Documents. The Owner will not process progress payment applications for Change Order work until all parties execute the Change Order.

10.2.1 Preliminary Pay Worksheet once each month that a progress payment is to be requested, the Contractor shall submit to the Architect/Engineer and the ODR a complete, clean copy of a preliminary pay worksheet or Preliminary Pay Application, to include the following:

10.2.1.1 The Contractor's estimate of the amount of Work performed, labor furnished and materials incorporated into the Work, using the established Schedule of Values.

- 10.2.1.2 An updated Work Progress Schedule including the Executive Summary and all required schedule reports.
- 10.2.1.3 HUB Subcontracting Plan reports.
- 10.2.1.4 Such additional documentation as Owner may require as set forth in the Supplementary General Conditions or elsewhere in the Contract Documents.
- 10.2.2 Contractor's Application for Progress Payment. As soon as practicable, but in no event later than seven days after receipt of the Preliminary Pay Worksheet, the AE and ODR will meet with the Contractor to review the Preliminary Pay Worksheet and to observe the condition of the Work. Based on this review, the ODR and the AE may require modifications to the Preliminary Pay Worksheet prior to the submittal of an application for progress payment, and will promptly notify the Contractor of revisions necessary for approval. As soon as practicable, the Contractor shall submit its Invoice on the appropriate and completed form, reflecting the required modifications to the Schedule of Values required by the AE and/or ODR. Attach all additional documentation required by the ODR and/or AE, as well as an affidavit affirming that all payrolls, bills for labor, materials, equipment, subcontracted work and other indebtedness connected with the Contractor's invoice are paid or will be paid within the time specified in Tex. Gov't Code, Chapter 2251. No invoice is complete unless it fully reflects all required modifications, and attaches all required documentation including the Contractor's affidavit.
- 10.2.3 Certification by Architect/Engineer. Within five days or earlier following the AE's receipt of the Contractor's formal invoice, the AE will review the application for progress payment for completeness, and forward to the ODR. The AE will certify that the application is complete and payable, or that it is incomplete, stating in particular what is missing. If the Invoice is incomplete, the Contractor shall make the required corrections and resubmit the Invoice for processing.
- 10.3 Owner's Duty to Pay. The Owner has no duty to pay the Contractor except on receipt by the ODR of; 1) a complete Invoice certified by the AE and 2) the Contractor's updated Work Progress Schedule, and 3) confirmation that the Contractor's as-built documentation at the site is kept current.
  - 10.3.1 Payment for stored materials and/or equipment confirmed by the Owner and AE to be on-site or otherwise properly stored is limited to 85 percent of the invoice price or 85 percent of the scheduled value for the materials or equipment, whichever is less.
  - 10.3.2 Retainage. The Owner will withhold from each progress payment, as retainage, 5 percent of the total earned amount, the amount authorized by law, or as otherwise set forth in the Supplementary General Conditions. - Retainage is managed in conformance with Tex. Gov't Code, Chapter 2252, Government Code, subchapter B.

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- 10.3.2.1 The Contractor shall provide written consent of its Surety for any request for reduction or release of retainage.
- 10.3.2.2 At least sixty-five (65) percent of the total Contract must be completed before the Owner can consider a retainage reduction or release.
- 10.3.3 Price Reduction to Cover Loss. The Owner may reduce any Periodic Invoice, or application for Progress Payment, prior to payment to the extent necessary to protect the Owner from loss on account of actions of the Contractor including, but not limited to:
  - 10.3.3.1 Defective or incomplete Work not remedied.
  - 10.3.3.2 Damage to Work of a separate Contractor.
  - 10.3.3.3 Failure to maintain scheduled progress or reasonable evidence that the Work will not be completed within the Contract Time.
  - 10.3.3.4 Persistent failure to carry out the Work in accordance with the Contract Documents.
  - 10.3.3.5 Reasonable evidence that the Work cannot be completed for the unpaid portion of the contract sum.
  - 10.3.3.6 Assessment of fines for violations of Prevailing Wage Rate law; or
  - 10.3.3.7 Failure to include the appropriate amount of retainage for that periodic progress payment.
- 10.3.4 Title to all material and Work covered by progress payments transfers to the Owner upon payment.
  - 10.3.4.1 Transfer of title to Owner does not relieve the Contractor of the sole responsibility for the care and protection of materials and Work upon which payments have been made until final acceptance of the entire Work, or the restoration of any damaged Work, or waive the right of the Owner to require the fulfillment of all the terms of the Contract.
- 10.4 Progress payments to the Contractor do not release the Contractor or its surety from any obligations under this Contract.
  - 10.4.1 Upon the Owner's request, the Contractor shall furnish manifest proof of the status of Subcontractor's accounts in a form acceptable to the Owner.
  - 10.4.2 Pay estimate certificates must be signed by a corporate officer or a representative duly authorized by the Contractor.
  - 10.4.3 Provide copies of bills of lading, invoices, delivery receipts or other evidence of the location and value of such materials in requesting payment for materials.



- 10.4.4 For purposes of Tex. Gov't Code § 2251.021 (a) (2), the date the performance of service is complete is the date when the Owner's representative approves the application for payment.
- 10.5 Off-Site Storage. With prior approval by the Owner and in the event Contractor elects to store materials at an off-site location, abide by the following conditions, unless otherwise agreed to in writing by the Owner.
- 10.5.1.1 Store materials in a Bonded Commercial Warehouse.
  - 10.5.1.2 Provide separate Insurance Coverage adequate not only to cover materials while in storage, but also in transit from the off-site storage areas to the project site. Copies of duly authenticated Certificates of Insurance, made out to insure the State Agency which is signatory to the contract, must be filed with the Owner's representative.
  - 10.5.1.3 Inspection by Owner's representative is allowed at any time. The Owner's Inspectors must be satisfied with the security, control, maintenance, and preservation measures.
  - 10.5.1.4 Materials for this project are physically separated and marked for the project in a sectioned-off area. Only materials which have been approved through the submittal process are to be considered for payment.
  - 10.5.1.5 Owner reserves the right to reject materials at any time prior to final acceptance of the complete Contract if they do not meet Contract requirements regardless of any previous progress payment made.
  - 10.5.1.6 With each monthly payment estimate, submit a report to the ODR, AE, and Inspector listing the quantities of materials already paid for and still stored in the off-site location.
  - 10.5.1.7 Make warehouse records, receipts and invoices available to Owner's representatives, upon request, to verify the quantities and their disposition.
  - 10.5.1.8 In the event of Contract termination or default by Contractor, the items in storage off-site, upon which payment has been made, will be promptly turned over to Owner or Owner's agents at a location near the jobsite as directed by the ODR. The full provisions of PERFORMANCE AND PAYMENT BONDS on this project cover the materials off-site in every respect as though they were stored on the Project Site.

## Article 11. Changes

- 11.1. Change Orders. A Change Order issued after execution of the Contract is a written order to the Contractor, signed by the ODR, the Contractor, and the Architect/Engineer, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time can only be changed by Change Order. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum and/or the Contract Time. The ODR may issue written authorization for the Contractor to proceed with work of a change order in advance of final execution by all parties.
- 11.1.1 The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, and the Contract Sum and the Contract Time will be adjusted accordingly. All such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents. If such changes cause an increase or decrease in the Contractor's cost of, or time required for, performance of the Contract, an equitable adjustment shall be made and confirmed in writing in a Change Order.
- 11.1.2 It is recognized by the parties hereto and agreed by them that the specifications and drawings may not be complete or free from errors, omissions and imperfections or that they may require changes or additions in order for the work to be completed to the satisfaction of Owner and that, accordingly, it is the express intention of the parties, notwithstanding any other provisions in this Contract, that any errors, omissions or imperfections in such specifications and drawings, or any changes in or additions to same or to the work ordered by Owner and any resulting delays in the work or increases in Contractor's costs and expenses, shall not constitute or give rise to any claim, demand or cause of action of any nature whatsoever in favor of Contractor, whether for breach of contract, *quantum meruit*, or otherwise; provided, however, that Owner shall be liable to Contractor for the sum stated to be due Contractor in any Change Order approved and signed by both parties, it being agreed hereby that such sum, together with any extension of time contained in said Change Order, shall constitute full compensation to Contractor for all costs, expenses and damages to Contractor, whether direct, consequential or otherwise in any wise incident to, arising out of, or resulting directly or indirectly from the work performed by Contractor under such Change Order.
- 11.1.3 Procedures for administration of Change Orders shall be established by the Owner and stated in Supplementary General Conditions, Special Conditions, or elsewhere in the Contract Documents.

- 11.1.4 Except as provided above, no order, oral statement, or direction of the Owner or his duly appointed representative shall be treated as a change under this article or entitle the Contractor to an adjustment.
- 11.1.5 The Contractor agrees that the Owner or any of its duly authorized representatives shall have access and the right to examine any directly pertinent books, documents, papers, and records of the Contractor. Further, the Contractor agrees to include in all its subcontracts a provision to the effect that the subcontractor agrees that the Owner or any of its duly authorized representatives shall have access to and the right to examine any directly pertinent books, documents, papers and records of such contractor relating to any claim arising from this Contract, whether or not the subcontractor is a party to the claim. The period of access and examination described herein which relates to appeals under the Disputes article of the Contract, litigation, or the settlement of claims arising out of the performance of this Contract shall continue until final disposition of such claims, appeals or litigation.
- 11.2. Unit Prices: If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated are so changed in a proposed Change Order that application of the agreed unit prices to the quantities of work proposed will cause substantial inequity to the Owner or the Contractor, the applicable unit prices shall be equitably adjusted as provided in the Special Conditions or as agreed to by the parties and incorporated into Change Order.
- 11.3. Claims for Additional Costs
  - 11.3.1 If the Contractor wishes to make a claim for an increase in the Contract Sum not related to a requested change, they shall give the Owner and the Architect/Engineer written notice thereof within twenty-one (21) days after the occurrence of the event giving rise to such claim, but, in any case before proceeding to execute the work considered to be additional cost or time, except in an emergency endangering life or property in which case the Contractor shall act in accordance with Article 7.2.1. No such claim shall be valid unless so made. If the Owner and the Contractor cannot agree on the amount of the adjustment in the Contract Sum, it shall be determined as set forth under Article 15. Any change in the Contract Sum resulting from such claim shall be authorized by Change Order.
  - 11.3.2 If the Contractor claims that additional cost is involved because of, but not limited to, 1) any written interpretation of the Contract Documents, 2) any order by the Owner to stop the Work pursuant to Article 14 where the Contractor was not at fault, 3) any written order for a minor change in the Work issued pursuant to Article 11.4, the Contractor shall make such claim as provided in Article 11.3.1.

- 11.3.3 Should the Contractor or his Subcontractors fail to call attention of the AE to obvious discrepancies or omissions in the Bid/Proposal Documents during the pre-bid/pre-proposal period, but claim additional costs for corrective work after contract award, the Owner may assume intent to circumvent competitive bidding for necessary corrective work. In such case, the Owner may choose to let a separate contract for the corrective work, or issue a Unilateral Change Order to require performance by the Contractor. Claims for time extensions or for extra cost resulting from delayed notice of contract document discrepancies or omissions will not be considered by the Owner.
- 11.4. Minor Changes. The AE, with concurrence of the ODR, will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time. Such changes shall be effected by written order which the Contractor shall carry out promptly and record on as-built record documents.
- 11.5. Concealed Site Conditions. If, in the performance of the Contract, subsurface, latent or concealed conditions at the site are found to be materially different from the information included in the bid/proposal documents, or if unknown conditions of an unusual nature are disclosed differing materially from the conditions usually inherent in work of the character shown and specified, the ODR and the Architect/Engineer shall be notified in writing of such conditions before they are disturbed. Upon such notice, or upon its own observation of such conditions, the Architect/Engineer, with the approval of the ODR, will promptly make such changes in the Drawings and Specifications as they deem necessary to conform to the different conditions, and any increase or decrease in the cost of the Work, or in the time within which the Work is to be completed, resulting from such changes will be adjusted by Change Order, subject to the prior approval of the ODR.
- 11.6. Extension of Time. All Changes to the Contract Time shall be made as a consequence of requests as required under Article 9.6, and as documented by Change Order as provided under Article 11.1.
- 11.7. Administration of Change Order Requests
- All changes in the Contract shall be administered in accordance with procedures approved by the Owner, and when required make use of such electronic information management system(s) as the owner may employ.
- 11.7.1 Routine changes in the Construction Contract shall be formally initiated by the Architect/Engineer by means of a Change Request form detailing requirements of the proposed change for pricing by the Contractor. This action may be preceded by communications between the Contractor, AE and ODR concerning the need and nature of the change, but such communications shall not constitute a basis for beginning the proposed Work by the Contractor. Except for emergency conditions described below, approval of the Contractor's

cost proposal by the Architect/Engineer and ODR will be required for authorization to proceed with the Work being changed. The Owner will not be responsible for the cost of work changed without prior approval and the Contractor may be required to remove work so installed.

- 11.7.2 All proposed costs for change order work must be supported by itemized accounting of material, equipment and associated itemized installation costs in sufficient detail, following the outline and organization of the established Schedule of Values, to permit analysis by the AE and ODR using current estimating guides and/or practices. Photocopies of Subcontractor and vendor proposals shall be furnished unless specifically waived by the ODR. Contractor shall provide written response to change request within twenty-one (21) calendar days of receipt.
- 11.7.3 Any unexpected circumstance which necessitates an immediate change in order to avoid a delay in progress of the Work may be expedited by verbal communication and authorization between the Contractor and Owner, with written confirmation following within twenty-four (24) hours. A limited scope not-to-exceed estimate of cost and time will be requested prior to authorizing Work to proceed. Should the estimate be impractical for any reason, the ODR may authorize the use of detailed cost records of such work to establish and confirm the actual costs and time for documentation in a formal Change Order.
- 11.7.4 Emergency changes to save life or property may be initiated by the Contractor alone (see Article 7.3) with the claimed cost and/or time of such work to be fully documented as to necessity and detail of the reported costs and/or time.

11.8. Pricing Change Order Work

The amounts that the Contractor and/or its Subcontractors add to a Change Order for profit and overhead will also be considered by the Owner before approval is given. The amounts established hereinafter are the maximums that are acceptable to the Owner.

- 11.8.1 For work performed by its forces, the Contractor will be allowed their actual costs for materials, the total amount of wages paid for labor, the total cost of Federal Old Age Benefit (Social Security Tax) and of Worker's Compensation and Comprehensive General Liability Insurance, plus Bond cost if the change results in an increase in the Bond premium paid by the Contractor. To the total of the above costs, the Contractor will be allowed to add a percentage as noted below to cover overhead and profit combined. Overhead shall be considered to include insurance other than mentioned above, field and office supervisors and assistants, including safety and scheduling personnel, use of small tools, incidental job burdens and general Home Office expenses, and no separate allowance will be made therefore.

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Allowable percentages for overhead and profit on changes will not exceed 15 percent if the total of self-performed work is less than or equal to \$10,000, 10 percent if the total of self-performed work is between \$10,000 and \$20,000 and 7.5 percent if the total of self-performed work is over \$20,000, for any specific change priced.

- 11.8.2 For subcontracted Work each affected Subcontractor shall figure its costs, overhead and profit as described above for Contractor's work, all subcontractor costs shall be combined, and to that total subcontractor cost the Contractor will be allowed to add a maximum mark-up of 10 percent if the total of all subcontracted work is less than or equal to \$10,000, 7.5 percent if the total of all subcontracted work is between \$10,000 and \$20,000 and 5 percent if the total of all subcontractor work is over \$20,000.

- 11.8.3 On changes involving both additions and deletions, percentages for overhead and profit will be allowed only on the net addition.

The Owner does not accept and will not pay for additional contract cost identified as indirect, consequential, or as damages caused by delay.

## **Article 12. Project Completion and Acceptance**

### **12.1. Closing Inspections**

12.1.1 **Substantial Completion Inspection.** When the Contractor considers the entire Work or part thereof Substantially Complete, it shall notify the ODR in writing that the Work will be ready for Substantial Completion Inspection on a specific date. The Contractor shall include with this notice the Contractor's Punchlist to indicate that it has previously inspected all the Work associated with the request for inspection, has corrected items where possible, and includes all items scheduled for completion or correction prior to final inspection. The failure to include any items on this list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. If any of the items on this list prevents the building from the use to which it is intended, the Contractor shall not request a Substantial Completion Inspection. The Owner and its representatives will review the list of items and schedule the requested inspection, or inform the Contractor in writing that such an inspection is premature because the Work is not sufficiently advanced or conditions are not as represented on the Contractor's list.

12.1.1.1. Prior to the Substantial Completion Inspection, the Contractor shall furnish a copy of its marked-up As-Built Drawings and a preliminary copy of each instructional manual, maintenance and operating manual, parts catalog, wiring diagrams, spare parts, specified written warranties and like publications or parts for all installed equipment, systems and like items. Delivery of these items is a prerequisite for requesting the Substantial Completion Inspection.

12.1.1.2. On the date requested by Contractor, or as mutually agreed upon pending the status of the open items list, the AE, ODR, the Contractor and other Owner representatives as determined by the Owner, will jointly attend the Substantial Completion Inspection, which shall be conducted by the ODR or their delegate. If the ODR determines that the Work is Substantially Complete, the ODR will issue a Certificate of Substantial Completion to be signed by the AE, Owner and Contractor, establishing the date of Substantial Completion. AE will provide with this certificate a list of punchlist items (the Pre-Final Punchlist) for completion prior to final inspection. This list may include items in addition to those on the Contractor's punchlist, which the inspection team deems necessary to correct or complete prior to Final Inspection. If the Owner occupies the facility upon determination of Substantial Completion, the Contractor shall complete all corrective Work at the

convenience of the Owner, without disruption to Owner's use of the facility for its intended purposes.

- 12.1.2 Final Inspection. The Contractor shall complete the list of items identified on the Pre-Final Punchlist prior to requesting a Final Inspection. Unless otherwise specified, or otherwise agreed in writing by the parties as documented on the Certificate of Substantial Completion, the Contractor shall complete and/or correct all Work within thirty (30) days of the Substantial Completion date. Upon completion of the Pre-Final Punchlist work, the Contractor shall give written notice to the ODR and AE that the Work will be ready for Final Inspection on a specific date. The Contractor shall accompany this notice with a copy of the updated Pre-Final Punchlist indicating resolution of all items. On the date specified or as soon thereafter as is practicable, the ODR, AE and the Contractor will inspect the Work. The AE will submit to the Contractor a Final Punchlist of open items that the inspection team requires corrected or completed before final acceptance of the Work.
- 12.1.2.1 Correct or complete all items on the Final Punchlist before requesting Final Payment. Unless otherwise agreed to in writing by the parties, complete this work within seven (7) days of receiving the Final Punchlist. Upon completion of the Final Punchlist, notify the AE and ODR in writing stating the disposition of each Final Punchlist item. The AE, Owner and Contractor shall promptly inspect the completed items. When the Final Punchlist is complete, and the Contract is fully satisfied according to the Contract Documents the ODR will issue a certificate establishing the date of Final Completion. Completion of all Work is a condition precedent to the Contractor's right to receive Final Payment.
- 12.1.3 Annotation. Any Certificate issued under this Article may be annotated to indicate that it is not applicable to specified portions of the Work, or that it is subject to any limitation as determined by the Owner.
- 12.1.4 Purpose of Inspection. Inspection is for determining the completion of the Work, and does not relieve the Contractor of its overall responsibility for completing the Work in a good and competent fashion, in compliance with the Contract. Work accepted with incomplete punchlist items or failure of the Owner or other parties to identify Work that does not comply with the Contract Documents or is defective in operation or workmanship does not constitute a waiver of the Owner's rights under the Contract or relieve the Contractor of its responsibility for performance or warranties.
- 12.1.5 Additional Inspections
  - 12.1.5.1 If the Owner's inspection team determines that the Work is not Substantially Complete at the Substantial Completion



Inspection, the ODR or AE will give the Contractor written notice listing cause(s) of the rejection. The ODR will set a time for completion of incomplete or defective work. Complete or correct all work so designated prior to requesting a second Substantial Completion Inspection.

12.1.5.2 If the Owner's inspection team determines that the Work is not complete at the Final Inspection, the ODR or the AE will give the Contractor written notice listing the cause(s) of the rejection. The ODR will set a time for completion of incomplete or defective work. The Contractor shall complete or correct all Work so designated prior to again requesting a Final Inspection.

12.1.5.3 The Contract Agreement contemplates three (3) comprehensive inspections: the Substantial Completion Inspection, the Final Completion Inspection, and the Inspection of Completed Final Punchlist Items. The cost to the Owner of additional inspections resulting from the Work not being ready for one or more of these inspections is the responsibility of the Contractor. The Owner may issue a Unilateral Change Order deducting these costs from Final Payment. Upon the Contractor's written request, the Owner will furnish documentation of any costs so deducted. Work added to the Contract by Change Order after Substantial Completion Inspection is not corrective work for purposes of determining timely completion, or assessing the cost of additional inspections.

12.1.6 Phased Completion. The contract may provide, or project conditions may warrant, as determined by the ODR, that designated elements or parts of the Work be completed in phases. Where phased completion is required or specifically agreed to by the parties, the provisions of the contract related to Closing Inspections, Occupancy and Acceptance apply independently to each designated element or part of the Work. For all other purposes, unless otherwise agreed by the parties in writing, Substantial Completion of the Work as a whole is the date on which the last element or part of the Work completed receives a Substantially Completion certificate. Final Completion of the Work as a whole is the date on which the last element or part of the Work completed receives a Final Completion certificate.

12.2 Owner's Right of Occupancy. The Owner may occupy or use all or any portion of the Work following Substantial Completion, or at any earlier stage of completion. Should the Owner wish to use or occupy the Work, or part thereof, prior to Substantial Completion, the ODR will notify the Contractor in writing. Work performed on the premises by third parties on the Owner's behalf does not constitute occupation or use of the Work by the Owner for purposes of this Article. All Work performed by the Contractor after

occupancy, whether in part or in whole, shall be at the convenience of the Owner so as to not disrupt Owner's use of, or access to occupied areas of the project.

12.3 Acceptance & Payment

12.3.1 Request for Final Payment. Following the certified completion of all work, including all punch list items, cleanup, and the delivery of record documents, the Contractor shall submit a certified Application for Final Payment. Include all sums held as retainage and forward to the AE and the ODR for review and approval.

12.3.2 Final Payment Documentation. Submit, prior to or with the Application for Final Payment, final copies of all close out documents, maintenance and operating instructions, guarantees and warranties, certificates, record documents and all other items required by the Contract. Submit Consent of Surety to Final Payment and an affidavit that all payrolls, bills for materials and equipment, subcontracted work and other indebtedness connected with the Work, except as specifically noted, are paid, will be paid, or otherwise satisfied within the period of time required by Tex. Gov't Code, Chapter 2251. Furnish documentation establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of claims and liens arising out of the Contract. The Contractor may not subsequently submit a claim on behalf of a subcontractor or vendor unless the Contractor's affidavit notes that claim as an exception.

12.3.3 Architect/Engineer Approval. The AE will review a submitted Application for Final Payment promptly but in no event later than ten (10) days after its receipt. Prior to the expiration of this deadline, the AE will either 1) return the Application for Final Payment to Contractor with corrections for action and resubmission or 2) accept it, note their approval and send to Owner.

12.3.4 Offsets and Deductions. The Owner may deduct from the Final Payment all sums due from the Contractor. If the Certificate of Final Completion notes any Work remaining, incomplete, or defects not remedied, the Owner may deduct the cost of remedying such deficiencies from the Final Payment. On such deductions, the Owner will identify each deduction, the amount, and the explanation of the deduction on or by the 21st day after Owner's receipt of an approved Application for Final Payment. Such offsets and deductions shall be incorporated via a final Change Order, including Unilateral Change Order as may be applicable.

12.3.5 Final Payment Due. Final Payment is due and payable by the Owner, subject to all allowable offsets and deductions, on the 31<sup>st</sup> day following the Owner's approval of the Application for Payment. If the Contractor disputes any amount deducted by the Owner, the Contractor shall give notice of the dispute on or before the thirtieth

(30<sup>th</sup>) day following receipt of Final Payment. Failure to do so will bar any subsequent claim for payment of amounts deducted.-

- 12.3.6 Effect of Final Payment. Final Payment constitutes a waiver of all claims by the Owner, relating to the condition of the Work except those arising from:
  - 12.3.6.1 Faulty or defective Work appearing after Substantial Completion (latent defects); and/or
  - 12.3.6.2 Failure of the Work to comply with the requirements of the Contract Documents; and/or
  - 12.3.6.3 Terms of any warranties required by the Contract, or implied by law; and/or
  - 12.3.6.4 Claims arising from personal injury or property damage to third parties.
- 12.3.7 Waiver of Claims. Final payment constitutes a waiver of all claims and liens by the Contractor except those specifically identified in writing and submitted to the ODR prior to the application for Final Payment.
- 12.3.8 Effect on Warranty. Regardless of approval and issuance of Final Payment, the Contract is not deemed fully performed by the Contractor and closed until the expiration of all warranty periods.

## Article 13. Warranty & Guarantee

- 13.1. Contractor's General Warranty and Guarantee. Contractor warrants to the Owner that all Work is executed in accordance with the Contract, complete in all parts and in accordance with approved practices and customs, and of the best finish and workmanship. The Contractor further warrants that unless otherwise specified, all materials and equipment incorporated in the Work under the Contract are new. The Owner may, at its option, agree in writing to waive any failure of the Work to conform to the Contract, and to accept a reduction in the Contract Price for the cost of repair or diminution in value of the Work by reason of such defect. Absent such a written agreement, the Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute and is not waived by any inspection or observation by the Owner, Architect/Engineer or others, by making any progress payment or final payment, by the use or occupancy of the Work or any portion thereof by the Owner, at any time, or by any repair or correction of such defect made by the Owner.
- 13.2. Warranty Period. Except as may be otherwise specified or agreed, the Contractor shall repair all defects in materials, equipment, or workmanship appearing within one year from the date of Substantial Completion of the Work. If Substantial Completion occurs by phase, then the warranty period for that particular Work begins on the date of such occurrence, or as otherwise stipulated on the Certificate of Substantial Completion for the particular Work.
- 13.3. Limits on Warranty. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
- 13.3.1 Modification or improper maintenance or operation by persons other than Contractor, Subcontractors, or any other individual or entity for whom Contractor is not responsible, unless Owner is compelled to undertake maintenance or operation due to the neglect of the Contractor.
  - 13.3.2 Normal wear and tear under normal usage after acceptance of the Work by the Owner.
- 13.4. Events Not Affecting Warranty. Contractor's obligation to perform and complete the Work in a good and workmanlike manner in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
- 13.4.1.1 Observations by Owner and/or AE.
  - 13.4.1.2 Recommendation to pay any progress or final payment by AE.

- 13.4.1.3 The issuance of a certificate of Substantial Completion or any payment by Owner to Contractor under the Contract Documents.
  - 13.4.1.4 Use or occupancy of the Work or any part thereof by Owner.
  - 13.4.1.5 Any acceptance by Owner or any failure to do so.
  - 13.4.1.6 Any review of a Shop Drawing or sample submittal; or
  - 13.4.1.7 Any inspection, test or approval by others.
- 13.5 Separate Warranties. If a particular piece of equipment or component of the Work for which the contract requires a separate warranty is placed in continuous service before Substantial Completion, the Warranty Period for that equipment or component will not begin until Substantial Completion, regardless of any warranty agreements in place between suppliers and/or Subcontractors and the Contractor. The ODR will certify the date of service commencement in the Substantial Completion Certificate.
- 13.5.1 In addition to the Contractor's warranty and duty to repair, the Contractor expressly assumes all warranty obligations required under the Contract for specific building components, systems and equipment.
  - 13.5.2 The Contractor may satisfy any such obligation by obtaining and assigning to the Owner a complying warranty from a manufacturer, supplier, or Subcontractor. Where an assigned warranty is tendered and accepted by the Owner which does not fully comply with the requirements of the Contract, the Contractor remains liable to the Owner on all elements of the required warranty not provided by the assigned warranty.
- 13.6 Correction of Defects. Upon receipt of written notice from the Owner, or any agent of the Owner designated as responsible for management of the Warranty Period, of the discovery of a defect, the Contractor shall promptly remedy the defect(s), and provide written notice to the Owner and designated agent indicating action taken. In case of emergency where delay would cause serious risk of loss or damage to the Owner, or if the Contractor fails to remedy within 30 days, or within another period agreed to in writing, the Owner may correct the defect and be reimbursed the cost of remedying the defect from the Contractor or its Surety.
- 13.7 Certification of No Asbestos Containing Materials or Work. The Contractor shall ensure compliance with the Asbestos Hazard Emergency Response Act (AHERA– 40 CFR 763-99 (7)) from all subcontractors and materials suppliers, and shall provide a notarized certification to the Owner that all equipment and materials used in fulfillment of their contract responsibilities are non Asbestos Containing building Materials (ACBM). This certification must be provided no later than the Contractor's application for Final Payment.

## **Article 14. Suspension and Termination**

- 14.1. Suspension of Work for Cause. The Owner may, at any time without prior notice, suspend all or any part of the Work, if after reasonable observation and/or investigation, the Owner determines it is necessary to do so to prevent or correct any condition of the Work, which constitutes an immediate safety hazard, or which may reasonably be expected to impair the integrity, usefulness or longevity of the Work when completed.
- 14.1.1.1. The Owner will give the Contractor a written notice of suspension for cause, setting forth the reason for the suspension and identifying the Work suspended. Upon receipt of such notice, the Contractor shall immediately stop the Work so identified. As soon as practicable following the issuance of such a notice, the Owner will initiate and complete a further investigation of the circumstances giving rise to the suspension, and issue a written determination of the findings.
- 14.1.1.2. If it is confirmed that the cause was within the control of the Contractor, the Contractor will not be entitled to an extension of time or any compensation for delay resulting from the suspension. If the cause is determined not to have been within the control of the Contractor, and the suspension has prevented the Contractor from completing the Work within the Contract Time, the suspension is an Excusable Delay and a Time Extension will be granted through a Change Order.
- 14.1.1.3. Suspension of work under this provision will be no longer than is reasonably necessary to remedy the conditions giving rise to the suspension.
- 14.2. Suspension of Work for Owner's Convenience. Upon seven (7) calendar days written notice to the Contractor, the Owner may at any time without breach of the Contract suspend all or any portion of the Work for a period of up to thirty days for its own convenience. The Owner will give the Contractor a written notice of suspension for convenience, which sets forth the number of suspension days for which the Work, or any portion of it, and the date on which the suspension of Work will cease. When such a suspension prevents the Contractor from completing the Work within the Contract Time, it is an Excusable Delay. A notice of suspension for convenience may be modified by the Owner at any time on seven (7) calendar days written notice to the Contractor. If the Owner suspends the Work for its convenience for more than 60 consecutive calendar days, the Contractor may elect to terminate the contract pursuant to the provisions of the contract.
- 14.3. Termination by Owner for Cause
- 14.3.1 The Owner may, without prejudice to any right or remedy, terminate the employment of the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and

## Uniform General Conditions

machinery thereon owned by the Contractor, under any of the following circumstances:

- 14.3.1.1 Persistent or repeated failure or refusal, except during complete or partial suspensions of work authorized under the Contract, to supply enough properly skilled workmen or proper materials; and/or
  - 14.3.1.2 Persistent disregard of laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, including the ODR; and/or
  - 14.3.1.3 Persistent failure to prosecute the work in accordance with the Contract, and to insure its completion within the time, or any approved extension thereof, specified in this Contract; and/or
  - 14.3.1.4 Failure to remedy defective work condemned by the ODR; and/or
  - 14.3.1.5 Failure to pay subcontractors, laborers, and material suppliers pursuant to Tex. Gov't Code Chapter 2251; and/or
  - 14.3.1.6 Persistent endangerment to the safety of labor or of the Work; and/or
  - 14.3.1.7 Failure to supply or maintain statutory bonds or to maintain required insurance, pursuant to the contract; and/or
  - 14.3.1.8 Any material breach of the Contract; and/or
  - 14.3.1.9 The Contractor's insolvency, bankruptcy, or demonstrated financial inability to perform the work.
- 14.4 Failure by the Owner to exercise the right to terminate in any instance is not a waiver of the right to do so in any other instance.
- 14.4.1 Should the Owner decide to terminate the employment of the Contractor under the provisions of Article 14.1.1, it will provide to the Contractor and its Surety thirty (30) days prior written notice.
  - 14.4.2 Should the Contractor or its Surety, after having received notice of termination, demonstrate to the satisfaction of the Owner, remedy to the condition(s) upon which the notice of termination was based, the notice of termination shall be rescinded in writing by the Owner. If so rescinded, the Work may continue without an extension of time.
  - 14.4.3 If the Contractor or its Surety fails to demonstrate remedy to the satisfaction of the Owner within thirty days following receipt of notice, the Owner may arrange for completion of the Work and deduct the cost of completion from the unpaid Contract Sum.
    - 14.4.3.1 This amount includes the cost of additional Owner costs such as AE services, other consultants, and contract administration.
    - 14.4.3.2 The Owner will make no further payment to the Contractor or its Surety until all costs of completing the Work are paid. If the

unpaid balance of the Contract Sum exceeds the costs of administering and finishing the Work, the Contractor will receive the excess funds. If such costs exceed the unpaid balance, the Contractor or its Surety will pay the difference to the Owner.

- 14.4.3.3 This obligation for payment survives the termination of the Contract.
- 14.4.3.4 The owner reserves the right in termination for cause to take assignment of all contracts between the Contractor and its Subcontractors, vendors and suppliers. The ODR will promptly notify the Contractor of the contracts the Owner elects to assume. Upon receipt of such notice, the Contractor shall promptly take all steps necessary to effect such assignment.
- 14.5 Termination for Convenience of Owner. The Owner reserves the right, without breach, to terminate the Contract prior to, or during the performance of the Work, for any reason. Upon such an occurrence, the following shall apply:
  - 14.5.1 The Owner will immediately notify the Contractor and the AE in writing, specifying the reason for and the effective date of contract termination. Such notice may also contain instructions necessary for the protection, storage or decommissioning of incomplete work or systems, and for safety.
  - 14.5.2 Upon receipt of the notice of termination, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due at that point in the Contract:
    - 14.5.4.1 Stop all work.
    - 14.5.4.2 Place no further subcontracts or orders for materials or services.
    - 14.5.4.3 Terminate all subcontracts.
    - 14.5.4.4 Cancel all materials and equipment orders as applicable.
    - 14.5.4.5 Take action that is necessary to protect and preserve all property related to this Contract which is in the possession of the Contractor.
  - 14.5.3 When the Contract is terminated for the Owner's convenience, the Contractor may recover from the Owner payment for all Work executed, including any additional work required pursuant to the notice of termination, and for any provable loss and reasonable expenses attributable to the Work resulting from such termination.
- 14.6 Termination By Contractor. If the Work is stopped for a period of ninety (90) days under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a contract with the



Contractor, then the Contractor may, upon thirty (30) additional days' written notice to the ODR, terminate the Contract and recover from the Owner payment for all Work executed and for any provable loss and reasonable expenses attributable to the Work resulting from such termination. If the cause of the work stoppage is removed prior to the end of the thirty (30) day notice period, the Contractor may not terminate the Contract.

- 14.7 Settlement on Termination. When the Contract is terminated for any reason, at any time prior to 180 days after the effective date of termination, the Contractor shall submit a final termination settlement proposal to the Owner based upon recoverable costs as provided under the contract. If the Contractor fails to submit the proposal within the time allowed, the Owner may determine the amount due to the Contractor because of the termination and pay the determined amount to the Contractor. -

## **Article 15. Dispute Resolution**

- 15.1 Unresolved Contractor Disputes. The dispute resolution process provided for in Tex. Gov't Code, Chapter 2260, shall be used by the Owner and the Contractor to attempt to resolve any claim for breach of contract made by the Contractor, that is not resolved under procedures described throughout the Uniform General Conditions, Supplemental Conditions, or Special Conditions of the Contract.
- 15.2 Alternative Dispute Resolution Process. The Owner may establish a dispute resolution process to be utilized in advance of that outlined in Tex. Gov't Code, Chapter 2260.

## Article 16. Miscellaneous

- 16.1. Supplemental and Special Conditions. When the Work contemplated by the Owner is of such a character that the foregoing Uniform General Conditions of the Contract cannot adequately cover necessary and additional contractual relationships, the Contract may include Supplemental and Special Conditions as described below:
- 16.1.1 Supplemental Conditions may describe the standard procedures and requirements of contract administration followed by a contracting agency of the State. Supplemental Conditions may expand upon matters covered by the Uniform General Conditions, where necessary, provided the expansion does not weaken the character or intent of the Uniform General Conditions. Supplemental Conditions are of such a character that it is to be anticipated that a contracting agency of the State will normally use the same, or similar, conditions to supplement each of its several projects.
- 16.1.2 Special Conditions shall relate to a particular project and be peculiar to that project but shall not weaken the character or intent of the Uniform General Conditions.
- 16.2. Federally Funded Projects. On Federally funded projects, the Owner may waive, suspend or modify any Article in these Uniform General Conditions which conflicts with any Federal statute, rule, regulation or procedure, where such waiver, suspension or modification is essential to receipt by the Owner of such Federal funds for the project. In the case of any project wholly financed by Federal funds, any standards required by the enabling Federal statute, or any Federal rules, regulations or procedures adopted pursuant thereto, shall be controlling.
- 16.3. Internet-based Project Management Systems. At its option, the Owner may administer its design and construction management through an Internet-based management system. In such cases, the Contractor shall conduct communication through this media and perform all project related functions utilizing this database system. This includes correspondence, submittals, requests for information, vouchers or payment requests and processing, amendment, change orders and other administrative activities.
- 16.3.1 Accessibility And Administration.
- 16.3.1.1 When used, the Owner will make the software accessible via the Internet to all project team members.
- 16.3.1.2 The Owner shall administer the software.
- 16.3.2 Training. When used, the Owner shall provide training to the project team members.

**End of Uniform General Conditions – revised 5/4/06**

## SPECIAL CONDITIONS

These Special Conditions are in addition to the requirements of the Uniform General Conditions and the Supplementary General Conditions of the Contract and are a part of the Contract Documents.

1. **LAYING OUT BUILDING:** The General Contractor shall employ an experienced and competent Professional Civil Engineer or a Registered Professional Land Surveyor (RPLS) and cause him to establish at least three (3) separate permanent benchmarks, such benchmarks shall be established using two (2) of the permanent University benchmarks as identified by the University to which easy access may be had during the progress of the Work, and from time to time to determine and verify the lines and grades. As the Work progresses, establish easily accessible benchmarks at each level referenced to finish floor line.
  - a. The layout work shall be supervised by the Civil Engineer or RPLS and approved by the Architect/Engineer. At completion of the layout work, the Civil Engineer or RPLS shall submit a signed report to the Architect/Engineer stating that he is satisfied with the work and its accuracy.
  - b. The General Contractor shall erect and maintain substantial protection of all established layout controls for structures, set their location to provide proper working clearance and verify that they are level and at the proper grade.
  - c. As the Work progresses, the General Contractor shall lay out partitions on rough floors in exact locations as a guide to all contractors and trades.
  - d. Before ordering any materials or doing any work, each Contractor shall verify and be responsible for the correctness of all measurements. No extra charge or compensation will be allowed as a result of difference between actual dimensions and the measurements indicated on the drawings. Any differences, which may be found, shall be submitted to the Architect/Engineer for consideration before proceeding with the Work.
2. **LEVEL OR TRANSIT:** The General Contractor shall maintain an accurate level or transit at the site at all times. This instrument shall be used to verify lines, grades, etc., and shall be available at all times for use by the Architect/Engineer and the Owner. A surveyor's level or grade control lasers shall be used to lay out all work and shall be used by operators skilled in its use.
3. **CUTTING, PATCHING AND INSTALLATION OF SLEEVES:** The General Contractor shall coordinate and oversee all cutting and patching activities in the execution of the work and shall leave all chases, holes or openings straight, true and of proper size as may be necessary for the proper installation of his own or other contractor's or subcontractor's work, consulting with the superintendent and contractors or subcontractors concerned regarding proper location and size.
  - a. No excessive cutting will be permitted nor shall any piers or other structural members be cut without the written approval of the Architect/Engineer. After such work has been installed, the Contractor shall carefully fit around, close up, repair, patch, and point up as directed to the entire satisfaction of the Architect/Engineer and Owner.
  - b. All this work shall be done carefully with proper tools by personnel of the particular trade to which such work belongs, and shall be done without extra charge to the Owner. Each Contractor or Subcontractor will be required to build into his own work, as directed, any and all items furnished by others. Cutting and repairing of new work, in place, made necessary by negligence of another Contractor or Subcontractor or anyone employed by him, shall be paid for by the party, which is at fault.
  - c. The work of each section of the Specifications, unless otherwise specified, includes all cutting,

patching and digging for work in that trade section required for proper accommodations of work of other trades. Execute such work with competent personnel skilled in trade required for restoration. The Contractor and/or each Subcontractor shall arrange and pay for cutting and patching required for installation of its own work, as applicable.

- d. The Contractor shall ensure sleeves are provided for all service lines, including piping and conduit, covered in the Contract documents, which may pass through walls, roof or floors. Sleeves through floors shall extend 2" above finish Floor and cast into floor or sealed with heavy-duty sealant or fire stop material.
4. SANITARY FACILITIES: The General Contractor shall provide an adequate number of temporary sanitary facilities for the use of all persons employed on the job, and shall clean same at least weekly, or more often as deemed necessary by the Owner. He shall post notices, take such precautions as may be necessary, and remove refuse deposited in or about the buildings necessary to maintain the premises in a sanitary condition. Sanitary facilities shall be located away from public view to greatest extent possible. Neither the General Contractor nor any of the construction work forces shall be allowed to use campus sanitary facilities.
5. PROTECTION: Each Contractor shall protect, properly and effectively, all materials and equipment furnished by him during and after their installation. Building materials, Contractor's equipment, etc., may be stored on the premises, but the placing of same shall be within the construction fence. When any room in the building is used as a shop, storeroom, etc., the Contractor will be held responsible for any repairs, patching or cleaning arising from such use. The Contractor shall protect and be responsible for any damage to the work or material, from the date of the agreement until the final payment is made, and shall make good without cost to the Owner, any damage or loss that may occur during this period. The Contractor shall handle all material as directed, so that it may be inspected by the A/E's and the Owner's representative(s). All cement, lime, insulation, and other material affected by weather shall be covered and protected to keep them free from damage while they are being transported to or stored on the site.
- a. During the execution of the Work, open ends of all piping, conduit, and mechanical ducts as well as all openings in equipment shall be closed before leaving the Work at any time, to prevent the entrance of foreign matter.
  - b. All heating, ventilating, plumbing, and electrical equipment shall be protected during the execution of the Work.
  - c. All plumbing fixtures shall be protected and shall be boarded over so that they cannot be used by personnel or others. All drains shall be covered until placed in service to prevent the entrance of foreign matter.
6. SIGNS: No signs or advertisements will be allowed to be displayed without the approval of the Owner.
7. SITE SECURITY WATCHMAN AND JANITOR: The Contractor, at its own expense, and option may employ unarmed security personnel when deemed necessary to protect its Work, but must notify the Owner of any such security firms or employees. Campus police will not provide security for the Contractor's areas. The Contractor shall provide a person or persons for janitor work, who shall keep all offices clean, attend to the temporary toilet rooms and keep them clean and supplied, attend to drinking water and supplies. This person shall also help to keep the construction areas broomed, free from accumulated debris, and relatively clean.
8. ACCESS TO SITE AND PROTECTIONS: The Construction Documents shows the area of the building site which may be used by the Contractors. A fence shall be erected by the General Contractor around this gross area. The Contractor and Subcontractors shall confine their activities to this area and in no way obstruct any other part of the campus or utilize any campus facilities for any purpose.

- a. As soon as Work is begun at the site, the General Contractor shall build a substantial wire mesh fence at least six feet high as shown on the Construction Documents and completely surrounding the site. Posts shall be placed not more than eight (8) feet apart and set securely. Wire mesh shall be tightly stretched over the supports.
- b. Enclosure fences shall be provided with fire gates and gates for trucking in locations shown on Construction Documents, hung with heavy strap hinges, and provided with hasps for locking. Fences and gates shall be properly maintained throughout the duration of the job and removed on completion or when directed by the Architect/Engineer. Where directed by MSU representatives, contractor shall include campus padlocks for access required for service work within fence and/or fire protection of existing buildings.
- c. The trees and shrubs, within the work area assigned to the Contractor and endangered plants near access ways to the above, shall be protected by the Contractor with drip-line fencing and tree trunk wooden shields per University policy and as detailed on drawings, all maintained in sound condition. Contractor shall not remove, cut or trim any trees or shrubs in the Contract area before notifying the Owners and Architect/Engineer's representative and receiving approval.
- d. The Contractor shall be responsible for the protection of existing building surfaces, both interior and exterior, utilities, exterior structures, pavements, sidewalks, vegetation, irrigation systems, and component parts and equipment. Any damage to existing areas will be repaired at the responsibility of the Contractor with the approval of the Owner. Repairs not satisfactorily completed will be done by the Owner and deducted from the Contractor's contract amount.
- e. The Contractor is responsible for expenses incurred as the result of the loss of a security access card or key. As the result of the loss of a master key, an entire building will have to be re-keyed, with the expense charged to the Contractor.

9. PROJECT CLEANLINESS: It shall be the responsibility of the Contractor to see that the debris, trash, and dust residue resulting from building operations are removed from the building and the property in a timely manner. All installed equipment and ductwork shall be protected from accumulations of construction dust. When project work occurs in existing buildings, existing spaces, finishes and ductwork shall be properly sealed and protected from construction dust and damage. The Contractor shall provide personnel for janitorial work in order to keep all offices, office toilet rooms, and portable toilets cleaned; attend to drinking water and supplies. Solid debris, such as brick bats, mortar and plaster droppings, may not be dumped on the grounds about the building. All scrap from lumber, crating, excelsior, paper and similar types of trash are to be removed from the building site. Trash, construction debris, and mud shall not be allowed to accumulate anywhere on the project for periods of longer than one week, whether in the building, on the grounds, in the adjacent areas, or on the campus streets serving as delivery and haul-off routes for the work of this project. In other words, there must be thorough cleanup of the building and its surroundings no less often than once a week, and more often as may be directed by the Owner.

10. WATER FOR BUILDING WORK: The General Contractor shall provide temporary lines for all water required in the building Work and will arrange with the Owner's Utility Department for water service. The Contractor shall include all connections and means of conveying same to place where required, including the necessary metering devices capable of measuring water used by construction activity. In lieu of temporary connections, the Contractor may make permanent connections and this may serve for the construction period. In the event the Owner does not have water available at the site from the Owner's existing distribution system, the Contractor shall negotiate with the City for water and pay all fees and rates required by the City Water Department or shall provide an on site water well of sufficient production for construction.

11. ELECTRICAL ENERGY: The Contractor shall arrange with the local Utility Company for temporary

construction power with metering, whenever available. When using temporary power provided by the local utility company, the contractor is responsible for all costs, including electrical energy costs. If power is available only through the Owner's on-campus system, the Contractor shall arrange for and provide metering equipment capable of measuring power used by construction activities, if relevant to the project. The Contractor may energize the permanent power system in the building only when approved by the Owner. All costs of electrical energy provided through the University's power grid shall be paid by the University unless it is determined that the Contractor is not using the energy in a prudent and reasonable fashion in which case the Contractor shall be required to pay at the prevailing rate of the local Utility Company. When utilizing local Utility Company power, invoices must be submitted prior to payment reimbursement.

12. **TEMPORARY HEAT & LIGHTING:** If temporary heat is required for protection of the Work, the General Contractor shall provide Owner approved heating apparatus. Provide heat in such a manner that no Work will be damaged and ensure adequate ventilation exists. The Contractor shall provide adequate lighting about the site for security, inspections of excavations, night shift work should such occur, and shall also provide adequate temporary interior lighting throughout the building enclosure to facilitate quality workmanship and appropriate inspection visibility.

13. **TEMPORARY SERVICES:** If relevant to the project, and after equipment has been connected to the Central Utilities System, the Contractor may request that the utilities department open valves to put systems in service for heating or cooling. The Contractor is NOT to open or close any valves to utility systems. Proper system operation having been demonstrated to the University Utility Department, the Contractor may use the systems for heating and/or cooling once the thermal controls are operational.

During operation of the mechanical equipment, prior to Substantial Completion, the Contractor shall keep the mechanical equipment in good operating condition, properly flushed with chemical treatment systems properly started, properly maintained, including regular replacement, and/or cleaning of filters, both temporary and permanent. The guaranty period shall start on the date of official acceptance. Filters shall be changed at least every 2 weeks and more frequently if extremely dusty conditions exist.

14. **REMOVAL OF TEMPORARY FACILITY:** When a temporary facility is no longer needed for the proper conduct of the Work, the Contractor shall completely remove it from the Project and shall repair or replace any material, equipment or finished surface damaged in doing so.
15. **WARRANTIES AND GUARANTEES:** Pursuant to Article XIII of the Uniform General Conditions, additional warranty requirements and guarantees are described more fully in various sections of the technical specifications.
16. **PROJECT SIGN:** If applicable, the Contractor shall construct and erect one project sign on the project site in a location designated by the Owner. The sign shall make clear reference to the Midwestern State University System as well as Midwestern State University-. Submit a one-quarter scale shop drawing of the sign complete with all lettering to the Architect/Owner for approval before construction. The sign shall remain the property of the Contractor, and upon project completion, the Contractor shall remove the sign and remove from University property in a legal manner.
17. **PROJECT PLANNING AND SCHEDULING:** The Contractor shall participate with the Owner and A/E in a project-planning workshop promptly upon execution of the contract unless specified differently in the Contract document. Based on the project plan developed at that workshop, and within twenty-one (21) calendar days from Notice to Proceed, the Contractor shall submit its proposed Work Progress Schedule for the entire duration of the project to the Owner and A/E for review. The Schedule shall be coordinated with the Contract Price Breakdown, or Schedule of Values, and shall include all significant procurement, including long lead-time delivery items and approval activities, all work placement activities, including start and completion dates, identification of time periods for overhead inspections, pre-final and final inspections, system start-up and

commissioning, and punch-list corrections, as a minimum. The initial schedule submission shall coincide with the initial submittal of the Contract Price Breakdown and the two documents will be reviewed together. The Contractor shall revise the schedule as necessary to obtain acceptance by the Owner and A/E to establish a Baseline Schedule for the project. Once the Baseline Schedule is accepted, the Contractor shall update the schedule monthly, as a minimum, to record actual progress of activity start and completion and remaining durations and shall provide updated reports monthly to the Owner and A/E in association with each request for progress payment. The format and content of monthly update reporting shall be as determined at the project-planning workshop unless specified otherwise in the contract documents. The Contractor shall include a separate line item in its Contract Price Breakdown for planning and scheduling, to include development of the accepted Baseline Schedule and all updates and reporting.

18. **CLARIFICATION OF INSURANCE REQUIREMENTS:** Refer to the Uniform General Conditions and Supplementary General Conditions, paragraph 5.2. When the project involves work in an existing structure, the scope of this Builder's Risk Insurance is to cover any portion of an existing building which is in the Contractor's care, custody or control (which may be necessary to do Work in another portion of the building), over and above the normal limitations imposed by paragraph 5.2. Paragraph 5.2 is not intended to increase the dollar amount of the Insurance, which is stipulated in paragraph 5.2 to be 100% of the value of the Work, but only to increase the scope of what is to be covered.
19. **PREVAILING WAGE RATE DETERMINATION:** Pursuant to the Uniform General Conditions/Supplementary General Conditions, the following schedule indicates the prevailing wage rate determination determined by the Owner.

See Attachment "B" Prevailing Rate Schedule.

20. **ONGOING CAMPUS/OWNER OPERATIONS:** This project is surrounded by continuously functioning campus facilities, including student housing, academic and research efforts. The Contractor shall make every effort to avoid disruptions to ongoing campus activities and to maintain a safe environment for students, faculty, and staff in the areas adjacent to the project. Campus utilities must not be interrupted except when scheduled and approved in advance through Owner-designated established channels. The Contractor or his personnel shall NOT open or close any valves of the central campus utilities. Valve operation is to be done by University utilities personnel only. The Contractor shall not activate or de-activate any campus utility system, or component of any such system, without express written direction from the Owner.

The facilities will only be available during the scheduled construction time-period as specified by the Owner, typically from 8:00 am until 6:00 pm Monday through Friday. Work during other times, including weekends, shall only be allowed with prior request and written authorization from the Owner. In addition, the Contractor shall accommodate and coordinate its construction work force and activities to allow the Owner's forces and Owner's separate subcontractors (i.e. telephone, data, IT, computer, and furniture installation) to enter the jobsite to perform their work.

21. **CONTRACTOR PARKING:** Parking is either within the Contractor's fenced area, or off campus at the Contractor's expense. There will be no parking outside of fenced area adjacent to the site or on public streets on campus for any of the contractor's work force unless specifically approved by the Owner.

A limited number of remote parking spaces may be provided near the campus. Such parking will be available at no cost to the Contractor or the workers but will require permits, issued by the campus police department, for all vehicles and transportation furnished by the Contractor. Such remote parking is provided for the convenience of the Contractor with the understanding that the Contractor is responsible for all workers and all workers' vehicles while they are on the campus.

22. **RESPONSIBILITY FOR WORK FORCE:** A superintendent shall be on site at all times while work is



in progress. The Contractor is responsible for the actions of its entire work force, including Subcontractor's and supplier's employees, whenever they are on the campus. The Contractor shall submit their plan for identifying and controlling all workers, and for management of personnel records, including payroll records. Identification badges for workers, busing of workers from remote parking lot(s), frequent written and verbal reminders to work force of appropriate behavior and avoidance of campus facilities, and publishing of established access and egress routes for vehicular and pedestrian traffic are required, as a minimum, in order to maintain control of the work force.

a. Unacceptable behavior on the part of the workers anywhere on campus, including parking lots, the project site, and the accessing route(s) through the site through the campus, or failure to obtain parking permits, or traffic violations while on campus may lead to cancellation of the Contractor's on-campus parking privileges. Further, identifiable offending worker(s) will be removed from the project.

b. Harassment of any person, whether student, faculty, staff, or visitor to the campus, is forbidden. Harassment includes any action such as jeering, whistling, calling-out, staring, snickering, making rude or questionable comments, or similar behavior. If identifiable, any offending worker(s) will be removed from the project.

23. SITE ACCESS AND CONTROL: All campus roads, drives and fire lanes as well as all sidewalks and pedestrian routes, other than those specifically indicated to be in the contractor's area of control, must be kept open at all times. The Contractor shall make advance preparations for, and obtain security clearance for, all significant material deliveries and truck traffic, cranes, concrete trucks, etc., through the campus to the project site. Contractor shall provide all traffic controls, warning signs, barricades, and flagmen during all construction traffic operations that affect roadways and pedestrian walkways with plans for same that are acceptable to the Owner.

24. NOISE CONTROL: Equipment locations and timing or sequence of work operations shall be coordinated so as not to inordinately conflict with the Owner's continuing use of the existing or adjacent buildings, and/or minimally interfere with scheduled meetings or events or on-going operations.

25. SMOKING: Smoking is not allowed inside any campus building or anywhere on campus except in designated areas. Smoking will not be allowed in any enclosed area of the building(s) of this project. Enclosed, as used here, refers to erection of exterior walls and overhead structure for any portion of the project; it does not mean to indicate a state of building "dry-in". Use or possession of illegal drugs or alcohol on the project site or anywhere on campus is forbidden.

26. SITE AND AREA MAINTENANCE: The Contractor shall erect erosion control at the perimeter of the site and otherwise control migration of construction debris and dirt to campus and public areas adjacent the project site. The Contractor shall keep all roadways in the vicinity of the project clear of mud, dirt, debris, and construction materials. The Contractor will be required to clean campus streets utilized as truck routes for the project if mud or debris is allowed to remain in the roadways. If such roadways, parking lots or site improvements are damaged by the work of this project, the Contractor will be required to repair them in kind to a quality acceptable to the Owner.

27. GENERAL PERMITS: The Owner is exempt from paying for permits and fees to local government entities related to work on the Owner's property. There will be no building permit required, no platting fees and no local government inspection fees for permanent work on the Owner's property. The Owner is not exempt from permit and fee requirements for work in public rights of way or outside the boundaries of the Owner's property. The Contractor shall secure, pay and maintain all required permits.

28. SEDIMENTATION AND EROSION CONTROLS/NPDES GENERAL PERMIT: The National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges from Construction Sites (General Permit) issued by the United States Environmental Protection Agency

(EPA) requires compliance for construction activities resulting in the disturbance of five (5) acres or more or if a construction site is part of a common plan of development of five (5) acres or more. The Owner's property is comprised of an overall total of approximately 473 acres of which this project covers a part; therefore, compliance with the NPDES General Permit is required.

- a. Indemnification. GENERAL CONTRACTOR HEREBY INDEMNIFIES AND HOLDS HARMLESS OWNER FROM ANY AND ALL LIABILITY, LOSS, DAMAGE, COST, AND EXPENSE ARISING OUT OF A VIOLATION OF THE APPLICABLE EPA NPDES REGULATIONS, THIS SPECIAL CONDITIONS SECTION, OR THE TERMS AND CONDITIONS OF THE GENERAL PERMIT TO THE EXTENT ATTRIBUTABLE TO AN ACT OR OMISSION OF GENERAL CONTRACTOR, ITS SUBCONTRACTORS AT ANY TIER, OR CONSULTANTS.

29. ENVIRONMENTAL PROTECTION PROCEDURES: Any existing trees and shrubs within the Project Site assigned to the contractor and any endangered plants near access ways to the Project Site, shall be protected by the Contractor as detailed in the Drawings, or maintained in sound condition until permission is given for their removal. Contractor shall not remove, cut or trim any trees or shrubs in the Project Site before notifying the Owner's representative and receiving his prior approval. Any vegetation damaged during construction shall be replaced in kind. The Contractor shall be responsible for repair of all damage to areas of the Project site used for construction storage purposes. Repair shall consist of replacing trees, vegetation, grasses in kind with watering and maintenance as required for establishment unless otherwise noted on the Drawings.

The Contractor is solely responsible for cleaning up and properly disposing of all spilled pollutants brought to the site as part of the Contractor's work, including oil, paint, fuels, antifreeze, solvents, etc. in accordance with applicable laws and regulations. Contractor must keep accurate records (such as receipts, copies of analytical results, etc.), indicating proper cleanup and disposal of spilled materials in accordance with applicable laws and regulations. Furthermore, Contractor is responsible for ensuring that all discharges from the site are in compliance with all applicable laws and regulations. Contractor is responsible for pollutant contaminated run-off and proper disposal of all waste materials generated as a result of work activities.

Chemical cleaning of new utility additions shall be done by circulating a good non-phosphate cleaner through as much of the new system as possible. Prior to dumping the cleaning agent, notify the City of Industrial Water Treatment Department to sample the effluent. If the City of approves dumping to drain, then dump to the sanitary sewer. Refill the system with water, circulate and again have the City of Industrial Waste Water Treatment Department to sample prior to dumping. If at any stage the City of refuses to accept the effluent, the Contractor must make special arrangements for the legal disposal of the effluent and give the owner a copy of the shipping and disposal manifests.

30. CONTRACTOR OCCUPANCY AND LIMITS OF CONSTRUCTION: The Contractor and all his personnel, his assigns, materialmen, suppliers and subcontractors shall confine and limit their work and use of the Project Site to those areas within the defined Project Site limits of construction. All areas beyond these limits are patrolled by the City of Police Department and The MSU Midwestern State University- Campus Police Department personnel. All public and University rules, laws and requirement shall be obeyed. No tools, construction vehicles, or construction material shall be permitted beyond the Project Site limits of construction. The Contractor shall confine his personnel within the Project Site limits of construction. Loitering of construction personnel beyond the fenced limits of construction or around the Project Site construction entry gates shall be discouraged.
31. RECORD DOCUMENTS: The Contractor shall provide the Owner, at between one month and three months prior to Substantial Completion, with a complete set of the as-built Telecommunication Drawings and Telecommunication Port Log for the Owner's use in coordinating selection and procurement of telephone/data equipment.

As a requirement for acceptance of Substantial Completion, the Contractor shall reproduce two (2) copies of the current As-Built Drawings and Specifications maintained at the job site and provide these copies to the Owner. These documents shall be labeled "Interim Record Drawings and Specifications", and are required to assist the Owner in the operation of the facility until Final Completion is accomplished and the final As-Built Drawings and Specifications are provided to the Project Architect/Engineer to prepare the final "Record Drawings" and "Record Specifications". Three (3) weeks before substantial completion acceptance of the project, the contractor shall have submitted a draft copy of the Owner's operating and maintenance manuals. Two (2) copies of the final owners operating and maintenance manuals shall be delivered within 30 days of substantial completion and include copies of ALL approved shop drawings and submittal; list of ALL subcontractors and vendors including names, addresses, phone numbers; warranty and guarantee documents, etc.

32. CHANGE ORDER PRICING: Article XII, Sec, 11.3.4 of General add the following:

The total cost of all labor and materials, including supervision up to the level of Project Superintendent, itemized to show man-hours by trade and classification, unburdened hourly rates, and total labor cost. Man-hour totals, labor rates, and materials shall be based on reasonable and prevailing area labor rates and materials costs.

33. FIELD MANAGEMENT AND TEMPORARY STRUCTURES:

- a. The Contractor shall coordinate and direct the work of this project from the site or Owner-designated area at adjacent site for the duration of the Work. One or more of the following options applies to this Project **only if designated by a checked box**:

The Owner will designate and provide an adequately sized enclosed area for field office operations to the General Contractor adjacent the Project site. This location is to be properly maintained and released back to the owner in its original condition.



The Contractor shall provide and maintain its own temporary field office(s) that is weather-tight, well-lighted, air conditioned and safely heated, and to include provisions for telephone, data, and facsimile services, conference area(s), including tables and chairs, toilet facilities, and maintenance of all project files including submittals, project correspondence, and payment and payroll records, etc. The University will assist in providing hook-ups for telephone, data, and facsimile services when project is within campus grid. A lockable, 12' x 12' minimum private office shall be provided for the use of the Owner and A/E, equipped with an operational telephone, a fax machine and computer connections.

The Contractor shall provide and maintain a conference area, which shall include at least one primary area suitable for up to fifteen (15) persons to participate in progress and coordination meetings. The walls of this conference area are to serve as display surfaces for maintaining current prints of project schedules and work placement plans. This space can be incorporated with the Contractor's office trailers, and will be for shared and joint use by both throughout the project duration.

The Contractor shall provide and maintain at the site for the duration of the Project, for the use of the Owner and its consultants, including the Architect/Engineer, a separate field office structure which is adequately weather-tight, well-lighted, air conditioned and safely heated, adequately supported and anchored, with toilet facilities, and two long distance phone/fax lines. Local calls made from these lines shall be paid by the General Contractor. Long distance calls shall be paid for by the person or party placing the calls. The telephone numbers shall be reported to the Owner and the Architect/Engineer as soon as the telephones are installed.

Such field office shall be a minimum of twelve (12) feet wide by about thirty- (30) feet long and shall be partitioned to provide for two separate work areas including two entry doors with keyed locks, and shall include toilet facilities. Each of the three "office" areas within this structure shall be provided with layout tables, plan storage, file cabinets, desk and chairs, one telephone and outlet and one fax and one data outlet, as well as adequate convenience outlets to accommodate business machines.

Telephone service to this field office shall include one phone line capable of local and long distance service with voice mail and one fax and one data line, for a total of three separate lines, each with individual phone numbers and each line to be connected to multiple outlets for convenient arrangement. All costs for providing this telephone service, including a phone unit in each separate area, shall be paid by the Contractor.

- b. The General Contractor shall arrange for each Subcontractor to have field office accommodations as necessary to perform their work adequately.
- c. The General Contractor shall provide adequate and safe entries to all field offices, including steps with railings and landings or stoops as required, and shall provide hard surface walkways to connect the field office structures to one another and to site entry or exit.
- d. Upon authorization to mobilize, the General Contractor shall submit a plan layout showing location of field offices, size and arrangement of spaces and outlets, fencing, site control points, and utility tie-in locations for Owner review and acceptance.
- e. All costs for temporary field offices shall be included in the Contractor's Contract Price Breakdown. Reimbursement of such costs shall be included in the regular Progress Payment on a monthly basis, pro-rated over the anticipated duration of the project.

#### 34. TEMPORARY EQUIPMENT:

- a. The General Contractor shall provide all scaffolding necessary for the performance of the Work. All scaffolding shall be so constructed, anchored, and braced as to comply in all respects with OSHA guidelines to afford safety and protection to both craftsmen and their Work, inspectors, and to the Work of other contractors.
- b. The General Contractor and its Subcontractors shall provide on the premises at locations approved by the Owner, suitable substantial watertight storage sheds for the storage of tools and all materials which would be damaged by the weather; shall maintain same in good condition and shall remove same when directed. All storage sheds shall be of sufficient size to hold the materials required and shall have floors raised at least 6" above the ground on heavy joists.
- c. Except as otherwise specified, the Contractor shall furnish at its own cost and risk, all significant tools, apparatus, hoists or cranes, derricks, etc.
- d. Temporary equipment shall be installed in such a manner that finish work will not be damaged by smoke, falling mortar, concrete or other causes. Location and arrangement of temporary equipment shall be subject to the approval of the Construction Inspector.
- e. All temporary shoring required for the installation of Work shall be included in this Contract and the General Contractor must assume all responsibility for this Work and make good any damage caused by improper supports or failure of shoring in any respect.

#### 35. SAFETY:

- a. The Contractor shall provide barricades, warning signs and lights. Comply with recognized standards and code requirements for the erection of substantial barricades where needed to

prevent accidents and any unsafe condition from developing during the construction period.

- b. The Contractor shall review fire prevention and protection needs with the Owner's personnel in procedures and post warnings and information. Maintain unobstructed access to fire extinguishers, temporary fire protection facilities, stairways and other access routes. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of ignition.
- c. The Contractor shall be responsible for initiating, maintaining, and supervising safety precautions and programs associated with the work. It shall be the duty and responsibility of the Contractor to comply with all pertinent sections of the Occupational Safety and Health Act and all amendments thereof. The Contractor shall do all things necessary and provide all equipment and labor necessary to protect students, staff, faculty, and the general public from dangers associated with the work. Walkways, parking areas, and other areas surrounding the job site will be in use and given priority. The University shall not be held responsible for failure of the Contractor to perform the job in a safe manner.

36. HAZARDOUS MATERIALS: For information only, an asbestos report has or has not been filed on the portion of the existing building involved in the project and a positive or negative result was reported. See abatement requirements, if relevant, elsewhere in the Construction Documents. In the event the Contractor encounters material, which he reasonably believed to be asbestos, which has not been abated, the Contractor shall immediately stop work in the area affected and report the condition to the Owner. If in fact the material is asbestos and has not been abated, the Contractor shall not resume the non-asbestos-related work in the affected area until the asbestos has been abated. The abatement action may be done in any of three ways, as the Owner may decide. The Owner may perform the abatement by its own forces, or the Owner may contract with a third party to perform the abatement, or the Contractor may perform the abatement by an appropriate means acceptable to the Owner such as performing the work through its own employees if they are appropriately certified or hiring an abatement subcontractor. If the Contractor is to perform the abatement, the Owner and the Contractor will negotiate a change order in accordance with the contract terms relative to extra work. In such a case, the Owner specifically agrees that the cost of any special comprehensive general liability insurance that may be required relative to the abatement work will be considered a direct cost of the extra work, on which like the other direct costs the Contractor will be allowed to add a percentage of 5% or 15%.

---End of Special Conditions---

DOCUMENT 00 73 43 - WAGE RATE REQUIREMENTS

PART 1 - GENERAL

1.01 WAGE RATE REQUIREMENTS

- A. Pursuant to the Wage Scale adopted by the Owner, Contractors and subcontractors involved in the construction of this Project shall pay their laborers and mechanics employed under the Contract at least the locally prevailing wages (including fringe benefits) listed in the wage determination in the contract, for the work performed. Labor standards clauses shall be included in covered contracts.
- B. Prevailing wages, including fringe benefits, shall be paid on all hours worked on the site of the work.
  - 1. Apprentices or trainees may be employed at less than the rates listed in the Contract wage determination only when they are in an apprenticeship program registered with the Department of Labor or with a state apprenticeship agency recognized by the Department.
- C. For prime contracts in excess of \$100,000, the Contractor and each subcontractor shall also, under the provisions of the Contract Work Hours and Safety Standards Act, pay laborers and mechanics employed in the performance of the contracts one and one-half times their basic rate of pay for all hours worked over 40 in a workweek. The overtime provisions of the Fair Labor Standards Act may also apply to DBA-covered contracts.
- D. Nothing contained herein, however, shall be construed to prohibit the payment of more than the prevailing rate of wages to any laborer, workman, or mechanic employed on the work.

1.02 DEFINITIONS

- A. The "prevailing wage" is the combination of the basic hourly rate and any fringe benefits listed in a wage determination.

1.03 POSTING WAGE RATES

- A. Post applicable wage determination on job site in a prominent and accessible place where they can be easily seen by the workers.

1.04 EMPLOYEE CLAIMS

- A. Any employee who alleges that he has not been paid the minimum wage rate may file a written claim with the Owner.

1.05 PAYMENT OF EMPLOYEES AND PAYROLL RECORDS

- A. The Contractor and each subcontractor shall pay covered workers weekly and submit weekly certified payroll records to the Owner.

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- B. Payment may be entirely as cash wages or by a combination of cash wages and employer-provided bona fide fringe benefits. If payment is by cash, obtain the signature of the employee verifying the payroll period, total hours worked, rate per hour, total wages earned and the date received.
- C. The Contractor and each subcontractor engaged at the site of the work shall prepare and maintain weekly payroll reports certified to be correct.
  - 1. Payroll records shall contain the name, social security number, classification, prevailing wage rate including fringe benefits per hour, hours worked each day, including regular hours and overtime hours.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 WAGE RATE SCHEDULE

- A. See attached Prevailing Wage Rate Determination.

END OF DOCUMENT 00 73 43

## **PREVAILING WAGE RATE DETERMINATION**

Midwestern State University has adopted the following Wage Scale indicating the wages to be paid for Journeyman including all fringe benefits. This Wage shall be paid to all the workers on the site of the Project. It does not apply to trades off the site of the actual construction project.

### **BUILDING CONSTRUCTION TRADES**

### **WAGE RATE**

#### **CLASSIFICATION**

Asbestos Workers, Insulators	\$11.05
Bricklayers, Stone Masons	\$15.75
Carpenters	\$12.50
Carpet Layers/Floor Installers	\$11.00
Concrete Finishers	\$12.25
Drywall Installers/Ceiling	\$12.08
Electricians	\$16.75
Elevator Mechanics	\$18.75
Fire Alarm Technicians	\$12.50
Light Equipment Operators	\$10.50
Heavy Equipment Operators	\$13.00
Glaziers	\$11.50
Ironworkers	\$13.60
Laborers	\$ 8.00
Lathers	\$15.25
Millwrights	\$15.29
Painters, Wall Covering	\$11.50
Pipe fitters	\$17.75
Plasterers	\$15.10
Plumbers	\$17.79
Reinforcing Steel Setters	\$10.50
Roofers	\$10.50
Sheet Metal Workers	\$17.55
Sprinkler Fitters	\$17.25
Terrazzo Workers	\$15.00
Tile Setters	\$15.00
Waterproofers/Caulkers	\$11.50

### **CIVIL/HEAVY CONSTRUCTION TRADES**

#### **DECSRIPTION**

Air Tool Person	\$ 7.25
Asphalt Raker	\$ 7.50
Batching Plant Scaleperson	\$ 7.00
Concrete Finisher (Paving)	\$ 7.60
Concrete Finisher (Structures)	\$ 7.60
Form Builder (Structures)	\$ 9.50
Form Setter (Paving and Curbs)	\$ 9.00
Form Setter (Structures)	\$ 9.00
Mechanic	\$ 7.50
Oiler	\$ 7.00
Serviceperson	\$ 7.00
Pipelayer	\$ 8.25
Welder	\$13.90



### **POWER EQUIPMENT OPERATORS**

Asphalt Paving Machine	\$ 9.00
Broom or Sweeper Operator	\$ 7.00
Bulldozer, 150HP or less	\$ 8.00
Crane, Clamshell, Shovel (less than 1-1/2 c.y.)	\$ 8.00
Crane, Clamshell, Shovel, Backhoe Derrick, Dragline, Shovel (1-1/2 c.y.)	\$ 8.25
Crusher and Screening Plant Operator	\$ 7.00
Foundation Drill Operator (truck)	\$ 8.50
Front End Loader (2-1/2 c.y.)	\$ 7.25
Motor Grade Operator, Fine grade	\$10.00
Motor Grader Operator Flat Wheel or Tamping	\$ 7.00
Roller, Steel Wheel (Plant-Mix Pavements)	\$ 7.25
Roller, Steel Wheel (Flat Wheel or Tamping)	\$ 7.25
Roller, Pneumatic (Self-Propelled)	\$ 7.25
Scrapers (17 c.y. or less)	\$ 7.25
Scrapers (over 17 c.y.)	\$ 7.50
Tractor (Crawler Type over 150HP)	\$ 7.00
Tractor (Pneumatic 80HP and less)	\$ 7.00
Traveling Mixer	\$ 7.00
Wagon Drill, Boring Machine/Post Hole Digger	\$ 7.00
Truck Driver	\$ 7.75
Cable Splicer	\$ 9.00
Lineperson	\$10.75
Groundperson	\$ 7.00

## SECTION 01 1000-SUMMARY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Project information.
  - 2. Work covered by Contract Documents.
  - 3. Work by Owner.
  - 4. Work under separate contracts.
  - 5. Owner-furnished products.
  - 6. Access to site.
  - 7. Coordination with occupants.
  - 8. Specification and drawing conventions.

#### 1.3 PROJECT INFORMATION

- A. Project Identification: New Residence Hall – Site Improvements – BP 01.
  - 1. Project Location: 3410 Taft Blvd, Wichita Falls, TX 76308
- B. Owner: Midwestern State University.
  - 1. Owner's Representative: Kyle Owen, Project Manager, 940.397.4648..
- C. Architect: Treanor Architects, 1700 Pacific Ave., Suite 2630, Dallas, TX 75201; 214.310.1018.

#### 1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following site improvements:
  - 1. Concrete sidewalks.
  - 2. Masonry plinth seating, garden walls, study bars, and fire pit.
  - 3. Concrete pad for Mustang sculpture.
  - 4. Exterior light pole foundations, poles, and light fixtures.
- B. Type of Contract:
  - 1. Project will be constructed under a single prime contract.

## 1.5 WORK BY OWNER

- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
- B. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
  - 1. Owner will be preparing residence hall for occupancy August 1<sup>st</sup>, 2016. Preparations include but are not limited to the following:
    - a. Furniture delivery.
    - b. Final cleaning.
    - c. Testing of systems.
    - d. Staff Training.

## 1.6 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Concurrent Work: Owner has awarded separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
  - 1. Student Housing Expansion Project: To Buford-Thompson Company for the construction of a new, 5-story, 153,000 SF residence hall.
  - 2. Contractor to coordinate use of site with building contractor.

## 1.7 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products.
- B. Owner-Furnished Products:
  - 1. Site Furniture.

## 1.8 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

## 1.9 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts

and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

#### 1.10 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
  1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 1000

## SECTION 01 2300 - ALTERNATES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

#### 1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

#### 1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract.
- C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Additional Site Improvements.

1. Base Bid: Existing site to remain.
2. Alternate: Provide accessible parking along Comanche Drive. Demolish existing drive west of Killingsworth Hall and provide new sidewalks, landscape turf, shrubs, trees, and sand volleyball court. In addition the alternate includes exterior light foundations, poles and light fixtures as well as storm drainage as indicated on Drawings and Specifications.

B. Alternate No. 2: Metal Trellis.

1. Base Bid: Existing site to remain.
2. Alternate: Provide complete turn-key solution including delegated design, concrete footings, and metal trellis structure as indicated on Drawings.

END OF SECTION 01 2300

## SECTION 01 25 00 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Division 01 Section "Alternates" for products selected under an alternate.
  - 2. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
  - 3. Divisions 02 through 49 Sections for specific requirements and limitations on substitutions.

#### 1.03 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

#### 1.04 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use form provided in Project Manual.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. Certificates and qualification data, where applicable or requested.

- g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
  - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
  - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.05 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

#### 1.06 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

### PART 2 - PRODUCTS

#### 2.01 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Requested substitution provides sustainable design characteristics that specified product provided.
    - c. Substitution request is fully documented and properly submitted.
    - d. Requested substitution will not adversely affect Contractor's construction schedule.



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- e. Requested substitution has received necessary approvals or authorities having jurisdiction.
- f. Requested substitution is compatible with other portions of the Work.
- g. Requested substitution has been coordinated with other portions of the Work.
- h. Requested substitution provides specified warranty.
- i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 25 00

**SECTION 01 25 00 – SUBSTITUTION FORM**  
**CONSTRUCTION STANDARDS**

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**01 25 00**

**SUBSTITUTION FORM**

**PART 1: GENERAL**

**1.01 SUBSTITUTION FORM**

A. The following form shall be used for product substitutions:

TO: ARCHITECT OF RECORD  
OR  
MIDWESTERN STATE UNIVERSITY PROJECT REPRESENTATIVE

PROJECT:

SPECIFIED ITEM:

Section \_\_\_\_\_ Paragraph \_\_\_\_\_ Description \_\_\_\_\_

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION \_\_\_\_\_

Upon submitting this Request for Substitution, the undersigned certifies that the following paragraphs are correct, unless otherwise modified on attachments:

1. Contractor has investigated the proposed substitution and believes that it is equal to or superior in all respects to specified item, and will conform to design requirements and artistic effect
2. Cost saving to Owner for accepting substitution: None \_\_\_  
\$ \_\_\_\_\_
3. Contractor will pay the Architect and/or Engineers for additional studies, investigations, submittal reviews, redesign and/or analysis caused by the requested substitution and at no additional cost to Owner.
4. Substitution requires dimensional changes or redesign of structure or M & E Work No \_\_\_ Yes \_\_\_ (If yes, attach complete data).
5. Contractor will waive future claims for added cost to Contract caused by substitution.
6. Changes in contract time caused by substitution: No \_\_\_ Yes \_\_\_ Add/Deduct \_\_\_ days.
7. Adverse affect on other Trades caused by substitution: No \_\_\_ Yes \_\_\_ (If yes, explain on attachment).

**SECTION 01 25 00 – SUBSTITUTION FORM**  
**CONSTRUCTION STANDARDS**

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8. Contractor will modify other parts of the Work as may be required to make all parts of Work complete and functioning. Yes \_\_\_ (Explain on attached page if necessary)
9. Same type of warranty for specified product will be furnished for proposed substitution: Yes \_\_\_ No \_\_\_
10. Maintenance Service Available: Yes \_\_\_ No \_\_\_  
Where? \_\_\_\_\_
11. Contractor has complied with requirements of the Midwestern State University's Design Guidelines and Construction Standards and Contract Documents as part of request for substitution, and has completely filled-in this form.

REASON FOR NOT GIVING PRIORITY TO SPECIFIED ITEM:  
See attached \_\_\_ Not required \_\_\_

Submitted by:

Signature \_\_\_\_\_

Firm \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date \_\_\_\_\_

Telephone \_\_\_\_\_

For Use by Architect:

\_\_\_ Approved

\_\_\_ Approved as noted

\_\_\_ Rejected

Rejected only for conformance with  
Design Concept of Project and with  
Information in Contract Documents.

Signature \_\_\_\_\_

Date \_\_\_\_\_

**REQUIRED ATTACHMENTS:**

- A. Product Data for Specified Item: Clearly marked to indicate full compliance with specification section and Contract Documents: Attached
- B. Product Data for Substitution: Clearly marked for adequate evaluation and comparison with data submitted for specified item: Attached \_\_\_
- C. Samples: Attached \_\_\_ Not Required \_\_\_
- D. Cost Data and Implications of Substitution: Attached \_\_\_ Not required \_\_\_
- E. Contractor's Comments: Attached \_\_\_ Not required \_\_\_
- F. Manufacturers certifications on asbestos and PCB: Required/must be attached
- G. Other: \_\_\_\_\_

**PART 2: PRODUCTS (NOT USED)**

**PART 3: EXECUTION (NOT USED)**

END OF SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
  - 1. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.03 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Form G710-1992 Architect's Supplemental Instructions or equivalent.

1.04 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    - e. Quotation Form: Use CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail."
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
  - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

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2. include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use CSI Form 13.6A, "Change Order Request (Proposal)," with attachments CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail."

1.05 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.06 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Form G-701-2001 Change Order or equivalent .

1.07 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Form G714-2007 Construction Change Directive or equivalent . Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
  - 1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.03 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.04 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with continuation sheets.
    - b. Submittal schedule.
    - c. Items required to be indicated as separate activities in Contractor's construction schedule.
  - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
  - 3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
  - 4. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract as described in Division 01 Section "Summary."
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Name of Architect.
    - c. Architect's project number.
    - d. Contractor's name and address.

- e. Date of submittal.
- 2. Arrange schedule of values consistent with format of AIA Document G703.
- 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
- 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
- 5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
- 6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- 7. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
- 8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
- 9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

#### 1.05 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
  - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent or surety to payment, for stored materials.
  2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  2. When an application shows completion of an item, submit conditional final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of values.
  3. Contractor's construction schedule (preliminary if not final).
  4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
  5. Products list (preliminary if not final).
  6. Schedule of unit prices.
  7. Submittal schedule (preliminary if not final).
  8. List of Contractor's staff assignments.
  9. List of Contractor's principal consultants.
  10. Copies of building permits.
  11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  12. Initial progress report.
  13. Report of preconstruction conference.
  14. Certificates of insurance and insurance policies.
  15. Performance and payment bonds.
  16. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.



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2. This application shall reflect Certificate(s) or Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  3. Updated final statement, accounting for final changes to the Contract Sum.
  4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  6. AIA Document G707, "Consent of Surety to Final Payment."
  7. Evidence that claims have been settled.
  8. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 29 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. Coordination drawings.
  - 3. Requests for Information (RFIs).
  - 4. Project meetings.
- B. Related Requirements:
  - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
  - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.03 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.04 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:
  - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
  - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.05 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate

construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
  2. Preparation of the schedule of values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Project closeout activities.
  8. Startup and adjustment of systems.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

#### 1.06 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    - e. Indicate required installation sequences.
    - f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance

requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
  6. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    - c. Fire-rated enclosures around ductwork.
  7. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
  8. Fire-Protection System: Show the following:
    - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
  9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
  10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Division 01 Section "Submittal Procedures."
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in preparing coordination digital data files.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Digital Data Software Program: Drawings are available in **AutoCAD Version 2013**.
    - c. Contractor shall execute a data licensing agreement in the form of agreement included in Project Manual .
  2. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.

3. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and Portable Data File (PDF) format.

#### 1.07 REQUESTS FOR INFORMATION (RFIS)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
  1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
  2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
  1. Project name.
  2. Project number.
  3. Date.
  4. Name of Contractor.
  5. Name of Architect.
  6. RFI number, numbered sequentially.
  7. RFI subject.
  8. Specification Section number and title and related paragraphs, as appropriate.
  9. Drawing number and detail references, as appropriate.
  10. Field dimensions and conditions, as appropriate.
  11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  12. Contractor's signature.
  13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: CSI Form 13.2A-2007 Request for Interpretation .
  1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
  1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use CSI Log Form 13.2B. Include the following:
  - 1. Project name.
  - 2. Name and address of Contractor.
  - 3. Name and address of Architect.
  - 4. RFI number including RFIs that were returned without action or withdrawn.
  - 5. RFI description.
  - 6. Date the RFI was submitted.
  - 7. Date Architect's response was received.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
  - 1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  - 2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

#### 1.08 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
  - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
  - 1. Conduct the conference to review responsibilities and personnel assignments.
  - 2. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 3. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Lines of communications.
    - f. Procedures for processing field decisions and Change Orders.
    - g. Procedures for RFIs.
    - h. Procedures for testing and inspecting.
    - i. Procedures for processing Applications for Payment.
    - j. Distribution of the Contract Documents.
    - k. Submittal procedures.
    - l. Preparation of record documents.
    - m. Use of the premises.
    - n. Work restrictions.
    - o. Working hours.
    - p. Owner's occupancy requirements.
    - q. Responsibility for temporary facilities and controls.

- r. Procedures for moisture and mold control.
  - s. Procedures for disruptions and shutdowns.
  - t. Construction waste management and recycling.
  - u. Parking availability.
  - v. Office, work, and storage areas.
  - w. Equipment deliveries and priorities.
  - x. First aid.
  - y. Security.
  - z. Progress cleaning.
4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Sustainable design requirements.
    - i. Review of mockups.
    - j. Possible conflicts.
    - k. Compatibility requirements.
    - l. Time schedules.
    - m. Weather limitations.
    - n. Manufacturer's written instructions.
    - o. Warranty requirements.
    - p. Compatibility of materials.
    - q. Acceptability of substrates.
    - r. Temporary facilities and controls.
    - s. Space and access limitations.
    - t. Regulations of authorities having jurisdiction.
    - u. Testing and inspecting requirements.
    - v. Installation procedures.
    - w. Coordination with other work.
    - x. Required performance results.
    - y. Protection of adjacent work.
    - z. Protection of construction and personnel.
  - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of record documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Submittal of written warranties.
    - d. Requirements for preparing operations and maintenance data.
    - e. Requirements for delivery of material samples, attic stock, and spare parts.
    - f. Requirements for demonstration and training.
    - g. Preparation of Contractor's punch list.
    - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - i. Submittal procedures.
    - j. Owner's partial occupancy requirements.
    - k. Installation of Owner's furniture, fixtures, and equipment.
    - l. Responsibility for removing temporary facilities and controls.
  4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at regular intervals.
1. Coordinate dates of meetings with preparation of payment requests.
  2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Progress cleaning.
      - 10) Quality and work standards.
      - 11) Status of correction of deficient items.



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- 12) Field observations.
  - 13) Status of RFIs.
  - 14) Status of proposal requests.
  - 15) Pending changes.
  - 16) Status of Change Orders.
  - 17) Pending claims and disputes.
  - 18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 31 00

SECTION 01 31 29 - TIME EXTENSIONS DUE TO ABNORMAL WEATHER CONDITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes requirements and means for determining and granting extensions for delays due to abnormal weather conditions.
- B. Related Requirements:
  - 1. Division 01 Section "Construction Progress Documentation" for construction scheduling.

1.03 DEFINITIONS

- A. Contract Time: The period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.
- B. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- C. Critical Path Activities: Work activities which form part of the critical path.
- D. Abnormal Adverse Weather: Adverse weather conditions in excess of the norm for the Project area based on historic averages as reported by NOAA.
  - 1. Precipitation: Abnormal will be interpreted as the number of days in excess of the norm during which rainfall exceeds 0.01 inch and/or snow/ice pellets exceed 1.0 inch.
  - 2. Temperature: No extension of time will be allowed for extreme temperatures unless the installation of a material specified to be installed within certain temperature limits is delayed due to temperature extremes. Extensions of time will then only be granted if conditions specified herein are followed.

1.04 ACTION SUBMITTALS

- A. Submit the following with claims for time extensions due to abnormal adverse weather:
  - 1. NOAA Local Climatological Data (LCD) from reporting station nearest to Project site for the month in which the delay occurred and for the prior year obtained from [www.ncdc.noaa.gov/IPS/lcd/lcd.html#SAMPLES](http://www.ncdc.noaa.gov/IPS/lcd/lcd.html#SAMPLES).
  - 2. Description of impact to ongoing Work activities.
  - 3. Probable effect of claimed time delay on progress of the Work.
- B. Submit electronic notice of weather delays to Owner's Representative within 24 hours of occurrence.

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- C. Submit claims for time extensions due to abnormal adverse weather monthly for the prior month's work, include copies of electronic notices of weather delays, with Application for Payment and in accordance with the Owner-Contractor Agreement.

1.05 CLAIMS FOR TIME EXTENSIONS

- A. Contract Time shall include the impact of delays due to normal adverse weather which can be reasonably anticipated.
- B. Time extensions due to abnormal adverse weather may be granted for adverse weather in excess of that which can be reasonably anticipated and which directly impacts critical path activities.
- C. Claims for time extensions due to abnormal adverse weather will only be considered if the following conditions exist:
  - 1. Delays exceed the time included for normal adverse weather delays on a cumulative monthly basis.
  - 2. Electronic notice of weather delay was received by Owner's Representative within 24 hours of occurrence.
  - 3. Contractor substantiates in a manner acceptable to the Architect, that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction by preventing the execution of major items impacting the critical path for completion.
- D. Claims for time extensions due to abnormal adverse weather will not be considered if the following conditions exist:
  - 1. Delay occurred during non-working hours.
  - 2. Delay occurred on non-working days (Saturdays, Sundays or holidays).
  - 3. Procedure specified herein is not followed.

1.06 DETERMINATION OF TIME EXTENSIONS

- A. Changes to Contract Time as a result of excess of weather delays will not be made until near the end of Project. Final determination will be based on a comparison of claims of delays made versus average days scheduled, and after determining that the actual delays negatively impacted the critical path activities.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 ATTACHMENTS

- A. A sample LCD weather report is attached following this Section.

END OF SECTION 01 31 29

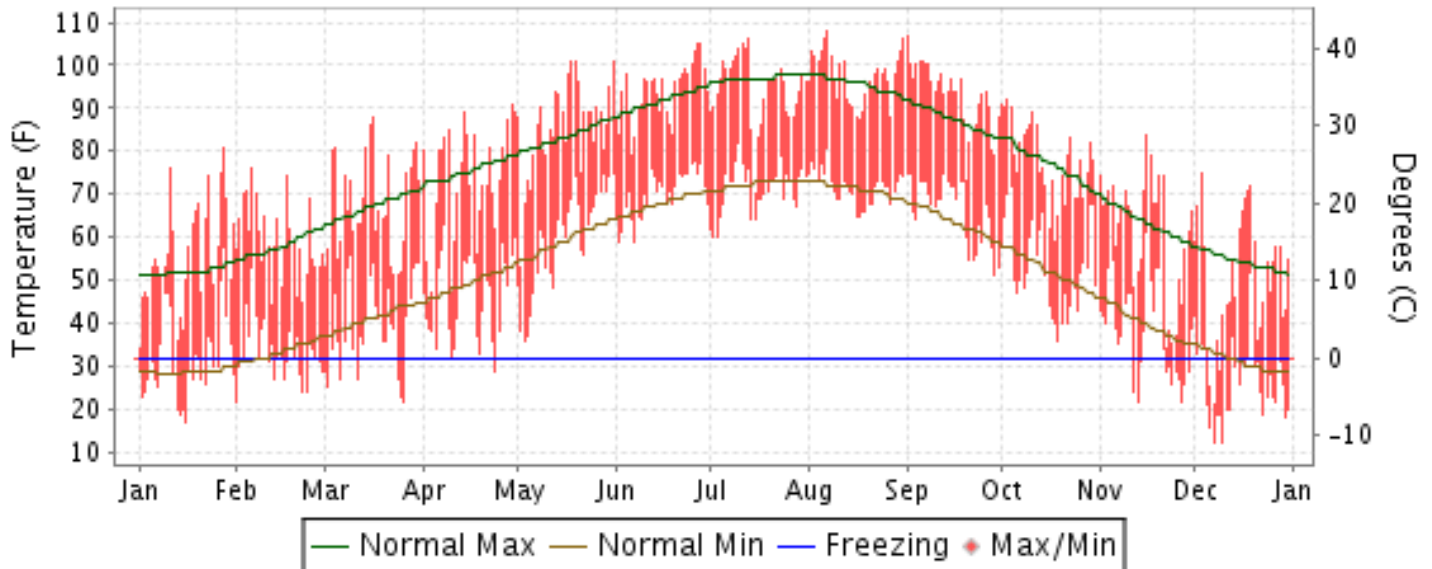


# 2013 LOCAL CLIMATOLOGICAL DATA ANNUAL SUMMARY WITH COMPARATIVE DATA

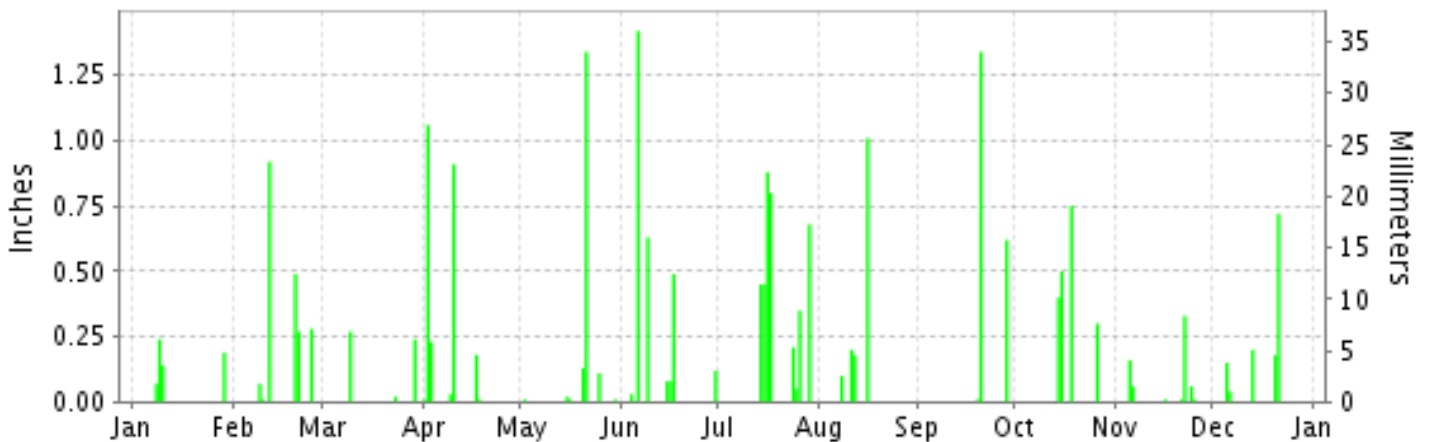
WICHITA FALLS,  
TEXAS (KSPS)

ISSN 0198-5248

## Daily Max/Min Temperature



## Daily Precipitation



## Daily Station Pressure



I CERTIFY THAT THIS IS AN OFFICIAL PUBLICATION OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, AND IS COMPILED FROM RECORDS ON FILE AT THE NATIONAL CLIMATIC DATA CENTER.

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NATIONAL  
ENVIRONMENTAL SATELLITE, DATA  
AND INFORMATION SERVICE

NATIONAL  
CLIMATIC DATA CENTER  
ASHEVILLE, NORTH CAROLINA

*Thomas R. Karl*  
DIRECTOR  
NATIONAL CLIMATIC DATA CENTER

# METEOROLOGICAL DATA FOR 2013

## WICHITA FALLS (KSPS)

**LATITUDE:** 33° 58'N      **LONGITUDE:** 98° 29'W      **ELEVATION (FT):** GRND: 1017 BARO: 1013      **TIME ZONE:** CENTRAL (UTC -6)      **WBAN: 13966**

	ELEMENT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F	MEAN DAILY MAXIMUM	55.9	59.2	67.6	72.7	85.6	93.8	94.6	97.3	92.9	77.5	61.3	50.5	75.7
	HIGHEST DAILY MAXIMUM	81	76	88	91	101	105	106	108	107	92	84	75	108
	DATE OF OCCURRENCE	28	06	16	29	31+	28+	13	07	01	03	16	03	AUG 07
	MEAN DAILY MINIMUM	31.7	33.3	39.6	45.9	59.5	70.1	71.1	71.7	66.4	52.8	38.3	26.4	50.6
	LOWEST DAILY MINIMUM	17	22	22	29	36	59	60	65	51	36	22	12	12
	DATE OF OCCURRENCE	16	01	26	24	03	07+	03+	17+	29	19	27+	10+	DEC 10+
	AVERAGE DRY BULB	43.8	46.3	53.6	59.3	72.6	82.0	82.9	84.5	79.7	65.2	49.8	38.4	63.2
	MEAN WET BULB	38.5	40.0	44.7	51.9	62.3	69.3	70.2	71.0	66.7	57.1	43.4	33.4	54.0
	MEAN DEW POINT	31.6	32.1	34.2	45.3	54.9	62.5	63.4	64.4	59.0	51.1	36.0	27.4	46.8
	NUMBER OF DAYS WITH:													
	MAXIMUM >= 90°	0	0	0	1	10	21	23	27	22	4	0	0	108
	MAXIMUM <= 32°	0	0	0	0	0	0	0	0	0	0	0	3	3
	MINIMUM <= 32°	20	17	7	2	0	0	0	0	0	0	11	25	82
	MINIMUM <= 0°	0	0	0	0	0	0	0	0	0	0	0	0	0
H/C	HEATING DEGREE DAYS	654	517	361	219	52	0	0	0	0	102	456	815	3176
	COOLING DEGREE DAYS	5	0	15	57	293	517	559	613	446	115	8	0	2628
RH	MEAN (PERCENT)	66	63	53	64	59	56	57	55	54	66	64	70	61
	HOUR 00 LST	74	69	61	74	70	64	64	65	62	74	72	75	69
	HOUR 06 LST	82	80	71	83	80	78	77	78	76	81	77	83	79
	HOUR 12 LST	57	53	42	53	46	44	46	40	39	54	51	60	49
	HOUR 18 LST	52	47	35	48	41	36	41	36	37	54	56	62	45
W/O	NUMBER OF DAYS WITH:													
	HEAVY FOG(VISBY <= 1/4 MI)	1	2	0	0	0	0	0	0	0	0	0	4	7
	THUNDERSTORMS	1	3	2	5	4	5	5	3	2	2	0	0	32
PR	MEAN STATION PRESS. (IN.)	29.04	28.91	28.93	28.83	28.82	28.82	28.88	28.88	28.85	28.90	29.08	29.04	28.92
	MEAN SEA-LEVEL PRESS. (IN.)	30.15	30.02	30.02	29.91	29.89	29.88	29.94	29.94	29.91	29.99	30.19	30.16	30.00
WINDS	RESULTANT SPEED (MPH)	1.1	1.2	1.7	4.0	7.2	6.5	5.6	4.7	4.3	3.9	2.2	0.9	3.2
	RES. DIR. (TENS OF DEGS.)	31	06	13	14	16	15	15	15	14	15	14	32	15
	MEAN SPEED (MPH)	9.6	11.2	12.3	13.4	14.8	12.2	9.7	9.0	9.0	11.2	11.8	9.6	11.2
	PREVAIL.DIR.(TENS OF DEGS.)	36	34	17	15	18	17	19	17	15	16	16	01	18
	MAXIMUM 2-MINUTE WIND													
	SPEED (MPH)	36	35	44	40	41	52	41	44	29	33	37	31	52
	DIR. (TENS OF DEGS.)	28	36	36	01	18	34	08	18	13	36	34	01	34
	DATE OF OCCURRENCE	29	07	04	10	28	17	24	16	07	18	21	29	JUN 17
	MAXIMUM 3-SECOND WIND:													
	SPEED (MPH)	44	41	52	48	53	66	53	59	38	40	45	38	66
	DIR. (TENS OF DEGS.)	28	32	36	36	18	34	06	19	12	33	34	02	34
	DATE OF OCCURRENCE	29	25	05	10	18	17	24	16	07	31	21	29	JUN 17
PRECIPITATION	WATER EQUIVALENT:													
	TOTAL (IN.)	0.64	2.04	0.53	2.43	1.63	2.85	3.87	1.49	1.97	1.95	0.64	1.29	21.33
	GREATEST 24-HOUR (IN.)	0.38	0.92	0.27	1.06	1.47	1.42	1.21	1.01	1.35	0.75	0.33	0.90	1.47
	DATE OF OCCURRENCE	09-10	12	09	02	20-21	06	16-17	16	19-20	18	22	20-21	MAY 20-21
	NUMBER OF DAYS WITH:													
	PRECIPITATION 0.01	4	6	3	7	7	7	8	4	3	4	7	5	65
	PRECIPITATION 0.10	3	4	2	4	3	4	7	4	2	4	2	4	43
	PRECIPITATION 0.10	0	0	0	1	1	1	0	1	1	0	0	0	5
	PRECIPITATION 1.00													
SNOWFALL	SNOW,ICE PELLETS,HAIL													
	TOTAL (IN.)	T	T	0.0	T	T	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.7
	GREATEST 24-HOUR (IN.)	T	T	0.0	T	T	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.5
	DATE OF OCCURRENCE	13+	25+		10	20						24	05	DEC 05
	MAXIMUM SNOW DEPTH (IN.)	0	0	0	0	0	0	0	0	0	0	T	1	1
	DATE OF OCCURRENCE											23	08+	DEC 08+
	NUMBER OF DAYS WITH:													
	SNOWFALL >= 1.0	0	0	0	0	0	0	0	0	0	0	0	0	0

# NORMALS, MEANS, AND EXTREMES

## WICHITA FALLS (KSPS)

**LATITUDE:**  
33° 58'N

**LONGITUDE:**  
98° 29'W

**ELEVATION (FT):**  
GRND: 1017 BARO: 1013

**TIME ZONE:**  
CENTRAL (UTC -6)

**WBAN: 13966**

	ELEMENT	POR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F	NORMAL DAILY MAXIMUM	30	54.2	58.3	67.0	75.8	83.6	91.4	96.9	96.6	88.1	77.0	65.1	54.7	75.7
	MEAN DAILY MAXIMUM	89	53.4	57.1	67.3	76.0	84.0	91.9	97.6	97.4	87.9	78.2	64.1	55.6	75.9
	HIGHEST DAILY MAXIMUM	66	87	93	100	103	110	117	114	113	111	102	89	88	117
	YEAR OF OCCURRENCE		1969	1996	1971	2011	2011	1980	1980	1964	2000	2000	1988	1954	JUN 1980
	MEAN OF EXTREME MAXS.	109	76.1	80.9	87.8	92.2	97.7	101.7	105.5	105.5	100.7	92.9	83.0	77.2	91.8
	NORMAL DAILY MINIMUM	30	29.8	33.5	41.2	49.4	59.6	67.6	71.9	71.4	63.3	52.0	40.3	30.8	50.9
	MEAN DAILY MINIMUM	89	29.9	33.3	41.4	50.5	60.1	68.2	72.9	72.3	63.9	53.3	40.2	32.5	51.5
	LOWEST DAILY MINIMUM	66	-5	-8	8	24	36	51	54	53	38	25	14	-7	-8
	YEAR OF OCCURRENCE		1966	1985	1989	1975	2013	1983	1970	1992	1989	1957	1950	1989	FEB 1985
	MEAN OF EXTREME MINS.	109	13.0	16.8	23.2	33.7	45.6	58.0	64.5	62.4	49.3	36.4	24.7	16.0	37.0
	NORMAL DRY BULB	30	42.0	45.9	54.1	62.6	71.6	79.5	84.4	84.0	75.7	64.5	52.7	42.8	63.3
	MEAN DRY BULB	89	41.7	45.2	54.4	63.3	72.1	80.2	85.3	84.8	75.9	65.7	52.2	44.0	63.7
	MEAN WET BULB	29	34.3	38.0	44.8	52.5	62.0	68.4	69.7	69.2	64.0	54.6	44.3	35.8	53.1
	MEAN DEW POINT	29	31.1	34.5	41.8	49.6	60.0	66.5	67.1	66.8	61.5	52.1	41.4	32.3	50.4
	NORMAL NO. DAYS WITH:														
	MAXIMUM >= 90	30	0.0	0.1	0.7	1.6	7.5	18.7	27.4	26.1	13.6	2.2	0.0	0.0	97.9
	MAXIMUM <= 32	30	1.4	0.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.4	3.9
	MINIMUM <= 32	30	18.9	11.4	4.9	0.5	0.0	0.0	0.0	0.0	0.0	0.3	5.8	17.4	59.2
	MINIMUM <= 0	30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
H/C	NORMAL HEATING DEG. DAYS	30	713	536	357	142	23	1	0	0	13	113	381	690	2969
	NORMAL COOLING DEG. DAYS	30	1	2	19	70	227	436	601	589	334	97	12	1	2389
RH	NORMAL (PERCENT)	30	66	65	63	62	67	65	57	58	64	66	68	69	64
	HOURLY 00 LST	30	73	73	71	72	78	76	66	68	74	74	76	74	73
	HOURLY 06 LST	30	80	80	79	80	86	85	78	80	84	84	83	81	82
	HOURLY 12 LST	30	56	55	51	49	53	51	44	46	51	52	54	57	52
	HOURLY 18 LST	30	57	52	47	46	51	48	40	42	50	54	60	61	51
S	PERCENT POSSIBLE SUNSHINE														
W/O	MEAN NO. DAYS WITH:														
	HEAVY FOG(VISBY <= 1/4 MI)	50	2.0	1.6	0.9	0.7	0.6	0.3	0.2	0.1	0.4	1.1	1.4	1.9	11.2
	THUNDERSTORMS	66	1.0	1.5	3.2	5.3	8.7	7.3	5.3	5.7	4.2	3.6	1.6	0.9	48.3
CLOUDINESS	MEAN:														
	SUNRISE-SUNSET (OKTAS)	1	4.8	4.8	7.2	4.4	5.6	2.0	1.6	2.1	3.2	3.2	4.0	4.0	3.9
	MIDNIGHT-MIDNIGHT (OKTAS)	1	4.8	4.0	7.2	3.6	5.6	1.6	1.6	2.4	1.6	2.8	4.0	4.0	3.6
	MEAN NO. DAYS WITH:														
	CLEAR	2	12.0	15.0	9.0	10.0	18.0	24.0	19.0	16.0	3.0	12.0	1.0	1.0	140.0
	PARTLY CLOUDY	2	6.5	3.5	3.0	6.0	6.5	9.5	6.0	4.0	2.0	3.0	3.0	5.0	58.0
	CLOUDY	2	11.0	8.0	4.5	4.0	11.5	1.5	1.0	2.0	1.0	3.0	8.0	5.0	60.5
PR	MEAN STATION PRESSURE(IN)	30	29.02	28.98	28.90	28.83	28.81	28.82	28.87	28.87	28.90	28.93	28.98	29.02	28.91
	MEAN SEA-LEVEL PRES. (IN)	30	30.13	30.08	29.99	29.91	29.87	29.87	29.92	29.93	29.96	30.01	30.07	30.12	29.99
WINDS	MEAN SPEED (MPH)	30	10.8	11.5	12.5	12.9	12.2	11.7	10.8	9.7	9.7	10.7	11.1	10.6	11.2
	PREVAIL.DIR(TENS OF DEGS)	34	36	36	17	17	17	17	17	17	17	17	17	36	17
	MAXIMUM 2-MINUTE:														
	SPEED (MPH)	20	46	48	62	48	59	69	60	48	51	46	55	45	69
	DIR. (TENS OF DEGS)		32	28	19	32	02	36	33	01	33	14	15	34	36
	YEAR OF OCCURRENCE		2008	1994	2004	2011	2001	2002	2000	2002	1996	1994	1994	2000	JUN 2002
	MAXIMUM 3-SECOND														
	SPEED (MPH)	20	56	62	91	63	69	94	74	61	64	55	63	54	94
	DIR. (TENS OF DEGS)		32	27	20	34	02	31	27	01	35	19	15	28	31
	YEAR OF OCCURRENCE		2008	1994	2004	2011	2001	2007	1994	2002	2011	2012	1994	2004	JUN 2007
PRECIPITATION	NORMAL (IN)	30	1.14	1.75	2.20	2.61	3.79	4.15	1.59	2.50	2.81	3.11	1.65	1.62	28.92
	MAXIMUM MONTHLY (IN)	69	4.48	4.55	6.29	8.50	13.22	8.60	11.86	7.61	10.23	7.86	6.85	6.93	13.22
	YEAR OF OCCURRENCE		1968	1990	1999	1957	1982	1989	1950	1971	1980	1972	2004	1991	MAY 1982
	MINIMUM MONTHLY (IN)	69	0.00	T	T	0.08	0.01	0.02	0.00	0.00	T	T	0.00	0.02	0.00
	YEAR OF OCCURRENCE		1986	1991	1956	1996	1966	2011	2003	2000	1983	1952	1949	1996	JUL 2003
	MAXIMUM IN 24 HOURS (IN)	69	2.11	3.00	4.32	5.33	5.70	5.36	3.93	5.82	6.22	5.61	2.58	2.98	6.22
	YEAR OF OCCURRENCE		1999	1981	1988	2009	1975	1985	1950	2008	1980	1959	1968	1991	SEP 1980
	NORMAL NO. DAYS WITH:														
	PRECIPITATION >= 0.01	30	4.8	5.3	6.7	6.2	8.7	7.7	5.0	6.2	6.0	7.4	5.3	5.0	74.3
	PRECIPITATION >= 1.00	30	0.2	0.3	0.5	0.7	1.2	1.4	0.4	0.7	1.0	1.1	0.5	0.4	8.4
SNOWFALL	NORMAL (IN)	30	1.4	0.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.0	3.9
	MAXIMUM MONTHLY (IN)	64	11.9	11.8	10.9	0.8	T	T	0.0	0.0	0.0	1.0	3.9	9.1	11.9
	YEAR OF OCCURRENCE		1966	1978	1989	1973	2013	1992	2011			1993	1957	2009	JAN 1966
	MAXIMUM IN 24 HOURS (IN)	64	8.1	5.7	9.7	0.8	T	T	T	0.0	0.0	1.0	3.9	7.8	9.7
	YEAR OF OCCURRENCE		1985	2010	1989	1973	2013	1992	2004			1993	1957	2009	MAR 1989
	MAXIMUM SNOW DEPTH (IN)	58	7	8	10	0	T	0	0	0	0	0	4	8	10
	YEAR OF OCCURRENCE		1966	1985	1989		1951						1976	2009	MAR 1989
	NORMAL NO. DAYS WITH:														
	SNOWFALL >= 1.0	30	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	1.1

# **PRECIPITATION (inches) 2013 WICHITA FALLS (KSPS)**

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1984	0.17	0.79	1.48	0.62	1.44	1.78	0.92	3.07	0.80	6.24	3.32	5.03	25.66
1985	1.08	2.61	3.77	6.15	1.69	7.07	0.21	1.75	1.46	3.69	1.11	0.11	30.70
1986	0.00	1.10	0.84	3.24	3.87	7.61	0.77	2.10	6.77	4.37	3.03	0.91	34.61
1987	1.78	4.16	1.89	0.32	10.17	3.74	1.47	2.43	2.20	0.11	1.66	4.84	34.77
1988	1.17	0.60	5.24	2.16	0.93	2.45	0.95	0.58	7.04	0.76	0.51	1.11	23.50
1989	1.04	3.50	1.54	0.32	4.54	8.60	3.19	6.17	5.01	2.25	0.03	0.28	36.47
1990	2.30	4.55	5.38	6.95	5.01	2.73	2.21	2.08	1.78	1.33	2.49	0.97	37.78
1991	2.66	-0.1	0.68	0.99	4.24	2.76	1.91	2.75	8.28	3.92	0.81	6.93	35.92
1992	1.78	1.15	1.27	1.08	3.56	7.94	1.78	1.86	1.73	0.17	4.57	2.21	29.10
1993	1.19	3.37	2.80	3.21	5.25	3.21	0.72	1.21	2.83	2.09	0.58	2.64	29.10
1994	0.22	2.66	1.07	2.01	1.79	1.46	3.10	0.14	1.51	3.74	2.33	0.86	20.89
1995	0.86	0.16	1.64	2.10	7.45	5.14	3.93	T	0.47	2.15	0.05	0.76	24.71
1996	0.06	T	2.33	0.08	0.64	1.89	1.77	5.49	5.00	1.10	3.77	T	22.13
1997	0.35	2.86	0.23	4.20	3.96	2.08	0.11	2.04	0.70	2.19	0.94	4.12	23.78
1998	2.42	2.34	3.84	1.63	0.19	2.25	1.95	1.27	0.21	2.73	2.26	1.94	23.03
1999	2.37	0.19	6.29	3.78	4.86	4.62	T	1.37	1.76	3.50	T	0.72	29.46
2000	0.73	1.20	2.51	2.81	1.33	3.63	0.70	0.00	0.07	6.38	5.16	1.27	25.79
2001	1.55	3.51	0.79	1.20	3.55	T	T	4.22	0.49	0.57	1.16	1.10	18.14
2002	1.16	1.06	3.01	4.42	1.58	4.77	2.92	0.15	2.37	4.62	0.67	1.88	28.61
2003	0.08	0.83	0.43	1.83	4.42	7.01	0.00	2.56	1.97	0.01	1.86	0.11	21.11
2004	1.37	3.12	1.63	1.83	1.81	5.37	4.81	5.42	0.99	3.98	6.85	0.76	37.94
2005	1.48	2.28	0.41	0.28	3.22	2.89	2.34	7.42	4.06	3.76	0.00	0.18	28.32
2006	0.63	0.17	2.74	1.54	2.04	1.04	0.09	1.24	3.56	6.09	0.87	2.25	22.26
2007	2.20	0.91	3.89	2.20	5.81	7.82	2.15	2.83	4.20	0.66	0.62	0.76	34.05
2008	0.01	0.99	2.87	2.83	2.91	3.47	1.05	7.38	1.72	3.41	0.10	1.05	27.79
2009	0.13	0.68	0.37	6.77	3.60	2.49	2.93	1.58	4.09	4.32	0.05	2.11	29.12
2010	1.76	2.47	1.06	4.12	3.76	3.47	3.07	1.99	5.41	1.51	0.23	0.13	28.98
2011	0.25	0.39	0.06	0.35	2.29	0.02	T	0.57	1.56	5.02	1.01	1.45	12.97
2012	2.24	0.60	3.49	2.40	1.05	2.45	0.37	2.68	3.22	0.51	0.20	0.60	19.81
2013	0.64	2.04	0.53	2.43	1.63	2.85	3.87	1.49	1.97	1.95	0.64	1.29	21.33
POR= 109 YRS	1.07	1.33	1.89	2.69	4.36	3.36	1.99	2.25	2.89	2.74	1.55	1.49	27.61

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# **AVERAGE TEMPERATURE (°F) 2013 WICHITA FALLS (KSPS)**

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1984	37.2	47.1	51.4	60.1	72.7	82.9	84.8	84.4	73.9	63.3	51.9	46.2	63.0
1985	34.8	40.8	55.9	64.2	72.2	78.1	83.0	85.4	75.9	64.7	50.7	38.6	62.0
1986	45.7	47.6	58.4	65.6	71.1	79.6	86.9	82.5	78.1	63.7	49.0	43.3	64.3
1987	39.2	48.7	51.2	62.1	73.1	78.3	82.2	85.1	74.4	63.8	53.2	42.8	62.8
1988	38.2	43.1	53.5	61.4	72.1	79.5	84.7	86.2	75.5	63.5	54.7	45.8	63.2
1989	46.4	37.2	53.8	65.4	72.5	76.1	82.9	81.0	72.0	66.2	54.6	35.0	61.9
1990	47.9	49.4	55.4	61.6	71.7	84.5	83.0	84.1	79.1	64.1	56.5	39.2	64.7
1991	39.3	51.5	57.0	65.4	73.9	79.8	85.1	81.1	72.0	65.2	48.3	46.8	63.8
1992	43.2	51.3	56.6	63.4	69.4	78.3	83.0	78.9	75.4	66.8	49.9	45.2	63.5
1993	40.9	43.4	52.5	60.5	68.1	78.7	86.1	84.0	73.7		47.2	45.2	
1994	40.3	41.4	54.9	62.5	69.0	82.5	82.6	83.6	74.8	65.9	53.7	46.3	63.1
1995	43.9	48.4	53.0	61.9	68.4	76.4	84.4	83.7	73.8	64.8	53.1	43.7	63.0
1996	39.5	48.5	50.1	61.6	79.0	82.2	86.5	81.5	72.5	63.6	50.9	46.2	63.5
1997	42.0	46.9	56.1	57.7	68.4	77.8	84.4	82.1	78.9	64.4	49.1	41.2	62.4
1998	44.6	47.3	50.5	59.4	76.7	84.2	89.3	85.6	83.4	68.5	55.3	43.3	65.7
1999	44.2	52.8	52.3	63.5	71.1	79.1	86.2	88.5	75.9	65.6	59.0	46.8	65.4
2000	44.8	53.0	56.2	62.7	76.9	78.7	87.0	90.3	79.3	67.7	46.7	36.5	65.0
2001	40.5	44.8	49.8	65.8	73.3	81.5	90.0	85.4	75.1	64.5	57.6	45.7	64.5
2002	45.5	44.9	51.0	64.4	70.2	78.6	82.2	85.0	76.9	59.8	50.6	44.2	62.8
2003	40.7	42.9	53.3	65.0	73.7	76.7	86.0	85.9	73.0	67.7	55.0	47.5	64.0
2004	45.1	42.5	59.3	63.6	73.4	77.3	81.2	78.9	76.5	67.3	53.6	45.5	63.7
2005	44.1	49.1	54.1	63.5	71.3	81.1	83.8	83.0	79.5	65.5	56.2	44.2	64.6
2006	52.5	46.2	59.1	70.1	75.5	82.7	88.4	89.2	74.1	65.6	55.5	46.0	67.1
2007	40.0	46.0	61.4	60.3	72.3	78.4	81.8	85.7	79.7	69.7	57.0	43.7	64.7
2008	44.3	49.1	57.2	63.8	74.7	85.8	86.7	84.6	75.3	66.0	54.2	42.9	65.4
2009	41.9	51.7	57.8	64.3	69.1	81.6	84.4	84.3	74.4	58.9	55.9	37.5	63.5
2010	39.6	39.2	52.4	63.4	71.1	83.2	83.6	87.2	77.9	65.4	54.0	44.9	63.5
2011	38.9	44.5	57.6	69.3	74.1	89.5	92.9	93.4	75.9	65.4	53.7	42.7	66.5
2012	46.5	47.9	61.5	68.1	76.2	82.5	88.4	85.2	76.5	63.0	56.9	45.0	66.5
2013	43.8	46.3	53.6	59.3	72.6	82.0	82.9	84.5	79.7	65.2	49.8	38.4	63.2
POR= 89 YRS	41.7	45.2	54.4	63.3	72.1	80.2	85.3	84.8	75.9	65.7	52.2	44.0	63.7

### HEATING DEGREE DAYS (base 65°F) 2013 WICHITA FALLS (KSPS)

YEAR	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
1984-85	0	0	65	129	400	582	930	673	301	67	1	0	3148
1985-86	0	0	31	83	431	812	592	482	226	76	12	0	2745
1986-87	0	0	0	98	473	665	791	452	419	162	1	0	3061
1987-88	0	0	0	92	370	682	824	630	376	138	7	0	3119
1988-89	0	0	3	89	318	587	568	772	391	123	16	0	2867
1989-90	0	0	41	100	318	923	525	428	316	154	44	0	2849
1990-91	0	0	3	120	267	793	791	376	265	63	15	0	2693
1991-92	0	0	25	116	496	558	671	391	262	107	35	0	2661
1992-93	0	0	1	47	457	614	737	597	394	169	30	0	3046
1993-94	0	0	15		530	607	756	651	334	145	42	0	
1994-95	0	0	18	98	349	572	646	460	388	148	32	0	2711
1995-96	0	0	41	65	350	656	783	491	476	148	2	0	3012
1996-97	0	0	16	103	419	579	714	500	283	233	30	0	2877
1997-98	0	0	0	155	472	733	625	494	469	189	2	0	3139
1998-99	0	0	0	47	290	664	636	343	388	105	9	0	2482
1999-00	0	0	14	85	195	558	618	342	281	122	16	0	2231
2000-01	0	0	22	86	546	877	754	560	467	70	2	0	3384
2001-02	0	0	6	86	253	595	597	557	443	116	25	0	2678
2002-03	0	0	0	217	431	641	751	617	375	87	9	0	3128
2003-04	0	0	0	46	322	536	610	646	212	103	26	0	2501
2004-05	0	0	0	39	333	599	642	442	334	99	53	0	2541
2005-06	0	0	0	103	289	639	387	522	238	30	6	0	2214
2006-07	0	0	1	104	299	583	768	530	157	197	1	0	2640
2007-08	0	0	0	65	272	654	644	458	280	120	15	0	2508
2008-09	0	0	0	90	329	679	710	375	263	116	46	0	2608
2009-10	0	0	7	197	270	844	778	719	395	101	26	0	3337
2010-11	0	0	3	56	334	616	799	589	266	47	47	0	2757
2011-12	0	0	3	93	349	684	566	493	163	50	1	0	2402
2012-13	0	0	4	158	262	621	654	517	361	219	52	0	2848
2013-	0	0	0	102	456	815							

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### COOLING DEGREE DAYS (base 65°F) 2013 WICHITA FALLS (KSPS)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1984	0	0	2	42	262	545	620	609	338	87	13	3	2521
1985	0	0	27	53	230	401	562	638	365	81	11	0	2368
1986	0	2	30	102	204	448	686	552	399	66	0	0	2489
1987	0	0	0	80	258	404	542	629	288	63	21	0	2285
1988	0	0	26	37	234	443	620	664	322	51	15	0	2412
1989	0	0	50	138	253	336	561	506	258	143	12	0	2257
1990	0	0	27	59	259	593	567	596	435	98	17	0	2651
1991	0	1	24	78	296	454	627	506	242	128	3	1	2360
1992	0	0	7	68	178	405	565	436	321	112	11	6	2109
1993	0	0	13	42	137	415	663	595	285		3	0	
1994	0	0	28	76	175	532	550	585	320	131	17	0	2414
1995	0	2	24	64	143	351	609	551	314	70	2	3	2133
1996	0	17	20	53	443	522	672	518	247	67	2	1	2562
1997	7	0	11	19	142	391	605	537	424	141	0	0	2277
1998	1	2	27	30	369	584	760	647	557	164	10	0	3151
1999	0	6	0	69	204	428	664	735	348	110	23	1	2588
2000	0	0	12	59	393	419	689	793	457	173	0	0	2995
2001	0	0	0	99	266	501	782	637	317	75	38	2	2717
2002	0	0	14	101	193	414	540	623	364	65	8	0	2322
2003	0	6	17	94	286	357	659	652	244	139	29	0	2483
2004	0	0	42	69	295	377	510	436	351	119	0	0	2199
2005	0	2	5	59	256	490	591	563	441	126	28	0	2561
2006	3	1	63	191	341	539	734	758	278	133	21	1	3063
2007	0	5	51	60	237	404	528	649	445	216	39	0	2634
2008	9	3	46	90	325	632	682	615	320	128	15	1	2866
2009	0	9	49	103	180	504	612	606	299	17	2	0	2381
2010	0	0	11	61	223	551	585	694	394	74	8	1	2602
2011	0	22	43	180	336	743	873	888	337	114	15	0	3551
2012	0	1	64	149	354	531	730	633	355	103	28	9	2957
2013	5	0	15	57	293	517	559	613	446	115	8	0	2628



## SNOWFALL (inches) 2013 WICHITA FALLS (KSPS)

YEAR	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
1984-85	0.0	0.0	0.0	0.0	0.0	0.4	8.7	0.2	0.0	0.0	0.0	0.0	9.3
1985-86	0.0	0.0	0.0	0.0	0.0	0.9	0.0	2.3	0.0	0.0	0.0	0.0	3.2
1986-87	0.0	0.0	0.0	0.0	0.0	T	2.4	T	0.0	0.0	0.0	0.0	2.4
1987-88	0.0	0.0	0.0	0.0	0.0	4.1	4.9	3.0	T	0.0	0.0	0.0	12.0
1988-89	0.0	0.0	0.0	0.0	T	T	2.3	T	10.9	0.0	0.0	0.0	13.2
1989-90	0.0	0.0	0.0	T	0.0	T	T	0.0	T	T	T	0.0	T
1990-91	0.0	0.0	0.0	0.0	0.0	1.1	T	0.0	T	0.0	0.0	0.0	1.1
1991-92	0.0	0.0	0.0	T	T	T	8.4	T	0.0	0.0	0.0	T	8.4
1992-93	0.0	0.0	0.0	T	T	T	T	T	T	T	T	T	T
1993-94	0.0	0.0	0.0	1.0	0.0			T	T	0.0	0.0	0.0	
1994-95	0.0	0.0	0.0	0.0	0.0		T	0.0	T	0.0	0.0		
1995-96		0.0	0.0	0.0	0.0			T					
1996-97						T	7.2	T					
1997-98													
1998-99													
1999-00													
2000-01													
2001-02													
2002-03						T	T	0.3	0.0	T	0.0	T	
2003-04	0.0	0.0	0.0	0.0	0.0	0.0	T	5.5	0.0	0.0	0.0	T	5.5
2004-05	T	0.0	0.0	0.0	T	1.3	T	T	0.0	0.0	T	T	1.3
2005-06	0.0	0.0	0.0	0.0	0.0	T	0.0	T	T	0.0	0.0	0.0	T
2006-07	0.0	0.0	0.0	0.0	1.0	0.0	T	T	0.0	T	0.0	0.0	1.0
2007-08	0.0	0.0	0.0	0.0	T	T	T	0.0	T	0.0	0.0	0.0	T
2008-09	0.0	0.0	0.0	0.0	0.0	0.0	T	T	T	T	0.0	0.0	T
2009-10	0.0	0.0	0.0	0.0	0.0	9.1	0.2	5.7	1.6	0.0	0.0	0.0	16.6
2010-11	0.0	0.0	0.0	0.0	0.0	0.0	T	5.8	0.0	T	T	0.0	5.8
2011-12	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.8	0.0	0.0	0.0	0.0	1.9
2012-13	0.0	0.0	0.0	0.0	0.0	3.5	T	T	0.0	T	T	0.0	3.5
2013-	0.0	0.0	0.0	0.0	0.2	0.5							
POR= 107 YRS	T	0.0	0.0	T	0.2	0.8	1.7	1.3	0.6	T	T	T	4.6

WBAN : 13966

## REFERENCE NOTES :

PAGE 1:  
THE TEMPERATURE GRAPH SHOWS NORMAL MAXIMUM AND NORMAL MINIMUM DAILY TEMPERATURES (SOLID CURVES) AND THE ACTUAL DAILY HIGH AND LOW TEMPERATURES (VERTICAL BARS).

PAGE 2 AND 3:

H/C INDICATES HEATING AND COOLING DEGREE DAYS.

RH INDICATES RELATIVE HUMIDITY

W/O INDICATES WEATHER AND OBSTRUCTIONS

S INDICATES SUNSHINE.

PR INDICATES PRESSURE.

CLOUDINESS ON PAGE 3 IS THE SUM OF THE CEILOMETER AND SATELLITE DATA NOT TO EXCEED EIGHT EIGHTHS(OKTAS).

GENERAL:

T INDICATES TRACE PRECIPITATION, AN AMOUNT GREATER THAN ZERO BUT LESS THAN THE LOWEST REPORTABLE VALUE.

+ INDICATES THE VALUE ALSO OCCURS ON EARLIER DATES.

BLANK ENTRIES DENOTE MISSING OR UNREPORTED DATA.

ASOS INDICATES AUTOMATED SURFACE OBSERVING SYSTEM.

PM INDICATES THE LAST DAY OF THE PREVIOUS MONTH.

POR (PERIOD OF RECORD) BEGINS WITH THE JANUARY DATA MONTH AND IS THE NUMBER OF YEARS USED TO COMPUTE THE MEAN. INDIVIDUAL MONTHS WITHIN THE POR MAY BE MISSING.

WHEN THE POR FOR A NORMAL IS LESS THAN 30 YEARS, THE NORMAL IS PROVISIONAL AND IS BASED ON THE NUMBER OF YEARS INDICATED.

0.\* OR \* INDICATES THE VALUE OR MEAN-DAYS-WITH IS BETWEEN 0.00 AND 0.05.

CLOUDINESS FOR ASOS STATIONS DIFFERS FROM THE NON-ASOS OBSERVATION TAKEN BY A HUMAN OBSERVER. ASOS STATION CLOUDINESS IS BASED ON TIME-AVERAGED CEILOMETER DATA FOR CLOUDS AT OR BELOW 12,000 FEET

CLEAR INDICATES 0 - 2 OKTAS, PARTLY CLOUDY INDICATES

3 - 6 OKTAS, AND CLOUDY INDICATES 7 OR 8 OKTAS.

GENERAL CONTINUED:

WIND DIRECTION IS RECORDED IN TENS OF DEGREES (2 DIGITS)

CLOCKWISE FROM TRUE NORTH. "00" INDICATES CALM. "36"

INDICATES TRUE NORTH.

RESULTANT WIND IS THE VECTOR AVERAGE OF THE SPEED AND DIRECTION.

AVERAGE TEMPERATURE IS THE SUM OF THE MEAN DAILY MAXIMUM AND MINIMUM TEMPERATURE DIVIDED BY 2.

SNOWFALL DATA COMPRISE ALL FORMS OF FROZEN

PRECIPITATION, INCLUDING HAIL.

A HEATING (COOLING) DEGREE DAY IS THE DIFFERENCE BETWEEN THE AVERAGE DAILY TEMPERATURE AND 65 F.

DRY BULB IS THE TEMPERATURE OF THE AMBIENT AIR.

DEW POINT IS THE TEMPERATURE TO WHICH THE AIR MUST BE COOLED TO ACHIEVE 100 PERCENT RELATIVE HUMIDITY.

WET BULB IS THE TEMPERATURE THE AIR WOULD HAVE IF THE MOISTURE CONTENT WAS INCREASED TO 100 PERCENT RELATIVE HUMIDITY.

ON JULY 1, 1996, THE NATIONAL WEATHER SERVICE BEGAN USING THE "METAR" OBSERVATION CODE THAT WAS ALREADY EMPLOYED BY MOST OTHER NATIONS OF THE WORLD. THE MOST NOTICEABLE DIFFERENCE IN THIS ANNUAL PUBLICATION WILL BE THE CHANGE IN UNITS FROM TENTHS TO EIGHTS(OKTAS) FOR REPORTING THE AMOUNT OF SKY COVER.

STATION HISTORY STOPPED WITH THE 2009 ANNUAL. IF YOU NEED STATION HISTORY INFORMATION GO TO "Historical Observing Metadata Repository", URL IS:

<http://www.ncdc.noaa.gov/homr/>

SNOWFALL STOPPED MONTH & YEAR INDICATED ABOVE. NO FURTHER YEARS INCLUDED UNLESS RESTARTED.

## NOTE:

The "Period of Record:(POR)" for all "averages" is based on "Summary of the Day First Order Station" and "Cooperative Summary of the Day" archives.

# **2013 WICHITA FALLS TEXAS (KSPS)**

Wichita Falls is located in the West Cross Timbers subdivision of the North Central Plains of Texas, about 10 miles south of the Red River and 400 miles northwest of the nearest portion of the Gulf of Mexico. The topography is gently rolling mesquite plain, and the elevation of the area is about 1,000 feet.

This region lies between the humid subtropical climate of east Texas and a continental climate to the north and west. The climate of Wichita Falls is classified as continental. It is characterized by rapid changes in temperature, large daily and annual temperature extremes, and by rather erratic rainfall.

The area lies in the path of polar air masses which move down from the north during the winter season. With the passage of cold fronts or northers in the fall and winter, abrupt drops in temperature of as much as 20 to 30 degrees within an hour sometimes occur. While the area is subject to a wide range of temperature, winters are on the whole relatively mild. January, the coldest month, has an average temperature around 40 degrees. Sub-zero temperatures occur about once every five years.

The summers in Wichita Falls are generally of the continental climate type, characterized by low humidity and windy conditions. Temperatures over 100 degrees are frequent during the common periods of hot weather. July and August, the hottest months, have average temperatures in the middle 80s.

The normal rainfall is nearly 27 inches per year, but the distribution is erratic to such an extent that prolonged dry periods are common. Several lakes in the area provide water for domestic, industrial, and irrigation purposes. The greater part of the rainfall comes in the form of showers rather than general rains. Over 75 percent of the annual moisture occurs during the period from late March to mid November, but dry periods of three to four weeks are to be expected during this time almost every year. While the dry conditions materially affect agriculture in this region, complete crop failure seldom results. Moderate flooding along Holliday Creek and the Wichita River, which run through the city, occur about once in each ten-year period. Snowfall, measuring an inch or more, occurs on average only two days a year.

Wind speeds average over 11 mph, and southerly winds prevail. Rather strong winds are observed in all months. Even though strong, gusty winds occur frequently, severe duststorms are rare. Most severe dust observed in the area is blown in from the north and west.

The area around Wichita Falls enjoys excellent aviation weather. Flying activities are possible on all but a very few days of the year. Approximately 95 percent of the time the ceiling is 1,000 feet or more with visibility of 3 miles or more.

# Station History

WICHITA FALLS, TX

NAME	Begin Date	End Date	Latitude	Longitude	Elevation Feet	Relocation	Platform
WICHITA FALLS MUNICIPAL AP	1930-09-01	1943-06-13	33° 58'	-98° 31'	1027		AIRWAYS
WICHITA FALLS MUNICIPAL AP	1993-05-01	2003-04-01	33° 58'	-98° 29'	1030	1 MI E	ASOS, COOP
WICHITA FALLS SHEPPARD AIR BASE	1960-06-23	1963-01-01	33° 58'	-98° 28'	994	2 MI SE	COOP
WICHITA FALLS MUNICIPAL AP	1968-12-01	1973-01-01	33° 58'	-98° 28'	994		AIRWAYS, COOP
WICHITA FALLS MUNICIPAL AP	1943-06-13	1955-02-01	33° 58'	-98° 31'	1027		AIRWAYS, COOP
WICHITA FALLS MUNICIPAL AP	1993-02-28	1993-05-01	33° 58'	-98° 28'	994		COOP
WICHITA FALLS KELL FIELD	1955-02-01	1959-12-31	33° 58'	-98° 31'	1020	225 FT N	AIRWAYS, COOP
WICHITA FALLS MUNICIPAL AP	1973-01-01	1993-02-28	33° 58'	-98° 28'	994		COOP, WXSVC
WICHITA FALLS KELL FIELD	1959-12-31	1960-06-23	33° 58'	-98° 31'	1020		COOP
WICHITA FALLS MUNICIPAL AP	2006-06-15	Present	33° 58'	-98° 29'	1017		ASOS, COOP
WICHITA FALLS MUNICIPAL AP	2003-04-01	2006-06-15	33° 58'	-98° 29'	1017		ASOS, COOP
WICHITA FALLS SHEPPARD AIR BASE	1963-01-01	1968-12-01	33° 58'	-98° 28'	994		AIRWAYS, COOP

# Element History

Element	Begin Date	End Date	Frequency	Time Of Observation	Equipment *	Equipment * Modifications	Equipment Exposure
TEMP	1992-02-02	1993-05-01	DAILY	2400	MXMN		
PRECIP	1993-05-01	2003-04-01	HOURLY	2400	TB	RCRD	
PRECIP	2003-04-01	2006-06-15	DAILY	2400	TB	RCRD	
TEMP	1930-09-01	1963-09-01	DAILY	2400			
TEMP	2003-04-01	2006-06-15	DAILY	2400	ATEMP		
PRECIP	1963-09-01	1992-02-02	HOURLY	2400	UNIV	RCRD	
PRECIP	1992-02-02	1993-05-01	HOURLY	2400	UNIV	RCRD	
PRECIP	1930-09-01	1963-09-01	DAILY		UNIV	RCRD	
PRECIP	1963-09-01	1992-02-02	DAILY	2400	UNIV	RCRD	
TEMP	1963-09-01	1992-02-02	DAILY	2400			
TEMP	1993-05-01	2003-04-01	DAILY	2400	HYGR		
PRECIP	2006-06-15	Present	HOURLY	2400	AWPAG	RCRD;HTD	
PRECIP	2006-06-15	Present	DAILY	2400	PCPNX		
PRECIP	1992-02-02	1993-05-01	DAILY	2400	UNIV	RCRD	
PRECIP	1993-05-01	2003-04-01	DAILY	2400	TB	RCRD	
PRECIP	2003-04-01	2006-06-15	HOURLY	2400	TB	RCRD	
TEMP	2006-06-15	Present	DAILY	2400	ATEMP		

\* For explanation of codes and abbreviations see Station Metadata link below.

Other Station Information can be found at:

ASOS Implementation by NWS: <http://www.nws.noaa.gov/ops2/Surface/asosimplementation.htm>

Station Metadata website: <http://www.ncdc.noaa.gov/homr>

INQUIRES/COMMENTS CALL: (828) 271-4800, option 2

Fax Number : (828) 271-4876

TDD : (828) 271-4010

Email : [ncdc.orders@noaa.gov](mailto:ncdc.orders@noaa.gov)

NOAA/National Climatic Data Center

Attn: User Engagement & Services Branch

151 Patton Avenue

Asheville, NC 28801-5001

Visit our Web Site for other weather data: [www.ncdc.noaa.gov](http://www.ncdc.noaa.gov)

## SECTION 01 33 00 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
  - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
  - 2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
  - 3. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 5. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### 1.03 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

#### 1.04 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
  - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
  - a. Scheduled date for first submittal.
  - b. Specification Section number and title.
  - c. Submittal category: Action; informational.
  - d. Name of subcontractor.
  - e. Description of the Work covered.
  - f. Scheduled date for Architect's final release or approval.
  - g. Scheduled date of fabrication.
  - h. Scheduled dates for purchasing.
  - i. Scheduled dates for installation.
  - j. Activity or event number.

#### 1.05 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals.
  1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project Record Drawings.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Contractor shall execute a data licensing agreement in the form of AIA Form C106-2013, "Digital Data Licensing Agreement" or equivalent agreement form acceptable to Owner and Architect.
    - c. The [following digital data files will be furnished] for each appropriate discipline:
      - 1) Floor plans.
      - 2) Reflected ceiling plans.
  2. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
  3. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format .
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
    - a. Sequential review is required where Architect's consultants prepared design drawings and specifications including but not limited to door hardware, structural, food service, fire protection, plumbing, HVAC, electrical, security, Audio-Visual / IT, civil, and landscape components.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
    - a. File name shall use Architect's project number followed by a decimal point and then the Specification Section number followed by another decimal point and then a sequential three-digit number (e.g., 4-0467-061000.001). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 4-0467-061000.001.A).
  3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
  4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name of Contractor.
    - e. Name of firm or entity that prepared submittal.
    - f. Names of subcontractor, manufacturer, and supplier.
    - g. Category and type of submittal.
    - h. Submittal purpose and description.
    - i. Specification Section number and title.
    - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    - k. Drawing number and detail references, as appropriate.
    - l. Location(s) where product is to be installed, as appropriate.
    - m. Related physical samples submitted directly.
    - n. Indication of full or partial submittal.
    - o. Transmittal number, numbered consecutively.
    - p. Submittal and transmittal distribution record.
    - q. Other necessary identification.
    - r. Remarks.
  5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
    - a. Project name.
    - b. Number and title of appropriate Specification Section.
    - c. Manufacturer name.

- d. Product name.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  - 1. Note date and content of previous submittal.
  - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

## PART 2 - PRODUCTS

### 2.01 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  - 1. Submit electronic submittals via email as PDF electronic files.
    - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  - 2. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
  - 3. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
  - 4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.

- d. Statement of compliance with specified referenced standards.
  - e. Testing by recognized testing agency.
  - f. Application of testing agency labels and seals.
  - g. Notation of coordination requirements.
  - h. Availability and delivery time information.
  - 4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  - 5. Submit Product Data before or concurrent with Samples.
  - 6. Submit Product Data in the following format:
    - a. PDF electronic file.
    - b. Three paper copies of Product Data unless otherwise indicated. Architect will return two copies.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
- 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches .
  - 3. Submit Shop Drawings in the following format:
    - a. PDF electronic file.
    - b. Two opaque (bond) copies of each submittal. Architect will return one copy(ies).
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  - 2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
    - e. Specification paragraph number and generic name of each item.
  - 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
  - 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.



- b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  - 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
  - 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
      - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  - 2. Manufacturer and product name, and model number if applicable.
  - 3. Number and name of room or space.
  - 4. Location within room or space.
  - 5. Submit product schedule in the following format:
    - a. PDF electronic file.
    - b. Three paper copies of product schedule or list unless otherwise indicated. Architect will return two copies.
- F. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.
- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

## 2.02 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

## PART 3 - EXECUTION

### 3.01 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.02 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

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- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00

## SECTION 01 40 00 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

#### 1.03 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 1.04 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

#### 1.05 ACTION SUBMITTALS

- A. Shop Drawings: For mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
  - 1. Indicate manufacturer and model number of individual components.
  - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

#### 1.06 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
  - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.

2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
  2. Entity responsible for performing tests and inspections.
  3. Description of test and inspection.
  4. Identification of applicable standards.
  5. Identification of test and inspection methods.
  6. Number of tests and inspections required.
  7. Time schedule or time span for tests and inspections.
  8. Requirements for obtaining samples.
  9. Unique characteristics of each quality-control service.
- 1.07 CONTRACTOR'S QUALITY-CONTROL PLAN
- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
  2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
  3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

## 1.08 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
  2. Project title and number.
  3. Name, address, and telephone number of testing agency.
  4. Dates and locations of samples and tests or inspections.
  5. Names of individuals making tests and inspections.
  6. Description of the Work and test and inspection method.
  7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement that equipment complies with requirements.
  3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

## 1.09 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.



- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
  - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
  - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
  - 1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Provide sizes and configurations of test assemblies, mockups, to adequately demonstrate capability of products to comply with performance requirements.
    - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    - e. Build at testing facility using personnel, products, and methods of construction indicated for the completed Work.

1. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
  2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
  4. Demonstrate the proposed range of aesthetic effects and workmanship.
  5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  7. Demolish and remove mockups when directed unless otherwise indicated.

#### 1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including

service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

- D. **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  - 6. Do not perform any duties of Contractor.
- G. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.
  - 5. Delivery of samples to testing agencies.
  - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. **Schedule of Tests and Inspections:** Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
  - 1. **Distribution:** Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
- B. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
  - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
  - 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
  - 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  - 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  - 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
  - 1. Date test or inspection was conducted.
  - 2. Description of the Work tested or inspected.
  - 3. Date test or inspection results were transmitted to Architect.
  - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.02 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.03 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies or standards are needed to perform a required construction activity, obtain copies directly from publication source.

#### 1.04 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
  1. DIN - Deutsches Institut für Normung e.V.; [www.din.de](http://www.din.de).
  2. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
  3. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
  4. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).
- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.
  1. COE - Army Corps of Engineers; [www.usace.army.mil](http://www.usace.army.mil).
  2. CPSC - Consumer Product Safety Commission; [www.cpsc.gov](http://www.cpsc.gov).
  3. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
  4. DOD - Department of Defense; <http://dodssp.daps.dla.mil>.
  5. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
  6. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
  7. FAA - Federal Aviation Administration; [www.faa.gov](http://www.faa.gov).
  8. FG - Federal Government Publications; [www.gpo.gov](http://www.gpo.gov).
  9. GSA - General Services Administration; [www.gsa.gov](http://www.gsa.gov).
  10. HUD - Department of Housing and Urban Development; [www.hud.gov](http://www.hud.gov).
  11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; <http://eetd.lbl.gov>.
  12. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
  13. SD - Department of State; [www.state.gov](http://www.state.gov).
  14. TRB - Transportation Research Board; National Cooperative Highway Research Program; [www.trb.org](http://www.trb.org).
  15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov](http://www.ars.usda.gov).
  16. USDA - Department of Agriculture; Rural Utilities Service; [www.usda.gov](http://www.usda.gov).
  17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; [www.ojp.usdoj.gov](http://www.ojp.usdoj.gov).
  18. USP - U.S. Pharmacopeia; [www.usp.org](http://www.usp.org).
  19. USPS - United States Postal Service; [www.usps.com](http://www.usps.com).
- D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
  1. CFR - Code of Federal Regulations; Available from Government Printing Office; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
  2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
  3. DSCC - Defense Supply Center Columbus; (See FS).

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4. FED-STD - Federal Standard; (See FS).
  5. FS - Federal Specification; Available from Department of Defense Single Stock Point;  
<http://dodssp.daps.dla.mil>.
    - a. Available from Defense Standardization Program; [www.dsp.dla.mil](http://www.dsp.dla.mil).
    - b. Available from General Services Administration; [www.gsa.gov](http://www.gsa.gov).
    - c. Available from National Institute of Building Sciences/Whole Building Design Guide; [www.wbdg.org/ccb](http://www.wbdg.org/ccb).
  6. MILSPEC - Military Specification and Standards; (See DOD).
  7. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
  8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. TFS - Texas Forest Service; Forest Resource Development and Sustainable Forestry;  
<http://txforests-service.tamu.edu>.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 42 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Division 01 Section "Alternates" for products selected under an alternate.
  - 2. Division 01 Section "Substitution Procedures" for requests for substitutions.
  - 3. Division 01 Section "References" for applicable industry standards for products specified.

1.03 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.04 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
  - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product



request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
- b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

#### 1.05 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

#### 1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

- B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original packages and containers or other packaging system with seals unbroken, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

- C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

#### 1.07 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

- B. Special warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
  - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.01 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation, unless otherwise indicated.
  - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
  - 4. Where products are accompanied by the term "as selected," Architect will make selection.
  - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
  - 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," or "or equivalent," or similar wording comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
  - 1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - 3. Products:
    - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
    - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
  - 4. Manufacturers:
    - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

- d. nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
    - 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
  - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.02 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
  - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  - 3. Evidence that proposed product provides specified warranty.
  - 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
  - 5. Samples, if requested.

## PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Coordination of Owner-installed products.
  - 6. Progress cleaning.
  - 7. Starting and adjusting.
  - 8. Protection of installed construction.
  - 9. Correction of the Work.
- B. Related Requirements:
  - 1. Division 01 Section "Summary" for limits on use of Project site.
  - 2. Division 01 Section "Submittal Procedures" for submitting surveys.
  - 3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
  - 4. Division 07 Section "Firestopping" for patching penetrations in fire-rated construction.

1.03 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
  - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
  - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
  - 3. Products: List products to be used for patching and firms or entities that will perform patching work.

4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
  - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

#### 1.05 CLOSEOUT SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- B. Certified Surveys: Submit two copies signed by land surveyor.
- C. Final Property Survey: Submit copies showing the Work performed and record survey data.

#### 1.06 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
  2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include, but are not limited to, the following:
    - a. Primary operational systems and equipment.
    - b. Fire separation assemblies.
    - c. Air or smoke barriers.
    - d. Fire-suppression systems.
    - e. Mechanical systems piping and ducts.
    - f. Control systems.
    - g. Communication systems.
    - h. Fire-detection and -alarm systems.
    - i. Conveying systems.
    - j. Electrical wiring systems.
    - k. Operating systems of special construction.
  3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
    - a. Water, moisture, or vapor barriers.
    - b. Membranes and flashings.
    - c. Exterior curtain-wall construction.
    - d. Sprayed fire-resistive material.
    - e. Equipment supports.
    - f. Piping, ductwork, vessels, and equipment.

- g. Noise- and vibration-control elements and systems.
- 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - 1. Description of the Work.

2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.02 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."
- E. Surface and Substrate Preparation: Comply with manufacturer's written recommendations for preparation of substrates to receive subsequent work.

### 3.03 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  2. Establish limits on use of Project site.
  3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  4. Inform installers of lines and levels to which they must comply.
  5. Check the location, level and plumb, of every major element as the Work progresses.
  6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and

electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

### 3.04 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
  - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
  - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.05 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.



- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.06 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

- E. : Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Division 01 Section "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

## 3.07 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
  - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
  - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

## 3.08 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
  - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

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- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.09 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
  - 5. Repair of the Work.
- B. Related Requirements:
  - 1. Division 01 Section "Photographic Documentation" for submitting final completion construction photographic documentation.
  - 2. Division 01 Section "Execution" for progress cleaning of Project site.
  - 3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 5. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
- C. In the event of any inconsistent or incompatible provisions, the Uniform General Conditions shall take precedence.

1.03 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.04 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.
- D. Maintenance Contracts: Properly executed continuing maintenance contract specified in individual Specification Sections.
  - 1. Initial Submittal: Submit draft copy of each contract at least 30 days prior to requesting inspection for Substantial Completion. Architect will comment on whether general scope

- and content of contract are acceptable. Correct or revise each contract to comply with Architect's comments.
2. Final Submittal: Submit each maintenance contract in final form prior to requesting inspection for Final Completion.
- E. Schedule of Maintenance Material Items: For maintenance material items specified in other Sections.
1. Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
- 1.05 SUBSTANTIAL COMPLETION PROCEDURES
- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
  3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Submit maintenance materials specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
  5. Submit test/adjust/balance records.
  6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
  2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  3. Complete startup and testing of systems and equipment.
  4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
  6. Advise Owner of changeover in heat and other utilities.
  7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements, including touchup painting.
  10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for final completion.

#### 1.06 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.07 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A or equivalent.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
  2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Page number.
  4. Submit list of incomplete items in the following format:
    - a. MS Excel electronic file. Architect will return annotated file.
    - b. PDF electronic file. Architect will return annotated file.

## 1.08 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
  - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
  - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

## 2.01 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
  - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

## PART 3 - EXECUTION

## 3.01 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.



- c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
  - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
  - e. Remove snow and ice to provide safe access to building.
  - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
  - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
  - h. Sweep concrete floors broom clean in unoccupied spaces.
  - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
  - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - k. Remove labels that are not permanent.
  - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
    - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
  - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
  - q. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

### 3.02 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
  - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
  - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
    - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

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3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

## Electronic File Agreement

**Project:** Midwestern State University

**Project No.:** SL14.003.00B

**Date:** Month DD, YYYY

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### CONTRACTOR'S USE OF ARCHITECT'S ELECTRONIC DRAWING FILES

1. In the event that Contractor obtains, whether for a fee or not, a copy of any of Treanor Architects, P.A.'s or its consultants' documents or data in electronic form for use in preparing shop drawings or record drawings, or other permitted use, Treanor Architects, P.A. grants Contractor a limited license to reproduce such data and Contractor agrees that:
  - A. It is understood and agreed that the data contained therein may be altered intentionally or unintentionally by user or others as a result of occurrences beyond the control and knowledge of Treanor Architects, P.A. These include errors in transportation, machine error, environmental factors, as well as operator error. The user, as part of the consideration for accepting the delivery of the electronic forms, agrees to indemnify, defend and hold harmless Treanor Architects, P.A., its insurers, shareholders, officers, directors, employees and consultants from any claims, liabilities, damages, loss and costs, including, but not limited to cost of defense arising out of changes of modifications to the data and electronic media form in the user's possession or released to others by the user and for any use of the electronic media and printed hard copy drawings and specifications. It shall be the user's responsibility to verify that the information contained in and displayed by the electronic media, accurately reflects the information contained in and displayed by the printed hard copy/drawings and/or specifications.
  - B. Under no circumstances shall the transfer of electronic data, or printed copy thereof, be deemed to be a sale by Treanor Architects, P.A. of tangible goods, and Treanor Architects, P.A. makes no warranties, express or implied, of merchantability or of fitness for a particular purpose.
  - C. The electronic data may represent only a portion of the construction document information and, as such, it may be incomplete. Treanor Architects, P.A. makes no representation as to its completeness, currency or accuracy and Treanor Architects, P.A. shall not be responsible to advise Contractor of any changes which may hereafter be made to the electronic data.
  - D. Treanor Architects, P.A. retains all copyrights to the designs, drawings, information and Architectural Works depicted in the electronic data and grants to Contractor a limited license to reproduce such information in connection with Contractor's work on the Project, and no other.
  - E. Treanor Architects, P.A. specifically disclaims all warranties, express or implied, including but not limited to implied warranties of merchantability and of fitness for a particular purpose, with respect to the electronic media and the information contained herein. Treanor Architects, P.A. shall have no liability with respect to any loss or damages directly or indirectly arising out of the use of the electronic media contained thereon. Notwithstanding the foregoing, Treanor Architects, P.A. shall not be liable for any loss of profit, interruption of business, damage to equipment or data, interruption of operations or any damage, including, but not limited to direct, special incidental or consequential damages.

- F. Contractor understands that any transfer or translation of electronic data from one computer system or environment to another can result in loss of important information and Contractor assumes that risk. Further, Contractor understands that the Contractor is responsible for any translation or modification of the electronic data necessary for use by the Contractor.
- G. Treanor Architects, P.A. makes no representation regarding the accuracy, completeness, or permanence neither of electronic files, nor for the merchantability or fitness for a particular purpose. Addenda information or revisions made after the date indicated on the electronic files may not have been incorporated. In the event of a conflict between Treanor Architects, P.A.'s sealed Contract Drawings and the electronic files, the sealed Contract Drawings shall govern. It is the Contractor's responsibility to determine if any conflicts exist. The electronic files shall not be considered to be Contract Documents as defined by the General Conditions of the Contract for Construction.
- H. Contractor shall require all subcontractors or suppliers to whom Contractor furnishes the electronic data to sign an identical copy of this Agreement. For any party who does not so sign this Agreement, Contractor agrees to defend, indemnify and hold harmless Treanor Architects, P.A. from claims, suits, expense, damages or loss, including attorney's fees, arising out of Contractor's furnishing such data to third parties.

**AUTHORIZED ACCEPTANCE**

by Treanor Architects, P.A.

by Contractor/Sub-Contractor

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name and Title

\_\_\_\_\_  
Print Name and Title

\_\_\_\_\_  
Date

\_\_\_\_\_  
Date

## SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous record submittals.
- B. Related Requirements:
  - 1. Division 01 Section "Execution" for final property survey.
  - 2. Division 01 Section "Closeout Procedures" for general closeout procedures.
  - 3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### 1.03 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set(s) of marked-up record prints.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
  - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

### PART 2 - PRODUCTS

#### 2.01 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

- a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
  - b. Accurately record information in an acceptable drawing technique.
  - c. Record data as soon as possible after obtaining it.
  - d. Record and check the markup before enclosing concealed installations.
  - e. Cross-reference record prints to corresponding archive photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Actual locations of routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Format: Annotated PDF electronic file with comment function enabled.
  3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  4. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect.
    - e. Name of Contractor.

## 2.02 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

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3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

- B. Format: Submit record Specifications as annotated PDF electronic file .

2.03 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file .
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.04 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file .
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

## SECTION 03 3053-MISCELLANEOUS CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
  - 1. Section 31 2000 "Earth Moving" for drainage fill under slabs-on-grade.
  - 2. Section 32 1313 "Concrete Paving" for concrete pavement and walks.

#### 1.3 ACTION SUBMITTALS

- A. Design Mixtures: For each concrete mixture.

#### 1.4 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

### PART 2 - PRODUCTS

#### 2.1 CONCRETE, GENERAL

- A. Comply with the following sections of ACI 301 unless modified by requirements in the Contract Documents:
  - 1. "General Requirements."
  - 2. "Formwork and Formwork Accessories."
  - 3. "Reinforcement and Reinforcement Supports."
  - 4. "Concrete Mixtures."
  - 5. "Handling, Placing, and Constructing."
- B. Comply with ACI 117.



## 2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

## 2.3 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
  - 1. Portland Cement: ASTM C 150/C 150M, Type I.
  - 2. Fly Ash: ASTM C 618, Class C or F.
- C. Normal-Weight Aggregate: ASTM C 33/C 33M, 1-1/2-inch nominal maximum aggregate size.
- D. Air-Entraining Admixture: ASTM C 260/C 260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
- F. Water: ASTM C 94/C 94M.

## 2.4 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

## 2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.

## 2.6 CONCRETE MIXTURES

- A. Comply with ACI 301.
- B. Normal-Weight Concrete:
  - 1. Minimum Compressive Strength: 4000 psi at 28 days.
  - 2. Maximum W/C Ratio: 0.45.
  - 3. Slump Limit: 5 inches, plus or minus 1 inch.

4. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

## 2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116, and furnish batch ticket information.
  1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 FORMWORK INSTALLATION

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

### 3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

### 3.3 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

### 3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

### 3.5 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Consolidate concrete with mechanical vibrating equipment according to ACI 301.

### 3.6 FINISHING FORMED SURFACES

- A. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent

formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.7 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
  - 1. Do not further disturb surfaces before starting finishing operations.

### 3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.
- B. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- C. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

END OF SECTION 03 3053

SECTION 04 05 00 - COMMON WORK RESULTS FOR MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
  - 1. Mortar and grout.
  - 2. Steel reinforcing bars.
  - 3. Masonry joint reinforcement.
  - 4. Ties and anchors.
  - 5. Embedded flashing.
  - 6. Miscellaneous masonry accessories.
  - 7. Masonry-cell insulation.
  - 8. Cavity-wall insulation.
- B. Related Sections:
  - 1. Division 04 Section "Brick Masonry."
    - a. Face brick.
  - 2. Division 04 Section "Concrete Unit Masonry."
    - a. Concrete masonry units.
  - 3. Division 04 Section "Cast Stone Masonry."
  - 4. Division 05 Section "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
  - 5. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles for unit masonry.
  - 6. Division 07 Section "Thermal Insulation" for insulation installed in masonry assemblies.
  - 7. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashing installed in masonry joints.
  - 8. Division 07 Section "Roof and Wall Specialties and Accessories" for manufactured reglets installed in masonry joints.

1.03 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
  - 1. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
  - 2. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
  - 3. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

4. Prism Test: For each type of construction required, according to ASTM C 1314.

#### 1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
  1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
  2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Verification: For each type and color of the following:
  1. Accessories embedded in masonry.

#### 1.06 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
  1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Material Certificates: For each type and size of the following:
  1. Cementitious materials. Include brand, type, and name of manufacturer.
  2. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  3. Grout mixes. Include description of type and proportions of ingredients.
  4. Reinforcing bars.
  5. Joint reinforcement.
  6. Anchors, ties, and metal accessories.
- C. Material Test Reports:
  1. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage cast stone and brick masonry. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
  1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
  2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

#### 1.07 QUALITY ASSURANCE

- A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockup of typical wall area as shown on Drawings.
  2. Build mockups for each type of exposed unit masonry construction in sizes approximately 96 inches long by 72 inches high by full thickness, including accessories.
    - a. Include a sealant-filled joint at least 16 inches long in each mockup.
    - b. Include lower corner of window opening framed with stone trim at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
    - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
  3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
  4. Protect accepted mockups from the elements with weather-resistant membrane.
  5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.09 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
  2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Structure is designed to be self-supporting and stable after the building is completed. Protect masonry walls during construction against wind damage by bracing as required until support of walls is integral with the completed building structure. Provide temporary bracing, guys, or tie-

downs as necessary. Such items are not shown on the Drawings. If installed, they shall be removed as conditions permit, and shall remain the Contractor's property.

- C. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- E. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- F. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

### 2.01 MORTAR AND GROUT MATERIALS

- A. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Masonry Cement: Not permitted .
- F. Mortar Cement: ASTM C 1329.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Lafarge North America Inc.; Lafarge Mortar Cement or Magnolia Superbond Mortar Cement.
- G. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

H. Aggregate for Grout: ASTM C 404.

I. Cold-Weather Admixture: Not permitted.

J. Water: Potable.

## 2.02 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Dur-O-Wal, a Hohmann & Barnard Co.; D/A 810, D/A 812 or D/A 817.
  - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
  - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
  - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

C. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Wire Size for Veneer Ties: 0.148-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

D. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

E. Masonry Joint Reinforcement for Multiwythe Masonry:

1. Adjustable (two-piece) type, ladder design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

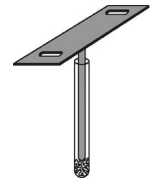
## 2.03 TIES AND ANCHORS


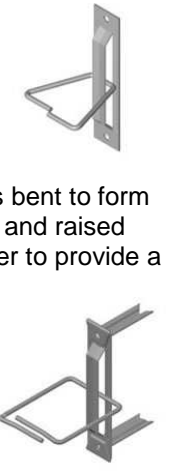

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
4. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
5. Stainless-Steel Sheet: ASTM A 666, Type 304.
6. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.



- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
  2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, hot-dip galvanized steel wire.
- D. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch- thick, steel sheet, galvanized after fabrication.
  2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, hot-dip galvanized steel wire.
    - a. For stone work fabricate tie sections from 0.187-inch-diameter, stainless-steel wire.
- E. Partition Top Anchors: 0.105-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Dur-O-Wal, a Hohmann & Barnard Co.; D/A 411.
    - b. Hohmann & Barnard, Inc.; PTA 420.
    - c. Wire-Bond; 4301.
- F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- G. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
    - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
  2. Contractor's Option: Unless otherwise indicated, provide any of the following types of anchors:
  3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
    - a. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch- thick, steel sheet, galvanized after fabrication.
    - b. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch- diameter, hot-dip galvanized steel wire.
      - 1) For stone work fabricate tie sections from 0.187-inch-diameter, stainless-steel wire
    - c. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, 2-3/4 inches wide by 3 inches high; with projecting tabs having slotted holes for inserting vertical legs of wire tie specially formed to fit anchor section.



- 1) Products: Subject to compliance with requirements, provide one of the following:
  - a) Dur-O-Wal, a Hohmann & Barnard Co.; D/A 213.
  - b) Heckmann Building Products Inc.; 213 with 282.
  - c) Hohmann & Barnard, Inc.; HB-200-X.
  - d) Wire-Bond; HCL-711.
- d. Anchor Section: Sheet metal plate, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom and with raised rib-stiffened strap, 5/8 inch wide by 3-5/8 inches long, stamped into center to provide a slot between strap and plate for inserting wire tie.
 
  - 1) Products: Subject to compliance with requirements, provide one of the following:
    - a) Dur-O-Wal, a Hohmann & Barnard Co; D/A 210 with D/A 700-708.
    - b) Heckmann Building Products Inc.; 315-D with 316.
    - c) Hohmann & Barnard, Inc.; DW-10HS.
    - d) Wire-Bond; Type III (#1004).
- e. Anchor Section: Gasketed sheet metal plate, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom; top and bottom ends bent to form pronged legs of length to match thickness of insulation or sheathing; and raised rib-stiffened strap, 5/8 inch wide by 6 inches long, stamped into center to provide a slot between strap and plate for inserting wire tie. Provide anchor manufacturer's standard, self-adhering, modified bituminous gaskets manufactured to fit behind anchor plate and extend beyond pronged legs.
 
  - 1) Products: Subject to compliance with requirements, provide the following:
    - a) Dur-O-Wal, a Hohmann & Barnard Co; D/A 210x with D/A 700-708.
    - b) Hohmann & Barnard, Inc.; X-Seal.
    - c) Wire-Bond; Type III X (#1004X).
- f. Anchor Section: Corrosion-resistant, self-drilling, eye-screw designed to receive wire tie. Eye-screw has spacer that seats directly against framing and is same thickness as sheathing and has gasketed, washer head that covers hole in sheathing.
 
  - 1) Products: Subject to compliance with requirements, provide one of the following:
    - a) Heckmann Building Products Inc.; Pos-I-Tie.
    - b) Hohmann & Barnard, Inc.; 2-Seal Tie.
    - c) Wire-Bond; SureTie.

H. Screws for Adjustable Masonry-Veneer Anchors:

1. Zinc-Plated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, minimum No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with mechanical zinc-coating complying with ASTM B 695 or electrodeposited zinc-coating complying with ASTM B 633.
2. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, minimum No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
  - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) ITW Buildex; Teks Maxiseal with Climaseal finish.
    - 2) Textron Inc., Textron Fastening Systems; Elco Dril-Flex with Stalgard finish.

3. Stainless-Steel Drill Screws for Steel Studs: Proprietary fastener consisting of carbon-steel drill point and 300 Series stainless-steel shank, complying with ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, minimum No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads.
  - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) Dur-O-Wal, a Hohmann & Barnard Co.; Stainless Steel SX Fastener.
    - 2) ITW Buildex; Scots long life Tek.

## 2.04 MISCELLANEOUS ANCHORS

- A. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.
- B. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- C. Postinstalled Anchors: Torque-controlled expansion anchors or chemical anchors.
  1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
  2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.
  3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

## 2.05 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with Division 07 Section "Sheet Metal Flashing and Trim."
- B. Flexible Flashing: Use one of the following unless otherwise indicated:
  1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) Advanced Building Products Inc.; Peel-N-Seal.
      - 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
      - 3) Dur-O-Wal, a Hohmann & Barnard Co.; Dur-O-Barrier Thru-Wall Flashing.
      - 4) Fiberweb, Clark Hammerbeam Corp.; Aquaflash 500.
      - 5) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
      - 6) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
      - 7) Hohmann & Barnard, Inc.; Textroflash.
      - 8) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
      - 9) Polyguard Products, Inc.; Polyguard 400.
      - 10) Sandell Manufacturing Co., Inc.; Sando-Seal.
      - 11) Williams Products, Inc.; Everlastic MF-40.
    - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- C. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
  2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
  3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
  4. Where flashing is fully concealed, use metal flashing or flexible flashing.
- D. Solder for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim."
- E. Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Joint Sealants."
- F. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- 2.06 MOVEMENT JOINT FILLERS AND GASKETS
- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- 2.07 WEEP/VENT PRODUCTS
- A. Weep/Vent Products: Use the following unless otherwise indicated:
1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
    - a. Products: Subject to compliance with requirements, provide the following:
      - 1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.
- 2.08 CAVITY DRAINAGE MATERIAL
- A. Mesh Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Provide the following configuration:
    - a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.
      - 1) Products: Subject to compliance with requirements, provide one of the following:
        - a) Mortar Net USA, Ltd.; Mortar Net.
        - b) Mortar Trap; Hohmann & Barnard Co.
- 2.09 CAVITY-WALL INSULATION
- A. Insulation: As specified in Division 7 Section "Building Insulation."

- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.
- C. Insulation Retainer Clips: Molded plastic discs or pads with edge slots designed to snap onto wire ties and hold insulation firmly against backup wall.
1. Acceptable Products:
    - a. D/A 2100 - Ins-O-Grips by Dur-O-Wall.
    - b. IRC001 by Simpson Strongtie Co.
    - c. V28 Insulation Retaining Clip by Vista Engineering Ltd.



## 2.10 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Diedrich Technologies, Inc.
    - b. EaCo Chem, Inc.
    - c. ProSoCo, Inc.

## 2.11 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
  2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, **Proportion** Specification. Provide the following types of mortar for applications stated unless another type is indicated.
1. For masonry below grade or in contact with earth, use Type M.
  2. For reinforced masonry, use Type S.
  3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
  3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  - 2. Verify that foundations are within tolerances specified.
  - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Accurately mark stud centerlines on face of weather-resistant sheathing paper before beginning masonry installation.
- B. Coat concrete and unit masonry backup for cast stone masonry with asphalt dampproofing.
- C. Clean dirty or stained cast stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.03 INSTALLATION, GENERAL

- A. Refer to other Division 04 Sections for installation of masonry assemblies utilizing products specified herein.
- B. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- C. Build chases and recesses to accommodate items specified in this and other Sections.
- D. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- E. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- F. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
  - 1. Mix units from several pallets or cubes as they are placed.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

- H. Coat cast stone with cementitious dampproofing as follows:
1. Stone at Grade: Beds, joints, and back surfaces to at least 12 inches above finish-grade elevations.
  2. Stone Extending below Grade: Beds, joints, back surfaces, and face surfaces below grade.
  3. Allow cementitious dampproofing formulations to cure before setting dampproofed stone. Do not damage or remove dampproofing in the course of handling and setting stone.

### 3.04 TOLERANCES

- A. General: Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
- B. Dimensions and Locations of Elements:
1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
  2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
  3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- C. Lines and Levels:
1. For bed joints, top surfaces of bearing walls, lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines do not vary from level by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
  2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
  3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
  4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
  5. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
  6. For faces of adjacent exposed brick masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
- D. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
  2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
  3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
  4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
  5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.
- E. Reinforcing Bars:
1. Variation from  $d$  for flexural elements (measured from center of reinforcement to the extreme compressive face of masonry):
    - a.  $d < 8$  inch:  $\pm 1/2$  inch
    - b.  $8 \text{ inch} < d < 24 \text{ inch}$ :  $\pm 1$  inch
    - c.  $d < 24$  inch:  $\pm 1-1/4$  inch

2. For vertical bars in walls 2 inch from the location along the length of the wall indicated on the project drawings.
3. In addition, a minimum clear distance between reinforcing bars and the adjacent face of a masonry unit of 1/4 inch for fine grout or 1/2 inch for coarse grout shall be maintained so that grout can flow around the bars.

### 3.05 LAYING UNIT MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings ; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, and remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
  1. Install adjustable hollow metal frame anchors, locating jamb anchors in horizontal bed courses near the top and bottom of each frame and at intermediate points spaced roughly equal.
  2. Fill jambs of hollow metal door and window frames solid with grout.
  3. Rake joints around exterior side of exterior hollow metal door frames for pointing with sealant.
  4. Protect inside (concealed) faces of door frames in exterior masonry walls, using fibered asphalt emulsion coating. Apply over shop primer approximately 1/8 inch thick and allow to dry before handling.
  5. Where hollow metal frames do not wrap around masonry jambs and heads, rub exposed square corners of CMU to remove sharp, irregular edges.
  6. Exercise care to embed conduits and pipes in masonry without fracturing exposed shells and to fit units around switch, receptacle and other boxes set in walls. Where electric conduits, outlets, switch boxes, and similar items occur, grind and cut units before building in services.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
  1. Install compressible filler in joint between top of partition and underside of structure above.



2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Division Section "Firestopping."

### 3.06 SETTING OF CAST STONE MASONRY, GENERAL

- A. Perform necessary field cutting and trimming as stone is set.
  1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.
  2. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.
  3. Pitch face at field-split edges as needed to match stones that are not field split.
- B. Cut and drill sinkages and holes in cast stone for anchors and supports.
- C. Coat cast stone with cementitious dampproofing as follows:
  1. Stone at Grade: Beds, joints, and back surfaces to at least 12 inches above finish-grade elevations.
  2. Stone Extending below Grade: Beds, joints, back surfaces, and face surfaces below grade.
  3. Allow cementitious dampproofing formulations to cure before setting dampproofed stone. Do not damage or remove dampproofing in the course of handling and setting stone.

### 3.07 INSTALLATION OF ANCHORED CAST STONE MASONRY

- A. Space anchors not more than 16 inches o.c. vertically and 24 inches o.c. horizontally. Install additional anchors within 12 inches of openings, sealant joints, and perimeter at intervals not exceeding 12 inches.
- B. Anchor cast stone coping with stone trim anchors where indicated. Install anchors by fastening to substrate and inserting tabs and dowels into kerfs and holes in stone units. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with mortar.

### 3.08 INSTALLATION OF ADHERED CAST STONE MASONRY VENEER

- A. Install flashing over sheathing and behind weather-resistant sheathing paper by fastening through sheathing into framing.
- B. Install lath over weather-resistant sheathing paper by fastening through sheathing into framing to comply with ASTM C 1063.
- C. Install lath over unit masonry and concrete to comply with ASTM C 1063.
- D. Install scratch coat over metal lath 3/8 inch thick to comply with ASTM C 926.
- E. Rake out joints for pointing with mortar to depth of not less than 1/2 inch before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

### 3.09 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
  3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
  4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set anchored cast-stone and trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
  2. Allow cleaned surfaces to dry before setting.
  3. Wet joint surfaces thoroughly before applying mortar.
- D. Provide sealant joints at copings and other horizontal surfaces, at expansion, control, and pressure-relieving joints, and at locations indicated.
1. Keep joints free of mortar and other rigid materials.
  2. Build in compressible foam-plastic joint fillers where indicated.
  3. Form joint of width indicated, but not less than 3/8 inch .
  4. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
  5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Division 07 Section "Joint Sealants."
- E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

### 3.10 CAVITY WALLS

- A. Bond wythes of cavity walls together using the following method:
1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
    - a. Use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement.
- B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- C. Apply air barrier to face of backup wythe to comply with Division 07 Section "Fluid-Applied Membrane Air Barriers."
- D. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

2. Install insulation retainer clips to hold insulation against backup.

### 3.11 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  1. Space reinforcement not more than 16 inches o.c.
  2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units where rigid anchors are not indicated.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.12 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
  1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
  3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

### 3.13 ANCHORING UNIT MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
  1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
  2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
  3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

### 3.14 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

- B. Locate control joints in concrete masonry at locations indicated on Drawings and in accordance with NCMA TEK 10-2B and as follows. Obtain Architect's approval of visual effect for the following locations if not specifically indicated on Drawings.
1. At change from walls supported on foundations to walls supported on floor slabs.
  2. At change from exterior wall to interior wall.
  3. Where walls supported on floors cross differing floor construction.
  4. At columns within masonry walls.
  5. At changes in wall height.
  6. At changes in wall thickness, such as at pipe and duct chases and pilasters.
  7. At (above) movement joints in foundations and floors.
  8. At (below) movement joints in roofs and floors that bear on a wall.
  9. At end of door and window opening lintels:
    - a. At one side of openings up to 6 feet wide
    - b. At both jambs of openings over 6 feet wide.
  10. Adjacent to corners of walls or intersections within a distance equal to half the control joint spacing.
  11. For walls without openings or other points of stress concentration, space control joints to create isolated panels with a length to height ratio of 1-1/2 but not to exceed 25 feet maximum spacing.
- C. Form control joints in concrete masonry using one of the following methods:
1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
  2. Install preformed control-joint gaskets designed to fit standard sash block.
  3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
  4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- D. Locate expansion joints in brick made from clay or shale at locations indicated on Drawings and in accordance with BIA Technical Note 18A and as follows. Obtain Architect's approval of visual effect for the following locations if not specifically indicated on Drawings
1. At changes in wall height.
  2. At wall offsets and setbacks.
  3. At (above) movement joints in foundations and floors.
  4. At door and window openings:
    - a. At one side of openings up to 6 feet wide
    - b. At both jambs of openings over 6 feet wide.
  5. At one half the straight-run expansion joint spacing in unreinforced parapets exposed on front, top, and back surfaces. Continue parapet expansion joints down to next horizontal expansion joint, natural interruption in brick, or to the base of the wall.
  6. Within 10 ft of corners in either wall with joint in adjacent wall located with distance between the joints around the corner equal to the straight-run expansion joint spacing.
  7. Where wall backing system changes.
  8. For walls without openings or other points of stress concentration, space expansion joints not to exceed the following:
    - a. 20 feet for 3/8 inch joints using sealant with plus or minus 50% elongation capacity.
    - b. 34 feet for 3/8 inch joints using sealant with plus 100% and minus 50% elongation capacity.
    - c. 23 feet for 1/2 inch joints using sealant with plus or minus 50% elongation capacity.
    - d. 46 feet for 1/2 inch joints using sealant with plus 100% and minus 50% elongation capacity.

- E. Form expansion joints in brick as follows:
  - 1. Build in compressible joint fillers where indicated.
  - 2. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."
- F. Building Expansion Joints Through Masonry:
  - 1. Form an open joint for installation of expansion joint assembly specified in Division 07 Section "Expansion Joint Cover Assemblies" or Division 07 Section "Joint Sealants" as scheduled. Maintain joint free and clear of mortar.
- G. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants," but not less than 3/8 inch.
  - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.
  - 2. Locate horizontal, pressure-relieving joints wherever masonry is built to the underside of a structural member other than a lintel supported by the adjacent masonry.

### 3.15 LINTELS

- A. Install steel lintels where indicated.
- B. Provide concrete or masonry lintels where shown and where openings of more than one and one-half times the width of the masonry units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

### 3.16 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install metal flashing as follows unless otherwise indicated:
  - 1. Install concealed through wall flashing in accordance with SMACNA "Architectural Sheet Metal Manual" Chapter 4 Flashing and with NCMA TEK Bulletins 19-4 and 19-5 details to ensure water resistant masonry construction.
  - 2. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal lap joints and penetrations in flashing with butyl sealant.
  - 3. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe. Form 1/4-inch hook in edge of flashing embedded in inner wythe.
  - 4. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under air barrier, lapping at least 4 inches.
  - 5. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
  - 6. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with butyl sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.

7. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with butyl sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.
  - C. Install flexible flashing as follows unless otherwise indicated:
    1. Apply primer in accordance with flexible flashing manufacturer's recommendations, prior to installation of flashing.
    2. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing.
    3. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
    4. Install preformed corners and end dams, under flexible flashing membrane, bedded in sealant in appropriate locations along wall.
    5. Starting at a corner, remove release sheet and apply membrane to substrate indicated.
    6. Extend membrane through outer wythe, turned up backup wall or wythe a minimum of 8 inches. Terminate top edge of flashing membrane on vertical surface with a metal termination bar. Apply sealant bead at each termination.
    7. Roll flashing into place. Ensure continuous and direct contact with substrate. Avoid trapping air and forming wrinkles.
    8. Lap ends and overlap preformed corners 4 inches minimum. Seal laps with sealant.
    9. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edges.
    10. Protect installed flexible flashing from damage during construction.
      - a. Inspect before covering and make repairs as necessary. Remove and replace damaged material. Repair holes and tears by covering with cut patch of similar product overlapping damage 2 inches minimum. Seal perimeter of patch repair with sealant/mastic.
      - b. Cover flexible flashing as soon as possible after installation has been observed and tested. Do not expose longer than 60 days, unless otherwise approved by membrane manufacturer in writing.
  - D. Install reglets for flashing and other related construction where they are shown to be built into masonry.
  - E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
    1. Use open head joints to form weep holes.
    2. Space weep holes 24 inches o.c. unless otherwise indicated.
  - F. Install cavity drainage material as follows unless otherwise indicated:
    1. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Cavity Drainage Material" Article.
  - G. Install vents in head joints in exterior wythes at the top of each continuous cavity/air space at same spacing as indicated for weeps. Use open head joints to form vents. Install vents at a consistent height for each compartment.
    1. Close cavities off vertically and horizontally (compartmentalize) with blocking in manner indicated in BIA Technical Note 27. Install through-wall flashing and weep holes above horizontal blocking.
- 3.17 REINFORCED UNIT MASONRY INSTALLATION
- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  2. Use low-lift grouting procedure as described in NCMA TEK 3-2 Grouting for Concrete Masonry Walls and NEMA TEK Bulletins 3-3 and 14-2.
  3. Place grout in the CMU cavities to completely fill each cavity with homogenous grout, extending from the lowest course to the top of the reinforced portion of the foundation or wall. Concrete or mortar shall not be used as grout for CMU.
  4. Between 5 and 20 minutes after the grout is placed, consolidate grout with a mechanical vibrator. Stop top of grout filling 1-1/2 inches below the top of the concrete block to form a key, except for the top course in the wall where the grout shall be struck flush with the top.
  5. Aggregate used in the grout shall be small enough not to interfere with placement and plasticity.
  6. Caging devices and centering clips shall be spaced vertically such that 2 clips or devices, one near its top and one near its bottom restrain every section of vertical reinforcing bar.
  7. Where grouted cores do not extend the full height of a wall, install grout stop mesh at the lower limit of the grout.
  8. Where required on the plans, grouting operations shall be observed by an independent testing agency.
- 3.18 UNIT MASONRY POINTING
- A. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- 3.19 FIELD QUALITY CONTROL
- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 and/or Level 2 special inspections according to the "International Building Code."
1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
  3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.

- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

### 3.20 ADJUSTING AND REPAIRING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. mockups, complying with other requirements, and showing no evidence of replacement.

### 3.21 CLEANING

- A. In-Progress Cleaning: Clean masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
  - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
- C. Waste Management and Disposal: As specified in Division 01 Section "Construction Waste Management and Disposal" and as follows:
  - 1. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of masonry work, remove from Project site.
  - 2. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 05 00



SECTION 04 21 13 - BRICK MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
  - 1. Face brick.
- B. Related Sections:
  - 1. Division 04 Section "Common Work Results for Masonry" for mortar and grout, reinforcement, ties and anchors, embedded flashing, and miscellaneous masonry accessories.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
  - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

1.04 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of the following:
  - 1. Masonry units.
    - a. Include material test reports substantiating compliance with requirements.
    - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
    - c. For exposed brick, include test report for efflorescence according to ASTM C 67.

1.05 QUALITY ASSURANCE

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Mockup: Comply with Division 04 Section "Common Work Results for Masonry."

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

PART 2 - PRODUCTS

2.01 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.02 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units.
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
  2. Provide special shapes for lintels (lipped), non-square corners, and other special conditions.
  3. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
  4. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
  5. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Face Brick: Facing brick complying with ASTM C 216.
1. Product[s]: Subject to compliance with requirements, provide the following :
  2. Grade: SW.
  3. Type: FBX
  4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
  5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
  6. Size (Nominal Dimensions - Actual dimensions 3/8 inch less than nominal):
    - a. Width: 4 inches.
    - b. Height: 2-2/3 inches.
    - c. Length: 8 inches.
  7. Application: Use where brick is exposed unless otherwise indicated.
  8. Color and Texture: Provide custom blend:
    - a. Field Brick: Match Cloud Ceramics modular face brick: 40 percent Driftwood blend, 40 percent Terracotta blend, 10 percent Cimarron blend, 5 percent Cameo blend, and 5 percent Old Rose blend .

PART 3 - EXECUTION

3.01 INSTALLATION

- A. As specified in Division 04 Section "Common Work Results for Masonry."

END OF SECTION 04 21 13

SECTION 04 72 00 - CAST STONE MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
  - 1. Cast stone panels and trim.
    - a. Medallions.
- B. Related Sections:
  - 1. Division 04 Section "Common Work Results for Masonry" for installing cast stone units in unit masonry.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.
  - 1. Include building elevations showing layout of units and locations of joints and anchors.
- C. Full-Size Samples: For each color and texture of cast stone unit required.
  - 1. Make available for Architect's review at Project site or at manufacturing plant, if acceptable to Architect.
  - 2. Make Samples from materials to be used for units used on Project.
  - 3. Approved Samples may be installed in the Work.

1.04 INFORMATIONAL SUBMITTALS

- A. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.
  - 1. Provide test reports based on testing within previous two years.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute.
- B. Source Limitations for Cast Stone: Obtain cast stone units through single source from single manufacturer.

Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.
- B. Pack, handle, and ship cast stone units in suitable packs or pallets.
  - 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
  - 2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

## 1.07 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

## 2.01 CAST STONE MATERIALS

- A. General: Comply with ASTM C 1364 and the following:
- B. Portland Cement: ASTM C 150, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast stone color indicated.
- C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33; gradation and colors as needed to produce required cast stone textures and colors.
- D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33, gradation and colors as needed to produce required cast stone textures and colors.
- E. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast stone material.
  - 1. Epoxy Coating: ASTM A 775/A 775M.
  - 2. Galvanized Coating: ASTM A 767/A 767M.
- F. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304.

## 2.02 CAST STONE UNITS

- A. Provide cast stone units complying with ASTM C 1364 using either the vibrant dry tamp or wet-cast method.
  - 1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
- B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
  - 1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
  - 2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
  - 3. Provide drips on projecting elements unless otherwise indicated.
- C. Fabrication Tolerances:
  - 1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
  - 2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
  - 3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
  - 4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.
- D. Cure units as follows:
  - 1. Cure units in enclosed moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
  - 2. Keep units damp and continue curing to comply with one of the following:
    - a. No fewer than five days at mean daily temperature of 70 deg F or above.
    - b. No fewer than six days at mean daily temperature of 60 deg F or above.
    - c. No fewer than seven days at mean daily temperature of 50 deg F or above.
    - d. No fewer than eight days at mean daily temperature of 45 deg F or above.
- E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- F. Color and Texture: Provide units with fine-grained texture and color to match Architect's sample .

## PART 3 - EXECUTION

## 3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 SETTING CAST STONE IN MORTAR

- A. Install cast stone units to comply with requirements in Division 04 Section "Common Work Results for Masonry."

## 3.03 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

- A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

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1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
  2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.
- B. Keep cavities open where unfilled space is indicated between back of cast stone units and backup wall; do not fill cavities with mortar or grout.
- C. Fill anchor holes with sealant.
1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.
- D. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.
- E. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.
1. Form open joint of width indicated, but not less than 3/8 inch
- F. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- G. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Division 07 Section "Joint Sealants."
- 3.04 ADJUSTING AND CLEANING
- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

END OF SECTION 04 72 00

## SECTION 07 92 00 - JOINT SEALANTS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes joint sealants for scheduled applications, including those specified by reference to this Section.
- B. Related Sections include the following:
  - 1. Divisions 02 through 49 Sections specifying sealant products.
  - 2. Division 04 Section "Common Work Results for Masonry" for masonry control and expansion joint fillers and gaskets.
  - 3. Division 07 Section "Firestopping" for sealing penetrations and joints in fire-resistance-rated construction.

#### 1.03 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

#### 1.04 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
  - 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  - 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
  - 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- B. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.
  - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
  - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
  4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- C. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
  2. Conduct field tests for each application indicated below:
    - a. Each type of elastomeric sealant and joint substrate indicated.
    - b. Each type of nonelastomeric sealant and joint substrate indicated.
  3. Notify Architect seven days in advance of dates and times when test joints will be erected.
  4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
    - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.
      - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
  6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- 1.05 ACTION SUBMITTALS
- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection for Standard Colors: For each type and color of joint sealant scheduled as a standard color for selection by Architect, provide Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification of Color Match: For each type and color of joint sealant scheduled as a custom color or to match a building component, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Schedule:
1. List each material proposed for use, and cross-reference to specific substrate application by color.
  2. Include typewritten list identifying the following for each sealant type:
    - a. ID Number on Joint Sealant Usage Schedule.
    - b. Manufacturer's catalog number.
    - c. Product name.
    - d. Generic classification.
    - e. Type, Grade, Class, and Modulus as applicable.
    - f. Uses related to exposure.
    - g. Approved uses related to joint substrates including approved Use "O" substrates.
    - h. Hardness after cure and after 5 years.



- i. Shrinkage percent.
    - j. Curing time.
    - k. Application temperature limits.
    - l. Minimum and maximum joint dimensions.
  - E. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
  - F. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
  - G. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
  - H. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
    - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
    - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
  - I. Field Test Report Log: For each elastomeric sealant application.
  - J. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
  - K. Warranties: Special warranties specified in this Section.
- 1.06 QUALITY ASSURANCE
- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
  - B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
  - C. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
    - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
  - D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
- 1.07 PROJECT CONDITIONS
- A. Do not proceed with installation of joint sealants under the following conditions:
    - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
    - 2. When joint substrates are wet.
    - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
    - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## 1.08 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Manufacturer's standard but not less than the following from date of Substantial Completion:
    - a. Silicone Sealants: 20 years.
    - b. Urethane Sealants: 5 years.
    - c. Polysulfide Sealants: 5 year non-immersion service; 1 year immersion service.
    - d. Moisture Resistant Silicone Sealants: 2 years.
    - e. Acrylic, Latex, Acoustic, and Butyl Sealants: 1 year.
- B. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
  - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
  - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
  - 3. Mechanical damage caused by individuals, tools, or other outside agents.
  - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

## 2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with South Coast Air Quality Management District (SCAQMD) Rule #1168. Volatile organic compound (VOC) limits listed below:
  - 1. Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Type:
  - 1. Provide Type M (multicomponent) sealants where required to achieve color match indicated and where specifically indicated.
  - 2. Provide Type S (single component) or Type M (multicomponent) sealants elsewhere.
- D. Grade:
  - 1. Provide Grade P (pourable) or Grade NS (nonsag) sealants at horizontal joints.
  - 2. Provide Grade NS (nonsag) sealants at vertical and non-horizontal joints.
- E. Class: Provide sealants suitable for anticipated joint movement.

- F. Use Related to Exposure:
1. Provide Use T (traffic) at horizontal traffic surfaces.
  2. Provide Use NT (nontraffic) or T (traffic) at vertical and horizontal non-traffic surfaces.
  3. Provide Use I (immersible) at joints subject to continuous immersion.
  4. Provide sealants suitable for contact with food where sealants are indicated for joints that will come in repeated contact with food.
  5. Where sealants are indicated for joints that are scheduled to be painted, provide sealants that accept paint coatings over cured sealant with no adverse affects to the applied paint including but not limited to staining, discoloration, and adhesion failure.
- G. Uses Related to Joint Substrates: Provide sealants suitable for contact with joint substrates indicated including but not limited to Mortar (M), Glass (G), Aluminum (A), and Other (O) as applicable.
1. Use O Joint Substrates: Coated glass, Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, limestone, marble, ceramic tile, wood, and other Use O substrates as indicated.
  2. Do not use acid-curing silicone sealants for the following joint substrates: Galvanized steel, marble, cement-based materials, copper, and other materials and finishes which may be corroded by acid-curing silicone sealant formulations.
  3. Do not use silicone sealants for applications where they will be continuously immersed in liquids.
  4. For fire-resistive glazing, use products identical to products used in test assemblies to obtain fire-protection rating.
- H. Joint Width: Provide sealants suitable for joint openings based on manufacturer's published minimum and maximum joint widths and depths.

## 2.02 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids: Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.
- F. Where elastomeric sealants are indicated for joints that are scheduled to be painted, provide products that accept paint coatings over cured sealant with no adverse affects to the applied paint including but not limited to staining, discoloration, and adhesion failure.
- G. Refer to separate Joint Sealant Products Schedule for a list of acceptable elastomeric sealant products.

## 2.03 SOLVENT-RELEASE JOINT SEALANTS

- A. Acrylic-Based Solvent-Release Joint Sealant: Comply with ASTM C 1311 or FS TT-S-00230.
- B. Butyl-Rubber-Based Solvent-Release Joint Sealant: Comply with ASTM C 1085.
- C. Refer to separate Joint Sealant Products Schedule for a list of acceptable solvent-release sealant products.

## 2.04 LATEX JOINT SEALANTS

- A. Latex Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834, Type OP, Grade NF.
- B. Refer to separate Joint Sealant Products Schedule for a list of acceptable latex sealant products.

## 2.05 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
- C. Refer to separate Joint Sealant Products Schedule for a list of acceptable acoustical sealant products.

## 2.06 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, any of the following types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
  - 1. Type C (closed-cell material with a surface skin).
- C. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- D. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- E. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint

surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.07 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply

primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.03 INSTALLATION

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- H. Installation of Glazing Sealants: Comply with manufacturer's written instructions and requirements specified in Division 08 Section "Glazing."

### 3.04 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
  - 1. Extent of Testing: Test completed elastomeric sealant joints as follows:

- a. New Sealant Joints: Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
  - b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
  2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab; Method B, Exposed Surface Finish Hand Pull Tab; or Method C, Field-Applied Sealant Joint Hand Pull Flap in Appendix X1 in ASTM C 1193, as appropriate for type of joint-sealant application indicated.
    - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
  4. Inspect tested joints and report on the following:
    - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
    - b. Whether sealants filled joint cavities and are free of voids.
    - c. Whether sealant dimensions and configurations comply with specified requirements.
  5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
  6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.
- 3.05 CLEANING
- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- 3.06 PROTECTION
- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.
- 3.07 JOINT-SEALANT SCHEDULE
- A. Refer to separate "Joint Sealant Use Schedule" for areas of application and color selection.

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END OF SECTION 07 92 00

07 92 00 - 10  
JOINT SEALANTS



**JOINT SEALANT USAGE SCHEDULE**

ID No.	Exterior Traffic Joints	Sealant Chemistry	Class	Color
E-1	Control and expansion joints in concrete, cast-in-place	Silicone	50	Standard
E-2	Control and expansion joints in concrete, cast-in-place, decorative	Silicone	50	Custom
E-5	Joints between asphalt paving & walls & other vertical surfaces	Silicone	50	Standard
E-6	Joints between concrete paving & walls & other vertical surfaces	Silicone	50	Standard
E-13	Joints in pedestrian plazas (immersion service)	Urethane or Polysulfide	25	Custom
ID No.	Exterior Non-Traffic Joints	Sealant Chemistry	Class	Color
E-22	Control and expansion joints in concrete, cast-in-place	Silicone	50	Standard
E-24	Control and expansion joints in stone; cast, cut and dimension	Silicone	50	Custom
E-26	Control and expansion joints in unit masonry, clay	Silicone	50	Custom
E-27	Control and expansion joints in unit masonry, concrete, decorative	Silicone	50	Custom
E-28	Control and expansion joints in unit masonry, concrete, painted	Silicone	50	Custom
E-29	Control and expansion joints in unit masonry, concrete, unfinished	Silicone	50	Standard
E-31	Joints between metal flashings, concealed lapped joints	Butyl	7½	Standard
E-32	Joints between metal flashings, exposed, prefinished	Silicone	50	Custom
E-33	Joints between metal flashings, exposed, unfinished	Silicone	50	Standard
E-34	Joints between metal panels, prefinished	Silicone	50	Custom
E-35	Joints between metal panels, natural finish	Silicone	50	Custom
E-37	Perimeter joints around frames, metal, field painted	Urethane	25	Standard
E-39	Perimeter joints around frames, metal, prefinished	Silicone	50	Custom
E-40	Setting bed for flashing receivers	Butyl	7½	Standard
E-41	Setting bed for thresholds & sills	Butyl	7½	Standard
E-42	Setting bed for metal flashing, metal frames, and wood frames	Butyl	7½	Standard
ID No.	Interior Traffic Joints	Sealant Chemistry	Class	Color
I-2	Control and expansion joints in concrete slabs, concealed	None required	N/A	N/A
I-3	Control and expansion joints in concrete slabs, exposed	Urethane	25	Standard
I-9	Control and expansion joints in tile in toilet rooms and kitchens	MR silicone	25	Custom
I-10	Control and expansion joints in tile not in toilet rooms and kitchens	Urethane	25	Custom
ID No.	Interior Non-Traffic Joints	Sealant Chemistry	Class	Color
I-20	Control and expansion joints in cast-in-place concrete	Urethane	25	Standard
I-21	Control and expansion joints in stone; cast, cut and dimension	Urethane	25	Custom
I-22	Control and expansion joints in tile in toilet rooms and kitchens	MR silicone	25	Custom

I-23	Control and expansion joints in tile not in toilet rooms and kitchens	Urethane	25	Custom
I-24	Control and expansion joints in unit masonry, clay	Urethane	25	Custom
I-25	Control and expansion joints in unit masonry, concrete, decorative, unfinished	Urethane	25	Custom
I-26	Control and expansion joints in unit masonry, concrete, painted	Urethane	25	Standard
I-27	Control and expansion joints in unit masonry, concrete, unfinished	Urethane	25	Standard
I-29	Control joints in acoustic walls and partitions including gaps	Acoustic latex or rubber	Min	Standard
I-30	Control joints in gypsum board ceilings and partitions	Acrylic	7½	Standard
I-32	Joints between gypsum shaftwall panels and penetrations and adjacent surfaces	Acoustic latex or rubber	Min	Standard
I-33	Joints between tile backing panels and penetrations	MR silicone	25	White
I-34	Joints between woodwork, painted and adjacent surfaces	Acrylic or latex	0	Standard
I-35	Joints between woodwork, transparent finished and adjacent surfaces	Silicone	50	Custom
I-36	Joints between plumbing fixtures & adjacent walls, floors, & counters	MR silicone	25	White
I-37	Joints in and between FRP panels and adjacent surfaces	Silicone	50	Custom
I-38	Joints in and between plastic laminate and adjacent surfaces	Silicone	50	Custom
I-39	Joints in and between synthetic countertops and adjacent surfaces	Silicone	50	Custom
I-41	Perimeter joints around frames, metal, field painted	Latex	0	Standard
I-42	Perimeter joints around frames, metal, prefinished	Silicone	50	Custom
ID No.	Glazing Sealants	Sealant Chemistry	Class	Color
G-4	Hollow metal frames to glass, cap bead	Silicone - neutral	50	Custom

## Colors of Exposed Joint Sealants:

Standard Color: As selected by Architect from manufacturer's full range for this characteristic.

Custom Color: Provide a custom color matching Architect's sample that complies with requirements.

C:\Users\Cathy\Dropbox (WDEO)\15001 Midwestern State\00 Specs by Issue\06\_15001 Midwestern State 2015-05-15 BP-2 100% CD\07 92 00 134\_wfl joint sealant usage products schedule bp-01 BP-2.xls\JOINT SEALANT USAGE SCHEDULE

**JOINT SEALANT PRODUCTS SCHEDULE**

MANUFACTURER	PRODUCT	CHEMISTRY	CURE	MODULUS	TYPE	GRADE	CLASS	EXPOSURE			USES					JOINT SIZE	
								T	NT	I	M	G	A	O		MIN	MA x
Pecora	AC-20 FTR Acoustical and Insulation Sealant	Acoustical Latex	---	---	S	NS	Min	--	NT	--	--	--	--	--	--	--	--
Specified Technologies	SpecSeal Smoke and Sound Sealant	Acoustical Latex	---	---	S	NS	Min	--	NT	--	--	--	--	--	--	--	--
USG	SHEETROCK Acoustical Sealant	Acoustical Latex	---	---	S	NS	Min	--	NT	--	--	--	--	--	--	--	--
Tremco	Tremco Acoustical Sealant	Acoustical Rubber	---	---	S	NS	Min	--	NT	--	--	--	--	--	--	--	--
Tremco	Mono 555	Acrylic	Solvent	---	S	NS	7½	--	NT	--	--	--	--	--	--	--	--
Pecora	BC-158	Butyl	Solvent	---	S	NS	7½	--	NT	--	--	--	--	--	--	--	--
Sonneborn	Multi-Purpose	Butyl	Solvent	---	S	NS	7½	--	NT	--	--	--	--	--	--	--	--
Tremco	Tremco Butyl	Butyl	Solvent	---	S	NS	7½	--	NT	--	--	--	--	--	--	--	--
Pecora	AC-20+	Latex	---	---	S	NS	0	--	NT	--	--	--	--	--	--	--	--
Sonneborn	Sonolac	Latex	---	---	S	NS	0	--	NT	--	--	--	--	--	--	--	--
Tremco	Tremflex 834	Latex	---	---	S	NS	0	--	NT	--	--	--	--	--	--	--	--
Dow Corning	786 Mildew Resistant	MR Silicone	Acid	High	S	NS	25	--	NT	--	--	G	A	O		¼ x ¼	1
GE Silicones	Sanitary SCS1700	MR Silicone	Acid	High	S	NS	25	--	NT	--	--	G	A	O		¼ x ¼	1 x ¾
Pecora	898	MR Silicone	Neutral	Medium	S	NS	50	--	NT	--	M	G	A	O		¼ x ¼	1 x ¾
Tremco	Tremsil 200	MR Silicone	Acid	Medium	S	NS	25	--	NT	--	--	G	A	O		¼ x ¼	1 x ½
Pecora	Synthacalk GC-2+	Polysulfide	---	---	M	NS	25	T	--	I	M	G	A	O		¼ x ¼	1 x ½
Crafco	34903 RoadSaver Silicone SL	Silicone	Neutral	Ultralow	S	P	100/50	T	--	--	--	--	--	O		¼ x ¼	1½ x ½
Dow Corning	790	Silicone	Neutral	Low	S	NS	100/50	--	NT	--	M	G	A	O		¼ x ¼	3 x ½
Dow Corning	791	Silicone	Neutral	Medium	S	NS	50	--	NT	--	M	G	A	O		¼ x ¼	3 x ¾
Dow Corning	795	Silicone	Neutral	Medium	S	NS	50	--	NT	--	M	G	A	O		¼ x ¼	3 x ½
Dow Corning	995	Silicone	Neutral	Medium	S	NS	50	--	NT	--	--	G	A	O		¼ x ¼	1 x ¾
Dow Corning	756 SMS	Silicone	Neutral	Medium	S	NS	100/50	--	NT	--	M	G	A	O		¼ x ¼	2 x ½
Dow Corning	890-SL	Silicone	Neutral	Ultralow	S	P	100/50	T	--	--	M	--	A	O		¼ x ¼	3 x ½
GE Silicones	SilPruf LM SCS2700	Silicone	Neutral	Low	S	NS	100/50	--	NT	--	M	G	A	O		¼ x ¼	2 x ¾
GE Silicones	SilPruf NB SCS9000	Silicone	Neutral	Medium	S	NS	50	--	NT	--	M	G	A	O		¼ x ¼	2 x ¾
GE Silicones	SilPruf SCS2000	Silicone	Neutral	Low	S	NS	50	--	NT	--	M	G	A	O		¼ x ¼	2 x ¾
Pecora	300 Pavement Sealant (Self-Leveling)	Silicone	Neutral	Ultralow	S	P	100/50	T	--	--	--	--	--	--		¼ x ¼	---
Tremco	Spectrem 1	Silicone	Basic	Low	S	NS	100/50	--	NT	--	M	G	A	O		¼ x ¼	1 x ½
Tremco	Spectrem 4TS	Silicone	Neutral	Low	M	NS	50	--	NT	--	M	G	A	O		¼ x ¼	---
Pecora	Dynatrol II	Urethane	---	---	M	NS	50	--	NT	--	M	G	A	O		¼ x ¼	2 x ½
Pecora	Dynatrol I-XL	Urethane	---	---	S	NS	25	--	NT	--	M	G	A	O		¼ x ¼	1½ x ½
Pecora	Urexpand NR-201	Urethane	---	---	S	P	25	T	--	--	M	--	A	O		¼ x ¼	1 x ½
Sika	Sikaflex - 1a	Urethane	---	---	S	NS	25	T	NT	--	M	G	A	O		¼ x ¼	2 x ½
Sika	Sikaflex - 1CSL	Urethane	---	---	S	P	25	T	NT	--	M	--	O			¼ x ¼	2 x ½
Sonneborn	NP 1	Urethane	---	---	S	NS	25	T	NT	--	M	G	A	O		¼ x ¼	2 x ½
Sonneborn	SL 1	Urethane	---	---	S	P	25	T	NT	--	M	G	A	O		¼ x ¼	2 x ½
Sonneborn	Ultra	Urethane	---	---	S	NS	25	T	NT	--	M	G	A	O		¼ x ¼	1 x ½
Tremco	Vulkem Nova 300 SSL	Urethane	---	---	S	P	50	T	NT	I	M	--	A	O		¼ x ¼	2 x ½

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DEFINITIONS

Type: S = Single Component; M = Multiple Component

Grade: NS = Non-Sag; P = Pourable or Self-Leveling

Class: Numerical values represent percent elongation/compression capability; "Min" implies "minimal"

Exposure: T = Traffic; NT = Non-Traffic; I = Immersion Service

Uses: M = Mortar; G = Glass; A = Aluminum; O = Other

## **SECTION 12 9300 - SITE FURNISHINGS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Bicycle racks.
  - 2. Pedestrian Pole Light
- B. Related Requirements:
  - 1. Division 03 Section "Cast-in-Place Concrete" for installing pipe sleeves cast, installing anchor bolts cast in concrete footings.
  - 2. Division 31 Section "Earth Moving" for excavation for installing concrete footings.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Material Certificates: For site furnishings.
  - 1. Wood Preservative Treatment: Include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

#### **1.6 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Trash Receptacle Inner Containers: Five full-size units for each size indicated.

**PART 2 - PRODUCTS****2.1 BICYCLE RACKS**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following: product must be submitted to and approved by the owner's representative.

1. Victor Stanley, Inc.
2. Kingsley~Bate, Ltd.
3. Landscape Forms.
4. Maglin Site Furniture Inc.
5. Urban Accessories, Inc.

**2.4 PEDESTRIAN LIGHT POLE**

- A. Light poles to match campus standard and to be approved by owner's representative prior to installation.

**2.5 MATERIALS**

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:

6. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211.
7. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221.
8. Structural Pipe and Tube: ASTM B 429/B 429M.
9. Sheet and Plate: ASTM B 209.
10. Castings: ASTM B 26/B 26M.

- B. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53/A 53M, or electric-resistance-welded pipe complying with ASTM A 135/A 135M.
3. Tubing: Cold-formed steel tubing complying with ASTM A 500/A 500M.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500/A 500M; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
6. Perforated Metal: From steel sheet not less than 0.120-inch (3.0-mm) nominal thickness; manufacturer's standard perforation pattern.
7. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F 1267.
8. Malleable-Iron Castings: ASTM A 47/A 47M, grade as recommended by fabricator for type of use intended.
9. Gray-Iron Castings: ASTM A 48/A 48M, Class 200.

- C. Stainless Steel: Free of surface blemishes and complying with the following:
  - 1. Sheet, Strip, Plate, and Flat Bars: ASTM A 666.
  - 2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.
  - 3. Tubing: ASTM A 554.
- D. Wood: Surfaced smooth on four sides with eased edges; kiln dried, free of knots, solid stock of species indicated.
  - 1. Wood Species: Manufacturer's standard.
  - 2. Certified Wood: Fabricate site furnishings with components produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
  - 3. Finish: Manufacturer's standard transparent wood preservative treatment and sealer.
- E. Fiberglass: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.
- F. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
  - 1. Polyethylene: Fabricated from virgin plastic HDPE resin.
- G. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials appropriate for the types of materials that it abuts; commercial quality, tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged.
  - 1. Angle Anchors: For inconspicuously bolting legs of site furnishings to on and below - grade substrate; per manufacturer's recommendation. Extend fasteners through pavers from concrete base when installed in a paver (brick, concrete, stone, etc.) surface.
- H. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M; recommended in writing by manufacturer, for exterior applications.
- I. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.
- J. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
  - 1. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

## 2.5 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment: Pressure-treat wood according to AWPA U1 and the following:

1. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.

## 2.6 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWWA M4 to cut surfaces.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

## 2.7 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.8 ALUMINUM FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

## 2.9 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.



- B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

## 2.10 IRON FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

## 2.11 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

- F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

**END OF SECTION 12 9300**

## SECTION 311000 - SITE CLEARING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities.
8. Temporary erosion and sedimentation control.

- B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

- C. Related Requirements:

1. Section 01500 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

#### 1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.
- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings and indicated according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.5 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
  - 1. Use sufficiently detailed photographs or video recordings.
  - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Topsoil stripping and stockpiling program.
- C. Rock stockpiling program.
- D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.
- E. Burning: Documentation of compliance with burning requirements and permitting of authorities having jurisdiction. Identify location(s) and conditions under which burning will be performed.

## 1.7 QUALITY ASSURANCE

- A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.
- B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

## 1.8 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and deliver to Owner as directed.
- D. Utility Locator Service: Notify 811One Call, The City of Wichita Falls, and the Midwestern State University Physical Plant Department for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- F. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- G. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
  - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

### 3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

### 3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."

- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Section 015639 "Temporary Tree and Plant Protection."

### 3.4 EXISTING UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
  - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.
  - 1. Arrange with utility companies to shut off indicated utilities.
  - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Owner not less than two (2) business days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Owner's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.
- F. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

### 3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
  - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
  - 2. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 48 inches below exposed subgrade.
  - 3. Use only hand methods or air spade for grubbing within protection zones.
  - 4. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

### 3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
  1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
  1. Limit height of topsoil stockpiles to 72 inches.
  2. Do not stockpile topsoil within protection zones.
  3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
  4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

### 3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
  1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
  2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

### 3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Burning tree, shrub, and other vegetation waste is permitted according to burning requirements and permitting of authorities having jurisdiction. Control such burning to produce the least smoke or air pollutants and minimum annoyance to surrounding properties. Burning of other waste and debris is prohibited.



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SITE IMPROVEMENTS - BP01  
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- C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

## SECTION 312000 - EARTH MOVING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

## A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete pavements.
6. Subbase course and base course for asphalt paving.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.
8. Excavating well hole to accommodate elevator-cylinder assembly.

## B. Related Requirements:

1. Section 013200 "Construction Progress Documentation" and Section 013233 "Photographic Documentation" for recording preexcavation and earth-moving progress.
2. Section 033000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
3. Section 311000 "Site Clearing" for site stripping, grubbing, stripping topsoil, and removal of above- and below-grade improvements and utilities.
4. Section 316329 "Drilled Concrete Piers and Shafts" for excavation of shafts and disposal of surplus excavated material.
5. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
6. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

## 1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices for earth moving specified in Section 012200 "Unit Prices."

- B. Quantity allowances for earth moving are included in Section 012100 "Allowances."

#### 1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
  2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
  3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

## 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct preexcavation conference at Project site.
  - 1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
    - a. Personnel and equipment needed to make progress and avoid delays.
    - b. Coordination of Work with utility locator service.
    - c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
    - d. Extent of trenching by hand or with air spade.
    - e. Field quality control.

## 1.6 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
  - 1. Geotextiles.
  - 2. Controlled low-strength material, including design mixture.
  - 3. Geofoam.
  - 4. Warning tapes.
- B. Samples for Verification: For the following products, in sizes indicated below:
  - 1. Geotextile: 12 by 12 inches.
  - 2. Warning Tape: 12 inches long; of each color.

## 1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each soil material proposed for fill and backfill as follows:
  - 1. Classification according to ASTM D 2487.
  - 2. Laboratory compaction curve according to ASTM D 698.
- C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

## 1.8 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

## 1.9 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Utility Locator Service: Notify 811 One Call, the City of Wichita Falls and the Midwestern University Physical Plant Department for the area where Project is located before beginning earth-moving operations.
- D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in are in place.
- E. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.
- F. The following practices are prohibited within protection zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Foot traffic.
  - 4. Erection of sheds or structures.
  - 5. Impoundment of water.
  - 6. Excavation or other digging unless otherwise indicated.
  - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. Refer to the Geotechnical Report No. 114-220 for the Project prepared by Apex Geoscience Inc. dated January 16, 2015.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

## 2.2 CONTROLLED LOW-STRENGTH MATERIAL

- A. Controlled Low-Strength Material: Self-compacting, flowable concrete material produced from the following:
  1. Portland Cement: ASTM C 150/C 150M, Type I.
  2. Fly Ash: ASTM C 618, Class C or F.
  3. Normal-Weight Aggregate: ASTM C 33/C 33M, 3/8-inch nominal maximum aggregate size.
  4. Foaming Agent: ASTM C 869/C 869M.
  5. Water: ASTM C 94/C 94M.
  6. Air-Entraining Admixture: ASTM C 260/C 260M.
- B. Produce low-density, controlled low-strength material with the following physical properties:
  1. As-Cast Unit Weight: 36 to 42 lb/cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
  2. Compressive Strength: 140 psi, when tested according to ASTM C 495/C 495M.
- C. Produce conventional-weight, controlled low-strength material with 140-psi compressive strength when tested according to ASTM C 495/C 495M.
- D. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
  1. Red: Electric.
  2. Yellow: Gas, oil, steam, and dangerous materials.
  3. Orange: Telephone and other communications.
  4. Blue: Water systems.
  5. Green: Sewer systems.
- E. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
  1. Red: Electric.
  2. Yellow: Gas, oil, steam, and dangerous materials.
  3. Orange: Telephone and other communications.
  4. Blue: Water systems.
  5. Green: Sewer systems.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

### 3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

### 3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

### 3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
- B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
  - 1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be

removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.

- a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

### 3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
  2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
  1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

### 3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### 3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
  1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
  1. Clearance: 12 inches each side of pipe or conduit.



- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
  3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
  4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- E. Trenches in Tree- and Plant-Protection Zones:
1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
  3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

### 3.8 EXCAVATION FOR ELEVATOR CYLINDER

- A. Drill well hole plumb in elevator pit to accommodate installation of elevator-cylinder assembly. Coordinate with applicable requirements for diameter and tolerances in Section 142400 "Hydraulic Elevators."
- B. Provide well casing as necessary to retain walls of well hole.

### 3.9 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify

soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
  2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

### 3.10 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

### 3.11 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### 3.12 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
  2. Surveying locations of underground utilities for Record Documents.
  3. Testing and inspecting underground utilities.
  4. Removing concrete formwork.
  5. Removing trash and debris.
  6. Removing temporary shoring, bracing, and sheeting.

7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

- B. Place backfill on subgrades free of mud, frost, snow, or ice.

### 3.13 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 12 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete.
- D. Trenches under Roadways: Refer to Plan Details for installation of utilities under roadways.
- E. Backfill voids with satisfactory soil while removing shoring and bracing.
- F. Initial Backfill:
  1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1inch in any dimension, to a height of 12 inches over the pipe or conduit.
    - a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
  2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.
- G. Final Backfill:
  1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
  2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
- H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

**3.14 SOIL FILL**

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

**3.15 SOIL MOISTURE CONTROL**

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

**3.16 COMPACTION OF SOIL BACKFILLS AND FILLS**

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
  - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material to a minimum 95% percent ASTM D698 at 100 % to 102% of optimum moisture.
  - 2. Under walkways, scarify and recompact top 6 inches (below subgrade and compact each layer of backfill or fill soil material at 92% percent ASTM D698 at 100 % to 102% of optimum moisture.
  - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85% percent ASTM D698 at 100 % to 102% of optimum moisture.
  - 4. For utility trenches, compact each layer of initial and final backfill soil material at 95% percent ASTM D698 at 100 % to 102% of optimum moisture.

### 3.17 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
  - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
  - 2. Walks: Plus or minus 1/2 inch.
  - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when 10-foot straightedge.

### 3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course under pavements and walks as follows:
  - 1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  - 2. Place base course material over subbase course under hot-mix asphalt pavement.
  - 3. Shape subbase course to required crown elevations and cross-slope grades.
  - 4. Place subbase course 6 inches or less in compacted thickness in a single layer.
  - 5. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 6. Compact subbase course at optimum to 102% moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
- C. Pavement Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### 3.19 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
  2. Determine that fill material classification and maximum lift thickness comply with requirements.
  3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:
1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 square feet or less of paved area or building slab but in no case fewer than three tests.
  2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
  3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

### 3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### 3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
  1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

## SECTION 321313 - CONCRETE PAVING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes the following:

1. Driveways.
2. Roadways.
3. Parking lots.
4. Curbs and gutters.
5. Walks.

- B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.
2. Section 321316 "Decorative Concrete Paving" for stamped concrete other than stamped detectable warnings.
3. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.
4. Section 321713 "Parking Bumpers."
5. Section 321723 "Pavement Markings."
6. Section 321726 "Tactile Warning Surfacing" for detectable warning mats and pavers.
7. Section 321729 "Manufactured Traffic-Calming Devices."

#### 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.



1. Review methods and procedures related to concrete paving, including but not limited to, the following:
  - a. Concrete mixture design.
  - b. Quality control of concrete materials and concrete paving construction practices.
2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
  - a. Contractor's superintendent.
  - b. Independent testing agency responsible for concrete design mixtures.
  - c. Ready-mix concrete manufacturer.
  - d. Concrete paving Subcontractor.
  - e. Manufacturer's representative of stamped concrete paving system used for stamped detectable warnings.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.
- C. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:
  1. Exposed Aggregate: 10-lb Sample of each mix.
- D. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified installer of stamped detectable warnings, ready-mix concrete manufacturer, and testing agency.
- B. Material Certificates: For the following, from manufacturer:
  1. Cementitious materials.
  2. Steel reinforcement and reinforcement accessories.
  3. Fiber reinforcement.
  4. Admixtures.
  5. Curing compounds.
  6. Applied finish materials.
  7. Bonding agent or epoxy adhesive.
  8. Joint fillers.

- C. Material Test Reports: For each of the following:
  - 1. Aggregates: Include screening data for each type of aggregate intended for use and service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- D. Field quality-control reports.

## 1.7 QUALITY ASSURANCE

- A. Stamped Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.
- B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").
- C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

## 1.9 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Paragraph 3.6, Concrete Placement, shall govern when concrete may be placed. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
  - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
  - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  - 3. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

## PART 2 - PRODUCTS

### 2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

### 2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
  - 1. Use flexible or uniformly curved forms for curves with a radius of 50 feet or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

## 2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from galvanized steel wire into flat sheets.
- B. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.
- C. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.
- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.
- F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.
- G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 deformed bars; assembled with clips.
- H. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.
- I. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 plain-steel bars.
- J. Tie Bars: ASTM A 615/A 615M, Grade 60; deformed.
- K. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- L. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
  - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
  - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- M. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.
- N. Zinc Repair Material: ASTM A 780/A 780M.

## 2.4 CONCRETE MATERIALS

- A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
1. Portland Cement: ASTM C 150/C 150M, gray portland cement Type I/II;
  2. Fly Ash: ASTM C 618, Class C or F.
  3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
  4. Blended Hydraulic Cement: ASTM C 595/C 595M, cement.
- B. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 4S, uniformly graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
  2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:
1. Aggregate Sizes: 1/2 to 3/4 inch nominal.
  2. Aggregate Source, Shape, and Color:
- D. Air-Entraining Admixture: ASTM C 260/C 260M.
- E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- F. Water: Potable and complying with ASTM C 94/C 94M.

## 2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry or cotton mats.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.

- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

## 2.6 RELATED MATERIALS

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy-Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature and grade complying with job requirements.
- E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.
- F. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
- G. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.

## 2.7 STAMPED DETECTABLE WARNING MATERIALS

- A. Detectable Warning Stamp: Semirigid polyurethane mats with formed underside capable of imprinting detectable warning pattern on plastic concrete; perforated with a vent hole at each dome.
  - 1. Size of Stamp: One piece, matching detectable warning area shown on Drawings 24 by 48 inches.
- B. Liquid Release Agent: Manufacturer's standard, clear, evaporating formulation designed to facilitate release of stamp mats.

## 2.8 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
  - 2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash or Pozzolan: 25 percent.
  - 2. Slag Cement: 50 percent.
  - 3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
  - 1. Air Content: 4% percent plus or minus 1-1/2 percent for 3/4-inch nominal maximum aggregate size.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use chemical admixtures in concrete as required for placement and workability.
  - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- F. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.
- G. Concrete Mixtures: Normal-weight concrete.
  - 1. Compressive Strength as indicated by plan sections.
  - 2. Maximum W/C Ratio at Point of Placement: 0.45.
  - 3. Slump Limit: 5 inches, plus or minus 1 inch.

## 2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
  1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
  2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 3/4 inch according to requirements in Section 312000 "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

#### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

#### 3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.



- D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.
- G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 6-inch overlap of adjacent mats.

### 3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
  - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
  - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
  - 2. Provide tie bars at sides of paving strips where indicated.
  - 3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
  - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
  - 1. Locate expansion joints at intervals of 100 feet unless otherwise indicated.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler not less than 1/4 inch or more than 1/2 inch below finished surface if joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 3/8-inch radius. Repeat grooving of contraction joints after applying surface finishes.
    - a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
    - a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
  3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes.

### 3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Concrete shall not be placed when the ambient air temperature is less than 35 deg F. Concrete may be placed if ambient air temperature is greater than 35 deg F and is anticipated to rise until the concrete has achieved its initial set.
- D. When ambient air temperature is greater than 95° F or is expected to rise above 95° F prior to concrete reaching its initial set, special precautions shall be taken such as adding ice to the mix (with reduction of water) to reduce the temperature at placement.

Sawing of contraction joints shall be immediately commenced as soon as the equipment can operate on the slab without marking the concrete. Use of water fog and sealants (provided they will not interfere with anticipated flooring products) should be considered and utilized as appropriate.

- E. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- F. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- G. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- H. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- I. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- J. Screed paving surface with a straightedge and strike off.
- K. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- L. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.
- M. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
  - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

### 3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to

power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

### 3.8 SPECIAL FINISHES

- A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:
  1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
  2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
  3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
  4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch.
  1. Spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
  2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
  3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
  4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:
  1. Uniformly spread 25 lb/100 sq. ft. of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.

2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
  3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
  4. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.
- D. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to paving surface according to manufacturer's written instructions and as follows:
1. Uniformly spread dry-shake hardener at a rate of 100 lb/100 sq. ft. unless greater amount is recommended by manufacturer to match paving color required.
  2. Uniformly distribute approximately two-thirds of dry-shake hardener over the concrete surface with mechanical spreader; allow hardener to absorb moisture and embed it by power floating. Follow power floating with a second application of pigmented mineral dry-shake hardener, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed hardener by final power floating.
  3. After final power floating, apply a hand-troweled finish followed by a broom finish.
  4. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.

### 3.9 DETECTABLE WARNING INSTALLATION

- A. Blockouts: Form blockouts in concrete for installation of detectable paving units specified in Section 321726 "Tactile Warning Surfacing."
1. Tolerance for Opening Size: Plus 1/4 inch, no minus.
- B. Cast-in-Place Detectable Warning Tiles: Form blockouts in concrete for installation of tiles specified in Section 321726 "Tactile Warning Surfacing." Screed surface of concrete where tiles are to be installed to elevation, so that edges of installed tiles will be flush with surrounding concrete paving. Embed tiles in fresh concrete to comply with Section 321726 "Tactile Warning Surfacing" immediately after screeding concrete surface.
- C. Stamped Detectable Warnings: Install stamped detectable warnings as part of a continuous concrete paving placement and according to stamp-mat manufacturer's written instructions.
1. Before using stamp mats, verify that the vent holes are unobstructed.
  2. Apply liquid release agent to the concrete surface and the stamp mat.
  3. Stamping: While initially finished concrete is plastic, accurately align and place stamp mats in sequence. Uniformly load, gently vibrate, and press mats into concrete to produce imprint pattern on concrete surface. Load and tamp mats directly perpendicular to the stamp-mat surface to prevent distortion in shape of

domes. Press and tamp until mortar begins to come through all of the vent holes. Gently remove stamp mats.

4. Trimming: After 24 hours, cut off the tips of mortar formed by the vent holes.
5. Remove residual release agent according to manufacturer's written instructions, but no fewer than three days after stamping concrete. High-pressure-wash surface and joint patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.

### 3.10 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
  1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
  3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

### 3.11 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/8 inch.
2. Thickness: Plus 1/4 inch.

### 3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
  1. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C 231/C 231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
  5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
  6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
    - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 300 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

### 3.13 REPAIR AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313



## SECTION 334100 - STORM UTILITY DRAINAGE PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Pipe and fittings.
  - 2. Nonpressure transition couplings.
  - 3. Pressure pipe couplings.
  - 4. Expansion joints and deflection fittings.
  - 5. Backwater valves.
  - 6. Cleanouts.
  - 7. Drains.
  - 8. Encasement for piping.
  - 9. Manholes.
  - 10. Channel drainage systems.
  - 11. Catch basins.
  - 12. Stormwater inlets.
  - 13. Stormwater detention structures.
  - 14. Pipe outlets.
  - 15. Dry wells.
  - 16. Stormwater disposal systems.

#### 1.3 DEFINITIONS

- A. FRP: Fiberglass-reinforced plastic.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
  - 1. Manholes: Include plans, elevations, sections, details, frames, and covers.
  - 2. Catch Basins and area inlets: Include plans, elevations, sections, details, frames, covers, and grates.

3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- B. Product Certificates: For each type of pipe and fitting, from manufacturer.
- C. Field quality-control reports.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle catch basins and storm water inlets according to manufacturer's written rigging instructions.

## 1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  1. Notify Owner no fewer than two (2) business days in advance of proposed interruption of service.
  2. Do not proceed with interruption of service without Owner's written permission.

## PART 2 - PRODUCTS

### 2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy classes.
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

## 2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI-Trademarked, Shielded Couplings:
  - 1. Description: ASTM C 1277 and CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Shielded Couplings:
  - 1. Description: ASTM C 1277 and ASTM C 1540, with stainless-steel shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- D. Cast-Iron, Shielded Couplings:
  - 1. Description: ASTM C 1277 and ASTM A 48/A 48M, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

## 2.3 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

- A. Pipe: ASTM A 716, for push-on joints.
- B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153, for push-on joints.
- D. Gaskets: AWWA C111, rubber.

## 2.4 DUCTILE-IRON, PRESSURE PIPE AND FITTINGS

- A. Push-on-Joint Piping:
  - 1. Pipe: AWWA C151, for push-on joints.
  - 2. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
  - 3. Compact Fittings: AWWA C153, for push-on joints.
  - 4. Gaskets: AWWA C111, rubber, of shape matching pipe and fittings.
- B. Mechanical-Joint Piping:
  - 1. Pipe: AWWA C151, with bolt holes in bell.
  - 2. Standard Fittings: AWWA C110, ductile or gray iron, with bolt holes in bell.
  - 3. Compact Fittings: AWWA C153, with bolt holes in bells.
  - 4. Glands: Cast or ductile iron, with bolt holes and high-strength, cast-iron or high-strength, low-alloy steel bolts and nuts.

5. Gaskets: AWWA C111, rubber, of shape matching pipe, fittings, and glands.

## 2.5 PE PIPE AND FITTINGS

- A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.
  1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
  2. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.
- B. Corrugated PE Pipe and Fittings NPS 12 to NPS 6: AASHTO M 294M, Type S, with smooth waterway for coupling joints.
  1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
  2. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

## 2.6 PVC PIPE AND FITTINGS

- A. PVC Cellular-Core Piping:
  1. PVC Cellular-Core Pipe and Fittings: ASTM F 891, Sewer and Drain Series, PS 50 minimum stiffness, PVC cellular-core pipe with plain ends for solvent-cemented joints.
  2. Fittings: ASTM D 3034, SDR 26, PVC socket-type fittings.
- B. PVC Corrugated Sewer Piping:
  1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
  2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
  3. Gaskets: ASTM F 477, elastomeric seals.
- C. PVC Profile Sewer Piping:
  1. Pipe: ASTM F 794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
  2. Fittings: ASTM D 3034, PVC with bell ends.
  3. Gaskets: ASTM F 477, elastomeric seals.
- D. PVC Type PSM Sewer Piping:
  1. Pipe: ASTM D 3034, SDR 26, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
  2. Fittings: ASTM D 3034, PVC with bell ends.
  3. Gaskets: ASTM F 477, elastomeric seals.
- E. PVC Gravity Sewer Piping:

1. Pipe and Fittings: ASTM F 679, T-1 wall thickness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.

F. PVC Pressure Piping:

1. Pipe: AWWA C900, Class 200 PVC pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: AWWA C900, Class 200 PVC pipe with bell ends
3. Gaskets: ASTM F 477, elastomeric seals.

G. PVC Water-Service Piping:

1. Pipe: ASTM D 1785, Schedule 40 PVC, with plain ends for solvent-cemented joints.
2. Fittings: ASTM D 2466, Schedule 40 PVC, socket type.

## 2.7 NONPRESSURE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443 rubber.
2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
3. For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
4. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
5. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Description: Elastomeric sleeve with a stainless steel sheer ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

## 2.8 PRESSURE PIPE COUPLINGS

- A. Description: AWWA C219, tubular-sleeve coupling, with center sleeve, gaskets, end rings, and bolt fasteners.
- B. Metal, bolted, sleeve-type, reducing or transition coupling, for joining underground pressure piping. Include 150-psig minimum pressure rating and ends sized to fit adjoining pipes.
- C. Center-Sleeve Material: Manufacturer's standard.
- D. Gasket Material: Natural or synthetic rubber.
- E. Metal Component Finish: Corrosion-resistant coating or material.

## 2.9 EXPANSION JOINTS AND DEFLECTION FITTINGS

- A. Ductile-Iron Flexible Expansion Joints:

1. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated. All fittings shall be wrapped with an 8 mil polyethylene sealed sleeve.

- B. Ductile-Iron Expansion Joints:

1. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated. All fittings shall be wrapped with an 8 mil polyethylene sealed sleeve.

- C. Ductile-Iron Deflection Fittings:

1. Description: Compound-coupling fitting, with ball joint, flexing section, gaskets, and restrained-joint ends, complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for up to 15 degrees of deflection. All fittings shall be wrapped with an 8 mil polyethylene sealed sleeve.

## 2.10 BACKWATER VALVES

### A. Cast-Iron Backwater Valves:

1. Description: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.
2. Horizontal type; with swing check valve and hub-and-spigot ends.
3. Combination horizontal and manual gate-valve type; with swing check valve, integral gate valve, and hub-and-spigot ends.
4. Terminal type; with bronze seat, swing check valve, and hub inlet.

### B. Plastic Backwater Valves:

1. Description: Horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

## 2.11 CLEANOUTS

### A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Medium Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

### B. Plastic Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

## 2.12 DRAINS

### A. Cast-Iron Area Drains:

1. Description: ASME A112.6.3 gray-iron round body with anchor flange and round, secured grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
2. Top-Loading Classification(s): Medium Duty.

**2.13 ENCASEMENT FOR PIPING**

- A. Standard: ASTM A 674 or AWWA C105.
- B. Material: Linear low-density polyethylene film of 0.008-inch minimum thickness.
- C. Form: tube.
- D. Color: Black.

**2.14 MANHOLES****A. Standard Precast Concrete Manholes:**

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Concentric-cone and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
10. Grade Rings: Reinforced-concrete rings, 6 inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

**B. Designed Precast Concrete Manholes:**

1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
3. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
4. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
5. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.



6. Grade Rings: Reinforced-concrete rings, 6-inch total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange and 26-inch diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

## 2.15 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
  - a. Invert Slope: 0.1 feet through manhole.
2. Benches: Concrete, sloped to drain into channel.
  - a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

## 2.16 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478 precast, reinforced concrete, of depth indicated, with provision for sealant joints.
  2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
  3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
  4. Top Section: concentric-cone unless flat-slab-top type is indicated. Top of cone of size that matches grade rings.
  5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
  6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
  7. Grade Rings: Include two or three reinforced-concrete rings, of 6 inch total thickness, that match 24-inch diameter frame and grate.
  8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Designed Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for joint sealants.
1. Joint Sealants: ASTM C 990, bitumen or butyl rubber.
  2. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
  3. Grade Rings: Include two or three reinforced-concrete rings, of 6-inch total thickness, that match 24-inch diameter frame and grate.
  4. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.
1. Size: As indicated on the plans.
  2. Grate Free Area: Approximately 50 percent unless otherwise indicated.
- 2.17 STORMWATER INLETS
- A. Curb Inlets: Made with vertical curb opening.
  - B. Gutter Inlets: Made with horizontal gutter opening. Include heavy-duty frames and grates.
  - C. Combination Inlets: Made with vertical curb and horizontal gutter openings. Include heavy-duty frames and grates.
  - D. Frames and Grates: Heavy duty.

**PART 3 - EXECUTION****3.1 EARTHWORK**

- A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

**3.2 PIPING INSTALLATION**

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process or microtunneling.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow.
  - 2. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
  - 3. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
  - 4. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
  - 5. Install corrugated steel piping according to ASTM A 798/A 798M.
  - 6. Install corrugated aluminum piping according to ASTM B 788/B 788M.
  - 7. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
  - 8. Install PE corrugated sewer piping according to ASTM D 2321.
  - 9. Install PVC cellular-core piping according to ASTM D 2321 and ASTM F 1668.
  - 10. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
  - 11. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
  - 12. Install PVC water-service piping according to ASTM D 2321 and ASTM F 1668.
  - 13. Install fiberglass sewer piping according to ASTM D 3839 and ASTM F 1668.

14. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
  15. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
- G. Install force-main pressure piping according to the following:
1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
  2. Install piping with 36-inch minimum cover.
  3. Install ductile-iron pressure piping according to AWWA C600 or AWWA M41.
  4. Install ductile-iron special fittings according to AWWA C600.
  5. Install PVC pressure piping according to AWWA M23, or ASTM D 2774 and ASTM F 1668.
  6. Install PVC water-service piping according to ASTM D 2774 and ASTM F 1668.
- H. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
1. Hub-and-spigot, cast-iron soil pipe and fittings.
  2. Hubless cast-iron soil pipe and fittings.
  3. Ductile-iron pipe and fittings.
  4. Expansion joints and deflection fittings.

### 3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
  2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
  3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
  4. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
  5. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
  6. Join corrugated steel sewer piping according to ASTM A 798/A 798M.
  7. Join corrugated aluminum sewer piping according to ASTM B 788/B 788M.
  8. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
  9. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
  10. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
  11. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.
  12. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.

13. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
14. Join fiberglass sewer piping according to ASTM D 3839 for elastomeric-seal joints.
15. Join nonreinforced-concrete sewer piping according to ASTM C 14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
16. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
17. Join dissimilar pipe materials with nonpressure-type flexible couplings.

B. Join force-main pressure piping according to the following:

1. Join ductile-iron pressure piping according to AWWA C600 or AWWA M41 for push-on joints.
2. Join ductile-iron special fittings according to AWWA C600 or AWWA M41 for push-on joints.
3. Join PVC pressure piping according to AWWA M23 for gasketed joints.
4. Join PVC water-service piping according to ASTM D 2855 for solvent-cemented joints.
5. Join dissimilar pipe materials with pressure-type couplings.

### 3.4 BACKWATER VALVE INSTALLATION

- A. Install horizontal-type backwater valves in piping where indicated.
- B. Install combination horizontal and manual gate-valve type in piping and in manholes where indicated.
- C. Install terminal-type backwater valves on end of piping and in manholes where indicated.

### 3.5 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
  1. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
  2. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
  3. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1-inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

### 3.6 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
- B.
  - 1. Use Medium-Duty, top-loading classification drains in paved foot traffic areas.
  - 2. Use Heavy-Duty, top-loading classification drains in vehicle-traffic service areas.
  - 3. Use Extra-Heavy-Duty, top-loading classification drains in roads.
- C. Embed drains in 4-inch minimum concrete around bottom and sides.
- D. Fasten grates to drains if indicated.
- E. Set drain frames and covers with tops flush with pavement surface.
- F. Assemble trench sections with flanged joints.
- G. Embed trench sections in 4-inch minimum concrete around bottom and sides.

### 3.7 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 1-inch above finished surface in landscaped areas unless otherwise indicated.

### 3.8 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

### 3.9 STORMWATER INLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

- E. Construct energy dissipaters at outlets, as indicated.

### 3.10 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

### 3.11 IDENTIFICATION

- A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

### 3.12 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24-inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:
  - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
  - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
  - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
  - d. Infiltration: Water leakage into piping.
  - e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

- a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
  - b. Option: Test plastic piping according to ASTM F 1417.
  - c. Option: Test concrete piping according to ASTM C 924.
6. Force-Main Storm Drainage Piping: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig.
- a. Ductile-Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.
  - b. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

### 3.13 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 334100