
PROJECT MANUAL

for the

Construction of

BRAZOS TOWN CENTER II – TRACT 21

Hwy. 59 at Brazos Town Center
Rosenberg, Texas

NewQuest Properties - Owner

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DIVISION 1
INTRODUCTION



DOCUMENT 00015 - TABLE OF CONTENTS**DIVISION 1 - INTRODUCTION**

00010	Consultant Sheet
00220	Geotechnical Report

DIVISION 2 - SITEWORK

02200	Earthwork
02221	Trenching, Backfilling and Compacting
02282	Termite Control
02515	Portland Cement Concrete Paving
02620	Concrete Sidewalks, Curbs and Gutters
02713	Water Distribution System
02721	Storm Sewerage System

DIVISION 3 - CONCRETE

03200	Concrete Reinforcement
03300	Cast-in-Place Concrete
03470	Precast Structural Concrete

DIVISION 4 - MASONRY

04300	Unit Masonry System
04320	Stone Veneer

DIVISION 5 - METAL

05120	Structural Steel
05210	Steel Joists and Joist Girders
05311	Steel Deck
05400	Cold-Formed Metal Framing
05500	Metal Fabrications

DIVISION 6 - WOOD AND PLASTICS

06100	Rough Carpentry
-------	-----------------

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07160	Dampproofing above Grade
07161	Fluid Applied Waterproofing
07183	Exterior Finish System
07200	Insulation
07210	Building Insulation
07241	Exterior Insulation and Finish System
07270	Firestopping and Fire Safing
07527	SBS Modified Bituminous Sheet Roofing

DIVISION 7 - THERMAL AND MOISTURE PROTECTION (cont.)

07620	Roof Related Sheet Metal
07721	Roof Accessories
07900	Building Sealants

DIVISION 8 - DOORS AND WINDOWS

08110	Steel Doors and Frames
08305	Access Doors
08410	Aluminum Entrances and Storefronts
08710	Finish Hardware
08800	Glazing

DIVISION 9 - FINISHES

09250	Gypsum Board Systems
09900	Painting
09965	Thorolastic

DIVISION 10 - SPECIALTIES

10522	Fire Extinguishers, Cabinets and Accessories
10530	Canopies
10990	Miscellaneous Specialties

DIVISION 11 - EQUIPMENT

Not Required

DIVISION 12 - FURNISHINGS

Not Required

DIVISION 13 - SPECIAL CONSTRUCTION

Not Required

DIVISION 14 - CONVEYING SYSTEMS

Not Required

DIVISION 15 - MECHANICAL

15010	General Provisions
15050	Basic Mechanical Materials and Methods
15250	Mechanical Insulation
15300	Fire Sprinkler System
15400	Plumbing

DIVISION 16 - ELECTRICAL

16010	General Provisions
16050	Basic Materials and Methods
16400	Service and Distribution
16500	Lighting

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SECTION 00220 – GEOTECHNICAL REPORT

1.01 GENERAL

- A. The sub-surface soil investigation and geotechnical report following this page is furnished by the Owner from an independent testing laboratory.
- B. The data included in the report may be used by the Contractor for general information only. The Architect and the Owner are not responsible for the accuracy of the data given therein.

GEOTECHNICAL ENGINEERING REPORT

**BRAZOS TOWN CENTER – PHASE II
U.S. 59 AT READING ROAD
ROSENBERG, TEXAS**

**PROJECT NO. 92065672
November 9, 2006**

Prepared for:

**NEWQUEST PROPERTIES
HOUSTON, TEXAS**

Prepared by:

Terracon
Houston, Texas

November 10, 2006

Terracon
Consulting Engineers & Scientists

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Re: Geotechnical Engineering Report
Brazos Town Center – Phase II
U.S. 59 at Reading Road
Rosenberg, Texas
Terracon Project No. 92065672

Dear Mr. Swoboda:

Enclosed is our Geotechnical Engineering Report for Phase II of the Brazos Town Center II mixed-use development in Rosenberg, Texas. We trust that this report is responsive to your project needs. Please contact us if you have any questions or if we can be of further assistance.

We appreciate the opportunity to work with you on this project and look forward to providing additional geotechnical engineering and construction materials testing services in the future.

Sincerely,

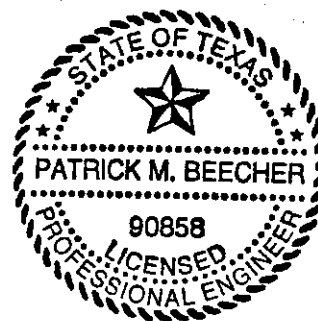
Terracon



Patrick M. Beecher, P.E.
Senior Project Manager



Todd E. Swoboda, P. E.
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Copies Submitted:
NewQuest Properties (4 Bound Copies & 1 Electronic Copy)

TABLE OF CONTENTS

INTRODUCTION.....	1
PROJECT DESCRIPTION	1
SITE EXPLORATION PROCEDURES	2
Field Exploration	2
Laboratory Testing.....	3
Sample Disposal	4
SUBSURFACE CONDITIONS	4
Area Geology	4
Soil Conditions	4
Groundwater Conditions.....	5
ENGINEERING RECOMMENDATIONS	6
Geotechnical Considerations	6
Foundation System.....	6
Drilled-and-Underreamed Footings	6
Grade Beams/Tilt-Wall Panels	8
Foundation Construction.....	8
<u>Foundation Construction Monitoring.....</u>	<u>9</u>
Floor Slab.....	10
Pavement Design	11
<u>General Pavement Areas</u>	<u>12</u>
<u>Proposed Internal Roadways</u>	<u>15</u>
Earthwork.....	16
<u>Wet Weather/Soft Subgrade Conditions</u>	<u>17</u>
Drainage	18
Geotechnical Considerations for Proposed Lift Station and Utilities.....	19
<u>Allowable Bearing Pressures for the Proposed Lift Station</u>	<u>19</u>
<u>Groundwater Control</u>	<u>19</u>
<u>Excavations</u>	<u>21</u>
<u>Uplift Pressures</u>	<u>22</u>
<u>Lateral Earth Pressures.....</u>	<u>23</u>
<u>Utility Bedding.....</u>	<u>23</u>
<u>Utility Backfill</u>	<u>24</u>
Detention Pond.....	24
<u>End of Construction</u>	<u>25</u>
<u>Long Term</u>	<u>26</u>
<u>Slope Protection and Erosion Control</u>	<u>26</u>
<u>Potential Use of Excavated Soils.....</u>	<u>26</u>
ADDITIONAL BORINGS	27
GENERAL COMMENTS.....	27

APPENDIX

Plan of Borings.....	A-1
Logs of Borings for Terracon Project No. 92065672.....	A-2 through A-23
Logs of Borings for Terracon Project No. 92065582.....	A-24 through A-34
Key to Symbol Sheet	A-35

GEOTECHNICAL ENGINEERING REPORT

**BRAZOS TOWN CENTER II – PHASE II
U.S. 59 AT READING ROAD
ROSENBERG, TEXAS**

**PROJECT NO. 92065672
November 10, 2006**

INTRODUCTION

This Geotechnical Engineering Report presents the results of our geotechnical study for Phase II of the Brazos Town Center II mixed-use development in Rosenberg, Texas. This project was authorized by Ms. Eleanor Haynes of NewQuest Properties through signature of our "Agreement for Services" on October 11, 2006. The project scope was performed in general accordance with Terracon Proposal No. P92-1667G-06, dated October 10, 2006.

The purpose of this report is to describe the subsurface conditions observed at the twenty-two borings drilled for this study, analyze and evaluate the test data, and provide recommendations with respect to:

- Site and subgrade preparation;
- Groundwater control and excavation guidelines;
- Utility construction considerations;
- Soil bearing capacity at the proposed lift station;
- Uplift and lateral earth pressures;
- Detention pond design guidelines;
- Foundation design and construction; and
- Pavement design guidelines.

PROJECT DESCRIPTION

The project involves the proposed construction of four retail buildings as part of Phase II of the Brazos Town Center II mixed-use development in Rosenberg, Texas. The footprints of the proposed retail buildings vary in size from approximately 20,000 to 83,500 square feet. Adjacent surface pavement areas are also planned at the site.

Phase II is also planned to include the construction of internal roadways, a detention pond, and a sanitary sewer lift station. The total length of the internal roadways is planned to be about 5,500 linear feet. We understand that utilities planned along the internal roadway vary from approximately 5 to 12 feet below grade. The detention pond is planned to cover approximately 12.7 acres to the south of the proposed retail buildings and have a maximum depth of about 16 feet. Three sides of the proposed detention pond are planned to be sloped at inclinations of 3.5 (Horizontal):1(Vertical) with one side sloped at 5(H):1(V). We understand that the lift station is planned to extend to a depth of approximately 20 feet.

Terracon previously performed a geotechnical study (Terracon Project No. 92065582, dated September 22, 2006) for various improvements within the Brazos Town Center II development for NewQuest Properties. As stated in our proposal, we have utilized available field and laboratory data obtained from this previous study to aid in the development of geotechnical engineering recommendations for this project.

Based on visual observations, the site appears to be relatively level. Much of the site had been cleared of vegetation which consisted of tall grass and weeds with scattered trees and bushes. Piles of vegetation and debris were observed in portions of the site. A drainage channel crosses the site in an east to west direction. The area surrounding this drainage channel is characterized by significant tree cover and underbrush.

SITE EXPLORATION PROCEDURES

Field Exploration

Subsurface conditions were evaluated by drilling ten test borings (A-1 through A-5, A-11, A-15, A-22, A-25, and A-26) to depths varying from about 15 to 20 feet along the proposed internal roadways, one test boring (A-9) to approximately 5 feet in the proposed surface pavement areas, seven test borings (A-12 through A-14 and A-17 through A-20) to about 20 feet in the proposed building areas, one test boring (A-16) to approximately 30 feet in the proposed lift station area, and three test borings (A-21, A-23, and A-24) to depths ranging from about 20 to 25 feet in the proposed detention pond area. In addition, due to their proximity to the proposed improvements associated with this project, the test borings performed as part of Terracon Project No. 92065582 (borings B-1 through B11) were utilized as part of this study.

Borings A-6 through A-8 and A-10 were inaccessible at the time of our field program due to significant piles of vegetation and debris that were created as a result of the clearing operations that occurred on this site. Once the site has been sufficiently cleared of vegetation and debris in the area of these borings, Terracon should be contacted to drill these borings to evaluate the subsurface conditions in this area of the site.

The borings were drilled with all-terrain vehicle (ATV) mounted continuous flight auger drilling equipment at the approximate locations shown on the Plan of Borings, Page A-1 of the Appendix. In addition, borings previously performed for Terracon Project No. 92065582 are also shown on the Plan of Borings for reference purposes. The borings were located by measuring from existing/adjacent features and property boundaries and estimating right angles without the use of surveying equipment. Boring depths were measured from the existing ground surface at the time of our field activities.

The Logs of Borings, presenting the subsurface soil descriptions, type of sampling used, and additional field data that were performed as part of Terracon Project No. 92065672 are shown on Pages A-2 through A-23 of the Appendix. The Logs of Borings that were performed as part of Terracon Project No. 92065582 are presented on Pages A-24 through A-34 of the Appendix. The Symbol Key Sheet, which defines the terms and descriptive symbols used on the logs, is presented on Page A-35.

Cohesive soil samples were generally recovered using thin-walled, open-tube samplers (Shelby tubes). Pocket penetrometer tests were performed on samples of cohesive soils in the field to serve as a general measure of consistency.

Granular soils and soils for which good quality thin-walled tube samples could not be recovered were sampled by means of the Standard Penetration Test (SPT). This test consists of measuring the number of blows (N) required for a 140 pound hammer free falling 30 inches to drive a standard split-spoon sampler 12 inches into the subsurface material after being seated six inches. This blow count or SPT "N" value is used to evaluate the engineering properties of the stratum.

Samples were removed from samplers in the field, visually classified, and appropriately sealed in sample containers to preserve their in-situ moisture contents.

Laboratory Testing

Samples obtained during the field program were visually classified in the laboratory by a geotechnical engineer or a senior technician. A testing program was conducted on selected samples, as directed by the geotechnical engineer, to aid in classification and evaluation of engineering properties required for analyses. Results of the laboratory tests are presented on the Logs of Borings, located in the Appendix, and/or are discussed in the following section.

Sample Disposal

All samples were returned to our laboratory in Houston, Texas. Samples not tested in the laboratory will be stored for a period of 60 days subsequent to submittal of this report and will be discarded after this period, unless we are notified otherwise.

SUBSURFACE CONDITIONS

Area Geology

The site for the proposed construction is located on the Beaumont formation, a deltaic nonmarine Pleistocene deposit. The Beaumont formation is heterogeneous containing thick interbedded layers of clay, fine sand and silt.

The clay fraction is primarily composed of montmorillonite, illite, kaolinite, and finely ground quartz. The clay present in the formation has been preconsolidated by a process of desiccation. Numerous wetting and drying cycles have produced a network of small randomly oriented, closely-spaced joints within some depth zones. These small joints frequently have a shiny appearance and the clays are called slickensided in these cases. The joint pattern may have an influence on the construction and engineering behavior of the soil.

The coastal plain in this region has a complex tectonic geology, several major features of which are: Gulf Coastal geosyncline, salt domes, major sea level fluctuations during the glacial stages, subsidence and faulting activities. Most of these faulting activities have ceased for millions of years, but some are still active. A fault investigation and study of the site geology are beyond the scope of this study.

Soil Conditions

The particular subsurface stratigraphy, as determined from our field and laboratory programs, is shown in detail on the Logs of Borings in the Appendix. A review of the boring logs indicates the general subsurface stratigraphy consists of near surface strata varying from low to moderately high plasticity sandy/silty clay soils and highly to very highly plastic clay soils that are occasionally underlain by silty sand, sandy silt, and clayey silt zones. A stratum of silty sand was observed at the ground surface at boring A-13 and exhibited a thickness of about 2 feet.

The on-site clay soils generally exhibited a high to very high plasticity, as indicated by liquid limits of 49 to 73 percent and plasticity indices of 32 to 52 percent, typically above 35 percent. In-situ moisture contents varied from 4 percent dry to 11 percent wet of the corresponding plastic limits. Measured undrained shear strengths from unconfined compressive strength tests varied from about 700 to 5,900 psf, generally above 1,500 psf.

The natural sandy/silty clay soils generally exhibited a low to moderately high plasticity, as indicated by liquid limits of 25 to 49 percent and plasticity indices of 8 to 32 percent. In-situ moisture contents ranged from 9 percent dry to 8 percent wet of the corresponding plastic limits. Measured percentages of fines (percent passing the No. 200 sieve) ranged from 52 to 96 percent. Measured undrained shear strengths from unconfined compressive strength tests varied from approximately 600 to 6,600 pounds per square foot (psf), generally greater than 1,500 psf. SPT "N" values measured for these soils ranged from 9 to 25 blows per foot.

Zones of silty sand/sandy silt were encountered underlying the clayey soils at borings A-11, A-14 through A-16, A-24, B-1, B-3, and B-5 at depths ranging from about 10 to 33 feet below existing grade. Measured percentages of fines varied from 8 to 69 percent. These soils are generally considered to be loose to medium dense, as indicated by measured SPT "N" values ranging from 4 to 26 blows per foot.

Strata of clayey silt were observed at borings A-16, A-17, and A-24 at depths varying from approximately 18 to 26 feet. A percentage of fines was measured to be 98 percent. Measured SPT "N" values ranged from 13 to 17 blows per foot. A plasticity index of one percent was measured for these soils, which is indicative of a soil with a very low plasticity.

Groundwater Conditions

The borings were dry augered to depths up to approximately 30 feet below existing grade in an attempt to observe groundwater conditions. Groundwater was observed at borings A-16, A-24, and B-1 through B-5 at depths ranging from about 20 to 25 feet during dry augering. Groundwater was not observed in the remaining borings during dry augering. Once groundwater was observed at borings A-16 and A-24, drilling was suspended for a period of about 15 minutes to allow the groundwater to rise and be recorded. In addition, many of the boreholes were left open upon completion of drilling to obtain groundwater levels after a period of about 24 hours after drilling. After 24 hours, groundwater was observed in borings A-16, A-24, and B-1 through B-5 at depths varying from approximately 19.5 to 25 feet. Detailed groundwater observations are presented on the Logs of Borings, Pages A-2 through A-34 of the Appendix.

These groundwater measurements are approximate and are considered short-term, since the borings are open for a short time period. On a long-term basis, groundwater will fluctuate seasonally with climatic changes and may be present at shallower depths. Additionally, groundwater conditions at the site should be evaluated just prior to construction. The groundwater levels may be checked by the use of test pits to the planned depths of utility trenches and/or other excavations planned at this site just prior to construction. Long term water levels can also be evaluated by installing and monitoring piezometers.

ENGINEERING RECOMMENDATIONS

The following recommendations are based upon the data obtained in our field and laboratory programs, project information provided to us, and on our experience with similar subsurface and site conditions.

Geotechnical Considerations

Expansive soils were observed on this site. This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and cracking in the structures should be anticipated. The severity of cracking and other damage such as uneven floor slabs will probably increase if any modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and distress may not be feasible, but it may be possible to further reduce the risk of movement associated with the expansive soils if the building is designed as a suspended structural slab with a void space with structural loads supported by drilled-and-underreamed footings. We would be pleased to discuss other construction alternatives with you upon request. Terracon can provide recommendations for a structural floor slab system or discuss other construction alternatives with you, if requested.

Foundation System

A foundation system of drilled-and-underreamed footings extending below the zone of seasonal moisture variation is generally preferred in the Houston area for soil conditions such as those observed at this site. Based on the subsurface conditions observed during our investigation, it is our opinion that this type of foundation system would be appropriate to support the proposed buildings, provided the subgrade is prepared as discussed in the following sections. For the smaller, lightly-loaded buildings, slab-on-grade foundation systems may also be considered. Recommendations for these types of foundation systems are provided in the following paragraphs, along with other geotechnical considerations for this project.

Drilled-and-Underreamed Footings

Drilled-and-underreamed footings should be supported in the natural clayey soils at a depth of 9 feet below existing grade (grade at the time of our field activities). The footings associated with the proposed buildings should be sized for a net dead plus sustained live load bearing pressure of 4,000 psf or a net total load bearing pressure of 6,000 psf, whichever conditions yields a larger bearing area. It is our opinion that the footings may be constructed with an underream to shaft ratio of 3:1.

The footings should contain sufficient vertical reinforcing steel throughout the entire shaft length to resist uplift (tensile) forces due to post-construction heave of the clayey soils. The magnitude of uplift is difficult to predict and will vary with in-situ moisture contents. For purposes of establishing sufficient reinforcing to resist uplift, the uplift pressures can be approximated by using a uniform uplift pressure of 1,500 psf over the entire perimeter of the shaft above the top of the bell.

The amount of reinforcing steel required can be computed by assuming that the dead load of the structure surcharges the pier, that the above estimated tensile force acts vertically on the shaft, and that the underream acts as a rigid anchor. However, in no case should the percentage of steel be less than 0.5 percent (based on 40 ksi steel).

In addition to having an adequate bearing area to support the compressive loads, the diameter of the underream should be large enough to overcome uplift forces on the pier without causing a local soil failure to the overlying soils. The ratio of underream (bell) diameter to shaft diameter should be a minimum of 2:1 to withstand uplift forces due to soil expansion.

A minimum clearance of one bell diameter of the larger footing should be provided between the underreams to develop the recommended bearing pressures and to control settlements. If a clearance of one diameter cannot be maintained in every case, the above bearing capacities should be reduced by 20 percent for a clearance between one-half and one bell diameters. Underreams closer than a clearance of one-half of a bell diameter are not recommended.

Post construction settlements of the drilled-and-underreamed footings should be one inch or less, assuming proper construction practices are followed. Differential settlements will result from variances in subsurface conditions, loading conditions and construction procedures, such as cleanliness of the bearing area or flowing water in the shaft. In general, differential settlements should be on the order of one-half of the total settlements.

Lateral resistance of drilled-and-underreamed footings is primarily developed by passive resistance of the soil against the side of the footing. Due to the potential for shrinkage cracks in the upper subgrade soils, the lateral resistance of the upper 3 feet of soils at the surface for exterior footings should be neglected. For the conditions observed, we recommend that a passive pressure of 1,500 psf be utilized for footings placed against an undisturbed vertical face of the in-situ soils.

The ultimate uplift capacity of drilled-and-underreamed footings consists of the dead weight of the foundation (Q1), the weight of any soil directly above the footing (Q2), and the adhesion or skin friction on a cylindrical surface equal in diameter to the footing diameter (Q3). The equivalent surface in Q3 may be taken as the surface extending vertically above the underream circumference. The value of skin friction may be considered to be 400 psf. It is recommended that the upper 3 feet of skin friction be neglected for exterior footing due to surface effects and the potential for shrinkage cracks within the clayey soils unless area paving is provided up to the

edge of the proposed building. We recommend using total unit weights of 120 pcf for soil and 150 pcf for reinforced concrete. The ultimate uplift capacity should be reduced by an appropriate factor of safety to compute allowable uplift capacity.

Grade Beams/Tilt-Wall Panels

Grade beams/tilt-wall panels associated with drilled-and-underreamed footings should be designed to span between the footings without subgrade support. Often, a vertical void of about 6 to 8 inches is provided beneath the grade beams in active clayey soils such as those observed at this site. However, recent findings indicate that the voids beneath the grade beams often fill with water, providing moisture to the surrounding subgrade. Therefore, provided that the subgrade is prepared as outlined in the “**Floor Slabs**” and “**Earthwork**” sections, it is our opinion that the grade beams/tilt-wall panels may be constructed without a void at this site. However, due to the underlying clayey soils, nominal upward movement of the grade beams may occur during moisture variations of the subgrade.

If construction of voids beneath the grade beams is planned, proper construction of the voids and soil retainers is very important. If the cardboard carton system is used on this project, we recommend that the carton form supplier provide, during initial concrete operations, a representative to instruct the work force on the proper installation methods for both the forms and the concrete. In addition, measures should be implemented to provide proper surface drainage away from the structures to reduce the potential for water to access the voids.

For tilt-wall panels, it is our experience that the dead load on the tilt-wall panels resulting from the wall and roof loads is generally large enough to significantly reduce the expansion of the subsurface soil. It is also our experience that during placement of the panels and subsequent backfill around the panels that a void occurs below the panels. This is due to the panels being placed on piers which normally are slightly above the subgrade. Based on the above discussion, it is our opinion that voids will not be required under the panels.

Backfill adjacent to the exterior of the grade beams or tilt-wall panels should consist of select fill material used in the floor slab. The select fill should be uniformly compacted to at least 95 percent of the Standard Effort (ASTM D 698) maximum dry density at a moisture content within 2 percent of optimum moisture.

Foundation Construction

Drilled excavations to a depth of at least 9 feet below existing grade will be necessary for installation of drilled-and-underreamed footings for the proposed structures at this site. The excavations should be performed with equipment capable of providing a relatively clean bearing area. Secondary structures (calcareous and ferrous nodules, sand seams, slickensides, etc.)

within the clayey soils may cause some sloughing during footing excavation. Thus, the drilling contractor should have casing available in the event that sloughing causes improperly formed shafts.

During drilling of the borings, groundwater was not observed at or above the proposed bearing depth of 9 feet (refer to the “**Groundwater Conditions**” section). Thus, we do not anticipate that a significant quantity of groundwater would be observed during the footing construction. However, depending on climatic conditions, groundwater levels will vary from the level observed during our study. If water seepage into the drilled footing excavation occurs, the contractor should remove the water prior to placement of concrete. Footing excavations should be backfilled with concrete as soon as practical. Footing excavations should be backfilled with concrete within about 2 to 4 hours of drilling; and in no case should an excavation be left open overnight. The concrete placed in the excavations should have a 6-inch slump with a plus or minus one inch tolerance. The bottom of each shaft excavation should be free of all loose materials and/or water, and the bearing surface should be evaluated immediately prior to placing concrete. Water must not be allowed to stand in the bottom of the excavation.

Also, the subgrade soils tend to become very sandy below a depth of about 10 to 12 feet below existing grade, such as observed at borings A-13 and A-14, and, if underreams were attempted below this depth, they would likely become unstable. Thus, we recommend the footing depths not be lowered below the recommended bearing depth of 9 feet below existing grade without discussion and consideration of the consequences. The contractor should not auger the shaft more than the recommended bearing depth under any circumstances without contacting us.

It is our opinion that drilled-and-underreamed footings may be constructed as previously discussed in this report, however, if underreams are marginally stable, particularly in the areas of borings A-13 and A-14, it may be possible to successfully complete underreamed footings by performing the sequence of construction without interruption, that is, each footing drilled, underreamed, and concreted in one continuous operation. The contractor must coordinate the operation very closely to have concrete on site at the time each footing is drilled and underreamed so that no shaft or underream is drilled without concrete standing by, ready to place. As previously discussed, due to the potential for inclusions and sand seams/zones within the clayey soils, we recommend the bell to shaft ratio be limited to 2:1. Straight shaft footings may also be considered in isolated problem areas. Terracon should be contacted for additional recommendations if straight-shaft footings are planned at this site.

Foundation Construction Monitoring

The performance of the foundation system for the proposed buildings will be highly dependent upon the quality of construction. Thus, we recommend that fill pad compaction and foundation installation be monitored full time by an experienced Terracon soil technician under the direction

of our geotechnical engineer. During foundation installation, the base of foundations should be monitored to evaluate the condition of the subgrade. We would be pleased to develop a plan for compaction and foundation installation monitoring to be incorporated in the overall quality control program.

Floor Slab

Planned finished grades at the site were not available at the time of this report. We anticipate that the finished floor elevations for the proposed buildings are planned to be within approximately one to 2 feet of existing grade. If significant cuts and/or fills are planned, Terracon should be notified to review and/or modify our recommendations given in this subsection.

The clayey soils encountered at this site generally exhibited a moderate to very high potential for volumetric change due to moisture variations. These moderately high to very highly plastic clayey soils can subject the lightly loaded interior floor slabs to significant movements (due to shrinking and swelling) with fluctuations in their moisture content. The movement potential is influenced primarily by the properties of the subgrade soils, as well as the moisture content of the subgrade at the time of construction, overburden pressures, and the stability of the moisture contents after construction. Based on method TEX-124-E in the Texas Department of Transportation (TxDOT) Manual of Testing Procedures and our experience with similar soils, we estimate that the subgrade soils exhibit a Potential Vertical Rise (PVR) on the order of two and one-half inches. Therefore, we highly recommend that the near-surface soils be prepared as stated below to reduce the potential for slab movement associated with volumetric changes of the near-surface clayey soils due to moisture variations to a more acceptable level. The actual movements could be greater if poor drainage, ponded water, and/or other unusual sources of moisture are allowed to infiltrate the soils beneath the structure after construction.

The most common method of subgrade preparation to reduce potential expansion of the subgrade would be to provide a pad of properly placed and compacted select fill beneath the slab. The corresponding decrease in the potential soil movements is primarily a function of the fill pad thickness and the moisture levels of the underlying clay subgrade. While the indicated preparations do not eliminate the potential for soil movement, the magnitude of such movements should be reduced to more acceptable levels. The level of subgrade preparation should be based on the performance desired by the owner, taking into consideration the effects which foundation movements could have upon the structure. Typically, a design PVR on the order of one inch or less is desired for retail structures such as those planned at this site. To reduce the estimated PVR of the subgrade to approximately one inch or less in the area of the proposed buildings, we recommend that a minimum 48-inch thick pad of properly placed and compacted select fill material be constructed immediately beneath the at-grade floor slab.

Select fill should be utilized for all grade adjustments within the proposed building areas. The building pads should extend horizontally a minimum distance of 5 feet beyond the edge of the proposed building footprints. Furthermore, we recommend that the surrounding exterior grades be sloped to provide positive drainage away from the buildings. Please refer to the **“Drainage”** section in this report for further discussion on providing proper drainage on the site.

The subgrade and building pad fill beneath the floor slabs should be prepared as outlined in the **“Earthwork”** section of this report, which contains material and placement requirements for select fill, as well as other subgrade preparation recommendations.

For any flatwork outside of the structures which will be sensitive to movement, subgrade preparation as discussed previously should be considered. This will be particularly important on surrounding sidewalks and paving immediately adjacent to the structures. If these adjacent flatwork areas are not prepared as stated above for the building areas, the estimated PVR for these areas could approach those indicated previously for in-situ conditions. If the soils swell in these areas, this could result in significant distress to the adjacent sidewalks and paving and possibly result in reversed drainage (flow of runoff toward the building) around the perimeter of the buildings.

Pavement Design

We anticipate that the pavement subgrade will generally consist of the on-site soils, ranging from low plasticity silty sand to variable plasticity clayey soils. The pavement subgrade areas should be prepared as discussed in the **“Earthwork”** section. Once the pavement subgrade has been properly prepared, we recommend that the top 6 inches of the finished subgrade soils directly beneath the pavement be chemically treated. Chemical treatment will increase the supporting value of the subgrade and decrease the effect of moisture on subgrade soils. This 6 inches of treatment is a required part of the pavement design and is not a part of site and subgrade preparation for wet/soft subgrade conditions.

The on-site clayey soils exhibiting a Plasticity Index generally greater than 15 percent should react well with about 5 to 6 percent lime. The percentage is given as application by dry weight and is typically equivalent to about 25 to 30 pounds of lime per square yard per 6-inch depth. The subgrade should be treated in accordance with TxDOT Standard Specification Item 260 for lime treated subgrade.

The on-site silty sands and clayey soils exhibiting a Plasticity Index generally less than 15 percent should react well with a mixture of lime-flyash applied as 3 percent lime and 7 percent flyash. The percentages are given as application by dry weight and are typically equivalent to about 15 pounds lime and 35 pounds flyash per square yard per 6-inch depth. The subgrade should be treated with lime-flyash in accordance with TxDOT 2004 Standard Specifications Item 265.

General Pavement Areas

Once the subgrade is properly prepared both flexible pavement systems (consisting of asphalt and base material) and reinforced concrete pavement systems may be considered for this project. Detailed traffic loads and frequencies were not available. However, it is anticipated that traffic will consist primarily of passenger vehicles in the parking areas and passenger vehicles combined with garbage trucks and occasional large multi-axle delivery trucks in driveways. Tabulated in the following table are the assumed traffic frequencies and loads used to design pavement sections for this project.

PAVEMENT AREA	TRAFFIC DESIGN INDEX	DESCRIPTION
Automobile Parking Areas	DI-1	Light traffic (Few vehicles heavier than passenger cars, no regular use by heavily loaded two axle trucks or larger vehicles). (EAL* < 6)
Driveways (Light Duty)	DI-2	Medium to light traffic (Similar to DI-1 including not over 50 loaded two axle trucks or lightly loaded larger vehicles per day. No regular use by heavily loaded trucks with three or more axles). (EAL = 6-20)
Driveways (Heavy Duty) and Truck Traffic Areas	DI-3	Medium traffic (Including not over 300 heavily loaded two axle trucks plus lightly loaded trucks or buses with three or more axles and no more than 30 heavily loaded trucks with more than three axles per day). (EAL = 21-75)

* Equivalent daily 18-kip single-axle load applications.

Listed below are pavement component thicknesses, which may be used as a guide for pavement systems at the site for the traffic classifications stated herein. It should be noted that these systems were derived based on general characterization of the subgrade. No specific testing (such as CBR tests, resilient modulus tests, etc.) was performed for this project to evaluate the support characteristics of the subgrade.

FLEXIBLE PAVEMENT SYSTEM		
COMPONENT	Material Thickness (Inches)	
	DI-1	DI-2
Asphaltic Concrete	2.0	2.5
Base Material	8.0	10.0
Treated Subgrade	6.0	6.0

RIGID PAVEMENT SYSTEM			
COMPONENT	Material Thickness (Inches)		
	DI-1	DI-2	DI-3
Reinforced Concrete	5.0	6.0	7.0
Treated Subgrade	6.0	6.0	6.0

Dedicated delivery truck lanes should be classified as DI-3 pavements. Additionally, we recommend that waste dumpster areas be constructed of at least 7-inches of reinforced concrete pavement. The concrete pad areas should be designed so that the vehicle wheels of the collection truck are supported on the concrete while the dumpster is being lifted to support the large wheel loading imposed during waste collection.

Presented below are our recommended material requirements for the various pavement sections. The materials and properties of reinforced concrete pavement shall meet applicable requirements in the ACI Manual of Concrete Practice.

Reinforced Concrete Pavement - The Portland cement concrete mix should have a minimum 28-day compressive strength of 3,500 psi.

Reinforcing Steel - Reinforcing steel should consist of #3 bars spaced at 12 inches or #4 bars spaced at 18 inches on centers in both directions. Reinforcing steel for DI-1 pavements may consist of #3 bars spaced at 18 inches.

Control Joint Spacing - ACI recommendations indicate that control joints should be spaced at about 30 times the thickness of the pavement. Furthermore, ACI recommends a maximum control joint spacing of 12.5 feet for 5-inch pavements and a maximum control joint spacing of 15 feet for 6-inch or thicker pavements. Sawcut control joints should be cut within 6 to 12 hours of concrete placement to help control the formation of plastic shrinkage cracks as the concrete cures. The depth of the joint should be at least one-quarter of the slab depth when using a

conventional saw or one inch when using early entry saws. The width of the cut should be in accordance with the joint sealant manufacturer recommendations.

Expansion Joint Spacing - ACI recommendations indicate that regularly spaced expansion joints may be deleted from concrete pavements. Therefore, the installation of expansion joints is optional and should be evaluated by the design team.

Construction Joints – When concrete is planned to be placed at different times, we recommend the use of a construction joint between paving areas. The construction joint should consist of a butt joint (not keyway joint).

Dowels at Expansion Joints - If expansion joints are provided, dowels at expansion joints should be constructed in accordance with ACI.

Hot Mix Asphaltic Concrete Surface Course - The asphaltic concrete surface course should be plant mixed, hot laid Type D (Fine Graded Surface Course) meeting the specifications requirements in TxDOT Standard Specification Item 340. Specific criteria for the job specifications should include compaction to within an air void range of 3 to 8 percent calculated using the maximum theoretical gravity mix measured by TxDOT TEX-227-F. The asphalt cement content by percent of total mixture weight should fall within a tolerance of ± 0.5 percent asphalt cement from the job mix design.

Base Material - Base material should be composed of crushed limestone or crushed concrete meeting the requirements of TxDOT Standard Specification Item 247, Type A or D, Grade 1. The base material should be compacted to a minimum of 95 percent of the maximum dry density as determined by the Modified Effort (ASTM D 1557) within 2 percent of optimum.

Treated Subgrade - The on-site clayey subgrade that exhibits a Plasticity Index generally greater than 15 percent should be treated with lime in accordance with the TxDOT 2004 Standard Specifications Item 260. The pulverization, mixing and curing of the lime treated subgrade is of particular importance in these clayey soils. The lime used should be conform to TxDOT 2004 Standard Specifications Item 260. On-site silty sands and clayey soils with a Plasticity Index less than 15 percent should be treated with lime-flyash in accordance with TxDOT 2004 Standard Specifications Item 265. The appropriate amount of lime and flyash should be determined for subgrade soils by conducting laboratory tests just prior to construction. Based on the classification test results, we recommend that about 5 to 6 percent lime for subgrade areas consisting of clayey soils with a Plasticity Index greater than 15 percent, and approximately 3 percent lime and 7 percent flyash in areas of silty sands and clayey soils with a Plasticity Index less than 15 percent be used for estimating and planning. The subgrade should be compacted to a minimum of 95 percent of the Standard Effort (ASTM D 698) maximum dry density at a moisture content within 2

percent of optimum moisture content. The subgrade is not suitable for heavy construction traffic prior to paving.

The pavement design methods described above are intended to provide structural sections with adequate thickness over a particular subgrade such that wheel loads are reduced to a level the subgrade can support. The support characteristics of the subgrade for pavement design do not account for shrink/swell movements of expansive clayey subgrade such as the soils observed at this site. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade. Post-construction subgrade movements and some cracking of pavements are not uncommon for clayey subgrade conditions such as those observed at this site. It is therefore important to minimize moisture changes in the subgrade to reduce shrink/swell movements. Although chemical treatment will help to reduce such movements/cracking, it cannot be economically eliminated.

Related civil design factors such as subgrade drainage, shoulder support, cross-sectional configurations, surface elevations and environmental factors which will significantly affect the service life must be included in the preparation of the construction drawings and specifications. Normal periodic maintenance will be required.

Proposed Internal Roadways

At the time of this investigation precise traffic loadings were not available. The pavement thicknesses should meet the Fort Bend County, City of Houston, or other appropriate standards for the street width being planned. Typical pavement thicknesses generally used in the Houston vicinity for streets other than major thoroughfare streets but where truck and frequent automobile traffic is anticipated are as follows:

- 7.0" Reinforced Concrete
- 6.0" Treated Subgrade

For pavement less than 30 ft face to face of curb and subject primarily to residential light truck and automobile traffic, the pavement thickness should be a minimum of the following:

- 6.0" Reinforced Concrete
- 6.0" Treated Subgrade

The steel reinforcement and expansion joint spacings should meet the Fort Bend County, City of Houston, or other appropriate paving design requirements. If either of these proposed roadways are planned to be classified as a major thoroughfare, Terracon should be contacted and provided appropriate traffic design information to determine the required pavement thickness

necessary to support the design traffic loads. We anticipate that reinforced concrete thicknesses for major thoroughfare roads will be more than 8 inches.

The methods used to determine the required pavement thickness are based upon only the physical and engineering properties of the materials, a chemically treated subgrade strength based upon our experience in the area and conventional thickness determination procedures. The reinforced concrete and treated subgrade for these pavements should meet the recommended specifications as stated above in the "General Pavement Areas" section of this report.

Related civil design factors such as subgrade drainage, shoulder support, cross-sectional configurations, surface elevations and environmental factors which will significantly affect the service life must be included in the preparation of the construction drawings and specifications. Normal periodic maintenance will be required.

Earthwork

Construction areas should be stripped of all vegetation, organics, loose/soft topsoil, debris, and other unsuitable surface materials. In addition, the piles of vegetation and debris observed in the area of borings A-6 through A-8 and A-10 should be removed from the site. Roots of trees to be removed within the construction areas should be grubbed to full depths. Special care should be exercised to remove all organics, sediment, and soft/wet soils when performing site stripping operations in the area of the drainage channel observed on-site. Once initial site stripping and excavation is completed and final subgrade elevations are achieved, the exposed subgrade should be proofrolled with a 20-ton roller or equivalent equipment (such as a loaded dump truck) to detect weak zones in the subgrade. Special care should be also exercised when proofrolling areas that have been stripped of heavy vegetation to detect potential weak zones within the subgrade. Weak areas detected during proofrolling, as well as zones containing organics and/or debris, should be removed and replaced with soils exhibiting similar classification, moisture content, and density as the adjacent in-situ soils. Proper site drainage should be maintained during construction so that ponding of surface runoff does not occur and cause construction delays and/or inhibit site access.

Subsequent to proofrolling, and just prior to placement of fill, the exposed subgrade soils should be evaluated for moisture and density. The subgrade should be within 2 percent of the optimum moisture content, and have an in-place dry density of at least 95 percent of the Standard Effort (ASTM D 698) maximum dry density of the in-situ soils. If the moisture or density does not meet the above criteria, the subgrade should be scarified to a minimum depth of 8 inches, moisture adjusted to within 2 percent of the optimum moisture content and compacted to at least 95 percent of the Standard Effort (ASTM D 698) maximum dry density.

Grade adjustments within the building area should be accomplished with select fill composed of clean, sandy clay (not a silt) with a plasticity index ranging between 10 and 20 percent. The select fill should be placed on prepared surfaces in lifts not to exceed 8 inches loose measure, with compacted thickness not to exceed 6 inches. The select fill should be compacted to at least 95 percent of the Standard Effort (ASTM D 698) maximum dry density within 2 percent of the optimum moisture content. For building areas receiving more than 5 feet of fill (such as in the area of the existing drainage channel), compaction to at least 100 percent of the Standard Effort (ASTM D 698) maximum dry density should be performed for select fill or on-site lime treated clayey soils placed below the 5-foot depth.

If blended or mixed soils are intended for use to construct the building pads, Terracon should be contacted to provide additional recommendations accordingly. Blended or mixed soils do not occur naturally. These soils are a blend of sand and clay and require mechanical mixing. If these soils are not mixed thoroughly to break down the clay clods and blend-in the sand to produce a uniform soil matrix, the fill material may be detrimental to slab performance. If blended soils are used, we recommend that additional samples of the blended soils, as well as clay clods, be obtained prior to and during earthwork operations to determine if the blended soils can be used in lieu of select fill.

In pavement areas, on-site soils may be considered for grade adjustments provided they are free of organics and debris. The on-site soils should be moisture adjusted to within 2 percent of the optimum moisture content and compacted to at least 95 percent of the Standard Effort (ASTM D 698) maximum dry density. For pavement areas receiving more than 5 feet of fill (such as in the area of the existing drainage channel), compaction to at least 100 percent of the Standard Effort (ASTM D 698) maximum dry density should be performed for select fill or on-site clayey soils placed below the 5-foot depth.

Prior to any filling operations, samples of the proposed borrow materials should be obtained for laboratory moisture-density testing. The tests will provide a basis for evaluation of fill compaction by in-place density testing. A qualified soil technician should perform sufficient in-place density tests during the filling operations to verify that proper levels of compaction are being attained.

Wet Weather/Soft Subgrade Considerations

Construction following wet weather periods may encounter difficulties due to the wet or soft surface soils becoming a general hindrance to equipment due to rutting and pumping of the soil surface. If the subgrade cannot be adequately compacted to minimum densities as described previously, one of the following measures will be required: 1) removal and replacement with select fill, 2) chemical treatment of the soil to dry and improve the stability of the subgrade, or 3) drying by natural means if the schedule allows. In our experience with similar soils in this area, it is our opinion that chemical treatment is the most efficient and effective method to increase the

supporting value of wet and weak subgrade. Terracon should be contacted for additional recommendations if chemical treatment of the subgrade is planned due to wet weather and/or soft subgrade conditions.

Drainage

All grades must provide effective drainage away from the building during and after construction. Water permitted to pond next to the building can result in greater soil movements than those discussed in this report. These greater movements can result in unacceptable differential floor slab movements, cracked slabs and walls, and roof leaks. Estimated movements described in this report are based on effective drainage for the life of the structure and cannot be relied upon if effective drainage is not maintained.

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

Flatwork will be subject to post construction movement. Maximum grades practical should be used for flatwork to prevent water from ponding. Allowances in final grades should also consider post-construction movement of flatwork, particularly if such movement would be critical. Where flatwork abuts the structure, effectively seal and maintain joints to prevent surface water infiltration.

Planters located within 10 feet of the structures should be self-contained to prevent water accessing the building and pavement subgrade soils. Locate sprinkler mains and spray heads a minimum of 5 feet away from the building line. Low-volume, drip style landscaped irrigation should not be used near the building. Collect roof runoff in drains or gutters. Discharge roof drains and downspouts onto pavements which slope away from the building or extend down spouts a minimum of 10 feet away from structures.

Utility trenches are a common source of water infiltration and migration. All utility trenches that penetrate beneath the building should be effectively sealed to restrict water intrusion and flow through the trenches that could migrate below the building. We recommend constructing an effective clay "trench plug" that extends at least 5 feet out from the face of the building exterior. The plug material should consist of clay compacted at a water content at or above the soils optimum water content. The clay fill should be placed to completely surround the utility line and be compacted in accordance with recommendations in this report.

Long-term pavement performance will be dependent upon several factors, including maintaining

subgrade moisture levels and providing for preventative maintenance. The following recommendations should be considered to help promote long-term pavement performance:

- Site grading at a minimum 2 percent grade away from the pavements;
- The subgrade and the pavement surface should have a minimum ¼-inch per foot slope to promote proper surface drainage,
- Consider appropriate edge drainage and pavement under-drain systems,
- Install pavement drainage surrounding areas anticipated for frequent wetting (e.g. garden centers, wash racks, etc.),
- Install joint sealant and seal cracks immediately,
- Seal all landscaped areas in, or adjacent to pavements to minimize or prevent moisture migration to subgrade soils,
- Placing compacted, low permeability clayey backfill against the exterior side of curb and gutter, and
- Placing curb, gutter, and/or sidewalk directly on subgrade soils without the use of base course materials.

Preventative maintenance should be planned and provided for the pavements at this site. Preventative maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Preventative maintenance consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventative maintenance.

Geotechnical Considerations for Proposed Lift Station and Utilities

Allowable Bearing Pressures for the Proposed Lift Station

For a slab-type foundation, the net allowable bearing pressure for the proposed lift station at a depth of about 20 feet below the existing ground surface may be taken as 2,000 psf. This allowable bearing pressure assumes the base of the excavation is relatively dry and undisturbed.

Groundwater Control

Open excavations for underground utilities along the proposed internal roadways (planned to be about 5 to 12 feet below grade) and at the location of the proposed lift station (planned depth of approximately 20 feet) at this site may encounter groundwater seepage to varying degrees depending upon the groundwater conditions at the time of construction and the location and depth of the facilities.

As noted on the boring logs and presented in the “**Groundwater Conditions**” section of this report, groundwater was not observed during or upon completion of drilling at the borings (A-1 through A-5, A-11, A-15, A-22, A-25, and A-26) located along the proposed internal roadways. Groundwater was observed at the boring (A-16) at the proposed lift station location at a depth of about 23 feet during dry augering and at a depth of approximately 22 feet about 24 hours after completion of drilling.

Based on the soil and groundwater information obtained during our field activities, we anticipate that the excavation to install the proposed lift station may extend to a depth of about 20 feet without advance dewatering. We anticipate that there may be seepage from the very silty zones and sandy silt soils observed below a depth of about 15 feet; however, these soils are fine grained and advance dewatering with well points may not be effective. It is our opinion that the seepage that may occur is expected to be minor and can be managed by pumping water collected within sumps positioned in the bottom of the excavation. Care should be taken to slope the excavation towards the sumps such that water can be collected and removed from the excavation.

We anticipate that the excavations to install the proposed underground utilities may extend to a depth of about 12 feet without advance dewatering. Seepage that may occur at these depths is expected to be minor which may be managed by pumping water collected within sumps positioned in the bottom of the trench. Excavations through silty sand soils which were observed below a depth of about 11 feet may require advance dewatering. Groundwater is typically controlled by the installation of vacuum wellpoints. However, vacuum wellpoints are generally less effective below a depth of about 15 feet beneath the top of the wellpoint. Deeper dewatering requires eductors or deep wells with submersible pumps or multiple-stage wellpointing.

The suggested methods given above serve as a guideline for groundwater control; other appropriate means may be required for groundwater control during construction. Control of groundwater should be accomplished in a manner that will preserve the strength of the soils, will not cause instability of the excavation, and will not result in damage to existing structures. Where necessary to this purpose, the water should be lowered in advance of excavation by wellpoints, deep wells, eductors, or similar methods. Open pumping should not be permitted if it results in boils, loss of fines, softening of the subgrade, or excavation instability. Wellpoints, deep wells and eductors should be installed with suitable screen and filter so that pumping of fines does not occur.

The well system should be in operation for at least several days prior to excavating to the design depth. It is recommended that the groundwater head be lowered at least 3 feet below the bottom of the excavation to provide a working area with increased stability. It is also important that the dewatering continue until the construction has been completed and that the dewatering system

be turned off in stages to allow groundwater to recover to its original level gradually, over a period of about 3 to 5 days.

Dewatering of loose or medium dense sands/silts might cause subsidence or compression of adjacent soils and adjacent structures, in spite of safeguards and methodology selected and used. For this reason, the dewatering operations must be performed and provided with great care to ensure caution and control of the potential subsidence resulting from the dewatering operations.

To further evaluate the groundwater at the time of construction, piezometers can be set just prior to construction. As an alternative, test pits may be excavated to the planned trench depth. Based on the results, the contractor should determine positive methods of groundwater management prior to starting excavation operations.

Excavations

For this project, either excavated side slopes or vertical cut excavations are feasible. However, we anticipate that the proposed lift station will be installed using the "caisson" method whereby the structure is sunk by excavating from the interior. The excavation should be performed in a manner to reduce the amount of over excavation to the least amount possible to avoid loss of ground and subsequent surface settlement around the underground structure.

For vertical sided excavations greater than 5 feet in depth, the excavations will require the use of a trench box or shoring and bracing to prevent sloughing and caving of the soil into the excavation. The contractor should use a trench box or shoring and bracing as necessary to maintain a safe and clean excavation which meets with OSHA requirements.

Bracing for vertical excavation walls should be designed to resist a uniform lateral earth pressure of at least $36H$ in psf, where H is the depth of the excavation in feet. Additional lateral pressure, due to surcharge loads along the trench, should be considered by adding a lateral pressure of 50 percent of the surcharge pressure.

In lieu of shoring, bracing, or trench boxes for excavations greater than 5 feet, OSHA standards provide recommendations for the design of temporary sloped excavations with a depth less than 20 feet. The OSHA standards provide maximum allowable slopes contingent on three designated soil types: Type A, Type B, or Type C. According to OSHA standards, temporary sloped excavations should be no steeper than 0.75-horizontal on 1-vertical (0.75H:1V) for Type A soils, 1H:1V for Type B soils, and 1.5H:1V for Type C soils. The surface slopes should be protected from deterioration and weathering if they are left open for significant periods of time.

Excavations must be performed and inspected under the supervision of a contractor designated Competent Person. The Competent Person, as defined by the OSHA (Occupational Safety and Health Administration) Standard, 29 CFR Part 1926.650 to .652, Subpart P - Excavations), must evaluate the excavations at the time of construction activity to safeguard workers.

Excavations should be performed with equipment capable of providing a relatively clean bearing area. Excavating equipment should not disturb the soil beneath the design excavation bottom and should not leave large amounts of loose soil in the excavation.

The bearing surface should be protected against disturbance and deterioration by completing the utility installation and backfilling operations as quickly as possible. If the base of the lift station cannot be poured the same day as the completion of the excavation, a thin seal slab should be placed to protect the surface from disturbance. The excavation bottom should be properly sloped to allow any water infiltrating into the excavation to be collected at a convenient location along the edge of the excavation. Water should not be allowed to stand on the bearing area.

Uplift Pressures

Uplift forces are caused by a difference in water level in the soil adjacent to the structure and inside the structure. If the backfill around the lift station is a sand or silt material, it is probable that the backfill will approach saturation during periods of heavy rainfall and the effective static water level will be at the surface. The uplift pressures will be resisted by adhesion or skin friction of the soil to the wall and by the dead weight of the structure. The value of skin friction for an engineered clay fill compacted to a minimum of 95 percent of the maximum dry density as determined by the Standard Effort (ASTM D 698) may be considered to be about 400 psf. It is recommended that the upper 3 feet of skin friction be neglected for a clay backfill due to potential soil shrinkage away from the structure. Sand backfill, compacted to 70 percent of the maximum relative density (ASTM D 4253 and 4254), may be considered to have a value for skin friction of zero at the surface varying linearly to 225 psf at a depth of 20 feet below grade.

An alternate design method would be to place a heel extending out from the foundation slab/mat into the backfill and rely on the weight of the soil above the heel on a 2-vertical to 1-horizontal slope to resist the uplift forces. The unit weight of soil above and below the water table for a properly compacted backfill will be 120 and 60 pcf, respectively. The preparation of the upper three feet of soil above the heel is critical to reduce the possibility of an upward bearing failure. The entire thickness of fill should be compacted to the above recommended values.

If underground structures are installed by excavating from the inside and allowing the structures to sink under its own weight, the soil contact may be very low immediately after construction due to the annulus created during construction. In this case, the uplift pressure must be resisted by

structural dead weight or by restoring the contact between the soil and the structure. If the annulus is open, grouting would be one means to restore skin frictional resistance. If grouted, a nominal skin friction of about 150 psf may be used to compute uplift resistance.

Lateral Earth Pressures

Soil around embedded structures will impose active to at-rest earth pressures against the embedded walls. Design lateral earth pressures may be computed using an equivalent fluid weight of 120 pcf for on-site soils. This pressure includes hydrostatic pressures but do not include surcharge forces imposed by construction or vehicular loading. The lateral pressure produced by surcharge may be computed as 50 percent of the vertical surcharge pressure applied as a constant pressure over the full depth of the buried structure.

If backfill is used around the upper portion of the lift stations, the fill will impose active to at-rest earth pressures against the embedded walls. Design lateral earth pressures imposed by compacted fill may be computed using an equivalent fluid weighing 85 pounds per cubic foot for clean sand backfill and 100 pcf for clayey soils. These pressures include hydrostatic pressures but do not include surcharge forces imposed by construction or vehicular loading. The lateral pressure produced by surcharge may be computed as 50 percent of the vertical surcharge pressure applied as a constant pressure over the full depth of the buried structure. If sand backfill is used, a 2-foot compacted clay seal should be placed at the top of sand backfill to reduce the amount of infiltration of surface water.

Utility Bedding

The subgrade and bedding for all storm, sewer and water lines should conform to the Fort Bend County, City of Houston, or other appropriate standards on pipeline bedding details. The soil encountered in the borings (A-1 through A-5, A-11, A-15, A-22, A-25, and A-26) drilled along the proposed internal roadways generally consists of clayey soils to depths of about 15 to 20 feet below existing grade with occasional zones of silty sands below approximately 11 to 12 feet. Groundwater was not observed in these borings during drilling operations.

Standard bedding details for pipes placed in strong clays (Satisfactory Soil Conditions) are outlined on City of Houston Department of Public Works and Engineering Standard Construction Specifications for Waste Water Collection Systems, Water Lines, Storm Drainage and Street Paving which includes City of Houston Drawing Nos. 02317-03, 02317-04 and 02317-09 for storm sewers and Drawing No. 02317-8 for sanitary sewers.

Where wet sand conditions are encountered, bedding details for Unsatisfactory Soil Conditions should be used as shown on City of Houston Drawing Nos. 02317-01 and 02317-02 for sanitary sewers and 02317-06 for storm sewers. Since the subgrade conditions and the groundwater level

at the time of construction may vary, the decision may be made in the field based on actual conditions at the time of construction and the response of the soil and water to open trenching and to dewatering.

The excavations should be monitored to detect any variation in soil condition from that found in our borings. Any changes noted in the soil stratigraphy should be brought to the attention of Terracon so that the conditions may be assessed and changes to the required bedding details made, as necessary.

Utility Backfill

The type of fill placed above the utility line bedding will depend on whether the surface above the line is paved or natural ground. If the surface is outside of the pavement areas then the backfill may consist of the excavated, native soils. The native soils used as backfill should be placed in thin lifts not exceeding 8-inches loose measure, moisture conditioned to above optimum moisture content, and compacted to at least 90 percent of the Standard Effort (ASTM D698) maximum dry density. Within pavement areas or within 3 horizontal feet of pavement, the backfill should consist of cement stabilized sand to the bottom of the pavement section and compacted to at least 95 percent of the maximum dry density as determined by the Standard Effort (ASTM D 698).

Prior to any filling operations, samples of the proposed borrow materials should be obtained for laboratory moisture-density testing. The tests will provide a basis for evaluation or fill compaction by in-place density testing. A qualified soil technician should perform sufficient in-place density tests during the filling operations to verify that proper levels of compaction are being attained.

Detention Pond

We understand that a 12.7-acre detention pond is planned to the southeast of the proposed retail buildings in the area of borings A-16 and A-21 through A-25. We also understand that this pond is planned to be approximately 16 feet deep and no permanent water level is planned to be maintained within this pond. Three sides of the proposed detention pond are planned to be sloped at inclinations of 3.5 (Horizontal):1 (Vertical) with one side sloped at 5(H):1(V). Based on the subgrade conditions observed in borings A-16 and A-21 through A-25, a majority of the sideslopes for the pond will likely consist of stiff to hard clayey soils. However, very silty clays and silty sands/sandy silts will likely be encountered below depths of about 15 feet and increase the potential for slope instability in these areas.

Slope stability analyses were performed for the steepest anticipated slope configuration of 3.5H:1V using the slope stability software SB-SLOPE. This software follows the limiting equilibrium circular failure surface method as developed by A.W. Bishop called the "Simplified Bishop Method of Slices." Slope stability analyses were performed for the End of Construction

and Long Term conditions for the proposed detention pond. The soil parameters utilized in this analysis are presented below.

Depth, Feet	Description	Unit Weight, pcf	ST		LT	
			c psf	ϕ deg	c psf	ϕ deg
0 – 15	Stiff to hard silty clay to clay	125	1,000	0	200	18
15 – 25	Loose to medium dense sandy silt to silty sand	120	0	27	0	27

Where,

c = cohesion

ϕ = friction angle

Contribution of shear strength within the top 3 feet was ignored due to the potential for tension cracks to form. A surcharge load (construction or maintenance equipment) at the top of the bank, if any, was assumed to be 250 psf.

The factors of safety represent the calculated resisting forces and moments divided by the calculated driving forces and moments of the various potential failure surfaces analyzed. These forces and moments are based on the estimated unit weights and shear strengths of the various soils in the slope profile. Accordingly, a factor of safety of 1.0 indicates impending failure. As the factor of safety is increased above 1.0, the risk of slope failure is reduced. As a practical matter, and in consideration of the variable and unknowns involved, the risk cannot be reduced to zero. The goal is to reduce the risk of slope failure to a reasonable and acceptable level, with due consideration of the consequences of failure. A factor of safety of 1.3 or greater is generally considered to be acceptable.

The results of the analyses together with computed factors of safety for the above two cases are discussed in greater detail in the following sections.

End of Construction

The end of construction conditions models the initial undrained condition of the soils, which is considered to occur immediately after construction is completed. For this analysis, unconsolidated undrained soil parameters were used as detailed in the table presented above. Based on our groundwater level readings obtained during our field program, the groundwater level immediately after construction is completed is anticipated to be below the bottom of the pond. A satisfactory factor of safety (FS) of approximately 2.7 was obtained for a 3.5H:1V slope configuration for end of construction stability analysis.

Long Term

The long-term case represents steady state piezometric and stress conditions. When a slope is excavated, altered stress conditions create pore pressure changes within the slope and the drained strength of the soils is mobilized. With time, the soil pore pressures adjust to the imposed stress and piezometric conditions, and the soils rely on their available strength for long term stability. Long-term soil parameters were therefore used for this analysis. Groundwater levels were considered to be below the bottom of the pond for long-term stability analysis. A satisfactory factor of safety (FS) of approximately 2.5 was obtained for a 3.5H:1V slope configuration for long-term stability analysis.

Based on the above analyses, it is our opinion that a maximum sideslope inclination of 3.5H:1V may be utilized for the proposed detention pond associated with this project.

Slope Protection and Erosion Control

Based on the soil conditions observed in the area of the proposed detention pond, the slopes of the pond will generally be formed in clayey subgrade. The bottom 2 feet of the pond are anticipated to be in very silty clays, silty sands, and/or sandy silts. These exposed subgrade soils may experience erosion-related problems and local sloughing with time. In order to protect the slope from erosion and to minimize groundwater influx during flooding, we highly recommend that a good grass cover or other means (i.e. geosynthetics) be established as soon as practical and maintained over the life of the slope. A back slope swale and drains should be constructed to prevent runoff from flowing over and down the slope. Regular maintenance of the detention pond sideslopes and vegetation will be necessary.

Potential Use of Excavated Soils

The soils encountered in the area of the proposed detention pond include variable plasticity clayey soils. The plasticity index of the clayey soils at borings A-16 and A-21 through A-25 ranged from 8 to 43 percent. Fill soils used in the building area should consist of a clean, sandy clay and have a plasticity index between 10 and 20 percent. The clayey soils may be used for general grading at the site provided they are free of organics and debris. These on-site clayey soils should not be utilized for fill for the building pad unless they are chemically treated with lime to help reduce their plasticity to make them acceptable for use as a select fill. If lime treatment of the on-site clayey soils for use in the building fill pads is desired, Terracon should be contacted for additional recommendations.

ADDITIONAL BORINGS

As previously discussed, borings A-6 through A-8 and A-10 were inaccessible at the time of our field program. Once the site has been sufficiently cleared of vegetation and debris in the area of these borings, Terracon should be contacted to drill these borings to evaluate the subsurface conditions in this area of the site and provide revised recommendations, if necessary.

GENERAL COMMENTS

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

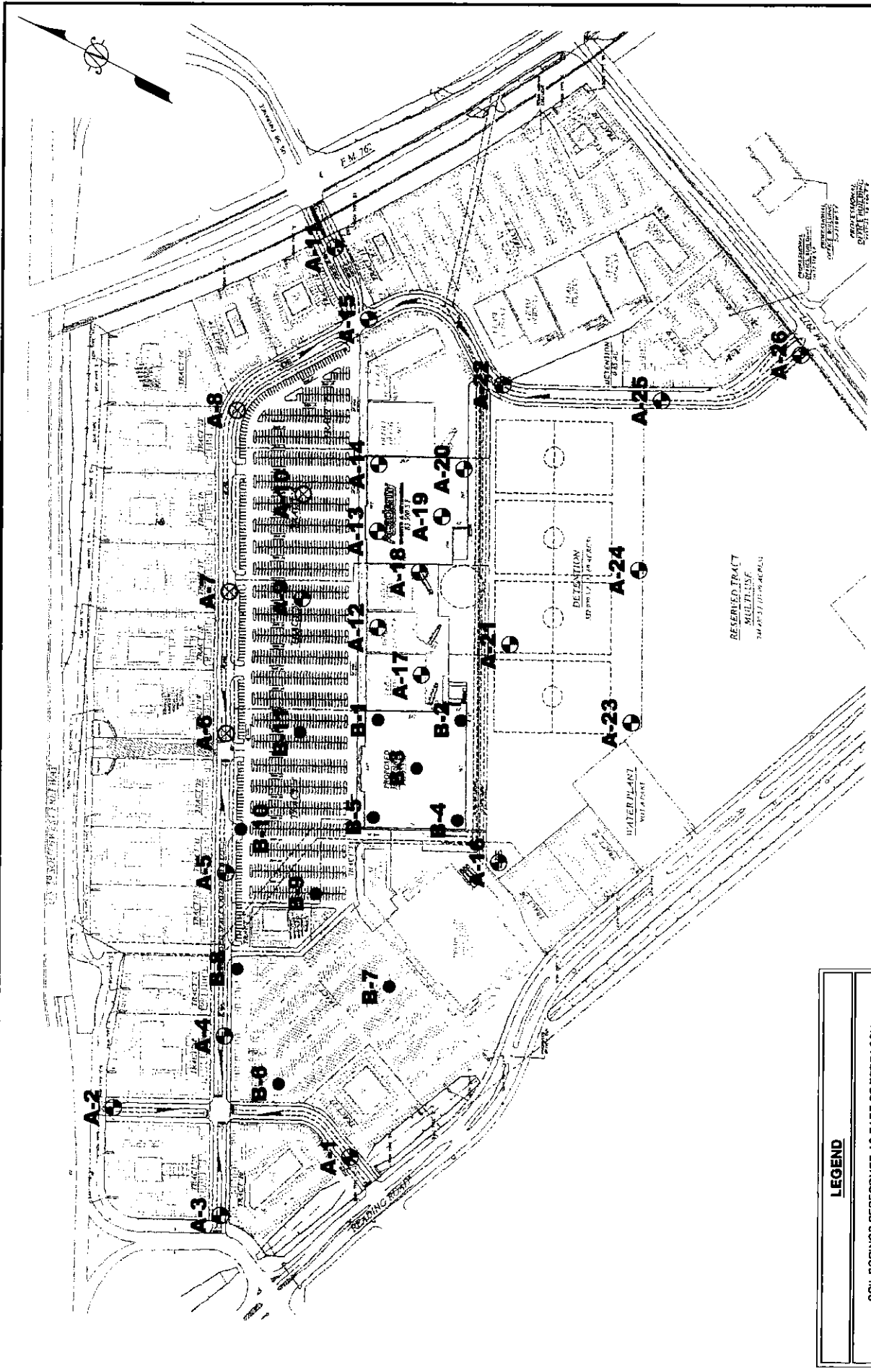
The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the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

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

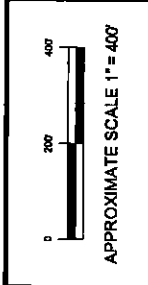
For any excavation construction activities at this site, all Occupational Safety and Health Administration (OSHA) guidelines and directives should be followed by the Contractor during construction to insure a safe working environment. In regards to worker safety, OSHA Safety and Health Standards require the protection of workers from excavation instability in trench situations.

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

APPENDIX



LEGEND	
●	SOIL BORINGS PERFORMED AS PART OF TERRACON PROJECT No. 92065-582
⊙	SOIL BORINGS PERFORMED AS PART OF TERRACON PROJECT No. 92065-872
⊗	INACCESSIBLE SOIL BORING LOCATIONS



Terracon
Consulting Engineers & Scientists
TERRACON NO. 92065-872

PLAN OF BORINGS
BRAZOS TOWN CENTER II - PHASE II
U.S. 59 AT READING ROAD
ROSENBERG, TEXAS

LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-1
 PROJECT NO. 92065672
 DATE 10-18-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 15 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)
						LL	PL	PI				
			P=2.0									GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling. After 24 hours: dry
			P=4.0	19		55	17	38				
			P=4.0									
			P=4.5	10	119							
10			P=4.5	12	116				5.4	2	0	
			P=4.5									
			P=4.5	22	107				2.2	1	0	DESCRIPTION OF STRATUM Stiff to hard dark gray to gray CLAY -with ferrous stains below 2 feet -tan and light gray with calcareous nodules 4 to 6 feet -reddish brown with slickensides below 6 feet
20												
30												
40												
50												Boring Terminated at 15 feet

N - STANDARD PENETRATION TEST RESISTANCE
 T - TXDOT CONE PENETRATION RESISTANCE
 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-2
 PROJECT NO. 92065672
 DATE 10-18-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA								DRILLING METHOD(S): Dry Augered 0 to 15 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ. FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU. FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ. FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ. IN)	GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling. After 24 hours: dry
						LL	PL	PI					
													DESCRIPTION OF STRATUM
			P=1.0	22		34	16	18					Firm gray Silty CLAY
			P=2.0										Stiff to hard tan and gray CLAY
			P=4.5	14	116				5.9	2	0		-tan and light gray 4 to 6 feet
			P=4.5										-reddish brown and light gray below 6 feet
10			P=4.5	15	109				5.7	2	0		-with slickensides and calcareous nodules below 10 feet
			P=4.5										
			P=4.5										Boring Terminated at 15 feet
20													
30													
40													
50													

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REMARKS:



HBC1 92065672 GPJ 11/10/06

LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-3
 PROJECT NO. 92065672
 DATE 10-18-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 15 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ.FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ.IN)
						LL	PL	PI				
			P=1.5	22								
			P=4.5									
			P=4.5	14		49	16	33				
			P=4.5	13	121							
10			P=4.5									
			P=4.5						85			
			P=4.5									
			P=4.5									
			P=4.5									
20												
30												
40												
50												

GROUNDWATER INFORMATION:
 No groundwater observed during or upon completion of drilling.
 After 24 hours: dry

DESCRIPTION OF STRATUM

Stiff to hard dark gray to gray CLAY
 -with ferrous stains below 2 feet
 -tan and light gray, slightly silty, with calcareous nodules below 4 feet

Hard reddish brown Sandy CLAY
 -very silty below 10 feet

Hard reddish brown and light gray CLAY with slickensides and calcareous nodules
 Boring Terminated at 15 feet

HBC1 92065672.GPJ 11/10/06

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REMARKS:



LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-4
PROJECT NO. 92065672
DATE 10-18-06
SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 15 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)
						LL	PL	PI				
			P=2.0									
			P=4.5	21		71	21	50				
			P=4.5	15	116				5.7	3	0	
			P=4.5									
			P=4.5									
			P=4.5	14	108				4.6	4	0	
			P=4.5									
DESCRIPTION OF STRATUM												
Stiff to hard gray CLAY												
-tan and gray 2 to 4 feet												
-tan and light gray with ferrous stains 4 to 6 feet												
-reddish brown and light gray with calcareous nodules below 6 feet												
Hard reddish brown Silty CLAY												
Boring Terminated at 15 feet												

HBC1 92065672.GPJ 11/10/06

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 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-5
 PROJECT NO. 92065672
 DATE 10-18-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 15 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ FT R: PERCENT ROD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)
						LL	PL	PI				
			P=1.0	34		73	23	50				
			P=4.5									
			P=4.5									
10			P=4.5	11	115	36	17	19		5.6	3	0
			P=4.5									
			P=4.25									
			P=3.5	33	94					3.0	7	0
20												
30												
40												
50												

GROUNDWATER INFORMATION:
 No groundwater observed during or upon completion of drilling.
 After 24 hours: dry

DESCRIPTION OF STRATUM

Hard gray CLAY
 -firm 0 to 2 feet
 -tan and light gray below 3 feet

Hard reddish brown and light gray Silty CLAY

Very stiff reddish brown and light gray CLAY with slickensides and calcareous nodules

Boring Terminated at 15 feet

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 T - TXDOT CONE PENETRATION RESISTANCE
 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



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LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-9
 PROJECT NO. 92065672
 DATE 10-20-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 5 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)
						LL	PL	PI				
10	/ / / / /		P=0.75 P=4.5 P=4.5	17		26	19	7				
20												
30												
40												
50												

GROUNDWATER INFORMATION:
 No groundwater observed during or upon completion of drilling.

DESCRIPTION OF STRATUM

Hard brown Sandy CLAY
 -firm, very sandy 0 to 2 feet

-tan and gray below 4 feet
 Boring Terminated at 5 feet

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REMARKS:



HBC1 92065672 GPJ 11/10/06

LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-11
 PROJECT NO. 92065672
 DATE 10-20-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 15 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling.
					LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI					
DESCRIPTION OF STRATUM												
	/	P=1.0	24		41	18	23					Firm gray and tan Silty CLAY
	/	P=4.5										Hard tan and light gray CLAY with calcareous nodules
	/	P=4.5										-reddish brown below 6 feet
	/	P=4.5										
10	/	P=4.5	11	115					3.2	3	0	Very stiff to hard reddish brown Sandy CLAY
	/	P=4.5	6									-very sandy below 10 feet
	X	N=26										Medium dense reddish brown Silty SAND
												Boring Terminated at 15 feet
20												
30												
40												
50												

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 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



HBC1_92065672.GPJ 11/10/06

LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-12
 PROJECT NO. 92065672
 DATE 10-19-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 20 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	
					LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI					
		P=1.5	20		36	14	22					Stiff dark gray Silty CLAY
		P=4.5										Hard gray CLAY
		P=4.5	8		30	13	17					Hard tan and light gray Sandy CLAY with ferrous stains
10		P=4.5	12	112					5.5	3	0	
		P=4.25										Very stiff reddish brown and light gray CLAY with slickensides
		P=4.25										Stiff to very stiff reddish brown and light gray Silty CLAY
20		N=12						95				-very silty, with sand seams below 18 feet
												Boring Terminated at 20 feet
30												
40												
50												

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 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



HBC1 92065672 GPJ 11/10/06

LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-13
 PROJECT NO. 92065672
 DATE 10-20-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA								DRILLING METHOD(S): Dry Augered 0 to 20 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling.
						LL	PL	PI					
													DESCRIPTION OF STRATUM
													Gray Silty SAND
			P=4.5	18		71	19	52					Hard reddish brown and gray CLAY
			P=4.5	16	111				5.6	2	0		-with light gray partings below 4 feet
			P=4.5	15		49	17	32					-slightly silty below 6 feet
10			P=4.5										Stiff to hard reddish brown and light gray Sandy CLAY with sand seams
			P=4.5	7	111				1.9	2	0		-very sandy below 12 feet
			P=4.25										Very stiff reddish brown and light gray CLAY
20			P=2.75										Very stiff reddish brown and light gray Silty CLAY
													Boring Terminated at 20 feet
30													
40													
50													

REMARKS:



HBC1 92065672.GPJ 11/10/06

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 RQD - ROCK QUALITY DESIGNATION

LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-14
 PROJECT NO. 92065672
 DATE 10-20-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 20 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES N: BLOWS/FT T: BLOWS/FT P: TONS/SQ FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling.
					LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI					
DESCRIPTION OF STRATUM												
10		P=0.75	28		39	21	18					Firm dark gray Silty CLAY
		P=4.5	14	126					6.2	2	0	Very stiff to hard gray Sandy CLAY -reddish brown and light gray below 4 feet -very sandy below 8 feet
		P=4.5	15		45	16	29					
		P=4.5	10	107					3.8	2	0	
		P=4.5	5									
20		N=9	4					26				Loose reddish brown Silty SAND
		N=10										
		N=7										
30												Boring Terminated at 20 feet
40												
50												

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 P - POCKET PENETROMETER RESISTANCE
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REMARKS:



LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-15
 PROJECT NO. 92065672
 DATE 10-20-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 15 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: TONS/SQ FT P: POCKET PENETROMETER RESISTANCE R: PERCENT OF ROCK CORE RECOVERY RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)
						LL	PL	PI				
			P=2.5									
			P=4.5	16		58	17	41				
			P=4.5									
			P=4.5	11	112					5.8	3	0
10			P=4.5						52			
			N=24									
20												
30												
40												
50												

GROUNDWATER INFORMATION:
 No groundwater observed during or upon completion of drilling.

DESCRIPTION OF STRATUM

Very stiff to hard dark gray to gray CLAY

-tan and light gray with calcareous nodules 4 to 6 feet
 -reddish brown and light gray below 6 feet

Hard reddish brown Sandy CLAY

Medium dense reddish brown Silty SAND

Boring Terminated at 15 feet

N - STANDARD PENETRATION TEST RESISTANCE
 T - TXDOT CONE PENETRATION RESISTANCE
 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



HBC1 92065672 GPJ 11/1/06

LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-16
 PROJECT NO. 92065672
 DATE 10-18-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 23 feet; Wet Rotary 23 to 30 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES N: BLOWS/FT T: BLOWS/FT P: TONS/SQ.FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ.IN)	GROUNDWATER INFORMATION: Groundwater observed at a depth of about 23 feet during dry augering. After a 15-minute monitoring period, the water level had risen to a depth of approximately 22 feet. 24 hours after completion of drilling, the water level remained at about 22 feet.
					LL	PL	PI					
DESCRIPTION OF STRATUM												
10	[Diagonal Hatching]	P=4.25 P=4.5	16		62	19	43					Very stiff to hard dark gray to gray CLAY -tan and gray with calcareous nodules below 4 feet
10	[Diagonal Hatching]	P=4.5 P=4.5	16		45	18	27					Very stiff to hard tan Silty CLAY -reddish brown below 8 feet
10	[Diagonal Hatching]	P=4.5	17	107					3.8	4	0	-with light gray partings below 13 feet -very silty below 15 feet
20	[Cross Hatching]	N=14	15								56	Medium dense reddish brown Sandy SILT with clayey seams
20	[Cross Hatching]	N=13	27		25	24	1	98				Stiff reddish brown Clayey SILT
30	[Diagonal Hatching]	P=2.0	23	108					0.7	9	0	Firm reddish brown CLAY -with numerous sand seams below 28 feet
40												Boring Terminated at 30 feet
50												

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 RQD - ROCK QUALITY DESIGNATION

REMARKS:



LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-17
 PROJECT NO. 92065672
 DATE 10-19-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 20 feet		
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ.FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ.IN)	GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling. After 24 hours: dry
						LL	PL	PI					
													DESCRIPTION OF STRATUM
			P=1.0										Firm gray Silty CLAY
			P=2.5	23		52	17	35					Very stiff gray CLAY
			P=4.5	14	115				5.7	3	0		Hard tan and light gray Sandy CLAY
10			P=4.5	12		31	16	15					Very stiff to hard reddish brown and light gray Silty CLAY
			P=4.5	11	102				2.0	4	0		
			P=2.75										Very stiff reddish brown CLAY
													Reddish brown Silty CLAY
20			N=17										Very stiff reddish brown Clayey SILT
													Boring Terminated at 20 feet
30													
40													
50													

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 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-18
 PROJECT NO. 92065672
 DATE 10-19-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 20 feet			
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ.FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ.IN)		
						LL	PL	PI						
			P=1.0										GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling. After 24 hours: dry	
			P=4.5	17		63	18	45						DESCRIPTION OF STRATUM
			P=4.5	13	119									Firm brown Silty CLAY
			P=4.5	13		43	15	28						Hard brown CLAY
10			P=4.5											Hard tan and light gray Sandy CLAY -with reddish brown partings and calcareous nodules below 6 feet
			P=4.5											Hard reddish brown and light gray Silty CLAY
			P=4.5											Hard reddish brown and light gray CLAY with calcareous nodules
20		⊗	N=25						96				Very stiff reddish brown very Silty CLAY	
													Boring Terminated at 20 feet	
30														
40														
50														

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 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



HBC1 92065672.GPJ 11/10/06

LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-19
 PROJECT NO. 92065672
 DATE 10-19-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 20 feet		
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ FT R: PERCENT ROD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	
						LL	PL	PI					
			P=2.0	18		30	16	14					GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling. After 24 hours: dry
			P=4.5	13	111				5.5	2	0	Stiff dark gray to gray Silty CLAY	
			P=4.5	10		33	15	18				Hard gray CLAY	
			P=4.5									Hard tan and light gray Sandy CLAY	
10			P=4.5	10	113				5.2	2	0	-reddish brown and light gray below 8 feet	
			P=4.5									Hard reddish brown Silty CLAY	
			P=4.0									Very stiff reddish brown CLAY	
20			P=4.5	11								Hard reddish brown very Silty CLAY with sand seams	
												Boring Terminated at 20 feet	
30													
40													
50													

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 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-20
 PROJECT NO. 92065672
 DATE 10-20-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA								DRILLING METHOD(S): Dry Augered 0 to 20 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ.FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ. IN)	GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling.
						LL	PL	PI					
													DESCRIPTION OF STRATUM
			P=0.5										Medium dense dark gray Silty SAND
			P=4.5	16									Hard gray Sandy CLAY -reddish brown below 4 feet
			P=4.5	14	123				6.3	2	0		
			P=4.5	11		38	16	22					
10			P=4.5										
			P=4.5	17	113				5.0	4	0	Hard reddish brown CLAY with calcareous nodules	
			P=4.5										
20			P=4.5									Hard reddish brown Silty CLAY with sand seams	
												Boring Terminated at 20 feet	
30													
40													
50													

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REMARKS:



HBC1 92065672 GPJ 11/10/06

LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-21
 PROJECT NO. 92065672
 DATE 10-19-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 20 feet		
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ.FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ.IN)	
						LL	PL	PI					
			P=1.25	18		25	17	8					GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling. After 24 hours: dry
			P=4.5										
			P=4.5	14	119				6.5	2	0		
			P=4.5										
10			P=4.5	16		39	18	21					
			P=4.25										
			P=3.75	23	101				1.1	5	0		
20			N=9						96				
													Boring Terminated at 20 feet
30													
40													
50													

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 RQD - ROCK QUALITY DESIGNATION

REMARKS:



HBC1 92065672 GPJ 11/1/06

LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-22
 PROJECT NO. 92065672
 DATE 10-20-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 20 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ.IN)	GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling.
					LL	PL	PI					
DESCRIPTION OF STRATUM												
10	P=1.5 P=2.5 P=4.5 P=4.5 P=4.5 P=4.5	24 14 14 7 118	40 44 14 30	16 14 30				4.7	2	0	Stiff dark gray to gray Silty CLAY -with tan partings below 2 feet	
20	P=4.25 P=4.5	28 95						2.4	3	0	Very stiff reddish brown and light gray CLAY with slickensides	
30											Hard reddish brown Silty CLAY	
40											Boring Terminated at 20 feet	
50												

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REMARKS:



LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-23
 PROJECT NO. 92065672
 DATE 10-19-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 20 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ.FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ.IN)
						LL	PL	PI				
GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling. After 24 hours: dry												
DESCRIPTION OF STRATUM												
10	[Diagonal Hatching]	P=1.0 P=4.5 P=4.5 P=4.25 P=3.0	18 21 20	104 102	58	17	41		3.5 1.3	7 6	0 0	Stiff to hard dark gray to gray CLAY -firm 0 to 2 feet -tan and light gray with calcareous nodules and ferrous stains 4 to 8 feet -reddish brown below 8 feet
20	[Diagonal Hatching]	P=3.0 P=2.75 N=7	17		33	19	14					Stiff to very stiff reddish brown Silty CLAY -very silty with sand seams below 18 feet
30												Boring Terminated at 20 feet
40												
50												

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REMARKS:



LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-24
 PROJECT NO. 92065672
 DATE 10-19-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 25 feet		
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: TONS/SQ. FT P: TONS/SQ. FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU. FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ. FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ. IN)	
						LL	PL	PI					
			P=2.5										GROUNDWATER INFORMATION: Groundwater observed at a depth of about 20 feet during drilling. After a 15-minute monitoring period, the water level had remained at approximately 20 feet. 24 hours after completion of drilling, the water level had risen to a depth of about 19.5 feet.
			P=4.5										
			P=4.5	16	47	17	30						DESCRIPTION OF STRATUM
			P=4.5	15	42	16	26						
10			P=4.5										Very stiff to hard dark gray to gray CLAY
			P=4.5	17	109				2.4	5	0		Hard tan and light gray Sandy CLAY -reddish brown and light gray below 6 feet
			P=3.0										Very stiff to hard reddish brown and light gray Silty CLAY
													Very stiff reddish brown CLAY
20			N=4								8		Loose reddish brown Silty SAND
			P=1.5	25									Stiff reddish brown Clayey SILT
30													Boring Terminated at 25 feet
40													
50													

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REMARKS:



LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. A-25
 PROJECT NO. 92065672
 DATE 10-19-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 15 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	DESCRIPTION OF STRATUM
					LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI					
		P=0.75	23		28	17	11					Firm dark gray Silty CLAY
		P=4.5										Hard tan and gray CLAY with calcareous nodules -with reddish brown partings below 4 feet
10		P=4.5	10	114				6.6	2	0		Hard reddish brown and light gray Silty CLAY
		P=4.5										Very stiff to hard reddish brown CLAY with slickensides and calcareous nodules
		P=4.5	20	103				2.2	6	0		Boring Terminated at 15 feet

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 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



HBC1 92065672.GPJ 11/10/06

LOG OF BORING

PROJECT: Brazos Town Center II - Phase II
 U.S. 59 at Reading Road
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO.	A-26
PROJECT NO.	92065672
DATE	10-19-06
SURFACE ELEVATION	Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 15 feet		
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ.FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ.IN)	GROUNDWATER INFORMATION: No groundwater observed during or upon completion of drilling. After 24 hours: dry
						LL	PL	PI					
													DESCRIPTION OF STRATUM
			P=2.5										Very stiff to hard dark gray to gray CLAY
			P=4.5	14		51	16	35					Hard tan and light gray Sandy CLAY
			P=4.5										Hard reddish brown and light gray Silty CLAY
10			P=4.5	14		48	16	32					Hard reddish brown and light gray CLAY with calcareous nodules
			P=4.5	12	105					5.8	2	0	Very stiff reddish brown Silty CLAY
			P=4.5										Boring Terminated at 15 feet
20													
30													
40													
50													

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 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



HBC1 92065672.GPJ 11/10/06

LOG OF BORING

PROJECT: JC Penney & Pavement Areas
 Brazos Town Center II
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. B-1
 PROJECT NO. 92065582
 DATE 9-14-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 30 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	DESCRIPTION OF STRATUM
					LL	PL	PI					
10	[Diagonal Hatching]	P=4.5	11		38	14	24					Hard dark gray to gray Sandy CLAY -reddish brown, tan, and light gray with ferrous stains below 6 feet
		P=4.5										
		P=4.5	14	119	46	14	32					
		P=4.5										
		P=4.5	16	109								
20	[Diagonal Hatching]	P=3.75	37	88					1.8	3	0	Stiff to very stiff reddish brown CLAY with slickensides and ferrous stains
		P=3.75										Very stiff reddish brown Silty CLAY
30	[Cross-hatching]	N=15						69				Medium dense brown to reddish brown Sandy SILT
		N=13										-with clayey seams below 23 feet
30	[Diagonal Hatching]	P=2.5										Very stiff reddish brown Silty CLAY
30	Boring Terminated at 30 feet											
40												
50												

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 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



HBC1 92065582 GFL 11/10/06

LOG OF BORING

PROJECT: JC Penney & Pavement Areas
 Brazos Town Center II
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. B-2
 PROJECT NO. 92065582
 DATE 9-14-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 30 feet		
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ.FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ. IN)	
						LL	PL	PI					
GROUNDWATER INFORMATION: Groundwater observed at a depth of about 22 feet during drilling. Upon completion of drilling: 26.5 feet 24 hours after drilling: 24 feet													
DESCRIPTION OF STRATUM													
0	/		P=4.5										Hard gray Sandy CLAY -with scattered roots 0 to 2 feet
10	/		P=4.5	10									-tan and light gray below 4 feet
	/		P=4.5	11		44	15	29					-with reddish brown partings and ferrous stains below 6 feet
	/		P=4.5	13	117	38	16	22		6.0	1	0	
	/		P=4.5										
	/		P=4.25	30	95					1.9	2	0	Stiff to very stiff reddish brown and light gray CLAY with slickensides
	/		P=3.25										Stiff to very stiff reddish brown and light gray Silty CLAY
20	X		N=11										-very silty 18 to 23 feet
	X		N=20	28		35	19	16					
	/		P=4.0										Very stiff reddish brown CLAY
30	/												Boring Terminated at 30 feet
40													
50													

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 T - TXDOT CONE PENETRATION RESISTANCE
 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



LOG OF BORING

PROJECT: JC Penney & Pavement Areas
 Brazos Town Center II
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. B-3
 PROJECT NO. 92065582
 DATE 9-14-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 30 feet; Wet Rotary 30 to 50 feet		
DEPTH (FT)	SOIL SYMBOL	SAMPLES N: BLOWS/FT T: BLOWS/FT P: TONS/SQ FT R: PERCENT ROD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	GROUNDWATER INFORMATION: Groundwater observed at a depth of about 25 feet during dry augering. 24 hours after drilling: 24 feet	
					LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI						DESCRIPTION OF STRATUM
10	[Diagonal Hatching]	P=4.5	12		41	16	25					Hard brown Sandy CLAY with pockets of sand and scattered roots	
		P=4.5	17		65	17	48					Hard gray and tan CLAY	
		P=4.5											Hard reddish brown, tan, and light gray Sandy CLAY
		P=4.5	14	120	44	15	29		6.0	2	0		
		P=4.5											
20	[Diagonal Hatching]	P=4.25	30	96					1.8	4	0	Stiff to very stiff reddish brown CLAY with slickensides and ferrous stains	
		P=1.5	23	100					0.6	14	0	Firm to very stiff reddish brown Silty CLAY	
		N=9	23					93				-very silty 18 to 28 feet	
30	[Diagonal Hatching]	N=17											
		P=2.5											
40	[Diagonal Hatching]	N=9										Loose reddish brown Sandy SILT	
		P=4.5										Hard reddish brown and light gray CLAY with slickensides	
		P=4.5											
50	[Diagonal Hatching]	P=4.5									Boring Terminated at 50 feet		

HBC:1 92065582.GPJ 11/10/06

N - STANDARD PENETRATION TEST RESISTANCE
 T - TXDOT CONE PENETRATION RESISTANCE
 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



LOG OF BORING

PROJECT: JC Penney & Pavement Areas
 Brazos Town Center II
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. B-4
 PROJECT NO. 92065582
 DATE 9-14-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 30 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: TONS/SQ.FT P: POCKET PENETROMETER RESISTANCE R: PERCENTAGE OF ROCK CORE RECOVERY RQD: ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ.IN)
						LL	PL	PI				
GROUNDWATER INFORMATION: Groundwater observed at a depth of about 25 feet during drilling. Upon completion of drilling: 26 feet 24 hours after drilling: 22.5 feet												
DESCRIPTION OF STRATUM												
			P=4.5									Hard dark gray to gray Sandy CLAY
			P=4.5	20								Hard gray to light gray CLAY
			P=4.5	16	115	53	17	36				-with tan partings below 4 feet
			P=4.5									Stiff to hard reddish brown and light gray Silty CLAY
10			P=4.25	19	103	37	16	21		1.7	6	0
			P=4.5									Hard reddish brown CLAY with calcareous nodules
			P=3.25	21								Stiff to very stiff reddish brown and light gray Silty CLAY
20			P=1.5									-very silty 18 to 23 feet
			N=10									
30			P=4.25									Very stiff reddish brown CLAY
												Boring Terminated at 30 feet
40												
50												

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 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



HBC1_92065582.GPJ 11/10/06

LOG OF BORING

PROJECT: JC Penney & Pavement Areas
 Brazos Town Center II
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. B-5
 PROJECT NO. 92065582
 DATE 9-14-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 30 feet		
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ.FT R: PERCENT ROD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	GROUNDWATER INFORMATION: Groundwater observed at a depth of about 25 feet during drilling. Upon completion of drilling: 27.5 feet 24 hours after drilling: 24 feet
						LL	PL	PI					
DESCRIPTION OF STRATUM													
			P=4.5	10									Hard gray Sandy CLAY
			P=4.5	15		56	16	40					Hard tan and light gray CLAY
			P=4.5	17		44	17	27					-with calcareous nodules and ferrous stains below 4 feet
10			P=4.5	16	106					3.7	3	0	Very stiff to hard reddish brown, tan, and light gray Sandy CLAY
			P=4.5										Hard reddish brown and light gray CLAY with slickensides and calcareous nodules
			P=2.25										Very stiff reddish brown and light gray Silty CLAY
20			N=11									55	Medium dense reddish brown Sandy SILT with clayey seams
			N=20										
30			P=3.75	28	98	39	20	19		1.0	5	0	Stiff to very stiff reddish brown Silty CLAY with sand seams
													Boring Terminated at 30 feet
40													
50													

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 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



LOG OF BORING

PROJECT: JC Penney & Pavement Areas
 Brazos Town Center II
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. B-6
 PROJECT NO. 92065582
 DATE 9-15-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 5 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ.IN)	GROUNDWATER INFORMATION: No groundwater observed during our upon completion of drilling.
					LL	PL	PI					
DESCRIPTION OF STRATUM												
10	/ / / / /	P=4.5	14		51	18	33					Hard dark gray to gray CLAY -with tan partings below 2 feet
		P=4.5	16									Boring Terminated at 5 feet
		P=4.5										
20												
30												
40												
50												

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 P - POCKET PENETROMETER RESISTANCE
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REMARKS:



LOG OF BORING

PROJECT: JC Penney & Pavement Areas
 Brazos Town Center II
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO.	B-7
PROJECT NO.	92065582
DATE	9-15-06
SURFACE ELEVATION	Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 5 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ.FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ.FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)
						LL	PL	PI				
	/ / / / /		P=4.5	10	106							
			P=4.5									
			P=4.5	15	120	61	19	42				
10												
20												
30												
40												
50												
DESCRIPTION OF STRATUM												
Hard dark gray to gray CLAY												
Boring Terminated at 5 feet												

N - STANDARD PENETRATION TEST RESISTANCE
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 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



LOG OF BORING

PROJECT: JC Penney & Pavement Areas
 Brazos Town Center II
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO.	B-8
PROJECT NO.	92065582
DATE	9-15-06
SURFACE ELEVATION	Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 5 feet		
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	
						LL	PL	PI					
	/ / / / /		P=4.5	10	115					6.1	2	0	Hard dark gray Sandy CLAY
	/ / / / /		P=4.5	17		69	19	50					Hard gray to light gray CLAY with ferrous stains
	/ / / / /		P=4.5										-with tan partings below 4 feet
													Boring Terminated at 5 feet

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 T - TXDOT CONE PENETRATION RESISTANCE
 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



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LOG OF BORING

PROJECT: JC Penney & Pavement Areas
 Brazos Town Center II
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. B-9
 PROJECT NO. 92065582
 DATE 9-15-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 5 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES N: BLOWS/FT T: BLOWS/FT P: TONS/SQ FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	GROUNDWATER INFORMATION: No groundwater observed during our upon completion of drilling.
					LL	PL	PI					
DESCRIPTION OF STRATUM												
	/ / /	P=4.5										Hard gray Sandy CLAY
	/ / /	P=4.5	12	118								Hard dark gray to gray CLAY
	/ / /	P=4.5										Boring Terminated at 5 feet
10												
20												
30												
40												
50												

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 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



LOG OF BORING

PROJECT: JC Penney & Pavement Areas
 Brazos Town Center II
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. B-10
 PROJECT NO. 92065582
 DATE 9-15-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 5 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)
						LL	PL	PI				
	/ / /		P=4.5	8		30	14	16				
	/ / /		P=4.5	12								
	/ / /		P=4.5									
10												
20												
30												
40												
50												

GROUNDWATER INFORMATION:
 No groundwater observed during our upon completion of drilling.

DESCRIPTION OF STRATUM

Hard gray Sandy CLAY

Hard dark gray to gray CLAY
 -with tan partings below 4 feet
 Boring Terminated at 5 feet

HBC1 92065582 GPJ 11/10/06

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 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



LOG OF BORING

PROJECT: JC Penney & Pavement Areas
 Brazos Town Center II
 Rosenberg, Texas

CLIENT: NewQuest Properties
 Houston, Texas

BORING NO. B-11
 PROJECT NO. 92065582
 DATE 9-15-06
 SURFACE ELEVATION Existing Grade

FIELD DATA				LABORATORY DATA							DRILLING METHOD(S): Dry Augered 0 to 5 feet	
DEPTH (FT)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT T: BLOWS/FT P: TONS/SQ FT R: PERCENT RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU.FT	ATTERBERG LIMITS (%)			MINUS NO. 200 SIEVE (%)	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)
						LL	PL	PI				
			P=4.5	4	97							
			P=4.5									
			P=4.5	14	117							
DESCRIPTION OF STRATUM												
Hard gray and brown Sandy CLAY												
Hard gray and tan CLAY												
Boring Terminated at 5 feet												

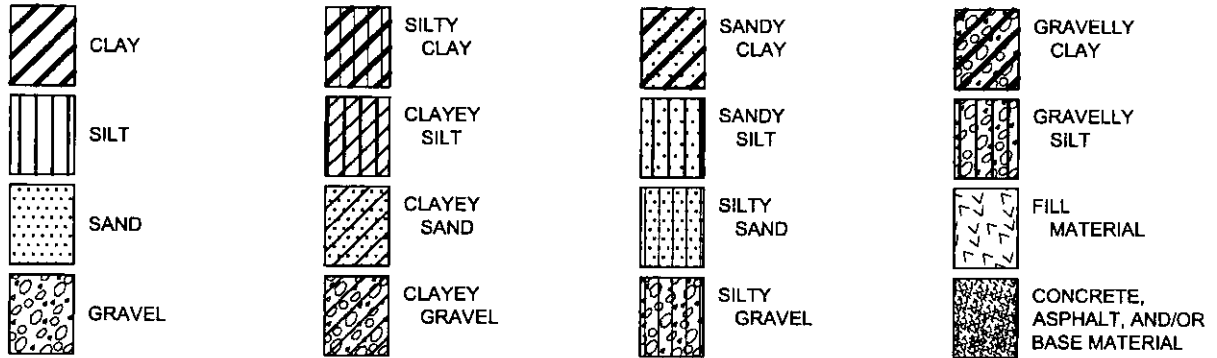
N - STANDARD PENETRATION TEST RESISTANCE
 T - TXDOT CONE PENETRATION RESISTANCE
 P - POCKET PENETROMETER RESISTANCE
 R - PERCENTAGE OF ROCK CORE RECOVERY
 RQD - ROCK QUALITY DESIGNATION

REMARKS:



KEY TO SOIL CLASSIFICATIONS AND SYMBOLS

SOIL TYPES



CONSISTENCY OF COHESIVE SOILS

Penetration Resistance (blows per foot)	Consistency	Undrained Compressive Strength (tsf)
0 - 2	Very Soft	0 - 0.25
2 - 4	Soft	0.25 - 0.5
4 - 8	Firm	0.5 - 1.0
8 - 15	Stiff	1.0 - 2.0
15 - 30	Very Stiff	2.0 - 4.0
> 30	Hard	> 4.0

PLASTICITY OF COHESIVE SOILS

Plasticity Index	Degree of Plasticity
0 - 5	None
5 - 10	Low
10 - 20	Moderate
20 - 40	Plastic
> 40	Highly Plastic

RELATIVE DENSITY OF COHESIONLESS SOILS

Penetration Resistance (blows per foot)	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

TERMS CHARACTERIZING SOIL STRUCTURE

Slickensided	- having inclined planes of weakness that are slick and glossy in appearance
Fissured	- containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical
Laminated	- composed of thin layers of varying color and texture
Interbedded	- composed of alternate layers of different soil types
Calcareous	- containing appreciable quantities of calcium carbonate

SAMPLER TYPES



**DIVISION 2
SITWORK**

SECTION 02200 - EARTHWORK**PART 1 – GENERAL****1.1 DESCRIPTION**

- A. Conditions of Contract and Division 1 - General Requirements, govern work of this Section.
- B. Work Included: All excavation, compacted engineered fill, exterior backfill, grading, fine grading and roadway preparation work necessary to complete the work per the Contract Documents.
- C. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specific requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity and numbers to accomplish the work of this Section in a timely manner.

1.3 TESTING SERVICE

- A. *Owner* shall secure and pay for the services of a testing laboratory to conduct the soil-testing program.
- B. A qualified representative (Soil Engineer) of the testing laboratory shall be present at the site during the performance of the work required under this Section. Contractor shall notify the testing laboratory a minimum of two days in advance of required testing and shall coordinate all testing with Engineer.
- C. The following tests shall be performed:
 - 1. Laboratory tests of proposed fill: ASTM D75.
 - 2. Laboratory compaction tests: ASTM D698.
 - 3. Field Density tests: ASTM D1556.
- D. Field density tests of compacted fill, backfill and base materials shall be made every other layer (lift) at intervals selected by the Soil Engineer.
- E. In the event the inspections and tests indicate the work has not been performed in accordance with the Drawings and Specifications, the materials shall be removed and the work redone and retested, at no additional cost to the Owner.

1.4 SUBMITTALS

- A. Reports of all inspections and tests performed by the Soil Engineer required by this Section shall be submitted to Owner's representative, Architect, Engineer and Contractor as soon as practical during construction of the work.

PART 2 – PRODUCTS**2.1 SOIL MATERIALS**

- A. Fill and backfill materials:

1. Provide soil materials free from organic matter and deleterious substances. Fill material is subject to the approval of the Soil Engineer conforming to the following:
 - a. Below structures: Engineered fill, predominantly granular, non-expansive, capable of the required compaction to achieve the design bearing capacity for foundation support of structure as shown on Drawings.
 - b. Other areas: Soils removed from excavations or imported from off-site as approved by a Soil Engineer.

B. Base under slabs:

1. Under all slabs on grade, provide 6" minimum thick granular base conforming to requirements of SW, SP or SP-SM, unified soil classification system with no more than 5% passing the #200 sieve. Refer to soils report.

2.2 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Soil Engineer.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed.
- B. Correct conditions detrimental to timely and proper completion of the work.
- C. Do not proceed until unsatisfactory conditions are corrected.

3.2 PROCEDURES

- A. Utilities:
 1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavation. If damaged, repair or replace at no additional cost to the Owner.
 2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
 3. If existing utilities are found to interfere with the permanent subsurface work being constructed under this Section, immediately notify the Engineer and secure instructions.
 4. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- B. Protection:
 1. Barricade open excavations as part of the work.
 2. Protect structures, utilities, sidewalks, pavements, railroad tracks and other facilities from damage caused by performance of the work under this Section.
- C. Dewatering:
 1. Remove all water, including rainwater, encountered during earthwork operations by pumps, drains and other approved methods.
 2. Keep excavations and site construction area free from water.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors and to other work being performed on or near the site.
- E. Maintain access to adjacent areas at all times.

3.3 EXCAVATING

- A. Perform excavation within the limits of the work to the lines, grades and elevations required by the Drawings.
- B. Excavated materials suitable for fill and backfill shall be stockpiled in an area so as not to cause obstruction to Owner.
- C. Unsuitable bearing soils encountered during excavation shall be excavated to a distance below grade as directed by the Soil Engineer and replaced with satisfactory materials as specified.
- D. Dispose of unsuitable excavated material and surplus material away from the site at disposal areas arranged and paid for by the Contractor unless Owner approves otherwise.
- E. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.
- F. Borrow:
 - 1. Obtain material for fill, if necessary, from off site, selected and paid for by the Contractor and approved by the Soil Engineer.
- G. Unauthorized excavation:
 - 1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific instruction from the Engineer.
 - 2. When acceptable to the Soil Engineer, compacted fill may be used to bring the bottom elevation to proper elevation.
- H. Stability of excavations:
 - 1. Slope sides of excavation to 1:1 maximum, unless otherwise directed by the Soil Engineer.
 - 2. Maintain sides and slopes of excavating in a safe condition until completion of backfilling.

3.4 FILLING AND BACKFILLING

- A. Backfill excavations with approved materials as promptly as progress of the work permits, but not until completion of the following:
 - 1. Acceptance of construction below finish grade.
 - 2. Inspecting, testing, approving and recording locations of underground utilities.
 - 3. Removal of formwork, shoring, bracing, trash and debris.
- B. Placing and compacting:
 - 1. Place backfill and fill materials in layers (lifts) as specified by Soil Engineer.
 - 2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
 - 3. Compact each layer to required percentage of maximum density.
 - 4. Do not place backfill or fill material on surfaces that are muddy, frozen or containing frost or ice.

3.5 GRADING

- A. General:
 - 1. Uniformly grade the areas within the grading limits, including adjacent transition areas.
 - 2. Compact with uniform levels or slopes between points where elevations are shown on the Drawings or between such points and existing grades.
- B. Grading:
 - 1. Grade adjacent areas to achieve drainage away from the construction work and to prevent ponding.
 - 2. Finish the surfaces to be free from irregular surface changes.

3.6 COMPACTING

- A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D698, standard proctor.
- B. Provide not less than the following percentage of maximum density (ASTM D698) of soil material compacted at optimum moisture content for each layer in place and as approved by the Soil Engineer.
 - 1. Below footings:
 - a. Each layer of fill and backfill material at (98%) of maximum density.
 - 2. Below slabs and paving:
 - a. Each layer of fill and backfill material including base at (95%) of maximum density.
 - 3. Unsurfaced areas:
 - a. Each layer of fill and backfill material at (95%) of maximum density.

3.7 CLEAN-UP

- A. Remove all surplus and discarded materials, equipment, rubbish and temporary structures on all parts of the work. The project site shall be left in a clean and acceptable condition.

END OF SECTION

SECTION 02221 - TRENCHING, BACKFILLING AND COMPACTING**PART 1 – GENERAL****1.1 DESCRIPTION**

- A. Work included: Trench, backfill and compact as specified herein and as needed for installation of underground utilities associated with the work.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

- A. Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity and numbers to accomplish the work in a timely manner.
- C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the Soil Engineer.

PART 2 – PRODUCTS**2.1 SOIL MATERIAL**

- A. Fill and backfill materials:
 - 1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 4" in greatest dimension and with no more than 15% of the rocks or lumps larger than 2" in their greatest dimension.
 - 2. Fill material is subject to the approval of the Soil Engineer and is that material removed from excavations or imported from off-site borrow areas, predominantly granular, non-expansive soil free from roots and other deleterious matter.
 - 3. Do not permit rocks having a dimension greater than 1" in the upper 12" of fill.
 - 4. Cohesionless material used for backfill: provide sand free from organic material and other foreign matter, and as approved by the Soil Engineer.

2.2 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 – EXECUTION**3.1 SURFACE CONDITIONS**

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINISH ELEVATIONS AND LINES

- A. Excavate trench to line and grade indicated on drawings.

3.3 PROCEDURES

- A. Utilities:
1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.
 2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
 4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.
 5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- B. Protection of persons and property:
1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 3. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.
- C. Dewatering:
1. Remove all water, including rainwater, encountered during trench and sub-structure work to an approved location by pumps, drains and other approved methods.
 2. Keep trenches and site construction area free from water.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors and to other work being performed on or near the site.
- E. Maintain access to adjacent areas at all times.

3.4 TRENCHING

- A. Provide sheeting and shoring necessary for protection of the work and for the safety of personnel.
1. Prior to backfilling, remove all sheeting.
 2. Do not permit sheeting to remain in the trenches except when, in the opinion of the Engineer, field conditions or the type of sheeting or methods of construction such as use of concrete bedding are such as to make removal of sheeting impracticable. In such cases, the Engineer may permit portions of sheeting to be cut off and remain in the trench.
- B. Open cut:
1. Excavate for utilities by open cut.
 2. If conditions at the site prevent such open cut, and if approved by the Engineer, trenching may be used.
 3. Short sections of a trench may be tunneled if, in the opinion of the Engineer, the conductor can be installed safely and backfill can be compacted properly into such tunnel.
 4. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the soil engineer.
 5. When the void is below the subgrade for the utility bedding, use suitable earth materials and compact to the relative density directed by the soil engineer, but in no case to a relative density less than 90%.
 6. When the void is in the side of the utility trench or open cut, use suitable earth or sand compacted or consolidated as approved by the soil engineer, but in no case to a relative density less than 90%.
 7. Remove boulders and other interfering objects and backfill voids left by such removals, at no additional cost to the Owner.
 8. Excavating for appurtenances:

- a. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
 - b. Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel or lean concrete as directed by the Soil Engineer and at no additional cost to the Owner.
- C. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.
- D. Depressions:
- 1. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
 - 2. Except where rock is encountered, do not excavate below the depth indicated or specified.
 - 3. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified.
- E. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, cover and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the Contract Documents.
- F. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.
- G. Cover:
- 1. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or subgrade:
 - a. Areas subject to vehicular traffic:
 - 1) Sanitary sewers:.....48"
 - 2) Storm drains:36"
 - b. Areas not subject to vehicular traffic:
 - 1) Sanitary Sewers:30"
 - 2) Storm drains:18"
 - c. All areas:
 - 1) Water lines:90"
 - 2) Natural gas lines:24"
 - 3) Electrical cables:42"
 - 4) Electrical ducts:36"
 - d. Concrete encased:
 - 1) Pipe sleeves - water and gas lines:...24"
 - 2) Sanitary sewers and storm drains: ...12"
 - 3) Electrical ducts:24"
 - 2. Where utilities are under a concrete structure slab or pavement, the minimum depth need only be sufficient to completely encase the conduit or pipe sleeve, and electrical long-radius rigid metal conduit riser, provided it will not interfere with the structural integrity of the slab or pavement.
 - 3. Where the minimum cover is not provided, encase the pipes in concrete as indicated. Provide concrete with a minimum 28-day compressive strength of 2500 psi.

3.5 BEDDING

- A. Provide Class C bedding for all pipe.

3.6 BACKFILLING

- A. General:
 - 1. Do not completely backfill trenches until required pressure and leakage tests have been performed and until the utilities systems as installed conform to the requirements specified in the pertinent Sections of these Specifications.

2. Except as otherwise specified or directed for special conditions, backfill trenches to the ground surface with selected material approved by the Soil Engineer.
3. Reopen trenches that have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified or otherwise correct to the approval of the Soil Engineer.
4. Do not allow or cause any of the Work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, tests approvals.
5. Should any of the Work be so enclosed or covered up before it has been approved, uncover all such Work and, after approvals have been made, refill and compact as specified, all at no additional cost to the Owner.

B. Lower portion of trench:

1. Deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to the density of the adjacent soil, or grade as specified herein, until there is a cover of not less than 24" over sewers and 12" over other utility lines.
2. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.

C. Remainder of trench:

1. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6" or 1/2 the layered thickness, whichever is smaller, in any dimension.
2. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density directed by the Soil Engineer.

D. Adjacent to buildings: Mechanically compact backfill within ten feet of buildings.

E. Consolidation of backfill by jetting with water may be permitted, when specifically approved by the Soil Engineer, in areas other than building and pavement areas.

3.7 TEST FOR DISPLACEMENT OF SEWERS AND STORMDRAINS

- A. Check sewers and storm drains to determine whether displacement has occurred after the trench has been backfilled to above the pipe and has been compacted as specified.
- B. Flash a light between manholes or, if the manholes have not yet been constructed, between the locations of the manholes, by means of a flashlight or laser.
- C. If the illuminated interior of the pipe line shows poor alignment, displaced pipes, or any other defects, correct the defects to the specified conditions and at no additional cost to the Owner.

3.8 PIPE JACKING

- A. The Contractor may, at its option, install steel pipe casings, tongue-and-groove reinforced concrete pipes and steel pipes under existing roads or pavements by jacking into place using procedures approved by the governmental agencies having jurisdiction and approved by the Soil Engineer.

3.9 TUNNELING OPERATIONS

- A. The Contractor may, at its option, tunnel pipes into position using procedures approved by the Soil Engineer and the governmental agencies having jurisdiction.

3.10 FIELD QUALITY CONTROL

- A. The Soil Engineer will inspect and approve open cuts and trenches before installation of utilities and will make the following tests:
 1. Assure that trenches are not backfilled until all tests have been completed;
 2. Check backfilling for proper layer thickness and compaction;
 3. Verify that test results conform to the specified requirements and that sufficient tests are performed;

4. Assure that defective work is removed and properly replaced.

END OF SECTION

SECTION 02282 – TERMITE CONTROL**PART 1 – GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes soil treatment for termite control.

1.3 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data and application instructions.
- C. Certification that products used comply with U.S. Environmental Protection Agency (EPA) regulations for termiticides.

1.4 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for preparing substrate and application.
- B. Engage a professional pest control operator who is licensed according to regulations of governing authorities to apply soil treatment solution.
- C. Use only termiticides that bear a federal registration number of the EPA and are approved by local authorities having jurisdiction.

1.5 JOB CONDITIONS

- A. Restrictions: Do not apply soil treatment solution until excavating, filling, and grading operations are completed, except as otherwise required in construction operations.
- B. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.6 WARRANTY

- A. Warranty: Furnish written warranty, executed by Applicator and Contractor, certifying that applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation.
- B. Warranty Period: 5 years from date of Substantial Completion.
- C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 – PRODUCTS**2.1 SOIL TREATMENT SOLUTION**

- A. General: Use an emulsible, concentrated termiticide that dilutes with water, specifically formulated to prevent termite infestation. Fuel oil will not be permitted as a diluent. Provide a solution consisting of one of the following chemical elements.

- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Chloropyrifos:
 - a. Dursban TC, Dow Chemical Co.
 - 2. Permethrin:
 - a. Dragnet FT, FMC Corp.
 - b. Torpedo, ICI Americas, Inc.
 - 3. Cypermethrine:
 - a. Prevail FT, FMC Corp.
 - b. Demon, ICI Americas, Inc.
- C. Dilute with water to concentration level recommended by manufacturer.
- D. Other solutions may be used as recommended by applicator if approved for intended application by local authorities having jurisdiction. Use only soil treatment solutions that are not harmful to plants.

PART 3 – EXECUTION

3.1 APPLICATION

- A. Surface Preparation: Remove foreign matter that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placing compacted full under slabs if recommended by toxicant manufacturer.
- B. Application Rates: Apply soil treatment solution as follows:
 - 1. Under slab-on-grade structures, treat soil before concrete slabs are placed, using the following application rates:
 - a. Apply 4 gallons of chemical solution per 10 linear feet to soil in critical areas under slab, including entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.
 - b. Apply 1 gallon of chemical solution per 10 sq. ft. as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallons of chemical solution to areas where fill is washed gravel or other coarse absorbent material.
 - c. Apply 4 gallons of chemical solution per 10 linear feet of trench for each foot of depth from grade to footing, along outside edge of building. Dig a trench 6 to 8 inches wide along outside of foundation to a depth of not less than 12 inches. Punch holes to top of footing at not more than 12 inches o.c. and apply chemical solution. Mix chemical solution with the soil as it is being replaced in the trench.
 - 2. At expansion joints, control joints, and areas where slabs will be penetrated, apply at rate of 4 gallons per 10 linear feet of penetration.
- C. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs after areas are covered by other construction.
- D. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

END OF SECTION

SECTION 02515 - PORTLAND CEMENT CONCRETE PAVING**PART 1 – GENERAL****1.1 DESCRIPTION**

- A. Work included: Provide Portland Cement concrete paving where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related work: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in division 1 of these Specifications.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Do not commence placement of concrete until mix designs have been reviewed and approved by the Engineer and all governmental agencies having jurisdiction and until copies of the approved mix designs are at the job site and the batch plant.
- C. Provide access for, and cooperate with, the inspector and testing laboratory representative.

PART 2 – PRODUCTS**2.1 FORMS**

- A. Construct forms with tight joints to the exact sizes, shapes, lines and dimensions shown and as required to obtain accurate alignment, location, grades, level and plumb work in the finished structure.
- B. Earth forms will not be permitted for paving.

2.2 REINFORCEMENT

- A. Comply with the following as minimums:
 - 1. Bars: ASTM A615, Grade 60, unless otherwise shown on the Drawings, using deformed bars for number 3 and larger.
 - 2. Welded wire fabric: ASTM A185.
 - 3. Bending: ACI 318.
- B. Fabricate reinforcement to the required shapes and dimensions, with fabrication tolerances complying with the CRSI "Manual of Standard Practices".
- C. Do not use reinforcement having any of the following defects:
 - 1. Bar lengths, depths or bends exceeding the specified fabricating tolerances;
 - 2. Bends or kinks not indicated on the Drawings or required for the Work;
 - 3. Bars with cross-section reduced due to excessive rust or other causes.

2.3 CONCRETE

- A. Concrete shall conform to the applicable requirements of Section 03300 except as otherwise specified. Concrete shall have a minimum compressive strength of 3500 psi at 28 days. Maximum size of aggregate shall be 1½ inches.

- B. Air Content
 - 1. Mixtures shall have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.
- C. Slump
 - 1. The concrete slump shall be 2 inches where determined in accordance with ASTM C143.
- D. Comply with the following as minimums:
 - 1. Portland cement: ASTM C150, Type I or II, low alkali.
- E. Aggregate, general:
 - 1. ASTM C30, uniformly graded and clean;
 - 2. Do not use aggregate known to cause excessive shrinkage.
 - 3. Aggregate, coarse: Crushed rock or washed gravel with maximum size between 3/4" and 1½", and with minimum size number 4.
 - 4. Aggregate, fine: Natural washed sand of hard and durable particles varying from fine to particles passing a 3/8" screen, of which at least 12% shall pass a 50-mesh screen.
- F. Water: Clean and potable.
- G. Use only such additives as are recommended in the mix design and approved by the Engineer and governmental agencies having jurisdiction.
- H. Provide concrete in the proportions established by the approved mix design.

2.4 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINAL PREPARATION OF SUBGRADES

- A. After preparation of subgrade as specified in another Section of these Specifications, thoroughly scarify and sprinkle the entire area to be paved and then compact to a smooth, hard, even surface of 95% compaction to receive the aggregates.

3.3 PLACEMENT OF BASE COURSE

- A. Base (where required):
 - 1. Spread the specified course aggregate to a thickness providing the compacted thickness shown on the Drawings.
 - 2. Compact to 95%.
- B. Thickness tolerance: Provide the compacted thickness shown on the Drawings within a tolerance of minus 0.0" to plus 0.5".
- C. Smoothness tolerance: Provide the lines and grades shown on the Drawings within a tolerance of 0.05 feet vertically and 1" in alignment at any point.

- D. Correct deviations by removing materials, replacing with new materials and reworking or recompacting as required.
- E. Use only the amount of moisture needed to achieve the specified compaction.

3.4 INSTALLATION

- A. Upon completion of base course and formwork, install reinforcement (if required) as shown on the Drawings.
 - 1. Clean reinforcement to remove loose rust and mill scale, earth and other materials which reduce bond or destroy bond with concrete.
 - 2. Position, support and secure reinforcement against displacement by formwork, construction and concrete placement operations.
 - 3. Place reinforcement to obtain the required coverages for concrete protection.
- B. Transit mix the concrete in accordance with provisions of ASTM C94.
 - 1. With each load, provide ticket certifying to the materials and quantities and to compliance with the approved mix design.
 - 2. On the transit-mix ticket, state the time water was first added to the mix.
 - 3. At the batch plant, withhold 2 1/2 gal of water per cu yd of concrete.
 - 4. Upon arrival at the job site, and as directed by the testing laboratory inspector, add all or part of the withheld water before the concrete is discharged from the mixer.
 - 5. Mix not less than five minutes after the withheld water has been added and not less than one minute of that time immediately prior to discharge of the batch.
 - 6. Unless otherwise directed provide 15 minutes total mixing time per batch after first addition of water.
- C. Do not use concrete that has stood over 30 minutes after leaving the mixer or concrete that is not placed within 60 minutes after water is introduced into the mix.
- D. Conveying:
 - 1. Place concrete in accordance with the following and pertinent recommendations contained in ACI 304.
 - 2. Deposit concrete continuously in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section.
 - 3. If a section cannot be placed continuously, provide construction joints as specified herein.
 - 4. Perform concrete placing at such a rate that concrete which is being integrated with fresh concrete is still plastic.
 - 5. Deposit concrete as nearly as practicable in its final location so as to avoid segregation due to rehandling and flowing.
 - 6. Do not subject concrete to any procedure which will cause segregation.
 - 7. Do not use concrete which becomes non-plastic and unworkable or does not meet required quality control limits or has been contaminated by foreign materials.
 - 8. Remove rejected concrete from the site.
- E. Deposit and consolidate concrete in a continuous operation within the limits of construction joints until the placing of a panel or section is completed.
 - 1. Bring surfaces to the correct level with a straightedge and then strike off.
 - 2. Use bullfloats or darbies to smooth the surface, leaving it free from bumps and hollows.
 - 3. Do not sprinkle water on the plastic surface. Do not disturb the surfaces prior to start of finishing operations.
- F. Expansion joints:
 - 1. Do not permit reinforcement to extend continuously through any expansion joint.
 - 2. Locate expansion joints along the edges of all structures and where indicated, filled to full depth with expansion joint material.
- G. Finishing:
 - 1. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
 - 2. During or after the first floating, check the planeness of surface with a ten foot straightedge applied at not less than two different angles.

3. Cut down high spots and fill low spots and produce a surface level within 1/4" in two feet as determined by a two foot straightedge placed anywhere on the surface in any direction.
4. Refloat the surface immediately to a uniform sandy texture.
5. While the surface is still plastic provide a textured finish by drawing a fiber bristle broom uniformly over the surface.
 - a. Unless otherwise directed by the Engineer provide the texturing in one direction only.
 - b. Provide "light", "medium" or "coarse" texturing as directed by the Engineer.

3.5 CURING AND PROTECTION

- A. Beginning immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.

END OF SECTION

SECTION 02620 - CONCRETE SIDEWALKS, CURBS AND GUTTERS**PART 1 – GENERAL****1.1 SECTION INCLUDES:**

- A. Work included: Provide concrete sidewalks, exterior slabs on grade, concrete aprons, trench drain, and curb and gutter where shown on the Drawings, as specified herein and as needed for a complete and proper installation.
- B. Section includes city or municipality having jurisdiction over sidewalk, curb, gutter, curb cuts, etc. on or offsite as shown on plans. Requirements in this spec are minimums. Comply with city or municipal authority requirements if more stringent.
- C. Concrete aprons to be designed for same loading as adjacent pavement.

1.2 RELATED SECTIONS

- A. Section 02200-Earthwork
- B. Section 02515-Portland Cement Concrete Paving
- C. Section 03200-Concrete Reinforcement
- D. Section 03300-Cast in Place Concrete

1.3 SUBMITTALS

- A. The following shall be submitted:
 - 1. Copies of all test reports within 24 hours of completion of test.
 - 2. Copies of certified delivery tickets for all concrete used in the construction.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity and numbers to accomplish the work of this section in a timely manner.
- C. Comply with standard of good practice regarding shipping, delivery, and handling of materials that are part of this Section.
- D. Comply with ACI 301 Standards for placing and finishing concrete.

1.5 PRODUCT HANDLING

- A. Comply with standard of good practice regarding shipping, delivery and handling of materials that are part of this Section.

1.6 WEATHER LIMITATIONS

- A. Placing During Cold Weather
 - 1. Concrete placement shall be discontinued when the air temperature reaches 40 degrees F. and is falling.
 - 2. Placement may begin when the air temperature reaches 35 degrees F. and is rising.
 - 3. Provisions shall be made to protect the concrete from freezing during the specified curing period. If necessary to place concrete when the temperature of the air, aggregates, or water is below 35 degrees F, placement shall be approved in writing.

4. Approval shall be contingent upon full conformance with the following provisions. The underlying material shall be prepared and protected so that it is entirely free of frost when the concrete is deposited. Mixing water shall be heated as necessary to result in the temperature of the in-place concrete being between 50 and 85 degrees F.
 5. The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer.
 6. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.
- B. Placing During Warm Weather
1. The temperature of the concrete as placed shall not exceed 85 degrees F except where an approved retardant is used.
 2. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. In no case shall the placing temperature exceed 95 degrees F.

PART 2 – PRODUCTS

2.1 CONCRETE

- A. Concrete shall conform to the applicable requirements of Section 03300 except as otherwise specified. Concrete shall have a minimum compressive strength of 3500 psi at 28 days. Maximum size of aggregate shall be 1-1/2 inches.
- B. Air Content
1. Mixtures shall have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.
- C. Slump
1. The concrete slump shall be max 4 inches where determined in accordance with ASTM C 143.

2.2 CONCRETE CURING MATERIALS

- A. Impervious Sheet Materials
1. Impervious sheet materials shall conform to ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.
- B. White Pigmented Membrane-Forming Curing Compound
1. White pigmented membrane-forming curing compound shall conform to ASTM C 309, Type 2.

2.3 JOINT FILLER STRIPS

- A. Contraction Joint Filler for Curb and Gutter:
1. Contraction joint filler for curb and gutter shall consist of hard-pressed fiberboard.
- B. Expansion Joint Filler, Premolded:
1. Expansion joint filler, premolded, shall conform to ASTM D 1751 or ASTM D 1752, 3/8-inch thick, unless otherwise indicated.

2.4 FORM WORK

- A. Form work shall be designed and constructed to insure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete.

PART 3 – EXECUTION

3.1 SUBGRADE PREPARATION

- A. The subgrade shall be constructed to the specified grade and cross section prior to concrete placement. Subgrade shall be placed and compacted to conform to applicable requirements of Section 02200 and soil testing report.
- B. Forms shall be carefully set to the indicated alignment, grade and dimensions. Forms shall be held rigidly in place by a minimum of three stakes per form placed at intervals not to exceed 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Clamps, spreaders, and braces shall be used where required to insure rigidity in the forms.
 1. Forms for sidewalks and curbs, aprons, and gutters shall be set with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10-foot long section.
- C. Trench Drainage System Installation. Install trench drainage system in accordance with manufacturer's instructions, approved shop drawings and design drawings, cast into concrete, and accurately placed. Bottom of drainage trench shall slope to drain outlet.

3.2 CONCRETE PLACEMENT

A. Inspection:

1. Verify formwork, anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

B. Preparation:

1. Thoroughly clean forms before placing concrete. Dampen masonry and porous earth in contact with concrete. Do not place concrete on water or frozen ground.
2. Prepare previously placed concrete by cleaning with steel brush and thoroughly wet and slush with neat cement grout immediately before placing new concrete.

C. Placing Concrete:

1. Notify Architect minimum 24 hours prior to commencement of concreting operations.
2. Place concrete as close as possible to final position. Prevent segregation. Place with maximum free drop of 5 feet. Compact during placing with internal vibrators (8000 vpm minimum). Work around reinforcement, embedded items and into form corners. Do not use vibrators to transport concrete within forms.
3. Place concrete within one hour after mix water has been added.
4. Place concrete in accordance with ACI 301. Cold Weather Placement:
 - a. Conform with requirements of ACI 306R.
 - b. Protect work from physical damage or reduced strength caused by frost, freezing, or low temperatures.
 - c. If at 40 deg F or expected, uniformly heat aggregates and water before mixing, to obtain 50-80 deg F mixture temperature at point of placement.
 - d. Do not use frozen materials or materials containing snow or ice, or place on frozen subgrade or subgrade containing frozen materials.
 - e. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

5. Hot Weather Placement:
 - a. Conform with requirements of ACI 305R.
 - b. Cool ingredients to maintain 90 deg F concrete temperature at time of placement.
 - c. Mixing water may be chilled, or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing.
 - d. Cover reinforcing steel with water-soaked burlap, to ensure steel temperature will not exceed ambient air temperature immediately before embedment in concrete.
 - e. Wet forms thoroughly before placing concrete.
 - f. Use water-reducing retarding admixture (Type D) when required by high temperatures.
6. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.
7. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect upon discovery.

D. Concrete Placement and Finishing:

1. Concrete shall be placed in the forms in one layer of such thickness that when consolidated and finished the sidewalks and curbs and gutters will be of the thickness indicated. The concrete shall be consolidated with an approved vibrator, and the surface shall be finished to grade with a wood float, bull float, or darby, edged and broom finished.
2. After straight-edging, the surface shall be finished to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic.
3. All slab edges, including those at formed joints, shall be finished carefully with an edger having a radius of 1/8 inch. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.
4. Finished surfaces shall not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 0.25 inch.

Provide tactile surface on ramps and curb cuts as required by authority having jurisdiction.

3.3 SIDEWALK JOINTS

- A. Sidewalk joints shall be constructed to divide the surface into rectangular areas. Transverse contraction joints shall be spaced at a distance equal to the sidewalk width or 5 feet on centers, whichever is less, and shall be continuous across the slab. Longitudinal contraction joints shall be constructed along the centerline of all sidewalks 10 feet or more in width. Transverse expansion joints shall be installed at sidewalk returns and opposite expansion joints in adjoining curbs. Expansion joints shall be formed about structures and features which project through or into the sidewalk pavement.
- B. Contraction Joints
 1. The contraction joints shall be formed in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness, using a jointer to cut the groove. Sawed control joint acceptable only in aprons.
- C. Expansion Joints
 1. Provide expansion joints where concrete meets building walls, wall supported on footings and bollards.
 2. Expansion joints shall be formed with 3/8-inch joint filler strips. Joint filler shall be placed with top edge 1/2 inch below the surface and shall be held in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/8 inch, and concrete over the joint filler shall be removed. At the end of the curing period, expansion joints shall be carefully cleaned and caulked.

3.4 CURB AND GUTTER JOINTS

- A. Curb and gutter joints shall be constructed at right angles to the line of curb and gutter.

- B. Contraction joints shall be constructed directly opposite contraction joints in abutting Portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length. Contraction joints shall be constructed by means of 1/8-inch thick separators and of a section conforming to the cross section of the curb and gutter. Separators shall be removed as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.
- C. Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb and gutter directly opposite expansion joints of abutting Portland cement concrete pavement, and shall be of the same type and thickness as joints in the pavement.
- D. Expansion joints shall be placed at the ends of all curved sections, at the ends of the curved portions of entrance and street returns and at 60' o.c. maximum on straight sections.

3.5 CURING AND PROTECTION

- A. Concrete shall be protected against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation by means of burlap mats, impervious sheeting or a uniform coating of white-pigmented membrane curing compound. Unhardened concrete shall be protected from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period.
- B. After curing, debris shall be removed and the area adjoining the concrete shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with lines and grades indicated.
- C. Completed concrete shall be protected from damage until accepted. The Contractor shall repair damaged concrete and clean concrete discolored during construction. Concrete that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed damaged portions shall be disposed of as directed.

3.6 FIELD QUALITY CONTROL

- A. The Contractor shall perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing. Based upon the results of these inspections and tests, the Contractor shall take the action and submit reports as required below, and any additional tests to insure that the requirements of these Specifications are met.
- B. Concrete Testing:
 - 1. Strength Testing:
 - a. The Contractor shall provide molded concrete specimens for strength tests.
 - b. Samples of concrete placed each day shall be taken not less than once a day or less than once for every 100 cubic yards of concrete.
 - c. The samples for strength tests shall be taken in accordance with ASTM C 172.
 - d. Cylinders for acceptance shall be molded in conformance with ASTM C 31 by an approved testing laboratory.
 - e. Each strength test result shall be the average of two test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved.
 - 2. Slump Test:
 - a. Two slump tests shall be made on randomly selected batches of each class of concrete for every 100 cubic yards, or fraction thereof, of concrete placed during each shift.
 - b. Additional tests will be performed when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noticed along the edges of slip-formed concrete.
 - 3. Perform 1 test for air content on randomly selected batches per 100 cy. per day or fraction thereof placed per day.
 - 4. The finished surface of each category of the completed work shall be uniform in color and free of blemishes and form or tool marks.

C. SURFACE DEFICIENCIES AND CORRECTIONS

- D. Exposed surfaces of the finished work will be inspected by the Owner and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work shall be removed and replaced at no additional cost to the Owner.

NOTE: 4' x 4' field mock-up with pattern required.

END OF SECTION

SECTION 02713 - WATER DISTRIBUTION SYSTEM**PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Ductile Iron Pipe water main and appurtenances as shown on the drawings, specified herein and as required for a complete and proper installation.

1.2 RELATED SECTIONS

- A. Section 02200 - Earthwork
- B. Section 02221 - Trenching, Backfilling and Compacting

1.3 PROJECT RECORD DOCUMENTS

- A. Accurately record location of utilities remaining, rerouted utilities and new utilities by horizontal dimensions, elevations or inverts and slope gradients.

1.4 PROTECTION

- A. Protect trees, shrubs, lawns and other features to remain as portions of the final landscaping.
- B. Protect benchmarks, existing structures roads, sidewalks, paving and curbs.
- C. Protect above or below grade utilities that are to remain.
- D. Repair damage.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with local State standards.
- B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for the proper performance of the work of this section.

1.6 PRODUCT HANDLING

- A. Except as otherwise approved by the Engineer, determine and comply with manufacturer's recommendations on product handling, storage, and protection.
- B. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
 - 1. Maintain packaged materials with seals unbroken and labels intact until time of use.
 - 2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.
- C. The Engineer may reject as non-complying such material and products that do not bear identification satisfactory to the Engineer as to manufacturer, grade, quality and other pertinent information.
- D. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.
- E. In event of damage, promptly make replacements and repairs to the approval of the Engineer and at no additional cost to the Owner.

- F. Additional time required to secure replacements and to make repairs will not be considered by the Engineer to justify an extension in the Contract Time of Completion.

1.7 SUBMITTALS

- A. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
1. Materials list of items proposed to be provided under this Section;
 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 3. Names and addresses of the earliest services and maintenance organization that readily stocks repair parts;
 4. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.

PART 2 – PRODUCTS

2.1 PIPE AND FITTINGS

- A. General:
1. Assume connection point to building service lines as being approximately five feet outside buildings and structures to which service is required.
 2. Pipe materials: Use ductile iron pipes as shown on the plans unless otherwise indicated or approved in advance by the Engineer.
- B. Pipe:
1. Ductile iron pipe:
 - a. Comply with ANSI A-21.51, with working pressure of not less than 150 psi unless otherwise shown or specified.
 - b. Use cement mortar lining complying with ANSI A-21.4 or AWWA C205, standard thickness.
- C. Joints:
1. Ductile iron pipe:
 - a. Use push-on joints complying with ANSI A-21.51 for ductile iron.
 - b. Use rubber gaskets and lubricant complying with applicable requirements of ANSI A-21.11.
- D. Fittings and specials:
1. Ductile iron pipe:
 - a. Use fittings and specials suitable for 150 psi pressure rating unless otherwise specified.
 - b. For use with push-on joint pipe, comply with ANSI A21.10 and ANSI 1-21.11.
 - c. Use cement mortar lining complying with ANSI A-21.4, standard thickness.
- E. Valves
1. Gate Vales:
 - a. Use gate valves designed for a working pressure of not less than 150 psi.
 - b. Provide connections as required for the piping in which they are installed.
 - c. Provide a clear waterway equal to the full nominal diameter of the valve, open by turning counter clockwise.
 - d. Provide an arrow on the operating nut or wheel, cast in metal, indicating direction of opening.
 - e. Valves 3" and larger:
 - (1) Design in accordance with AWWA C500, standard, bronze trimmed, on-rising stem, solid wedge disc valves.
 - (2) Buried valves: Provide 2" operating nuts and in a suitable valve box with extension and marked cover.
 - (3) Provide tee handle socket operating wrenches of suitable size.

2.2 VALVE BOXES

- A. Valves 3" and larger:
 - 1. Use service box of cast iron, extension type of the required length, with screw adjustment.
 - 2. Provide the word "WATER" cast into the cover.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FIELD MEASUREMENT

- A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 HANDLING

- A. Handle pipe accessories so as to ensure delivery to the trench in sound, undamaged condition:
 - 1. Carry pipe into position; do not drag.
 - 2. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.
- B. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during laying operations by plugging or other method approved by the Engineer.
- C. Before installation, inspect each piece of pipe and each fitting for defects:
 - 1. Material found to be defective before or after laying: Replace with sound material meeting the specified requirements, and without additional cost to the Owner.
- D. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

3.4 PIPE CUTTING

- A. Cut pipe neatly and without damage to the pipe.
- B. Unless otherwise recommended by the pipe manufacturer, and authorized by the Engineer, cut pipe with mechanical cutter only.
 - 1. Use wheel cutters when practicable.

3.5 LOCATING

- A. Locate water pipe at least ten feet away, horizontally, from sewer pipes.
 - 1. Where bottom of the water pipe will be at least 12" above top of the sewer pipe, locate water pipe at least six feet away, horizontally, from the sewer pipe.
- B. Where water lines cross under gravity-flow sewer lines, fully encase the sewer pipe in concrete for a distance of at least ten feet each side of the crossing, or provide pressure pipe with no joint located within 36" of the crossing.
 - 1. Cross water lines in cases above sewage force mains or inverted siphons at least 24" above the sewer line.
 - 2. Encase in concrete those joints in the sewer main closer, horizontally, than 36" to the crossing.
- C. Do not place water lines in the same trench with sewer lines or electric wiring.

3.6 PLACING AND LAYING

- A. General:

1. Lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other equipment approved by the Engineer.
2. Do not dump or drop any of the materials of this Section into the trench.
3. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.
4. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate bells, couplings, and joints.
5. Take up and relay pipe where the grade or joint was disturbed.
6. Do not lay pipe in water, or when trench conditions are unsuitable for the work; keep water out of the trench until jointing is completed.
7. Securely close open ends of pipe, fittings, and valves when work is not in progress.
8. Where any part of coating or lining is damaged, repair to the approval of the Engineer and at no additional cost to the Owner.

B. Connections: Use specials and fittings to suit the actual conditions where connections are made between new work and existing mains. Use only those specials and fittings approved by the utility having jurisdiction.

C. Sleeves:

1. Where pipe passes through walls of valve pits or structures, provide cast iron wall sleeves.
2. Fill annular space between walls and sleeves with rich cement mortar.
3. Fill annular space between pipe and sleeves with mastic.

3.7 JOINTING

A. Ductile iron pipe, push-on type joints:

1. Install in accordance with AWWA C600, modified as necessary by the recommendation of the manufacturer to provide for special requirements of ductile iron pipe.
2. Make connections between different types of pipe and accessories with transition fittings.
3. Rubber gaskets: Handle, lubricate where necessary, and install in strict accordance with the recommendations of the manufacturer.

3.8 SETTING VALVES AND VALVE BOXES

A. General:

1. Center valve boxes on the valves, setting plumb.
2. Tamp earth fill around each valve box to a distance of four feet on all sides, or to the undisturbed trench face if less than four feet.
3. Tighten stuffing boxes, and fully open and close each valve to assure that all parts are in working condition.

B. Service boxes:

1. Where water lines are located below paved streets having curbs, install boxes directly back of the curbs.
2. Where no curbing exists, install boxes in accessible locations beyond limits of street surfacing, walks and driveways.

3.9 THRUST BLOCKS

A. General:

1. Provide thrust blocks, or metal tie rods and clamps or lugs, on plugs, caps, tees, and bends deflecting 22-1/2 degrees or more either vertically or horizontally, and on water lines 6" in diameter or larger.
2. Provide concrete thrust blocking with a compressive strength of 2500 psi in 28 days.

B. Installation:

1. Locate thrust blocking between solid ground and the fitting to be anchored.
2. Unless otherwise shown or directed by the Engineer, place the base and thrust bearing sides of thrust blocking directly against undisturbed earth.

3. Sides of thrust blocking not subject to thrust may be paced against forms.
4. Place thrust blocking so the fitting joints will be accessible for repair.
5. Protect steel rods and clamps by galvanizing or by coating with bituminous paint.

3.10 TESTING AND INSPECTING

- A. Closing uninspected work: Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been completely inspected and tested, and has been approved by the Engineer.
- B. Hydrostatic tests:
 1. Where any section of a water line is provided with concrete thrust blocking for fittings, do not make hydrostatic tests until at least five days after installation of the concrete thrust blocking, unless otherwise direct by the Engineer.
 2. Devise a method for disposal of waste water from hydrostatic tests, and for disinfection, as approved in advance by the Engineer.
- C. Pressure tests:
 1. After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled leaving the joints exposed for examination, subject the newly laid piping and valved sections of water distribution and service piping to a hydrostatic pressure of 200 psi.
 2. Open and close each valve several times during the test.
 3. Carefully examine exposed pipe, joints, fittings, and valves.
 4. Replace or remake joints showing visible leakage.
 - a. Remove cracked pipe, defective pipe, and cracked or defective joints, fittings, and valves. Replace with sound material and repeat the test until results are satisfactory.
 - b. Make repair and replacement without additional cost to the Owner.
- D. Leakage test:
 1. Leakage tests shall be conducted in accordance with AWWA C-600 except that leakage shall not exceed one-half the amount allowed by AWWA C-600.
- E. Time for making test:
 1. Except for joint material setting, or where concrete reaction backing necessitates a five day delay, pipelines jointed with rubber gaskets, mechanical, or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill.
 2. Cement mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.
- F. Disinfection:
 1. Before acceptance of the potable water system, disinfect each unit of completed water supply, distribution, and service line in accordance with AWWA C601.
 2. Perform all such tests and disinfection in a manner approved by governmental agencies having jurisdiction.
 3. Furnish two copies of a Certificate of Disinfection to the Engineer.

END OF SECTION

SECTION 02721 STORM SEWERAGE SYSTEM**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Conditions of Contract and Division 1 - General Requirements govern work of this Section.
- B. Provide storm sewerage system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- C. Related work specified elsewhere:
 - 1. Section 02200 - Earthwork
 - 2. Section 02221 - Trenching, Backfilling and Compacting

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

- A. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.

PART 2 – PRODUCTS**2.1 PIPE MATERIALS**

- A. General Material Requirements:
 - 1. Pipe, fittings, manholes and appurtenances shall be new materials and shall be of the type, size, strength, and quality as shown on the Drawings and as specified in this Section.
 - 2. Contractor may be requested to secure and deliver to Civil Engineer a written statement from the manufacturer assuring the quality and compliance to the applicable specifications of all materials furnished and installed under this Contract. This shall not relieve the Contractor of responsibilities regarding quality of materials furnished and installed.
- B. Provide pipe and associated materials of the size indicated on the Drawings and meeting the following requirements.
 - 1. Reinforced concrete pipe (RCP): Provide Class 5 complying with ASTM C76.
 - a. Provide rubber type gaskets for concrete pipe, complying with ASTM C433 but with shore durometer hardness, type A 40-55, in lieu of the hardness specified.
 - b. Provide gasket and jointing materials with not more than one splice.
 - 2. Ductile iron pipe: Comply with ANSI A-21.51. Use cement mortar lining complying with ANSI A-21.4 or AWWA C205, standard thickness.
 - 3. Polyvinyl chloride pipe (PVC): Conform to ASTM D 3034 - (SDR 35).
 - a. Either solvent cement or elastomeric gasket joints.
 - 4. Flexible watertight joints:
 - a. Gasket must be approved by the Civil Engineer on the basis of data furnished by the manufacturer.
 - 5. Corrugated High Density Polyethylene Pipe (HDPE) – Conforming to AASHTO M252 Type S, M294 Type S and MP7-97 Type S.

- a. Joints shall incorporate a Polyisoprene gasket meeting ASTM F477 that provides a leak-resistant joint performance.
- b. Pipe shall have a corrugated exterior with a smooth interior.

2.2 DRAINAGE STRUCTURES

A. General:

1. Construct manholes, inlets, and junction structures of reinforced concrete or precast reinforced concrete, complete with metal frames and covers or gratings, and with fixed ladder rungs where indicated on the Drawings or required by codes.
2. Individual wall-mounted aluminum, plastic-covered steel, or galvanized steel rungs are acceptable.

B. Materials:

1. Concrete: Comply with provisions for 3000 psi concrete specified in Section 03300.
2. Mortar for pipe joints and connections to other drainage structures, and manhole construction:
 - a. Comply with requirements of ASTM C270, type M, except the maximum placement time shall be one hour.
 - b. Hydrated lime complying with ASTM C141, type B, may be added to the mixture of sand and cement in an amount equal to 25% of the volume of cement used.
 - c. Provide a quantity of water in the mixture sufficient to produce a stiff workable mortar, which shall be clean and free from harmful acids, alkalis, and organic impurities. Use the mortar within 30 minutes after water is added to the mix.
3. Precast reinforced concrete manholes and catch basins:
 - a. Comply with ASTM C478, precast rings and cone sections.
 - b. Fully bed the joints between precast concrete risers and tops in mortar, and smooth both interior and exterior surfaces uniformly.
 - c. Provide reinforced and bottom open for field pouring to insure slope through structure.
 - d. Standard and "T" manholes and catch basins shall conform to requirements as shown on the Drawings and as specified.
 - e. If the mainline is 42 inches or larger, use precast "T" sections as shown on the detail drawings unless otherwise specified.
 - f. When specifically permitted by the Civil Engineer, precast segmental blocks may be used to build up manholes and/or catch basins. Blocks shall conform to ASTM C139 and shall be radial wall for manholes and circular catch basins.
 - g. Frames and covers (castings) for manholes and catch basins shall be as follows or approved substitute:
 - 1) Storm Sewer Manholes: Neenah Foundry Co. with center pick hole and "Storm Sewer" imprinted on the cover.
 - 2) Catch Basins: Neenah Foundry Co. as shown on Drawings.
4. Riprap - Filter Blanket
 - a. Riprap work shall conform to Local DOT Specification for Hand-Placed Riprap and the following unless otherwise shown on the Drawings:
 - 1) Riprap stones: Provide hand-placed riprap in accordance with Local DOT Specification. Individual stones, except those used for chinking, shall weigh not less than 50 pounds.
 - a) Use only crushed limestone or dolomite.
 - b) Broken concrete, masonry or stone removed from old structures or pavement is not acceptable.
 - 2) Granular filter material: Provide geotextile or granular filter under riprap in accordance with Local DOT Specifications.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 EXCAVATING, TRENCHING, AND BEDDING

- A. Excavate, trench, and bed for site drains in accordance with pertinent provisions of Project Manual, and the following.
- B. Movement of construction machinery:
1. Use means necessary to avoid displacement of, and injury to, pipe and structures while compacting by rolling or operating equipment parallel to the pipe.
 2. Movement of construction machinery over a culvert or storm drain at any stage of construction is solely at the Contractor's risk.
- C. Bedding:
1. Provide a bedding surface for the pipe with a firm foundation of uniform density throughout the entire length of the pipe.
 2. Bed the pipe carefully in a soil foundation accurately shaped and rounded to conform to the lower 1/4 of the outside perimeter of circular pipe, or set the pipe in a bed of sand.
 3. Tamp bedding where necessary.
 4. Provide bell holes and depressions for pipe joints of only the length, depth, and width required for making the particular pipe joint properly.
 5. Where plastic pipe is used, provide a minimum of 4" of sand bedding over the top and under the pipe.

3.3 INSTALLING PIPE

- A. General:
1. Carefully examine each pipe prior to placing.
 - a. Promptly set aside defective pipe and damaged pipe.
 - b. Clearly identify defects.
 - c. Do not install defective pipe or damaged pipe.
 2. Place pipe to the grades and alignment indicated, with a tolerance of one in 1000 vertical and one in 500 horizontal, unless otherwise directed by the Engineer.
 3. Provide adequate facilities for lowering pipe safely into the trenches.
 4. Do not place pipe in water, nor place pipe when trench or weather is unsuitable for such work.
- B. Concrete and clay pipe: Place by proceeding upgrade with the spigot ends of bell and spigot pipe, and the tongue ends of tongue and groove pipe, pointing in the direction of flow.

3.4 JOINTS

- A. Joining concrete pipe and clay pipe:
1. Use the specified mortar ingredients.
 2. Use the mortar within 60 minutes from the time water is first added to the mix.
 3. Wipe the inside of the joint clean and smooth. Perform wiping by dragging a suitable swab or long handled brush through the pipe as installation progresses.
 4. Protect the mortar bead on the outside from air and sun with suitable covering until cured.
 5. Unless otherwise directed by the Engineer, use one of the following methods of jointing for bell and spigot and tongue and groove pipe:
 - a. Cement mortar bell and spigot joint:
 - 1) Bed the first pipe to the established grade line, with the bell end placed upstream.
 - 2) Clean surface of bell with wet brush, and fill lower portion with mortar to such depth as to bring the inner surfaces of the abutting pipes flush and even.
 - 3) Clean the spigot end of each subsequent pipe with a wet brush, and uniformly match the bell so that the sections are closely fitted.

- 4) After laying each section, fill remainder of joint with mortar, and form a bead around the outside of the joint with mortar.
 - 5) Use the specified mortar. If mortar can slump before setting, wrap or bandage the outside of the joint with cheesecloth to retain mortar in place.
- b. Flexible watertight joints:
- 1) Use the specified materials. Equal materials may be used when specifically approved in advance by the Engineer.
 - 2) Install gaskets and joint materials in accordance with the manufacturers' recommendations as approved by the Engineer.
 - 3) Protect from sun, blowing dust, and other deleterious agents at all times.
 - 4) Align the pipe with previously installed pipe, and pull the joint together. If, while making the joint, the gasket or jointing material becomes loose and can be seen through exterior joint recess when joint is pulled to within 1" of closure, remove pipe and remake the joint.
 - 5) Inspect gaskets, and replace loose and improperly affixed gaskets and jointing materials.
- B. Polyvinyl chloride pipe joints: Install with the specified materials and in accordance with the manufacturers' recommendations as approved by the Engineer, applying solvent cement to pipe and fitting as recommended in ASTM D2855.
- C. Joining pipe of different materials: Provide fittings or couplings made for the pipe material jointing, or provide a concrete collar as approved by the Engineer.
- D. Joining pipe of different sizes:
1. Provide reducer fittings to the larger pipe.
 2. Where pipes are different materials as well as different sizes, use the same material for reducer fitting as in the larger pipe.
 3. Use saddle connection when branch lines join a main or collector main.
 4. Use eccentric collar joint when the slope of the pipe is less than 1%.

3.5 DRAINAGE STRUCTURES

- A. Install drainage structures in accordance with the Drawings and with the manufacturers' recommendations as approved by the Engineer.

3.6 BACKFILLING

- A. Backfill and compact above and adjacent to the pipe and structures in accordance with pertinent provisions of the Project Manual, Civil Engineering drawings, or local governmental requirements, which ever is more stringent. In-place density of the backfill material should at a minimum be compacted to 95% of a Standard Proctor Value as determined by ASTM D698.

3.7 TESTING AND INSPECTING

- A. Provide personnel and equipment necessary, and perform tests required to demonstrate that the work of this Section has been completed in accordance with the specified requirements.
- B. Hydrostatic test on watertight joints:
1. Make a hydrostatic test on each watertight joint. Test one sample of each type watertight joint used. If one sample fails because of faulty workmanship, test an additional joint.
 2. Demonstrate that joints in reinforced and unreinforced concrete pipe comply with ASTM C443.
 3. Comply with ASTM C425 for tests of joints in clay pipe.
 4. Make tests in concrete pipe and clay pipe at an internal hydrostatic pressure of 10 psi for 24 hours.
 5. Only joints within the building area and outside the building area but within ten feet of exterior walls or faces of the buildings need be tested.

6. Replace or repair joints found to be faulty. Repeat the test and repair cycle until joints are demonstrated to meet the specified requirements.

END OF SECTION



DIVISION 3
CONCRETE



SECTION 03200 - CONCRETE REINFORCEMENT**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Reinforcing steel bars, welded steel wire fabric for cast-in-place concrete.
- B. Support chairs, bolsters, bar supports and spacer for supporting reinforcement.

1.2 RELATED SECTIONS

- A. Section 03300 – Cast in Place Concrete.
- B. Section 04300 -Unit Masonry System: Reinforcement for masonry.

1.3 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ACI SP-66 - Detailing Manual.
- C. ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement.
- D. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- E. AWS D1.4 - Structural Welding Code - Reinforcing Steel.
- F. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- G. CRSI - Manual of Standard Practice.
- H. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
- I. CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

1.4 QUALITY ASSURANCE

- A. Perform concrete reinforcement work in accordance with CRSI Manual of Standard Practice, and CRSI Documents 63 and 65.
- B. Conform to ACI 301 and ACI SP-66.
- C. Fibrous Reinforcement: Provide Manufacturer's technical representative to instruct concrete supplier in proper batching and mixing of materials to be provided.

1.5 SUBMITTALS

- A. Material and Equipment Submittals:
 - 1. Shop Drawings: Indicate sizes, spacings, locations and quantities of reinforcing steel, wire fabric, bending and cutting schedules, splicing, stirrup spacing, supporting and spacing devices.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade billet-steel and deformed bars, uncoated finish.
- B. Weldable Reinforcing Steel: ASTM A706, 60 ksi yield, deformed bars.

- C. Bar Dowels: ASTM A615, 40 and 60 ksi, plain round and deformed.
- D. Welded Steel Wire Fabric: ASTM A185 plain type.
- E. Steel Wire: ASTM A82, plain, cold drawn steel.

2.2 FIBROUS REINFORCEMENT

- A. Not allowed in concrete slog if finish surface is exposed and is not covered with carpet, vinyl, etc.
- B. Acceptable Manufacturers:
 - 1. W. R. Grace & Co., "Grace Fibers".
 - 2. Fibermesh, Inc., "Fibermesh".
 - 3. Forta Fibre, Inc., "Forta CR".
- C. Collated, fibrillated polypropylene fibers for secondary reinforcing of concrete members (floor slab and sidewalks).
- D. Mix materials in conformance with ASTM C-90.

2.3 ACCESSORY MATERIALS

- A. Tie Wire: Conform to CRSI recommendations.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and spaced for strength and support of reinforcement during installation and placement of concrete; including load bearing pad on bottom to prevent vapor barrier puncture.
- C. Chairs, Bolsters, Bar Supports, Spacers Adjacent to Architectural Concrete Surfaces: plastic coated or stainless steel type; sized and shaped as required.

2.4 FABRICATION

- A. Fabricate in accordance with ACI SP-66, providing concrete cover specified in Section 03300.
- B. Locate reinforcing splices not indicated on Drawings at points of minimum stress. Indicate location of splices on Shop Drawings.
- C. Weld reinforcing bars in accordance with AWS D1.4.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before placing concrete, clean reinforcement of foreign particles or coatings.
- B. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.
- C. Do not displace or damage vapor barrier required by Section 03300.
- D. Place reinforcement to obtain minimum coverages for concrete protection as specified in Section 03300.
- E. Install welded steel wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.2 FIBROUS REINFORCEMENT:

- A. Mix batched concrete in strict accordance with fibrous concrete manufacturer's instructions and recommendations for uniform and complete dispersion.
- B. Use of fibrous reinforcement shall not change water requirements of mix.

3.3 FIELD QUALITY CONTROL CONCRETE REINFORCEMENT

- A. Field inspection and testing will be performed.
- B. Special Structural Testing and Inspection Services: Structural Testing and Inspection shall be performed by qualified parties as specified herein. Include items required by state Building Code and other items that in the professional judgment of the Structural Engineer of Record, are critical to the integrity of the building structure.
- C. Reinforcing Placement: A special inspector shall inspect the placement of reinforcing for footings, slabs-on-grade, and other concrete work scheduled for reinforcing prior to concrete placement.

END OF SECTION

SECTION 03300 – CAST-IN-PLACE CONCRETE**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Formwork, shoring, bracing, anchorage, inserts, embedded items and openings.
- B. Form accessories
- C. Cast-in-place concrete.
- D. Concrete hardener, sealer, and slip-resistant finish coatings.
- E. Concrete curing materials and methods.
- F. Accessories.
- G. Installation of sleeves and blockouts for mechanical and electrical work.
- H. Stripping forms.
- I. Trench Drain.
- J. Tilt-Up Concrete Wall - Alternate

1.2 PRODUCTS FURNISHED AND INSTALLED (BUT SPECIFIED UNDER OTHER SECTIONS)

- A. Section 03200 - Concrete Reinforcement.
- B. Section 04300 -Unit Masonry System: Masonry accessories attached to formwork.
- C. Section 05120 - Structural Steel: Anchorages cast in concrete.
- D. Section 05500 - Metal Fabrications: Steel for embedment into concrete.
- E. Section 09900 - Painting

1.3 PRODUCTS SPECIFIED (BUT FURNISHED AND INSTALLED UNDER OTHER SECTIONS)

- A. Section 05120 - Structural Steel: Non-shrink grout.

1.4 RELATED SECTIONS

- A. Section 04300 - Unit Masonry Systems: Concrete for bond beams and core fill.
- B. Section 05120 - Structural Steel: Anchor bolts and embedded bearing plates for steel joists.
- C. Section 07900 – Building Sealants.

1.5 REFERENCES

- A. AASHTO M182.
- B. ACT 117 – Standard Tolerances for Concrete Construction and Materials.
- C. ACI 301 - Specifications of Structural Concrete for Buildings.
- D. ACI 305R - Hot Weather Concreting.
- E. ACI 306R - Cold Weather Concreting.

- F. ACI 347 - Recommended Practice for Concrete Formwork.
- G. ACI SP-66 - ACI Detailing Manual.
- H. ASTM A53 - Pipe, Steel, Black and Hot Dipped, Zinc-Coated Welded and Seamless.
- I. ASTM A446 - Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process, Structural (Physical) Quality.
- J. ASTM A611 - Steel, Cold Rolled Sheet, Carbon, Structural.
- K. ASTM C31 - Making and Curing Concrete Test Specimens in the Field.
- L. ASTM C33 - Concrete Aggregates.
- M. ASTM C39 - Compressive Strength of Cylindrical Concrete Specimens.
- N. ASTM C42 - Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- O. ASTM C94 - Ready-Mixed Concrete.
- P. ASTM C143 - Slump of Portland Cement Concrete.
- Q. ASTM C150 - Portland Cement.
- R. ASTM C171 - Sheet Materials for Curing Concrete.
- S. ASTM C172 - Sampling Freshly Mixed Concrete.
- T. ASTM C173 - Air Content of Freshly Mixed Concrete by the Volumetric Method.
- U. ASTM C231 - Air Content of Freshly Mixed Concrete by the Pressure Method.
- V. ASTM C260 - Air Entraining Admixtures for Concrete.
- W. ASTM C309 - Liquid Membrane Forming Compounds for Curing Concrete.
- X. ASTM C494 - Chemical Admixtures for Concrete.
- Y. ASTM D1751 - Preformed Expansion Joint Filler for Concrete Paving and Structural construction (Non-extruding and Resilient Bituminous Types).
- Z. ASTM E1155 - Test Method For Determining Floor Flatness and Levelness Using The F-Number System.
- AA. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.
- BB. PS 1-83 -U.S. Product Standard for Construction and Industrial Plywood.
- CC. ASTM C1028 - Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces.
- DD. ADAAG - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities.

1.6 SYSTEM DESCRIPTION

- A. Formwork: Design, engineer and construct formwork, shoring and bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines, and dimensions; and that formwork is able to support vertical and lateral loads until such loads can be supported by concrete structure.

- B. Slab Design Criteria: Min. slab thickness shall be 4", based on a minimum 3,000 PSF soil bearing pressure, 100 PSF uniform floor design load with 400 psf fixture point loading. Engineer of record shall verify slab thickness based on site specific conditions, modify the design criteria thickness as required for site specific conditions and report any deviation from the design criteria to owner's PM.
- C. Tilt-Up Concrete Alternate –
1. If tilt-up panels are cast on the floor, slabs that are exposed in the finished store special care must be taken to protect slabs from damage and staining.
 - a. The "leave out-pour back" must be less than 2'-6" wide or must be the width to first control joint "approx 14 feet" dowel leave-out to slab.
 - b. All forms must be attached to slab with "tapcons" or adhesive. Use of drilled holes and nails is not acceptable.
 - c. All rustication strips, form liners, and accents must be attached with adhesive.
 - d. All panels must be cast with all hollow metal frames and overhead door frames in place.
 - e. All edge forms must be removed prior to lifting. All tapcons must be removed with screw gun to eliminate "pop outs."
 - f. All form debris must be removed from slab immediately.
 - g. Control joints that were caulked must be recut to remove caulk.
 - h. If lifting process damages floor surface then slab must be replaced. Replacement area to be full size of panels defined by control joints. Replacement panel to be doweled to existing slab with 12" x 1/2" diameter smooth dowel spaced 12" o.c. Finish to match adjacent slabs.

1.7 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301, ACI SP-66 and ACI 347.
- B. Maintain copy of ACI 301 on site.
- C. Concrete Floor Finish Applicator: Company specializing in concrete floor surface finishing with three years experience.
- D. Concrete Floor Finishing: Furnish finishing materials in manufacturer's packaging with application instructions.
- E. Cast-in-Place Concrete: Obtain materials from the same source throughout the Work.

1.8 SUBMITTALS

- A. Material and Equipment Submittals:
 1. Mix Design: Indicate proposed mix for design of each class of concrete to Architect review 15 days prior to commencement of work. Do not begin concrete production until mixes have been reviewed and accepted by Architect.
 2. Certification of compliance for each material furnished stating that material conforms to acceptable ASTM standards.
 3. Proprietary materials and items including forming accessories, admixtures, patching compounds, joint systems, curing compounds, dry-shake finish materials. Product conformation to applicable specifications. Submit manufacturers literature.
- B. Quality Control Submittals:
 1. Concrete Delivery Tickets: Indicate quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump and time of batching for each load delivered.
 2. Test Reports: Indicate project identification name and number, concrete placement date, testing service name, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

PART 2 - PRODUCTS

2.1 GENERAL

- A. It is the intention of the designers that the system meet the recommendations of ADAAG for slip resistance using ASTM C1028 as follows:
 - 1. Accessible Routes (as defined by ADAAG): 0.6 static coefficient of friction
 - 2. Ramps (as defined by ADAAG): 0.8 static coefficient of friction

2.2 FORM MATERIALS

- A. Conform to ACI 301 and ACI 347.
- B. Void Forms: Moisture resistant treated paper faces; biodegradable; structurally sufficient to support weight of wet concrete until initial set; 2 inches thick.

2.3 FORMWORK ACCESSORIES

- A. Form Ties: Removable or snap-off metal of adjustable length; 1-1/2" break back dimension; free of defects that will leave holes no larger than 1" diameter in concrete surface.
- B. Form Release Agent: Proprietary mix, colorless material which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
- C. Fillets for Chamfered Corners: 3/4" x 3/4", wood, rigid plastic, metal or rubber type; maximum possible lengths; fabricated to produce uniform smooth lines and tight edge joints.
- D. Nails, Spikes, Lag Bolts, Through Bolts and Anchorages: Sized as required; of strength and character to maintain formwork in place while placing concrete.
- E. Below Grade Pipe Sleeves: ASTM A53, schedule 40, galvanized.

2.4 INTEGRAL JOINT MATERIALS

- A. Joint Filler: ASTM D1751, 1/2" thick, pre-formed, resilient, non-extruding, asphalt impregnated, vegetable fiber and finely divided mineral filler.
- B. Column Isolation Joint Filler: Plastic square type as indicated on the drawings, designed to lock shut around columns, full slab thickness or 2 layers 10 mill polyethylene.

2.5 SEALANTS

- A. Sealant and Primer: Specified in Section 07900.

2.6 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type I, IA, II, III, or IIIA. Single brand and type of cement for all floor slabs.
- B. Fine and Coarse Aggregates: ASTM C33.
 - 1. Local aggregates not complying with ASTM C33, but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to Architect.
- C. Water: Clean and not detrimental to concrete or steel.

2.7 CONCRETE MIX

- A. Provide concrete of characteristics scheduled at end of Section.
- B. Mix and deliver concrete in accordance with ASTM C94.
 - 1. During hot weather, or under conditions promoting rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.

- a. 85 - 90 deg F, reduce mixing and delivery time from 90 to 75minutes.
 - b. 90 deg F and above, reduce mixing and delivery time to 60 minutes.
- C. High Early Strength Concrete: Type III Portland Cement may be used to produce high early strength concrete. Adding additional amounts of Portland Cement to produce high early strength concrete will not be permitted.
 - D. Use accelerating admixtures in cold weather only (below 50 deg F) when approved by Architect. Use of admixtures will not relax cold weather placement requirements.
 - E. Use set-retarding admixtures during hot weather only when approved by Architect.
 - F. Add air entraining agent to concrete mix for concrete work subject to freeze-thaw cycling. Do not use air-entrained concrete for interior floor slabs.
 - G. Water-reducing admixtures may be used in all concrete to reduce unit water content, and to increase slump.
 - H. Water-Cement Ratio: 0.53 maximum for floor slabs.

2.8 ADMIXTURES

- A. Air Entrainment: ASTM C260; "Air-Mix", Euclid Chemical Co; "Protex Air-Entraining Solution", Protex Industries.
- B. Chemical Admixtures: ASTM C494; containing not more than 1% chloride ions and no calcium chloride:
 - 1. Type A - Water Reducing: "Eucon WR-75", Euclid Chemical Co; "Pozzolith 344N", Master Builders; "Plastocrete 160", Sika Chemical Corp; Chemtard", Chem-Masters Corp.
 - 2. Type D - Water Reducing and Retarding: For hot weather use only; "Pozzolith 300-R", MasterBuilders; "Eucon Retarder 75", Euclid Chemical Co; "Daratard", W.R.Grace Co; "Plastiment", Sika Chemical Co.
 - 3. Type E - Water Reducing and Accelerating: "Accelguard 80", Euclid Chemical Co; "Pozzolith 500", MasterBuilders.

2.9 FINISHING MATERIALS

- A. Chemical Hardener: Sealing and Dustproofing. Nox-Crete Duro-Nox (1-800-669-2738).
- B. Finish Coat: Nox-Crete Duro Polish.
- C. Cleaner: Nox-Crete Bio-Clean:

2.10 ACCESSORIES

- A. Vapor Barrier: 10 mil thick clear polyethylene film; type recommended for below grade application. Adhesive-backed polyethylene sealing tape.
- B. Non-shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 7000 psi in 28 days
 - 1. "Masterflow 713", Master Builders
 - 2. "SonnogROUT", Sonneborn-Contech
 - 3. "Euco-NS", Euclid Chemical Co
 - 4. "Five Star Grout, U.S. Grout Co
 - 5. "Duragrout, L&M Construction Chemical Co.

2.11 CURING MATERIALS

- A. Owner Preferred Material for interior slabs to receive hardener/sealer. Nox-Crete Silcoseal 2000 C or 2000 F (1-800-669-2738).
- B. Alternate Membrane Curing Compound: Water based membrane forming curing compound conforming to ASTM C309, Type 1 non-resinous and applicable federal and state solvent emissions standards.

1. Compatibility Requirements: Verify compatibility carpet adhesives and concrete floor finish system. If slabs are scheduled to receive penetrating sealer or sealer/hardener, ceramic tile or quarry tile must be fully removed prior to finish surface install.
2. Acceptable Manufacturers:
 - a. Conspec "High Seal".
 - b. Dayton-Superior "Safe Cure and Seal (J18)".
 - c. Euclid "Aqua Cure VOX".
 - d. Master Builders "Masterkure".
 - e. L & M "Dress & Seal WB".
 - f. Sonneborn "Kure-N-Seal W".

2.14 Bonding Compound: Polyvinyl acetate, re-wettable type Accolade, Euclid Chemical Co.

1. Daraweld C, W.R.Grace
2. Sonocrete, Sonneborne-Contech.

PART 3 - EXECUTION

3.1 COORDINATION

- A. Ensure all work required to be in place, and furnished by other sections, is coordinated and correctly placed prior to concrete placement.

3.2 FORMWORK INSTALLATION

A. Formwork Inspection:

1. Verify lines, elevations and measurements before proceeding with formwork.

B. Formwork Preparation:

1. Earth forms not permitted, unless written approval given by Architect.
2. Minimize form joints. Symmetrically align joints and make water tight to prevent leakage of mortar.
3. Arrange and assemble formwork to permit stripping, so that concrete is not damaged during its removal.
4. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

C. Formwork Erection:

1. Construct formwork to maintain tolerances in accordance with ACI 301.
2. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be over stressed by construction loads.
3. Provide chamfer strips on all exposed external corners.
4. Install void forms. Protect from moisture before concrete placement. Protect from crushing during concrete placement.
5. Build-in sleeves, anchors, inserts, bolts and other devices indicated or required. Provide sleeves 1/2" larger in diameter than piping to be sleeved, unless otherwise indicated. Install sleeves flush with finished surfaces. Coordinate sleeves, thimbles, and other items furnished or set in place by other sections.
6. Do not displace or damage vapor barrier.

D. Preparation of form surfaces:

1. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.
2. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust stained steel formwork is not acceptable.
3. Do not apply form release agent where concrete surfaces are scheduled to receive rough wood texture or special finishes which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

E. Formwork Inserts, Embedded Parts, and Openings:

1. Provide formed openings where required for work embedded in or passing through concrete.
2. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
3. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.
4. Verify lines, elevations and measurement before proceeding with formwork.

F. Formwork Cleaning:

1. Clean forms to remove foreign matter as erection proceeds.
2. During cold weather, remove ice and snow from forms. Do not use de-icing salts, calcium chloride or other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs. Do not use water to clean out completed forms, unless formwork and construction proceed within heated enclosure. Use compressed air to remove foreign matter.

G. Form Removal:

1. Do not remove forms, shoring and bracing until concrete has sufficient strength to support its own weight, and construction and design loads which may be imposed upon it.
2. Remove load supporting forms when concrete has attained 100 percent of required 28 day compressive strength.
3. Strip forms after the following times have elapsed after concrete placement:
 - a. Footings: 24 hours minimum.
 - b. Columns and sides of Beams: 36 hours minimum.
 - c. Structural Slabs and Beam Bottoms: 7 days or when job specimens indicate that the strength is at least 2/3 of design strength, whichever is longer.
4. Reshore structural members due to design requirements or construction conditions to permit successive construction.
5. Remove formwork progressively so no unbalanced loads are imposed on structure.
6. Do not damage concrete surfaces during form removal.
7. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.
8. Exposed Concrete Surfaces:
 - a. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.
 - b. Clean surfaces of forms to be reused in Work.
 - c. Split, frayed, delaminated, patched or damaged form facing material will not be acceptable for exposed surfaces.
 - d. Apply new form coating compound as specified for new formwork.

3.3 VAPOR BARRIER INSTALLATION

- A. Install vapor barrier on top of compactable base under interior slabs on grade. Lap joints minimum 12" and tape seal. Do not disturb or damage vapor barrier while placing concrete. Repair damaged vapor barrier.

3.4 JOINT INSTALLATION

- A. Locate and form expansion control and contraction joints to pattern as shown on Drawings.
- B. Install waterstops continuous without displacing reinforcement.
- C. Place formed construction joints in floor slab pattern placement sequence. Set top screed to required elevations. Secure to resist movement of wet concrete.
- D. Install joint fillers and sealants in accordance with manufacturer's instructions. Use primers of type recommended by joint filler and sealant manufacturer.
- E. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.
- F. Construction Joints:
1. Joints not shown on Drawings to be located so as not to impair strength or appearance of structure, as determined by Architect.
 2. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints. Provide dowels where directed.

3. Roughen and thoroughly clean surface of concrete, remove laitance, and wet surface before placing new concrete against joint. Slush vertical joints with neat cement grout immediately before placing new concrete.
4. Place construction joints in reinforced concrete only as indicated on reinforcing steel shop drawings.

G. Control Joints:

1. Slabs on Grade: Use soft-cut equipment to saw cut control joints as soon as concrete has set sufficiently to allow sawing.
 - a. Max 15 ft. OC EW.
 - b. Depth of cut $\frac{1}{4}$ to $\frac{1}{3}$ of slab thickness
 - c. If concrete slog is poured after columns are set, use "star" pattern at columns to avoid "leave outs."

H. Isolation Joints:

1. Provide isolation joints at interior slabs-retaining walls and columns, exterior slabs on fill to vertical surfaces.
2. Form joint with joint filler from bottom of slab to within $\frac{1}{2}$ " of finished slab surface.

I. Expansion Joints:

1. Locate where indicated on Drawings and where exterior slabs abut restraining walls. Do not run reinforcing through joints. Form joints with joint filler extending full depth of slab, unless otherwise indicated. Hold joint filler $\frac{3}{8}$ " below concrete surface.

3.5 CONCRETE PLACEMENT

A. Inspection:

1. Verify formwork, anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

B. Preparation:

1. Thoroughly clean forms before placing concrete. Dampen masonry and porous earth in contact with concrete. Do not place concrete on water or frozen ground.
2. Prepare previously placed concrete by cleaning with steel brush and thoroughly wet and slush with neat cement grout immediately before placing new concrete.

C. Placing Concrete:

1. Notify Architect minimum 24 hours prior to commencement of concreting operations.
2. Place concrete as close as possible to final position. Prevent segregation. Place with maximum free drop of 5 feet. Compact during placing with internal vibrators (8000 vpm minimum). Work around reinforcement, embedded items and into form corners. Do not use vibrators to transport concrete within forms.
3. Place concrete within one hour after mix water has been added. .
4. Place concrete in accordance with ACI 301.

Cold Weather Placement:

- a. Conform with requirements of ACI 306R.
- b. Protect work from physical damage or reduced strength caused by frost, freezing, or low temperatures.

- c. If at 40 deg F or expected, uniformly heat aggregates and water before mixing, to obtain 50-80 deg F mixture temperature at point of placement.
- d. Do not use frozen materials or materials containing snow or ice, or place on frozen subgrade or subgrade containing frozen materials.
- e. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

Hot Weather Placement:

- a. Conform with requirements of ACI 305R.
- b. Cool ingredients to maintain 90 deg F concrete temperature at time of placement.
- c. Mixing water may be chilled, or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing.
- d. Cover reinforcing steel with water-soaked burlap, to ensure steel temperature will not exceed ambient air temperature immediately before embedment in concrete.
- e. Wet forms thoroughly before placing concrete.
- f. Use water-reducing retarding admixture (Type D) when required by high temperatures.
- g. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.
- h. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect upon discovery.

3.6. EXISTING WORK

- A. Where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-shrinking grout.

3.7 DEFECTIVE CONCRETE

- A. Modify or replace concrete not conforming to required lines, details, and elevations.
- B. Repair may be acceptable to owner. If repairs are not approved by owner, replace concrete not properly placed or of the specified type.
- C. Patch imperfections to match in place concrete.

3.8 TOLERANCES

- A. Float and provide troweled finish in accordance with procedures in ACI 301, Chapter 11 and as recommended by ACI to achieve floor flatness and levelness specified. Uniformly slope to elevations shown on the Drawings to floor drains.
- B. Finished surfaces, other than rooms with floor drains, shall have floor flatness and levelness as determined in accordance with ASTM E1155 as follows:

C. <u>Occupancy</u>	(i) F_F	F_L
	(Flatness)	(Levelness)
Average	30	25
Local Minimums	25	17

- D. A test surface to determine the average value shall be the entire floor.
- E. A test section to determine the minimum local value shall meet the following criteria:
 1. No test section shall measure less than 4 ft. in width nor less than 15 ft. in length.
 2. No portion of the test surface shall be associated with more than one test section
 3. When testing a concrete floor, no test section boundary shall cross any construction joint
- F. Verify floor flatness and levelness of first section within 72 hours of finishing. If floor slab does not meet minimum average values specified, do not proceed with further installations until corrective measures for installation and finishing are made to meet minimum average floor flatness and levelness, and are approved by the Architect.
 - A. Corrective measures, acceptable to the owner, made to floor slabs scheduled to receive finish materials.
 - B. Corrective measures such as grinding, planing, surface repair or retopping will not be permitted for floor slabs scheduled for clear sealer/hardener finish

- C. In areas with floor drains, maintain floor level at walls. Slope surface uniformly to drains or as shown on drawings. Unless shown otherwise on plans.

3.9 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed.
- B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.
- C. Cure cylinders in same proximity to and protected and cured in same manner as in-place concrete from which sample was taken.
- D. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
 - 1. Compression: ASTM C31 specimens, ASTM C39 tests; Four concrete test cylinders will be taken for every 100 or less cu yds of each class of concrete placed each day, or for each 5000 sq. ft of surface area placed.
 - a. One specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
 - b. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.
 - c. Mold and store cylinders for laboratory-cured test specimens, except when field-cured test specimens are required.
 - d. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 - e. Strength level of concrete will be considered satisfactory if averages of sets of two consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.
 - 2. Slump: ASTM C143; one slump test will be taken for each set of test cylinders taken, and one test for each concrete load at point of discharge.
 - 3. Air Content: ASTM A173, volumetric method for lightweight or normal weight concrete; ASTM C231, pressure method for normal weight concrete; one for each set of compressive strength specimens.
 - 4. Concrete Temperature: Test hourly when temperature is 40 deg F and below, and when 80 deg F and above; and each time a set of compression test specimens made.
- E. Test results:
 - 1. Submit test reports with information requested in Submittals portion of this Section.
 - 2. Report in writing on same day tests made.
- F. Additional Tests:
 - 1. Testing service shall make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect.
 - 2. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed.

3.10 CONCRETE FINISHING

- A. Finish concrete floor surfaces in accordance with ACI 301.
- B. Uniformly spread, screed, and float concrete. Do not use grate tempers or mesh rollers. Do not spread concrete by vibration.
- C. Finish floors as scheduled at end of Section.

3.11 CURING

- A. Preferred material for interior slabs only is Nox-Crete Silcoseal 2000 F or Silcoseal 2000C in California.
- B. Silcoseal is easy to remove and meets requirements of ACI 309 for troweled concrete only. When weather conditions are excessively hot and/or windy during concrete placement or 1 day after cure as defined by ACI 305, contractor must wet cure using burlap or burlene for 4 days, or a ACT M 309 Type 1.

- C. Nox-Crete Silcoseal 2000F/C Cure and Bondbreaker. Silcoseal should be applied as a curing agent to the slab as soon as possible (usually after saw cutting crack control joints). Application rates:
 - 1. To cure non tilt-up construction slabs, and/or slabs under roof, apply Silcoseal at approximately 500 SF/Gal.
 - 2. To cure tilt-up construction slabs, and/or slabs with no roof overhead, apply Silcoseal at approximately 300-400 SF/Gal.
 - 3. On tilt-up projects, tilt-up contractor must apply additional bondbreaker coats at recommended coverage rates in technical bulletin.
- D. Maintain minimum ambient temperature at 55 degrees F for 7 days for normal concrete and 3 days for High Early Strength concrete.
- E. Cure formed surfaces by leaving formwork in place during entire curing period, or if forms are removed during curing period, by one of the methods specified below for unformed surfaces.
- F. Keep steel forms heated by sun and wood forms in contact with concrete wet during curing period.
- G. Sealing Compound: Apply after control joints are complete, free water on the surface has disappeared and no water sheen can be seen.
- H. Membrane Curing Compound:
 - 1. Install in accordance with manufacturers' instructions.
 - 2. Membrane curing compounds on surfaces to be covered with the following: liquid chemical hardener, waterproofing, damp proofing, flooring, painting, and other coatings and finish materials must be completely stripped prior to application of floor finish.

3.12 EXPOSED CONCRETE FINISH

- A. Apply concrete hardener and slip-resistant coating/ sealer on floor surfaces as scheduled. Apply in accordance with manufacturer's instructions.
- B. Clean floors prior to application of hardener.
 - 1. Nox-Crete Bio-Clean. Used to clean Silcoseal residue off of slab. Dilute 1 part Bio-Clean with 3 parts water, apply solution at 200 SF/Gal. and scrub floor using a walk-behind or riding-type floor machine equipped with nylon scrub brushes. Rinse slab with clean water and use squeegee to dry.
 - 2. If other membrane curing agent was used, remove as recommended by manufacturer.
- C. Test surface to confirm curing agent was removed.
- D. Apply Duro-Nox, line strip, and one coat Duro-Polish in accordance with manufacturer's instruction.
- E. Floor Hardeners and finishes to be installed during the last week prior to start of fixturing. Except communication and electrical rooms, apply a hardener prior to equipment install - polish not required.
 - 1. Nox-Crete Duro-Nox, Liquid Sealer, Hardener, and Dustproofer. Apply at approximately 200 SF/Gal. per recommendations outlined in Duro-Nox Technical Bulletin.
 - 2. Apply Line Strip Prior to Duro-Polish. See Section 9900-Paint.
 - 3. Nox-Crete Duro Polish. Delivers high gloss, slip resistant surface. Initial Duro-Polish application should be applied undiluted by mop or sponge at approximate rate of 750 SF/Gal.
- F. Maintain floor finishes per manufacturer's instructions until building turnover to the owner.
- G. Close spaces in which sealer is being applied to traffic, and keep closed 48 hours minimum after last application is completed.

3.13 PATCHING AND CLEANING FORMED SURFACES

- A. Patch tie holes and defective areas immediately after form removal.
- B. Clean exposed concrete to remove laitance, efflorescence and stains.
- C. Rough Form Finish: Patch holes and defects; otherwise leave surfaces with texture imparted by forms.

- D. Smooth Form Finish: Patch holes and defects; completely remove fins by rubbing with wood blocks.

3.14 PROTECTION

- A. Protect finished work.
- B. Immediately after placement, protect concrete from premature drying, staining, and mechanical injury.
1. Add lifts. Self-propelled equipment on slog must be "diapered" and wheel "taped."
 2. Provide drop cloths under all operations that could stain concrete—pipe cutting, paint mixing, etc. Check daily for stains under drop cloths and remove as required.
 3. Remove and clean all stains immediately.

PART 4 - SCHEDULES

4.1 FORMWORK SCHEDULE

Location Form Finish Material

Exposed smooth plywood, steel, glass reinforced plastic.

Unexposed semi-smooth lumber, plywood, steel, glass reinforced plastic.

4.2 CONCRETE MIX SCHEDULE

Mix	Strength	Agg	Slump	Air	Type
<u>Min</u>	<u>psi</u>	<u>max</u>	<u>in</u>	<u>%</u>	<u>Weight</u>
A	4000	3/4	3-4	N/A	Standard
B	4000	1/3*	3-4	5-7	Standard
C	3000	1/3*	3-4	N/A	Standard
D	3000	1-1/2	3-5	N/A	Standard
E	3500	1-1/2	2	5-7	Standard
F	3000	3/8	3-5	N/A	Standard

* 1/3 Slab Thickness

4.3 CONCRETE LOCATION SCHEDULE

Mix Location

A All concrete, except as specified below.

B Concrete exposed to weather, except as specified below.

C Slabs on grade.

D Spread and continuous footings.

E Slip formed curbs, etc.

F Fill for masonry lintels and bond beams and fill for steel pan stairs and Interior slabs on permanent metal formwork.

4.4 FLOOR SLAB FINISH SCHEDULE

<u>Finish</u>	<u>Location/Flooring</u>
Trowel	Thin set tile work, resilient flooring, paint, thin film.
Non-Slip	Interior stair treads, platforms and ramps.
Trowel and Polish	All interior exposed concrete surfaces-concrete must have a uniform troweled finish without trowel marks.

4.5 CONCRETE MOISTURE TEST

The design guideline requires that all concrete slabs (both new and existing) be tested for excessive surface alkalinity (ph) and excessive moisture vapor, that the architect of record be notified in advance of such testing and that a certified record of the test results be submitted to the architect. Moisture is to be tested using the Calcium Chloride Moisture Test Kit developed by the Rubber Manufacturers Association with a minimum of one test per 1000 square feet. An acceptable level is LESS THAN 3-lbs of moisture per 1,000 square feet per 24 hours. Surface alkalinity is to be tested using either a pH Paper Test or a Phenolphthalein Test each with a minimum of one test per 1000 square feet. An Acceptable pH reading is a level LESS THAN 9. Neither carpet nor tile is to be installed on a slab testing at unacceptable levels without the written approval of the Construction Manager.

4.6 G.C. to give at least 3-day advance notice to the C.M. and architect of the anticipated pouring of concrete slabs.

END OF SECTION

SECTION 03470 – PRECAST STRUCTURAL CONCRETE (CONCRETE TILT-UP PANELS)**PART 1 - GENERAL****1.1 WORK SPECIFIED HEREIN**

- A. All labor, materials, equipment and services necessary to manufacture, transport and erect all precast structural concrete tilt-up wall panels as indicated or specified. General Contractor to submit to the City for approval the name, manufacturer, and MSDS of the concrete release agent (bond breaker) prior to use.

1.2 QUALITY ASSURANCE

- A. Provisions for concrete testing specified under Section 03300 – Concrete Cast-in-Place, are applicable to the work under this Section.
- B. Tolerances shall conform to Paragraph 4.0 of ACI-117-81.

1.3 SUBMITTALS

- A. Submit shop drawings for all work under this Section. Shop drawings shall show in detail all reinforcing dowels, plates, etc., required as well as method of lifting, location and types of inserts to be used for lifting. Include information affecting other trades, such as locations of openings. Cast no members until shop drawings are reviewed.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Unless specifically specified otherwise, all materials shall conform to requirements specified in other applicable Sections of Division 3 of these Specifications.
- B. General Contractor to submit to city for approval, prior to use, the Name, Manufacturer and MSDS information regarding concrete release agent.
- C. Steel plates, anchors, dowels, etc., shall be from material conforming to ASTM A 36.
- D. Lifting inserts shall have a minimum capacity in tension, pull out and shear equal to 1-1/2 times the dead weight of the member.
- E. Bond breaker used in casting members shall be non-staining and shall be compatible with the specified finish coating. Use waterproof bond breaker where needed due to potential inclement weather.
- F. Bearing pads shall be neoprene, sizes indicated.

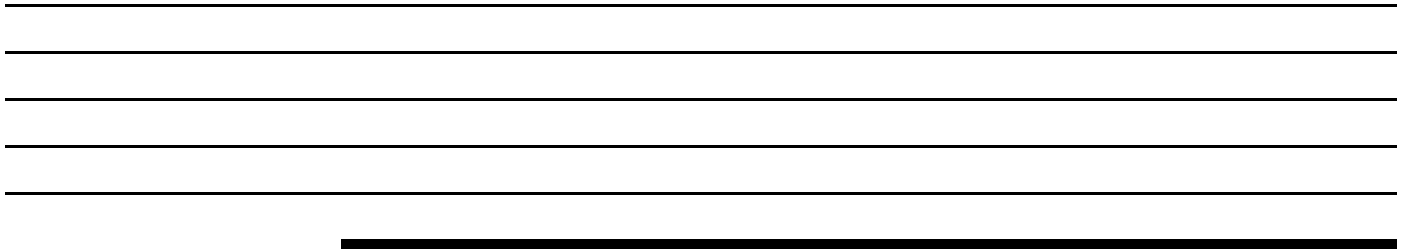
PART 3 - EXECUTION**3.1 WORKMANSHIP**

- A. Members may be cast on floor slabs (only those slab areas where V.C.T. shall be applied) or on a waste slab at General Contractor's option, however, shop drawings shall clearly indicate where members will be cast.
- B. Cast members true and accurate with all miscellaneous bolts, inserts, weld plates, sleeves, blockouts and other items required for connection of structural members or to accommodate the various trade requirements. Provide chamfer edges as detailed. Build in wood nailers, flashing reglets and dovetail anchor slots where required or indicated.
- C. Install lifting inserts in all members adequate in number and capacity to safely handle the dead weight of the members.
- D. Position lifting inserts in members so that tension stresses in concrete due to bending do not exceed 10% of the concrete strength at time of lifting.
- E. All provisions of Section 03300, Cast-in-Place Concrete, of these Specifications shall apply to all work under this Section.

3.2 ERECTION AND INSTALLATION

- A. Erect all members in a workmanlike manner using only competent, experienced workmen.
- B. Make all connections in accordance with the Contract Drawings and reviewed shop drawings.
- C. Do not lift members until a minimum of 7 days old or until concrete has attained a minimum ultimate strength of, f 'c of 3000 PSI as determined by tests, except where higher strength is required due to lifting stresses in members. For lifting of members furnish an adequate spreader with rotating sheaves to keep lifting force approximately equal to all points. Crane capacity shall be a minimum of 175% of weight of member.
- D. Erect members true to line in location indicated. Adequately brace and support members until permanent connections are made.
- E. Perform all welding using only certified welders (certification reviewed during the preceding 12 month period) in accordance with the Contract Drawings and reviewed shop drawings.
- F. Take all necessary precautions to protect members from damage after installation. Remove all wedges, spacers, or other setting appliances which are likely to cause staining of members as soon as practical. Repair or replace any members which do not comply with Contract Documents or reviewed shop drawings.

END OF SECTION



**DIVISION 4
MASONRY**



SECTION 04300 - UNIT MASONRY SYSTEM**PART 1 - GENERAL****1.1 WORK INCLUDED**

- A. Plain and decorative concrete masonry units.
- B. Mortar and grout.
- C. Cavity vents.
- D. Joint reinforcement, anchors, and accessories.
- E. Mortar fill of steel door frames installed in masonry construction.

1.2 PRODUCTS FURNISHED AND INSTALLED (BUT SPECIFIED UNDER OTHER SECTIONS)

- A. Section 03200 – Concrete Reinforcement: Bond beam, lintel and core reinforcement.
- B. Section 05120 – Structural Steel: Anchors embedded in masonry.
- C. Section 05210 – Steel Joists and Joist Girders: Steel bearing pads for joists.
- D. Section 05500 – Metal Fabrications: Loose steel lintels, fabricated steel items.
- E. Section 07200 – Insulation: Granular masonry core fill insulation.
- F. Section 07620 – Roof Related Sheet Metal: Reglets for flashings.

1.3 RELATED SECTIONS

- A. Section 05400 – Cold-Formed Metal Framing; for metal back-up framing for masonry veneer.
- B. Section 07183 – Exterior Finish System: Coating for exterior masonry.
- C. Section 07200 – Insulation: Insulation for exterior walls.
- D. Section 07900 – Building Sealants: Rod and sealant at control and expansion joints.

1.4 REFERENCES

- A. ASTM C67 - Methods of Sampling and Testing Brick and Structural Clay Tile.
- B. ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement.
- C. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM C90 - Hollow Load-Bearing Concrete Masonry Units.
- E. ASTM C144 - Aggregate for Masonry Mortar.
- F. ASTM C150 - Portland Cement.
- G. ASTM C207 - Hydrated Lime for Masonry Purposes.
- H. ASTM C270 - Mortar for Unit Masonry.
- I. ASTM C476 - Grout for Reinforced and Non-Reinforced Masonry.
- J. ASTM C744 - Prefaced Concrete and Calcium Silicate Masonry Units.

- K. ASTM E119 - Fire Tests of Building Construction and Materials.
- L. Uniform Building Code (UBC) - 1994 Edition.
- M. ASTM E447, "Standard Test Method for Compressive Strength of Masonry Prisms".
- N. ACI 530.1/ASCE 6/TMS 602, "Specifications for Masonry Structures".
- O. ASTM C780, "Test Method for Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

1.5 QUALITY ASSURANCE

- A. Independent testing laboratory will perform ongoing inspections during masonry operations under provisions of Section 01400.
- B. Submit documentation indicating compliance with the requirements for the specified compressive strength of masonry is in accordance with one of the following subsections. This testing shall be arranged by Contractor and performed by Owner's testing agency.
 - 1. **Prism Test Method:** in accordance with the requirements of UBC.
 - a. In advance of start of construction: Minimum of one set of five (5) prisms.
 - b. Test one at 3 days, two at 7 days, and two at 28 days.
 - 2. **Unit Strength Method:** in accordance with the requirements of UBC.
 - a. In advance of construction, tests to be performed for compressive strength of units, mortar and masonry grout to show compliance with compressive strength required in UBC Table 21-D.
 - 1) Prior to the start of construction, prism testing conforming to paragraph above may be used in lieu of testing the unit strength.
- C. Prior to the start of masonry construction, arrange and conduct a telephone pre-construction conference with the Project Structural Engineer, masonry subcontractor and masonry inspector present at the same location from where the call is being placed.
- D. Do not use more than one manufacturer for each type of concrete block.
- E. Obtain face brick from one manufacturer.
- F. Do not change source or brands of mortar materials during the course of the work.
- G. Fire Performance Characteristics: Where fire rated construction is indicated, provide materials and construction which are identical to assemblies whose fire endurance has been determined by testing in compliance with ASTM E119.

1.6 SUBMITTALS

- A. Material and Equipment Submittals:
 - 1. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of reinforcement bars. Comply with Section 03200 of this specification. Show bar schedules, diagrams of bent bars and other assemblies as required for fabrication and placement of reinforcement for unit masonry work.
- B. Quality Assurance Submittals:
 - 1. Certificates: Submit manufacturer's certificates that materials meet or exceed specified requirements.
 - 2. Test Reports:
 - a. Submit aggregate reports and mortar mix designs for review not less than 14 days prior to beginning of masonry work. do not start masonry work until aggregate test reports and mortar mix designs have been reviewed by the Structural Engineer.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 deg. F prior to, during, and 48 hours after completion of masonry work.
 - 1. Take precautions as required to protect the Work from damage by the elements. Employ methods which will provide quality equal in every respect to work completed under favorable conditions.
 - 2. At temperatures between 40 deg F and 32 deg F, heat mixing water to produce mortar temperatures between 40 deg F and 120 deg F.
 - 3. At temperatures between 32 deg F and 25 deg F, heat mixing water and sand to produce mortar temperatures between 40 deg F and 120 deg F.
 - 4. Do not use frozen masonry units or materials.
- B. During freezing or near freezing weather lay masonry in strict accordance to the International Masonry Industry's, "Recommended Practices for Cold Weather Masonry Construction."

PART 2 - PRODUCTS**2.1 MORTAR MATERIALS**

- A. Portland Cement: ASTM C150, normal-Type I; white color. Provide white where colored mortar is specified.
- B. Mortar Cement: Contractor may, at his option, use mortar cement manufactured by Lafarge Corporation (No substitution) conforming to the requirements for mortar types specified and complying with the current Uniform Building Code Standard 21-14 for Mortar Cement.
 - 1. Submit current certified test report indicating mortar cement meets UBC requirements for air content, flexural bond strength and compressive strength for each mortar type.
- C. If pre-blended portland cement-hydrated lime is used, submit product data for each mortar type and certification that products contain only portland cement and hydrated lime, and meet ASTM C270, proportion specifications, with maximum air content of 12 percent.
- D. Masonry cements are **NOT** acceptable.
- E. Mortar Aggregate: ASTM C144, standard masonry type; clean, dry, protected against dampness, freezing, and foreign matter.
- F. Grout Course Aggregate: Maximum 3/8" size.
- G. Grout Fine Aggregate: Sand.
- H. Hydrated Lime: ASTM C207, Type S.
- I. Water: Clean and potable.

2.2 CONCRETE MASONRY UNITS

- A. Hollow Load Bearing Units: ASTM C90, Grade N, Type I; lightweight (when possible, to be determined by the Architect) or normal weight; minimum 125 pcf, moisture controlled, manufactured from sand and gravel aggregate conforming to ASTM C33, pressure cured.
- B. Faces of units exposed in finished work shall be of uniform color and texture and free of chips, cracks, or other imperfections detracting from appearance of a sample wall when viewed from a distance of 15 feet.

2.3 BOND PATTERN

Running bond with special coursing and patterns.

- A. Joints: Concave joints.

2.4 MIXES

- A. Mortar for Non-load and Load Bearing Walls and Partitions: ASTM C270, Type S, if preferred, unless Type M required by structural design.
- B. Grout for Reinforced Masonry: ASTM C476.

2.5 MORTAR AND GROUT MIXING

- A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270, 2,500 psi.
- B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C746, 3,000 psi.
- C. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.
- D. Do not use anti-freeze compounds to lower the freezing point of mortar or grout.
- E. If water is lost by evaporation, retemper within two hours of mixing. Do not retemper mortar after two hours of mixing.
- F. Do not retemper colored mortar.

2.6 REINFORCEMENT AND ANCHORAGES

- A. **Single Wythe Joint Reinforcement:** Truss type; hot-dipped galvanized to comply with ASTM A153, Class B-2 coating; 9 gage side rods and cross ties. Provide preformed corners and tees.
 - 1. A.A. Wire Products, Blok-Trus AA600.
 - 2. Dur-O-Wal, Inc., Dur-O-Wal Truss.
 - 3. Hohman and Barnard, Inc., Lox-All No. 125 Truss-Mesh.
 - 1. Masonry Reinforcing Corporation of America, Series 300, Single Wythe Truss Type.
- B. **Multiple Wythe Joint Reinforcement:** Truss type; hot-dipped galvanized to comply with ASTM A153, Class B-2 coating; 9 gage side rods and cross ties.
 - 1. A.A. Wire Products, 3 Wire Blok-Trus AA610.
 - 2. Dur-O-Wal, Inc., Dur-O-Wal Cavity Truss Trirod.
 - 3. Masonry Reinforcing Corporation of America, Series 300, Three Wire Cavity Truss Type.
- C. **Adjustable Wall Ties (Stone to Concrete Block):** Truss type reinforcement for back-up wyth with 3/16" diameter adjustable wall tie eye sections at 16" oc. Provide 3/16" dia. rectangular type ties with pintle legs which allow up to 1-1/4" misalignment in bed joints. When pintle is inserted in eye, maximum allowable "play" is 1/16". Hot dipped galvanized to comply with ASTM A153, Class B-2 coating having a minimum of 1.50 oz. of zinc per sq. ft.
 - 1. Dur-O-Wal, Inc., #9 Dur-O-Eye.
 - 2. Hohman and Barnard, Inc., Lox-All No. 170 Adjustable Eye-Wire.
- D. **Rigid Wall Anchors (Intersecting Masonry Walls Erected Separately):** Rigid steel anchors fabricated from 1/4" x 1-1/2" bar stock, at least 2'-0" long with ends turned up 2"; hot dipped galvanized to comply with ASTM A153, Class B-2 coating.
 - 1. A.A. Wire Products.
 - 2. Dur-O-Wal, Inc.
 - 3. Hohman and Barnard, Inc.
 - 4. Masonry Reinforcing Corporation of America.

- E. **Trapezoidal Ties and Column Anchors (Concrete Block Masonry Secured to Columns):** 1/4" diameter brite galvanized steel anchors welded to steel column, and 1/4" steel beam ties, hot dipped galvanized to comply with ASTM A153, Class B-2 coating; size for 8" concrete block.
1. A.A. Wire Products.
 2. Dur-O-Wall, Inc.
 3. Hohman and Barnard, Inc.
 4. Masonry Reinforcing Corporation of America.
- F. **Veneer Anchors (Stone to Steel Studs):** Two piece adjustable type; hot dipped galvanized to comply with ASTM A153, Class B-2 coating; 3/16" wire tie with 14 gage strap anchor for screw attachment with 1-1/4" minimum cadmium plated screws, 2 per anchor. Size wire tie to extend within 1" of veneer face.
1. Hohman and Barnard, Type DW-10.
 2. Dur-O-Wall, Inc., D/A 213.
- G. **Veneer Anchors (Masonry Facing to Sheathing Backup, Cavity Wall Construction):** Two piece adjustable type; hot dipped galvanized to comply with ASTM A153, Class B-2 coating; 3/16" wire tie with 14 gage strap anchor for screw attachment with 1-1/4" minimum cadmium plated screws, 2 per anchor. Size wire tie to extend within 1" of veneer face.
1. Heckmann Building Products, Inc., 315-D
 2. Hohman and Barnard, Type DW-10.
 3. Dur-O-Wall, Inc., D/A 213.
- H. **Dovetail Triangular ties:** 12 gage anchors with standard anchor slot, hot dipped galvanized to comply with ASTM A153, Class B-2 coating. Provide ASTM A82, 1/4" diameter triangular dovetail anchor.
1. A.A. Wire Products.
 2. Dur-O-Wall, Inc.
 3. Hohman and Barnard, Inc.
 4. Masonry Reinforcing Corporation of America.
- I. **Reinforcing Steel:** Type specified in Section 03200; size as shown on Drawings.

2.7 INSULATION

- A. Masonry Core Insulation: **INSUL-6** as specified in Section 07200.

2.8 MASONRY FLASHINGS

- A. **Plastic Flashings:** Sheet polyvinylchloride; 20 mil thick, black.
1. AFCO "V-Seal".
 2. Nervastral Inc., "Nervastral HD".
 3. Sandell "Nu-flex PVC Flashing."
 4. Sonneborn-Contech, Hydrocide Vinyl Seal.
 5. York Manufacturing, Wascoseal Type 20.

2.9 CAVITY VENTS

- A. Block Vents: Nominal 16" wide x 8" high x 4" deep, cast aluminum fixed louver box and blades, insect screen, drips top and bottom, internal water dam. Baked enamel finish.
1. Airolite, Type A-14.
 2. Construction Specialties, Model 23 Ex.
 3. Industrial Louvers, Model 117.

2.10 ACCESSORIES

- A. Bond Breaker Strips: 15 lb., asphalt saturated felt building paper.

- B. Weep Holes: Woven Polymer

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify items provided by other Sections of work are properly sized and located.
- B. Establish lines, elevations, and coursing. Protect from disturbance.
- C. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing.

3.2 INSTALLATION - GENERAL

- A. Do not wet concrete masonry units.

3.3 COURSING

- A. Place masonry to lines and elevations indicated.
- B. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
- C. Lay concrete masonry units in running bond. Course one block unit and one mortar joint to equal 8".
 1. Form concave mortar joints in exposed surfaces.
 2. Form concave joints in exterior surfaces below grade.
 3. Vertical Scored CMU: form raked joints depth to match scoring in cmu units. Form horizontal joints with "weathered" joint
 4. Flush cut joints not tooled and not exposed to view.

3.4 PLACING AND BONDING

- A. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints are not permitted.
- B. Fully bond intersections, and external and internal corners.
- C. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.
- D. Remove excess mortar.
- E. Perform jobsite cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.
- F. Isolate masonry partitions from vertical structural framing members with a control joint.

3.5 REINFORCEMENT AND ANCHORAGES

- A. Before placing concrete, clean reinforcement of foreign particles or coatings.
- B. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.
- C. Install horizontal joint reinforcement 16" oc., unless otherwise indicated
- D. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend 16" minimum each side of opening.
- E. Place joint reinforcement continuous in first and second joint below top of walls.
- F. Lap joint reinforcement ends minimum 6". Extend 16" minimum each side of opening.

- G. Place reinforcing bars supported and secured against displacement. Maintain position within 1/2" of true dimension.
- H. Place reinforcement to obtain minimum coverages for concrete protection as required.
- I. Verify that anchorages embedded in concrete or attached to structural steel members are properly placed. Embed anchorages in every second joint.
- J. Place veneer wall ties maximum 16" oc vertically and 24" oc horizontally. Stagger veneer ties in alternate courses. Place at maximum 3" oc each way around perimeter of openings, within 12" of openings.
- K. Reinforce joint corners and intersections with strap anchors 16" oc.
- L. Lap bar reinforcement min 40 bar diameters or as specified on structural

3.6 MASONRY FLASHINGS

- A. Extend flashings through veneer, turn up minimum 8" and bed into mortar joints of masonry back-up. Lap bar reinforcement min 40 diameters or as specified on structural.
- B. Extend flashings through veneer, turn up minimum 8" onto gypsum sheathing and lap with building paper at steel stud back-up.
- C. Lap end joints minimum 6" and seal watertight.
- D. Use flashing manufacturer's recommended adhesive.

3.7 LINTELS

- A. Install loose steel lintels.
- B. Install reinforced unit masonry lintels over openings where steel lintels are not scheduled. Construct lintels using grout fill and reinforcing.
- C. Use reinforcing bars of one piece lengths only.
- D. Place and consolidate grout fill without disturbing reinforcing.

3.8 GROUTED COMPONENTS

- A. Reinforce bond beam with reinforcing bars one inch from bottom web or as shown.
- B. Grouting vertical cores- comply with requirements for high or low lift grouting. Stop grouting at midpoint of a block for each lift.
- C. Place and consolidate grout fill without disturbing reinforcing.
- D. At bearing points, fill masonry cores with grout minimum 16" from opening.
- E. Provide reinforced concrete block lintels and bond beams as indicated on the Drawings or specified herein. Use reinforced concrete block lintels at all openings in concrete block walls less than 4'-0", including openings for mechanical and electrical work not specifically indicated to have other types of lintels. do not use concrete block bond beams with break-out webs as lintel beams at masonry wall openings.
- F. Support and tie reinforcing in place with a minimum of 3/4" between reinforcing and block shells. Build in anchors and other accessories.
- G. Fill with concrete core fill as specified under Section 03300.

3.9 CONTROL JOINTS

- A. Do not continue horizontal joint reinforcing across control joints, unless otherwise indicated.
- B. Provide control joints as indicated on the Drawings, but not over 24 feet on center. Construct control joints using keyed sash block and preformed resilient keys. Install resilient keys in accordance with the manufacturer's recommendations.

3.10 CORE FILL INSULATION

- A. Verify holes and openings have been sealed to prevent escape of insulation. Ensure spaces are free of mortar to allow installation of insulation.
- B. Place insulation in walls, in accordance with manufacturer's instructions. Completely fill spaces.

3.11 BUILT-IN WORK

- A. As work progresses, build-in metal door frames, lintels, anchor bolts, plates, and other items to be built in the work supplied by other Sections.
- B. Build-in items plumb and level.
- C. Bed anchors of metal door and sidelight frames in mortar joints. Fill frame voids solid with mortar. Fill masonry cores with grout minimum 12" from framed openings.
- D. Do not build-inorganic materials subject to deterioration.

3.12 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, and sleeves. Cooperate with other Sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.

3.13 STOPPING AND RESUMING WORK

- A. Rack back in each course; toothing not permitted. Remove loose units and mortar interfering with fresh mortar bed when joining fresh masonry to set or partially set masonry.

3.14 TOLERANCES

- A. Alignment of Columns: Maximum 1/4" from true line.
- B. Variation from Unit to Adjacent Unit: 1/32" maximum.
- C. Variation from Plane of Wall: 1/4" in 10 feet and 1/2" in 20 feet or more.
- D. Variation from Plumb: 1/4" per story.
- E. Variation from Level Coursing: 1/8" in 3 feet; 1/4" in 10 feet; 1/2" maximum.
- F. Variation of Joint Thickness: 1/8" in 3 feet.
- G. Maximum Variation from Cross Sectional Thickness of Walls: Plus or minus 1/4".

3.15 CLEANING

- A. Remove excess mortar, dirt, and smears.
- B. Replace defective mortar. Match adjacent work.

- C. Promptly remove excess wet mortar from the face of the stone as work progresses. Clean stone masonry with a stiff nylon brush and clean water only. If it is necessary to clean stonework with chemicals, Specialty Proprietary Cleaners such as Tex Tral Light Colored Masonry & Stone Cleaner or equal used in proper dilution are the recommended cleaning products for use on the limestone when used in accordance with the Chemical Manufacturer's recommended cleaning practices according to the Chemical Manufacturer's Recommendations. Please consult your Upchurch Kimbrough representative for cleaning details and recommendations.

Supplied by Upchurch Kimbrough Company, 7401 Westview, Houston, TX 77055, phone: 713-957-1520, fax: 713-957-1268, contact Tanya Bryan

- D. Use non-metallic tools in cleaning operations.

3.16 PROTECTION

- A. Protect finished installation.
- B. Maintain protective boards at exposed external corners which may be damaged by construction activities.
- C. Provide protection without damaging completed work.
- D. At each day's end, roof covering is installed min cover 10 mill poly continuous over top of wall and extended 2' beyond face of wall on each side. Hold in place with continuous plank at masonry units as required.

3.17 MASONRY SCHEDULE

- A. Masonry unit designations as indicated on Drawings.

END OF SECTION

SECTION 04320 – STONE VENEER**PART 1 – INSTALLATION RECOMMENDATIONS – THIN STONE VENEER**

Flat and corner pieces are used for most installations. Flats are applied to the flat wall surface and ordered in square feet. Corners are applied to outside corners and are ordered in linear feet. Using corners around window and door openings provides added dimension, depth, enhances the finished design and can be ordered on per-job basis.

1. Preparing the Surface

Over sheetrock, wall board, paneling, plywood, other rigid wood-related sheathing or rigid insulation board

Cover the wall surface with weather-resistance barrier. The barrier shall be equal to that provided for in the U.B.C. Standard NO. 14-1 for kraft waterproof building paper of asphalt-saturated rag felt. The building paper or felt shall be applied horizontally with the upper layer lapped over the lower layer not less than 6 inches.

Then install 2.5 lb. (or heavier) diamond mesh expanded metal lath. Use galvanized lath for exterior applications. Black metal lath (non-galvanized) may be used for interior applications. Overlap lath sides by not less than ½” and lath ends by not less than 1 inch. Attach the lath using galvanized nails or staples 6” on center vertically and 16” on center small cups pointing upwards. Double wrap metal lath with a minimum of 16” around all inside and outside corners. Then apply a 1/2” thick scratch coat of mortar over the metal lath and allow it to set. Mortar can either be type N or S.

Over clean unpainted, unsealed, untreated brick, block, concrete or other masonry surfaces

No surface preparation is necessary.

Over painted, sealed or treated brick, block, concrete or other masonry surfaces

The surface must either a) be cleaned back to the original surface by sandblasting, water blasting, acid etching or wire brushing, b) have metal lath attached using corrosion resistant concrete nails with a scratch coat applied over the metal lath.

2. Preparing the Mortar

Mortar should be mixed to a workable consistency.

A. Mortar mix for standard installation – use type N or type S mortar mix as follows:

1. Mix type N mortar:

2 parts type N masonry cement
3 to 5 parts masonry sand
Water

Or

1 part Portland cement
1 part Lime
3 to 5 parts masonry sand
Water

2. Mix type S mortar:

3 parts type S masonry cement
5 to 7 parts masonry sand
Water

Or

2 parts Portland cement
1 part Lime
5 to 7 parts masonry sand
Water

If additional strength is desired in the mortar a latex thinset mortar (such as Lata-Crete products) or an acrylic bonder (such as Acryl-Coat from US Spec) may also be used as components.

B. Latex Thinset Mix

3 parts Portland cement
2 parts latex thinset mortar
7 parts masonry sand
Water

C. Bonding Agent Mix

3 parts type S masonry cement
7 parts masonry sand
Bonding agent and Water (preblended 1:1)

3. Applying the Stone

A. Setting the Stone – Using a mason’s trowel, apply approx. ½” thick even layer of mortar to the entire back of the stone. Then press the stone firmly into place on the prepared wall surface squeezing the mortar out around all edges. Using a gentle wiggling action or tapping of stone will ensure a good bond.

For joint less/dry-stacked installations, it’s important when setting the stone that the edges of the stone are properly sealed with mortar to ensure satisfactory bond.

If the stone is being installed onto a very dry surface or in a hot/dry climate the wall surface should be wet to prevent excessive absorption of moisture from the mortar. This can be done by spraying or brushing TYG water onto the wall surface. The wall surface should be allowed to dry for a few minutes after wetting to eliminate excess surface water.

B. Grouting the Joints – After the stone has been applied to the wall surface, use a grout bag to fill the joints with mortar, forcing grout into any voids. Any mortar that accidentally gets on the same stone should be allowed to set until dry and crumbly, and then brushed off with a dry whisk broom.

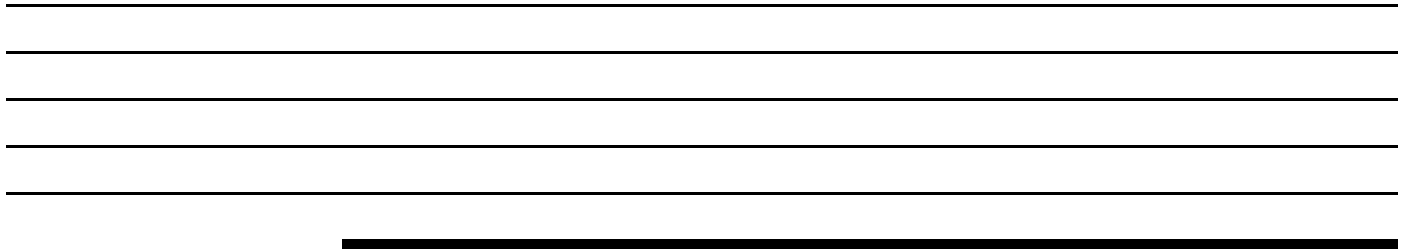
C. “Dry Stack Look” – We recommend grouting to fill noticeable void and to conceal cut or broken cut or broken stone edges. Approx. ½ amount of grout as for “jointed look”. The “dry stack” appearance will result from deep striking of the joints.

D. Finishing the Joints – When the mortar joints become firm (normally 30-60 minutes), use a wooden or metal striking tool to rake out the excess mortar to the desired depth while at the same forcing the mortar into the joints so as to thoroughly seal the stone edges. Be careful not to work the joints too soon or the mortar will smear. After working the joints, use a whisk broom to smooth the joints and clean away any loose mortar from the joints and stone face.

Note:

- It is important to divert water run-off away from stone surfaces by using cant strip, gutters and flashing. Water run-off combined with severe freeze-thaw conditions can result in damage. Stone should not be used below water level.
- Do not install in temperatures below 40 Fahrenheit. Provide supplemental heat if necessary to ensure a minimum of 40 Fahrenheit temperature between installation and mortar drying approx. 24 hours.
- General contractor to provide a complete 4’ x 8’ stone mock-up with specified field stone and 2’ x 3’ paving stone material.

END OF SECTION



**DIVISION 5
METAL**



SECTION 05120 - STRUCTURAL STEEL**PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Structural steel framing members, structural steel support members, required bracing, welds, fasteners and base plates.

1.2 PRODUCTS SPECIFIED AND FURNISHED (BUT INSTALLED UNDER OTHER SECTIONS)

- A. Section 03300 – Cast-In-Place Concrete: Anchors cast in concrete.
- B. Section 04300 - Unit Masonry System: Anchors embedded in masonry.

1.3 RELATED SECTION(S)

- A. Section 05500 - Metal Fabrications: Non-structural framed openings and miscellaneous architectural fabrications.

1.4 REFERENCES

- A. ASTM A6 - Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use.
- B. ASTM A36 - Structural Steel.
- C. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
- D. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
- E. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- F. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- G. ASTM A490 -Heat-Treated Steel Structural Bolts, 150 KSI Minimum Tensile Strength.
- H. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- I. ASTM A572 – Specification For High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- J. ASTM E94 - Practice for Radiographic Testing.
- K. ASTM E142 - Controlling Quality of Radiographic Testing.
- L. ASTM E164 - Practice for Ultrasonic Contact Examination of Weldments.
- M. ASTM E709 - Practice for Magnetic Particle Examination.
- N. AWS D1.1 - Structural Welding Code - Steel.
- O. AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- P. AISC - Code of Standard Practice for Structural Steel Buildings and Bridges.
- Q. AISC - Specifications for Structural Steel Joints using ASTM A325 or ASTM A490 Bolts.
- R. FF-S-325 - Shield, Expansion; Nail, Expansion; And Nail, Drive Screw (Devices, Anchoring, Masonry).

1.5 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the following, except as otherwise indicated:

- B. AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", including "Commentary" and Supplements thereto as issued.
- C. AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
- D. AWS D1.1 Structural Welding Code - Steel.
- E. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".
- F. Qualifications for Welding Work: Quality welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
- G. Provide certification that welders to be employed in work have satisfactorily passed AWS qualifications tests. If recertification of welders is required, retesting will be contractor's responsibility.

1.6 SUBMITTALS

- A. Material and Equipment Submittals:
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, and locations of structural members, connections, attachments, fasteners, cambers, and loads.
 - 2. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.
 - 3. Prepare shop drawings under supervision of a Professional Structural Engineer registered in the State where Project is located.
- C. Quality Assurance Submittals:
 - 1. Test Reports: Submit reports of tests conducted on shop and field bolted and welded connections. Include data indicating locations of connection tested, type(s) of test conducted, and test results.
 - 2. Certificates: Submit certification indicating that welders employed in work have passed AWS qualification tests.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Structural Steel Members: ASTM A36 or ASTM A572 see structural drawings.
- B. Structural Tubing: ASTM A501.
- C. Bolts, Nuts, and Washers: ASTM A325 or ASTM A490.
- D. Anchor Bolts: ASTM A36 or A307.
- E. Expansion Bolts: Stud type with 2 independent expansion wedges, zinc plated in accordance with ASTM B633, SCI, Type 3. Conform to FF-S-325, Group II, Type 4, Class 1. Hilti Fastening Systems, "Hilti Kwik Bolt".
- F. Welding Materials: AWS D1.1; type required for materials being welded.
- G. Grout: Non-metallic, non-shrink grout; Euclid, Euco N-S Grout; Grace, Non-Metallic Grout; Master Builders, Masterflow 713 Grout; Sonneborn, SonogROUT; US Grout Company, Five Star Grout.
- H. Primer: Fabricators standard rust-inhibitive, primer, 2.0 mils dry film thickness. Color: Gray.
- I. Fabricator to certify that primer is acceptable and compatible to fireproofing manufacturers product.

- J. Electrodes: E70, Section 1.17, AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings and AWS D1.1, Structural Welding Code - Steel.

2.2 FABRICATION

- A. Fabricate structural steel members in accordance with AISC Specifications.
- B. Roof Opening Structural Steel Frames: ASTM A36, carbon steel headers, with extended leg anchors welded in place.

2.3 FINISH

- A. Clean, prepare, and shop prime structural steel members. Do not prime surfaces to be field welded, to receive cementitious fireproofing, or in contact with concrete.

PART 3 - EXECUTION

3.1 ERECTION

- A. Erect structural steel in accordance with AISC Specifications.
- B. Make provision for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Do not field cut or alter structural members without approval of Architect.
- D. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete. Use a primer consistent with shop coat.
- E. Shim and level baseplates and bearing plates to be grouted, with steel shims or leveling nuts and washers. Support structural steel bearing on masonry walls on a full bed of grout.
- F. Roof Opening Structural Steel Frames: Maintain opening size, keeping all corners square. Secure by welding to structure.

3.2 QUALITY CONTROL

- A. Field inspection and testing will be performed.
- B. Special Structural Testing and Inspection Services: Structural Testing and Inspection shall be performed by qualified parties as specified herein. Include items required by the current Building Code, and other items, which in the professional judgement of the Structural Engineer of Record, are critical to the integrity of the building structure.
- C. Testing and inspection agency to inspect high-strength bolted and welded connections, perform tests, and prepare reports. Testing agency shall conduct and interpret tests and report whether test specimens comply with requirements.
- D. Bolted Connections: Inspect shop and field bolted and welded connections according to AISC specifications.
- E. Welded Connections: Inspect and test shop and field welded connections during fabrication and erection as follows: Visually inspect all welds.

END OF SECTION

SECTION 05210 - STEEL JOISTS AND JOIST GIRDERS**PART 1 - GENERAL****1.1 WORK INCLUDED**

- A. Open web steel joists and joist girders, with bridging, attached bearing plates, angles, and anchors.

1.2 PRODUCTS SPECIFIED AND FURNISHED (BUT INSTALLED UNDER OTHER SECTIONS)

- A. Section 03300 – Cast-In-Place Concrete: Anchors cast in concrete.
- B. Section 04300 - Unit Masonry System: Anchors embedded in masonry.

1.3 RELATED SECTIONS

- A. Section 05120 - Structural Steel.
- B. Section 05311 - Steel Deck.
- C. Section 05500 - Metal Fabrications: Structural framed openings.

1.4 REFERENCES

- A. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- B. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- C. ASTM A490 - Heat-Treated Structural Steel Bolts, 150 KSI Minimum Tensile Strength.
- D. AWS D1.1 - Structural Welding Code - Steel.
- E. SJI - Standard Specifications for Open Web Steel Joists K-Series.
- F. SJI - Standard Specifications for Joist Girders.

1.5 PREFERRED VENDOR PROGRAM

- A. Owner Preferred Vendor for this product is SMI Joist Co., - Arkansas, 3565 Highway 32 North, Hope, AR 71801, Contact: Cliff Knowles, Telephone 800.643.1577, FAX 800.427.4272.

1.6 QUALITY ASSURANCE

- A. Conform to SJI Standard Specifications, Load Tables, and Weight Tables for Open Web Steel Joists, K Series.
- B. Conform to SJI Standard Specifications for Joist Girders.
- C. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS Standard Qualification Procedure.
- D. Welders to be employed in work shall have satisfactorily passed AWS qualifications tests. If recertification of welders is required, retesting will be contractor's responsibility.

1.7 SUBMITTALS

- A. Material and Equipment Submittals:
 - 1. Shop Drawings:
 - a. Indicate standard designations, configuration, sizes, spacing, and locations of joists, joist coding, bridging, connections, attachments, and cambers. Indicate size and spacing of holes in chords for securing wood nailers

and other work. Deduct area of holes from the area of the chord when calculating strength of the member. Submit calculations for joists with other than uniform top chord loadings, and for all joist girders. Calculation submittal is for Architect's records, not for review.

- b. Prepare shop drawings and calculations under seal of a Professional Structural Engineer registered in State where Project is located.

B. Quality Assurance Submittals:

1. Shop Drawings: Submit reports of tests conducted on field bolted and welded connections. Include data indicating locations of connection tested, type(s) of test conducted, and test results.
2. Certification: Submit certification indicating that welders employed in work have passed AWS qualification tests.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Comply with SJI Standard Specifications.
- B. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular hexagon type, low carbon steel.
- C. High-Strength Threaded Fasteners: ASTM A325 or A490, heavy hexagon structural bolts with nuts and hardened washers.
- D. Primer: Comply with SJI Standard Specifications. Color: Gray.
 1. Joist manufacturer to certify that primer is acceptable and compatible to fireproofing manufacturers product.
- E. Grout: Provide Non-metallic, non-shrink grout; Euclid, Euco N-S Grout; Grace, Non-Metallic Grout; Master Builders, Masterflow 713 Grout; Sonneborn, SonogROUT; US Grout Company, Five Star Grout.

2.2 FABRICATION

- A. Fabricate steel joists and joist girders in accordance with SJI Standard Specifications including headers, bridging, and other supplementary framing.
- B. Provide bottom and top joist chord extensions indicated or required.
- C. Provide holes in chord members where shown for securing other work to steel joists.
- D. Camber joists and joist girders to maximum SJI recommendations.
- E. Prepare and shop prime with one coat of primer. Provide a continuous dry paint film of not less than 1.5 mils. Do not prime surfaces to receive cementitious fireproofing or to be field welded or in contact with concrete.

PART 3 - EXECUTION

3.1 ERECTION

- A. Erect steel joists and joist girders in accordance with SJI Standard Specifications.
- B. Bear joists and joist girders on supports in accordance with SJI.
- C. During erection, provide temporary bracing for induced loads and stresses.
- D. Coordinate placement of anchorages in concrete and masonry construction for securing bearing plates and angles.
- E. Field weld joist seat to placed bearing plates or angles after alignment, positioning after installation of bridging in accordance with SJI specifications.
- F. Do not permit erection of decking until joists are braced and bridged.

- G. Do not field cut or alter joists without approval of Architect.
- H. After erection, prime welds, abrasions, and surfaces not primed. Use primer consistent with shop coat.

3.2 QUALITY CONTROL

- A. Field inspection and testing will be performed.
- B. Special Structural Testing and Inspection Services: Structural Testing and Inspection shall be performed by qualified parties as specified herein, and in accordance with the provisions of Section 01400. Include items required by the current Building Code, and other items which in the professional judgement of the Structural Engineer of Record, are critical to the integrity of the building structure..
- C. Testing and inspection agency to inspect bolted and welded connections, and prepare reports. Testing agency shall conduct and interpret inspections and report on compliance with requirements.
- D. Field Bolted Connections: Inspect in accordance with SJI and AISC specifications.
- E. Field Welding: Inspect and test during erection of joist and joist girders as follows:
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - 2. Perform visual inspection on all welds.

END OF SECTION

SECTION 05311 - STEEL DECK**PART 1 - GENERAL****1.1 WORK INCLUDED**

- A. Steel roof deck, fasteners and accessories.

1.2 RELATED SECTIONS

- A. Section 05120 - Structural Steel: Bearing plates and angles for metal decking, including anchorage.
- B. Section 05210 - Steel Joists and Joist Girders Steel joist erection.
- C. Section 05500 - Metal Fabrications: Steel frames for roof openings.

1.3 REFERENCES

- A. AISI - Specification for the Design of Cold-Formed Steel Structural Members.
- B. ASTM A611 - Steel, Cold-Rolled Sheet, Carbon, Structural.
- D. AWS D1.1 - Structural Welding Code - Steel.
- E. AWS D1.3 - Specification for Sheet Steel in Structures.
- F. FM Approval Guide - Equipment, Materials, Services for Conservation of Property.
- G. FM Loss Prevention Data 1-28 - Insulated Steel Deck.
- H. SDI - Design Manual for Composite Decks, Form Decks, Roof Decks.

1.4 REGULATORY REQUIREMENTS

- A. Factory Mutual Engineering Corporation (FM): Provide metal roof decking as listed in FM Approval Guide, and conforming to Loss Prevention Data 1-28, Class 1 Insulated Steel Deck Roof System.

1.5 SUBMITTALS

- A. Material and Equipment Submittals:
 - 1. Shop Drawings:
 - a. Indicate decking plan, deck profile dimensions, supports, projections, openings, finishes, pertinent details, and accessories.
 - b. Indicate permanent metal formwork materials, layout, anchorage details, and accessories for fabrication and erection.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products to site.
- B. Store decking on wood sleepers with slope for positive drainage.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Metal Decking: ASTM A611, Grade C, cold rolled steel sheet, 1-1/2" high, SDI BW; 36" wide sheets; 0.0295" thick (22 gauge for spans up to 6'-0") or 0.0358" thick (20 gauge for spans up to 6'-6") sufficient length for 3-span installation; lapped joints. For specific requirements, see structural drawings.
 - 1. Primer: Manufacturer's standard rust inhibitive primer over industry standard cleaned surface. Color: Light Grey or White.

2.2 FASTENERS AND ACCESSORIES

- A. Self-Drilling Fasteners: #10 hex head screws.
- B. Welding Materials: AWS D1.1 and AWS D1.3.
- C. Weld washers.

2.3 FABRICATION

- A. Fabricate metal decking and permanent metal formwork in accordance with SDI Design Manual for Composite Decks, Form Decks, Roof Decks to accommodate a minimum yield strength of 33,000 PSI.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Erect metal decking in accordance with SDI Design Manual for Composite Decks, Form Decks, Roof Decks. Provide welding in accordance with AWS D1.1 and AWS D1.3. Comply with specified regulatory requirements.
- B. Place deck units on supporting steel framework in a 3-span condition and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
- C. On steel support members provide 1-1/2" minimum bearing. Align and level on supports.
- D. On masonry support surfaces provide 4" minimum bearing. Align and level on supports.
- E. Mechanically fasten side laps with self-drilling fasteners.
- F. Immediately after welding deck in place, touch-up welds, burned areas, and surface coating damage with prime paint.

3.2 QUALITY CONTROL

- A. Welders certification for type and position of welding being performed.
- B. Visual inspection of roof and floor deck welding. Review type and spacing of side lap fasteners.
- C. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
- D. Visual inspection on all welds.

END OF SECTION

SECTION 05400 - COLD FORMED METAL FRAMING**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Cold formed metal framing, fasteners, and accessories.

1.2 RELATED SECTIONS

- A. Section 05120 – Structural Steel: Structural building framing.
- B. Section 05500 – Metal Fabrications; for metal supports and hangers.
- C. Section 06100 – Rough Carpentry: Wood Blocking and Curbing.
- D. Section 07200 – Insulation: Batt and Blanket Insulation within framing members.
- E. Section 09250 – Gypsum Board Systems: Gypsum sheathing and accessories, suspended gypsum board system.

1.3 REFERENCES

- A. AISI "Specification for the Design of Cold Formed Steel Structural Members," September 3, 1980.
- B. ASTM A446-93 "Spec for Steel Sheet, Zinc Coated (Galvanized) by Hot Dip Process, Structural (Physical) Quality."
- C. ASTM A525-91, "General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process".
- D. ASTM C955-88, "Load-Bearing (Transverse and Axial) Steel Studs, Runners (Track), and Bracing or Bridging for screw Application of Gypsum Board and Metal Plaster Bases".
- E. ASTM A570-93, "Spec for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality."
- F. AWS D1-.3-84 "Structural Welding Code - Sheet Steel".
- G. Federal Specification #DOD P21035.
- H. American Welding Society (AWS) D1.1-88, "Structural Welding Code".

1.4 SUBMITTALS

- A. Submittals:
 - 1. Shop Drawings:
 - a. Submit descriptive data for all components, indicating conformance with the project requirements. Fastener data shall include recommended design values which are based on actual tests.
 - 2. Quality Assurance Submittals:
 - a. Certificates to be submitted to the Special Inspector: Welder qualifications.
 - b. Warranty: Furnish a written guarantee to the owner stating that all materials and workmanship are guaranteed against defects for a period of two (2) years after completion and final acceptance of work. Defects due to faulty material or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced by the Contractor at his expense.

1.5 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the following, except as otherwise indicated:
 - 1. AISI "Specification for the Design of Cold-Formed Steel Structural Members".

2. American Welding Society (AWS) D1.3 and D1.1.

B. Fabricator shall comply with the following requirements:

1. Erection shall be performed by an organization which has a minimum of three (3) years successful experience installing comparable cold-formed metal framing under its present business name.
2. The erector shall also be able to demonstrate an experience record of the firm's work completed or currently under construction within the past three (3) years.
3. All welding shall be performed by welders qualified for welding sheet steel in accordance with Section 6 of AWS D1.3 and AWS D1.1.

1.6 PREINSTALLATION CONFERENCE

A. Convene a pre-installation conference one week prior to commencing work of this Section.

1. Attendance required of Contractor, system installer, and parties directly affecting work of this Section.
2. Review conditions of installation, installation procedures and coordination required with Related Work.

1.7 PROJECT/SITE CONDITIONS

A. Verify all dimensions given on the shop drawings and make field measurements as necessary to lay out the work properly and to assure proper fit and proper elevations be fully responsible for accuracy of all measurements and laying out of the work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Steel Joists, Studs, Runners, and Accessories:

1. Clark Steel Framing Systems.
2. Dietrich Industries, Inc.
3. Unimast Corporation
4. Dale/Incor

B. Fasteners:

1. Atlas
2. ITW Buildex
3. Unimast

2.2 MATERIALS

A. Design is based on the sample products shown on Drawings and specified herein. Products of other manufacturers are acceptable only where material and section properties meet or exceed specified products. Provide joists, studs, runners, and accessories of same manufacturer.

2.3 COLD FORMED STEEL

- A. Provide manufacturer's standard "C" shaped studs and joists of size and gauge as indicated on the drawings. If not indicated on drawings the studs and joists shall conform to requirements specified in this Section.
- B. All studs shall as a minimum, meet the requirements of ASTM C955.
- C. Studs shall be a minimum of 20 gauge and shall be galvanized.
- D. Galvanized studs and joists shall conform to:
 1. For 16 gauge and heavier studs and joists, ASTM A446 grade D, with a minimum yield of 50,000 psi.

2. For 18 and 20 gauge studs and joists, ASTM A446 grade A, with a minimum yield of 33,000 psi.

E. Tracks, runners and bridging shall be of the same type, grade and gauge as supporting studs and/or joists.

2.4 STEEL JOISTS

A. Dietrich 10CSJ18 or as indicated. Provide bridging, tracks, closures, stiffeners, and accessories necessary for complete installation as recommended by manufacturer.

2.5 STEEL RUNNERS

A. Dietrich 10" deep, same gauge as supported studs or joists, unless otherwise indicated.

2.6 STEEL CLIP ANGLES

A. Dietrich Joist End Clip, standard 2" x 2", 14 gauge steel, prepunched, unless otherwise indicated.

2.7 STRAP BRACING

A. 4" wide, 14 gauge steel, unless otherwise indicated.

2.8 FASTENERS

A. Provide fasteners necessary for complete installation as recommended by manufacturer.

2.9 BRIDGING

A. Dietrich 1-1/2" x 16 gauge cold rolled channel.

B. 1-1/2" wide, 20 gauge steel bridging.

2.10 WELDING

A. Electrode: E70 according to AISI and AWS Standards.

2.11 COLD GALVANIZING

A. Norfolk, "ZRC".

B. Welco, "Cold Galv".

2.12 FABRICATION

A. Framing components may be assembled into panels prior to erecting. Prefabricate panels square with components attached to prevent racking.

B. Cut framing components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members.

C. Fasten components with self-drilling screws as shown on the Drawings and specified herein, and as necessary to ensure strength of connection. Do not wire tie components.

D. Welded connections shall be permitted only where indicated on Drawings.

PART 3 - EXECUTION

3.1 ERECTION

A. Install work according to manufacturer's recommendations.

B. Handle framing components and panels to prevent distortion.

C. Erect members level and true to lines and dimensions.

- D. Anchor runners securely to supporting structure.
- E. Anchor abutting runners securely to a common structural element, or splice together.
- F. Align members and securely anchor to runners. Do not splice members. Alternate orientation of joists such that adjacent joists have flanges projecting in opposite directions.
- G. Where lateral support of partitions and suspended ceilings is required for seismic bracing, construct the Work as specified herein and to meet applicable codes, ordinances, and regulations.
- H. Provide continuous strap bracing anchored to each member.
- I. Provide bridging at 3'-4" maximum spacing. Anchor cold rolled channel bridging to studs through clip angle connector. Anchor continuous strap bridging to each flange of stud and provide solid CR runner bridging at first two and last two spaces of wall or roof framing and at 8'-0" maximum spacing between ends of wall or roof.
- J. Provide maximum of 1 fastener each runner flange (2 per stud or joist) at stud or joist to runner connection, unless otherwise indicated.
- K. Provide minimum of 3 fasteners per stud or joist at stud to joist, runner to structural steel and stud or joist to clip angle or plate connections, unless otherwise indicated.
- L. Immediately after erection clean welds, scratches and other abraded spots and touch-up with the same prime coat used on painted members or cold galvanizing on galvanized members.

3.2 OPENINGS

- A. Coordinate framed openings with other trades to determine exact size and location.
- B. Provide an additional joist around framed openings which interrupt one or more spanning members, unless otherwise noted.

3.3 FIELD QUALITY CONTROL

- A. Special Structural Testing and Inspection:
 - 1. Special Structural Testing and Inspection and Conventional Testing and Inspection shall be performed by qualified parties as specified herein and in accordance with the provisions of Section 01400.
 - 2. The Owner will provide the following tests and inspections:
 - a. Test welding as follows:
 - 1) Fillet Welds: Visually inspect 100% of all fillet welds, for size, length and quality, per AWS D1.3 and D1.1.
 - 2) procedures and Preparation: Verify the following:
 - a) Qualifications of all welders as AWS certified.
 - b) Proposed welding procedures and materials.
 - b. Inspect as follows:
 - 1) Verify materials delivered to site comply with contract documents and approved shop drawings.
 - 2) At the beginning of field erection, perform daily observation of welding procedures until satisfied that proper procedures are being used and adequate welds are obtained.
 - 3) After erection of cold-formed metal framing and before enclosure, visually inspect the work for conformance with Contract Documents.
- B. Deficiencies found during inspection will be brought to attention of Architect.
- C. Corrective procedures for deficiencies shall be demonstrated to the satisfaction of Owner.

- D. When erection of framing is completed, but before placing finish or insulation materials, make a final inspection of installation and submit a final report to Owner as soon as Work is in accordance with Contract Documents.

END OF SECTION

SECTION 05500 - METAL FABRICATIONS**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Shop fabricated ferrous metal items, galvanized or prime painted, including but not limited to the following:
 - 1. Guardrails, handrails and handrail brackets.
 - 3. Roof access ladder with safety cage.
 - 4. Steel supports for aluminum entrances and storefronts.
 - 5. Steel pipe bollards.
 - 6. Embedded plates, loose angles.
 - 7. Steel frames for overhead doors.
 - 8. Dock leveler pit curb angles embedded in concrete.
 - 9. Lift Truck Wheel Stops.
 - 10. Unistrut framing and components.
 - 11. Other items of miscellaneous iron and steel indicated on Drawings, not indicated on Structural Drawings, and not specified under other Sections including but not limited to miscellaneous clip angles, plates and other miscellaneous steel frames and supports.

1.2 PRODUCTS SPECIFIED (BUT FURNISHED AND INSTALLED UNDER OTHER SECTIONS)

- A. Section 03300 – Cast-In-Place Concrete: Metal fabrications to be embedded in concrete.
- B. Section 04300 – Unit Masonry System: Metal fabrications to be embedded in masonry.

1.3 RELATED SECTIONS

- A. Section 05400 – Cold-Formed Metal Framing.
- B. Section 08410 – Aluminum Entrances.
- C. Section 09900 – Painting: Paint finish.

1.4 REFERENCES

- A. ASTM A36 – Structural Steel.
- B. ASTM A53 – Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
- C. ASTM A307 – Low-Carbon Steel Externally and Internally Threaded Fasteners.
- D. ASTM A386 – Zinc-Coating (Hot-Dip) on Assembled Steel Products.
- E. ASTM A570 – Specification for Hot-Rolled Carbon Steel Sheet, Structural Quality.
- F. AWS D1.1 – Structural Welding Code -Steel.

1.5 STRUCTURAL REQUIREMENTS –

Min requirements unless higher loads required by code.

- A. Fabricate ladder or stair assembly to support live load of 100 lb/sq ft with deflection of stringer not to exceed 1/360 of span.
- B. Railing assembly, wall rails, and attachments to resist lateral force of 200 lbs. at any point without damage or permanent set and 50 lbs. per linear ft. applied simultaneously in both vertical and horizontal directions.

1.6 SUBMITTALS

- A. Submit Shop Drawings:

1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
2. Include erection drawings, elevations, and details where applicable.
3. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Sections: ASTM A36.
- B. Sheet Steel: ASTM A570,
- C. Steel Tubing: ASTM A53, Grade B, Schedule 40, black finish except as otherwise scheduled.
- D. Bolts, Nuts, and Washers: ASTM A307.
- E. Welding Materials: AWS D1.1; type required for materials being welded.
- F. Primer: Fabricator's standard gray primer, 2.0 mils dry film thickness.
- G. Galvanizing Repair Compound: ZRC Chemical Products Co.; ZRC Compound.
- H. Handrail Wall Brackets: Julius Blum & Co., Inc., No. 382 Malleable Iron Wall Bracket.

2.2 FABRICATION - GENERAL

- A. Verify dimensions on site prior to shop fabrication.
- B. Fabricate items with joints tightly fitted and secured.
- C. Fit and shop assemble in largest practical sections, for delivery to site.
- D. Weld corners and seams continuously. Grind exposed welds flush and smooth with adjacent finished surface. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of structure, except where specifically noted otherwise.
- F. Make exposed joints butt tight, flush and hairline.
- G. Supply components required for anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, except where specifically noted otherwise.

2.3 FINISHING

- A. Galvanized Steel: Shop applied cold galvanized after fabrication. Apply in conformance with manufacturer's directions for intended use.
- B. Shop Primed Steel: Shop prime steel items not indicated to be galvanized. Remove loose mill scale and rust from structural steel, and remove mill scale and rust from ornamental metal. Thoroughly clean to remove oil, grease, dirt and other foreign material, and apply one shop coat of rust-inhibitive primer containing at least 50% rust-inhibitive pigments. Carefully apply paint to provide smooth and even surface. Minimum dry film thickness 2.0 mils.
- C. Do not prime surfaces in direct contact with concrete or where field welding is required.

2.4 FABRICATION - INDIVIDUAL COMPONENTS

A. Pipe Rails, Handrails and Guardrails:

1. Fabricate from 1-1/4" nominal, standard weight, Schedule 40 steel pipe unless otherwise indicated.
 - a. Interior Rails and components shall be prime painted for field finish under Section 09900.
2. Cut pipe square within 2 deg., and to length within 1/8".
3. Form elbow bends and wall returns to uniform radius, free from buckles and twists, with finished surfaces smooth.
4. Close exposed ends of steel pipe with prefabricated wall return fittings.
5. Miter and cope intersections of posts and rails, thoroughly fuse, and remove splatter, grind exposed welds to blend and contour surfaces to match those adjacent.
6. Wall Brackets: Provide Blum No. 386 or equal malleable iron brackets spaced not over eight feet on center or 12" from ends for wall mounted pipe rails.
7. Pickets: Provide 1" square tube pickets at 4" on center as indicated.
8. Form and assemble joints which will be exposed to weather so as to exclude water.

B. Fabricated Steel Roof Access Ladder:

1. Provide min. 1/2" x 2-1/2" continuous structural steel flat bar side rails, with eased edges, spaced 18" apart.
 - a. Provide 3/4" diameter solid structural steel bar rungs, spaced 12" o.c.
 - b. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
2. Provide for supports on ladders at top and bottom and at intermediate points spaced not more than 5'-0" o.c.
 - a. Use welded or bolted steel brackets, designed for adequate support and anchorage, and to hold ladder clear of wall surface with minimum 7" clearance to centerline of rungs.
3. Provide non-slip surface on each rung, as required by OSHA and code.
4. Provide retractable railing extensions at roof as required by code and OSHA.
5. Fabricate ladder safety cages from structural steel flat bars, assembled by welding or riveting.
 - a. Provide 5/16" x 4" top and bottom hoops and intermediate hoops spaced not more than 20'-0" o.c.; 5/16" x 2" hoops at 4'-0" o.c. between the 4" wide hoops; and 5/16" x 2" vertical bars, secured to each hoop and spaced 9" o.c.
 - b. Provide for fastening assembled safety cage to ladder rails and adjacent construction.
6. Finish: prime painted

C. Bollards:

1. ASTM A53, concrete filled steel shell column:
 - a. Interior Bollards (Type C) fabricated from 4" diameter x 40" high pipe welded to 1/2" thick steel base with holes for 4 3/4" diameter anchor bolts.
 - b. Exterior Bollards (Type B) fabricated from 6" I.D x length as indicated, set with minimum 4'2" above grade, set in concrete.
2. Finish: prime painted.

D. Wall Opening Frames:

1. ASTM A36 steel, shapes as indicated on Drawings.
2. Anchors: Carbon steel bent straps, 1" x 1/8" x 12".
3. Weld strap anchors 24" o.c. to frame member.
4. Finish: prime painted.

E. Miscellaneous Steel Frames (Non-Structural):

1. ASTM A36, carbon steel headers, with extended leg anchors welded in place.
2. Finish: Prime painted.

F. Loose Angle Lintels:

1. ASTM A36, structural steel angles or other approved shapes.
2. Size as indicated on Drawings.
3. Finish: Prime painted.

G. Burglar Bars at Roof Openings:

1. At roof openings larger than 8" x 8", provide 1/2" dia. case hardened steel bars, spaced 4" o.c. each way.
2. Weld bars to supporting steel frames.
3. Finish: Prime painted.

H. Accessible Parking Sign Post:

1. Fabricate from 2-1/2" dia steel pipe set in concrete.
2. Finish: Galvanized.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Obtain Architect approval prior to site cutting or making adjustments not scheduled.
- B. Clean and strip site primed steel items to bare metal where site welding is scheduled.
- C. Make provision for erection loads with temporary bracing. Keep work in alignment.
- D. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate Sections.

3.2 INSTALLATION - GENERAL

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Perform field welding in accordance with AWS D1.1.
- C. After installation, touch-up field welds and scratched or damaged surfaces with primer. Repair galvanized surfaces with galvanizing repair compound.

3.3 INSTALLATION - INDIVIDUAL COMPONENTS**A. Pipe Rails, Handrails and Guardrails:**

1. Anchor railing posts in concrete.
2. Grout solid according to manufacturer's instructions.
3. Set posts plumb and aligned to within 1/8" in 12 ft.
4. Set rails horizontal, or parallel to rake of steps, to within 1/8" in 12 ft.
5. Support wall rails on brackets, spaced not more than 4 ft. o.c., providing 1-1/2" minimum 2" max hand space.
6. Weld rail assemblies to stair channel toe, where applicable.

B. Wall Opening Frames:

1. Maintain opening size, keeping all corners square.
2. Secure anchors within masonry and concrete walls.
3. Anchor frames at floor, concealing all fastener heads.

END OF SECTION



DIVISION 6
WOOD AND PLASTICS



SECTION 06100 - ROUGH CARPENTRY**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Rough carpentry work, including but not limited to the following:
 - 1. Non-structural framing.
 - 2. Miscellaneous furring and stripping for wall finishes
 - 3. Dust proof enclosures.
 - 4. Miscellaneous blocking and canting for roofing system and related metal flashings.
 - 5. Blocking and canting for roof mounted mechanical items.
 - 6. Parapet backing.
 - 7. Plywood wainscot at walls.
 - 8. In wall wood blocking for support of accessories.
 - 9. Plywood mounting boards for electrical and telephone equipment.
 - 10. Preservative treated wood blocking in contact with concrete, masonry and curbs for roof mounted equipment.
 - 11. Fire Retardant treatment of wood blocking and sheeting where required by local code.
- B. Coordination with appropriate sections of all requirements for backing and blocking.

1.2 RELATED SECTION(S)

- A. Section 04300 - Unit Masonry System: Setting anchorage in foundations for work of this Section.

1.3 REFERENCES

- A. SPIB - Southern Pine Inspection Bureau.
- B. WCLIB - West Coast Lumber Inspection Bureau.
- C. WWPA - Western Wood Products Association.
- D. APA - American Plywood Association.
- E. AWPA - American Wood Preservers Association.
- F. AWPB - American Wood Preservers Bureau
- G. PS 1 - Construction and Industrial Plywood.
- H. PS 20 - American Softwood Lumber Standard.
- I. N.F.P.A. - National Design Specification for Wood Construction.

1.4 UNIT PRICES

- A. Provide unit prices according to Bid Form or schedule included in Summary of Work as applicable.

1.5 QUALITY ASSURANCE

- A. All wood materials to bear a visible grade stamp, of agency certified by National Forest Products Association (N.F.P.A.).

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store in weather protected, ventilated areas with a constant, minimum temperature of 60 degrees F maximum relative humidity of 25 to 55 percent.

PART 2 - PRODUCTS

2.1 MATERIALS - GENERAL

- A. Dimensions: Specified dimensions are nominal, actual dimensions to conform to PS 20.
- B. Surfacing: Surface four sides (S4S), unless specified otherwise.

2.2 MATERIALS

- A. Lumber: Provide new, sound and thoroughly seasoned lumber conforming to requirements of PS 20; graded in accordance with established Grading rules; of following species and grades:
 - 1. Non-Structural Light Framing (less than 2 in thick): Hem-Fir (WCLIB or WWPA), SPF (WWPA) or Southern Pine kiln dried (SPIB); moisture content 19% maximum at time of dressing "S-DRY", or 15% maximum "MC-15" or "K-D"; graded as follows:
 - a. General framing: Standard and better, or Stud grade.
 - b. Plates, blocking, curbs, and nailers:
 - 1) Up to 2 x 4 in. Stud grade
 - 2) Over 2 x 6 in. Construction grade and better.
 - c. General utility purposes: Economy grade.
- B. Softwood Plywood/Sheathing: Conform to requirements of PS-1. Provide panels bearing appropriate APA grade, and trade mark. Provide exterior grade plywood where any face or edge is exposed to the weather.
 - 1. Parapet Backing Panels: APA Rated Sheathing, C-D, Group 2, Exposure 1, Minimum 24/0 Plugged, Exterior glue; fire-retardant treated if required by code; 3/4 in. min. thickness.
 - 2. Equipment Backing Panels: Plywood, APA B-C INT, Plugged, Exterior glue; identification index Group 2; fire-retardant treated if required by code; 5/8 in. min thickness or as shown on plans.
 - 3. Roofing Blocking: APA C-D EXT, Plugged, Exterior glue; identification index Group 2; 3/4 in. min. thickness.
 - 4. Wall Wainscot Panels: APA B-C INT, Plugged, Exterior glue; identification index Group 2; fire-retardant treated if required by code; 3/4" min. thickness or as shown on plans.
- C. Wood Panel Board:
 - 1. Wood Particle Board: Composed of wood chips; type made with high waterproof resin binders of grade to suit application; sanded faces.
 - 2. Tempered Hardboard: Pressed wood fiber with resin binder tempered grade, 1/4" minimum thickness or as shown on plans.
- D. Nails, Spikes and Staples: Galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations; size and type to suit application and in accordance with manufacturer's recommendations.
- E. Bolts, Nuts, Washers, Lags, Pins and Screws: Medium carbon steel; sized to suit application and in accordance with manufacturer's recommendations; galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations.
- F. Joist Hangers and Framing Accessories: Simpson Company or prior approved equal, sized and profiled to suit application and in accordance with manufacturer's recommendations; galvanized finish.
- G. Fasteners: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolts or power activated type for anchorage to steel.
- H. Building Paper: ASTM D336, 15 lb. asphalt felt.
- I. Power Driven Fasteners

1. Pnuetek, Inc.: Pneumatically driven fastener with .143" shank diameter, .315" head diameter, and .073" head thickness installed with 1-1/2" wide 18 gauge galvanized steel strap, ICBO #3447. Contact local Pnuetek representative or Pnuetek, Inc.; Hudson, NH.; 603/883-1660.
2. Hilti: "DN" powder driven fastener with 1-7/16" diameter by .060" thick washer, ICBO #2388.

2.3 ACCESSORIES

- A. Dust and Vapor Barrier: reinforced flame retardant polyethylene sheets, 6 mil minimum thickness.
- B. Polypropylene Tape: Flame retardant self-adhering type, 2" wide.

2.4 PRESERVATIVE TREATMENT

- A. Shop pressure treat and deliver to site ready for installation.
- B. Wood Preservative (Pressure Treatment): Apply in conformance with AWWA Standard P5, using water-borne preservatives complying with AWPB LP-2 or LP-22. After treatment, kiln-dry to maximum moisture content of 15%.
 1. Apply treatment complying with AWWA Standard C2.

2.5 FIRE RETARDANT TREATMENT

- A. Shop treat and deliver to site ready for installation, wood materials requiring UL fire rating. Provide UL approved identification on treated materials.
- B. Apply in conformance with AWWA Standard P5, using water-borne preservatives complying with AWPB LP-2 or LP-22. After treatment, kiln-dry to maximum moisture content of 15%.
- C. Apply in compliance with the applicable AWWA Standard as follows:
 1. Plywood: AWWA C27, Interior Type A And Exterior Type.
 2. All other wood: AWWA C20, Interior Type A and Exterior Type.
- D. If wood is required to be both preservative and fire retardant treated apply both treatments in conformance with AWWA Standard P5 using water-borne preservatives complying with AWPB LP-2 and LP-22. After treatment kiln-dry to a maximum moisture content of 15%.

PART 3 - EXECUTION

3.1 BLOCKING

- A. Fasten wood blocking to framing with fasteners capable of withstanding loads to be applied to blocking. Install blocking for support of items as required.
- B. Install continuous pieces of longest possible lengths, cut to fit and fully bearing on framing.

3.2 ROOF RELATED WOOD BLOCKING

- A. Anchor blocking to metal decking and framing as detailed with 1/2" bolts set a maximum of 4'-0" o.c.
- B. Where blocking is more than 6" wide, anchor with 1/2" bolts set at 2'-6" o.c. and stagger alignment.
- C. Where blocking is required on roof deck, build-up, shim, or cut as required to set top of blocking flush with the top of the adjacent insulation.
- D. Cover wood blocking with temporary waterproof covering until permanent flashing is installed.

3.3 PLYWOOD SHEATHING

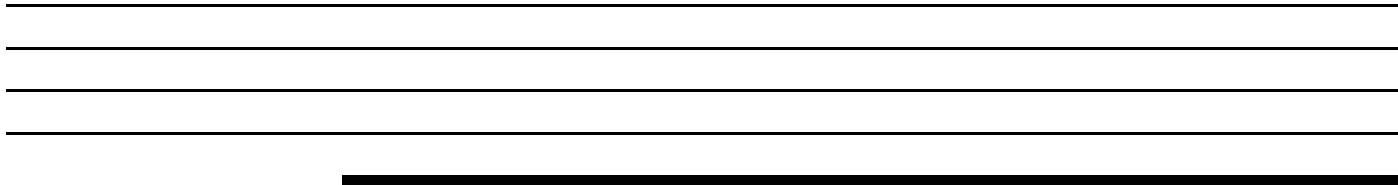
- A. Install with face grain perpendicular to direction of framing.

- B. Allow minimum space 1/16" between end joints and 1/8" at edge joints for expansion and contraction of panels; double these spaces under wet or humid conditions.
- C. Fasten 6" o.c. along panel edges and 12" o.c. at intermediate supports with non-corrosive screws.
- D. Apply building paper horizontally to face of exterior sheathing beginning at the bottom of the wall, and lap each layer 2", allowing 6" at endlaps, fasten with corrosion-resistant staples. For soffited areas, apply building paper beginning at the rear of the soffit lapping and fastening as specified for vertical surfaces. Cut back felt 1/2" on each side of break in supporting members where control joints will be located.
- E. Install telephone and electrical panel backboards with plywood sheathing material where required.

3.4 DUST PROOF ENCLOSURES

- A. Cover wood studs with reinforced flame retardant polyethylene sheets. Locate joints in polyethylene sheets over studs and horizontal blocking and attach to studs and blocking with staples at 6" on center. Lap joints 6" and seal with tape. Seal perimeter of dust proof enclosures to adjacent existing construction with tape. Maintain dust proof enclosure in sound condition during construction and remove when no longer required (**Note: If in an interior location with H.V.A.C. unit should be shut off at disconnect on the roof and turned back on after dust enclosure is removed**).

END OF SECTION



DIVISION 7
THERMAL AND MOISTURE PROTECTION



SECTION 07160 – DAMPPROOFING ABOVE GRADE**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Dampproofing applied to exterior face of all exterior sheathing and masonry back up walls for brick/stone veneer exposed to the weather.

1.2 SUBMITTALS

- A. Product Data:
1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 2. Manufacturer's installation instructions.
- B. Certifications:
1. Manufacturer's certification of compatibility with rigid insulation specified in Sections 07210.
 2. Manufacturer's affidavit that materials used in Project contain no asbestos, lead, or PCB's.

1.4 WARRANTY

- A. Warrant the work specified herein for one (1) full year/continuous without failure.

PART 2 - PRODUCTS**2.1 APPROVED MANUFACTURERS/PRODUCTS**

- A. Manufacturers listed below whose product meets or exceeds the specifications is approved for use on the Project with Architect's approval. Other manufacturers must have a minimum of five (5) years experience manufacturing equivalent products to those specified and comply with Division 1 requirements regarding substitutions to be considered. If other than the manufacturer listed as basis of specification is used, use their literature for specific installation requirements.
1. Chemrex Inc., Sonneborn (Hydrocide 700B Mastic), Shakopee, MN
 2. ChemMasters (Masterguard 700), Madison, OH
 3. Henry Company, Houston, TX
- B. Specifications are based on Henry *789 Fibrated Asphalt Emulsion Dampproofing manufactured by Henry Company, Houston, TX; 713.671.9502; 800.231.4551

2.2 PRODUCT DESCRIPTION

- A. Type: Fibered Emulsion Coating and Dampproofing.
- B. Use: Dampproofing on exterior sheathing, masonry, and as an insulation adhesive.
- C. Composition and Materials: Asphaltic resin and clay colloidal emulsifiers.
- D. Limitations: Apply material when temperature is over 45 degrees F and protect from rain or freezing until completely dry. Do not apply where material will be in continuous contact with water or ponded water situations.

2.3 TECHNICAL DATA

- A. Henry Brand Synko-Mastic #789:
1. Permeability, perm-inch: 0.10
 2. Cured Film Properties:
 - a. Flammability: No Flash
 - b. Firm set, hours, maximum (50 percent R.H., 70+ degrees F): 24
 - c. Heat test, 212 degrees: No blistering or sagging
 - d. Flexibility, @ 180 degrees F arc, 2 inch mandrel, @32 degrees F: No cracking
 - e. Resistance to water: No blistering, no re-emulsification

- after thorough curing
No flame
- f. Direct flame test:
3. Henry #789 Fibered Asphalt Emulsion Dampproofing meets ASTM D1226 Type IV Federal Spec. SS R-1781 Type 1. Military Spec. Mil-R-3472 Clay Type "Except fibers are not asbestos".

2.4 MISCELLANEOUS MATERIALS

- A. Provide primers, glass fabric scrim tape, mastic, and other materials not specifically described, but required for a complete and proper installation as instructed by the dampproofing manufacturer or required.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Surface Preparation: All dust, dirt, old loose or scaling coatings should be removed from the surface before coating. All cracks, joints, penetrations, and splits should be sealed, repaired with four (4) inch wide glass fabric scrim tape embedded in Henry #789. dusty or porous masonry surfaces should be dampened with water. Highly porous masonry should be primed with Henry #792 Penetrating Asphalt Primer or #788 Non-Fibered Asphalt Emulsion Dampproofing which has been thinned with one (1) gallon water per five (5) gallons of #788. Cleaned metal surfaces should also be primed. Architect shall approve the taping of joints and surface preparation prior to the application of the dampproofing.
- B. Working Conditions: apply under normal working conditions above 45 degrees F and rising. Do not apply when rain is imminent.
- C. Application: Apply with brush or spray equipment. Soft brushes free from stiff bristles should be used and the material applied in even strokes. When spraying, apply in one coat with a 50% overlap of the spray pattern to obtain a uniform and continuous coating.
1. Insure continuous coating free of breaks, voids and pinholes.
 2. Thoroughly cover all cracks, joints, and corners.
 3. Provide dampproofing in all exterior cavity walls on concrete masonry units, and on all exterior sheathing including areas above soffits, doors and windows.
- D. Coverage: Minimum 3/32 inch (2.4mm) Dry Film Thickness.
- E. Storage: Keep container tightly sealed and protect from freezing in shipping and storage.

3.2 TESTING AND INSPECTING

- A. Twenty (20) days after completion of this portion of the work, at the discretion of the Architect, demonstrate by running water test that the Work of this Section will successfully repel water.
1. Notify the Architect at least 72 hours in advance, and conduct the test in the Architect's presence.
 2. By means of an outrigger, or similar acceptable equipment. Place the nozzle of a ¾ inch garden hose at a point approximately 10 feet-0 inches away from top of wall where approved by the Architect, aiming the nozzle at slight downward angle to direct full stream of water onto wall.
 3. Run water onto wall at full available force for not less than four (4) hours.
 4. Upon completion of the four (4) hour period, inspect interior surfaces of wall for evidence of moisture penetration.
- B. If evidence of moisture penetration is discovered, apply an additional coat of approved water repellent to exterior surface in areas directed by the Architect, repeating application and testing (at no additional cost to the Owner) until no evidence of moisture penetration is found.

END OF SECTION

SECTION 07161 – FLUID APPLIED WATERPROOFING**PRODUCT DESCRIPTION:**

Vulkem 250 GC is an aliphatic, rapid curing, high solids, VOC compliant, modified polyurethane waterproofing membrane that can be applied to Green or Damp Concrete. Vulkem 250 GC is a one-part moisture curing elastomer available in two viscosities (SL and R). Both the SL (Self-Leveling) and R (Rollable) viscosities are suitable for horizontal applications. Only the R (Rollable) grade is suitable for vertical and cant bead applications.

BASIC USES:

Vulkem 250 GC is a fluid-applied, elastomeric waterproofing membrane that can be applied to “Green” Concrete. Vulkem 250 GC is commonly used as a between slab on plaza decks, parking decks, roof terraces, podiums, and reflecting pools. Vulkem 250 GC is also used for waterproofing foundation walls, landscaped areas, planter boxes, tunnels, etc. The Vulkem 250 GC is an effective membrane for use on concrete, wood, metal and other masonry surfaces.

LIMITATIONS:

- Do not apply to contaminated surfaces.
- Not to be used as an exposed or wearing surface
- Use with adequate ventilation.
- Concrete forms must be removed for a minimum of 24 hours before Vulkem 250 GC can be applied.

COLOR:

Black

PACKAGING:

5 Gallon (19 L) Pails and 55 Gallon (208 L) Drums.

APPLICABLE STANDARDS:

Conforms to the performance requirements of ASTM C836.

INSTALLATION:

Surface to be waterproofed must be clean and dry. Concrete slabs should have a light steel trowel followed by a fine hair broom or equivalent finish and should be water cured. Consult Architect or Engineer for minimum cure time on concrete before water cure can be stopped and foot traffic is permitted. Allow a minimum of 24 hours for concrete surface to dry after stopping water cure on decks or removing forms on walls. If release agents are present, they must be removed before the application of Vulkem 250 GC. Following good drainage practice, the structural slab should be sloped to drain a minimum of 1/8” (3.2mm) per running foot (30.5cm). All shrinkage cracks shall be treated with a 60 mil (1.5mm) coating of Vulkem 250 GC six inches (15.3cm) wide centered over the crack. Moving structural cracks greater than 1/16” (1.6mm) can be routed out and caulked with Vulkem 201/222 T, stripped with bond breaker tape and coated with a 60 mil (1.5mm) detail coat of Membrane, or treated with Tremco Elastomeric Sheeting embedded in membrane, centered over the crack. When using Vulkem 210/222 on green or damp concrete, priming with Vulkem 171 is required. Consult your local Tremco District Manager or technical service representative for further information.

At all horizontal-vertical junctures and all projections, a one inch (2.54cm) cant of Vulkem 250 GC shall be installed. Integral flashing shall be installed to the height indicated on the drawings. At expansion joints and other areas of potential high movement, Tremco Elastomeric Sheeting embedded into the membrane may be required. Consult your local Tremco Representative or Distributor for specific design details.

All detailing must be cured a minimum of 12 hours prior to the application of the membrane. Detailing should be wiped clean with Xylol or Toluol prior to the application of the membrane.

Vulkem 250 GC shall be spray, roller, squeegee or trowel applied at the rate of four gallons per 100 square feet (1.63 liter per square meter) to provide a thickness of 60 mils (1.5mm).

A Flood Test should be run; the membrane should be cured to a firm rubber set (36 hour minimum) before flooding. Flood with a minimum of one inch (2.54cm) of water for 24 hours.

Allow Vulkem 250 GC to completely cure before a protection course of Tremco Protection Mat and/or an approved TREMDrain drainage mat can be applied.

AVAILABILITY:

Separate instructions for Tremco’s high build cold fluid applied membrane are available on www.tremcosealants.com. Immediately available from your local Tremco Field Representative, Tremco Distributor or Tremco Warehouse.

WARRANTY:

Tremco warrants its Membranes to be free of defects in materials, but makes no warranty as to appearance or color. Since methods of application and on site conditions are beyond our control and can affect performance, Tremco makes no other warranty, expressed or implied, including warranties of MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE, with respect to Tremco Membranes. Tremco's sole obligation shall be, at its option, to replace, or refund the purchase of the quantity of Tremco Membrane proved to be defective and Tremco shall not be liable for any loss or damage.

END OF SECTION

SECTION 07183 - EXTERIOR FINISH SYSTEM**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Surface preparation including minor surface patching and pressure wash cleaning.
- B. Applying a high build, breathable elastomeric coating to the building exterior.
- C. Application of breathable acrylic paint for accents.
- D. Surface primer.

1.2 RELATED SECTIONS

- A. Section 07900 - Joint Sealers.

1.3 QUALITY ASSURANCE

- A. Applicator: Authorized by manufacturer.
- B. Certifications: Coating applicator shall contact the manufacturer's representative as indicated herein. The representative shall submit the following documents:
 - 1. Certification that applicator is approved to apply manufacturer's system as specified.
 - 2. All materials shall be from one manufacturer.
 - 3. The finish must provide 100% coverage without pinholes, skips, runs, overspray etc.

1.4 MOCK-UP

- A. Prior to application of finish system, coordinate with Architect and select a wall area of a minimum of 200 square feet in a least visible area and apply surface preparation materials and protective coatings for approval by Architect.
- B. Approved mock-up shall be used as a quality standard for actual construction and shall remain as part of the finish work.

1.5 SUBMITTALS

- A. Material and Equipment Submittals:
 - 1. Product Data.
 - 2. Installation Instructions.
- B. Quality Assurance Submittals: Submit the following:
 - 1. Certification: Manufacturer's authorized representative's certification that:
 - a. Surfaces to which coating to be applied is in proper condition to receive application.
 - b. Installers are properly trained in manufacturer's recommended installation procedures, and are prepared to use manufacturer's recommended equipment for the application.
 - c. Materials delivered to site are those approved by Architect.
- C. Closeout Submittals: Submit the following:
 - 1. Warranties: As specified in herein.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Apply finish system when ambient and surface temperature is 45 deg. F. and rising for 24 hours after application.

- B. Test masonry surfaces with a commercial moisture meter. Do no painting work on surfaces unless the surfaces are determined to be of not greater than 17 moisture content as determined by a moisture meter.
- C. Do not apply finish system on masonry walls until permanent protection is installed to keep rain from penetrating tops and backs (interior side) of walls.

1.7 WARRANTY

- A. Materials Warranty: Five year manufacturer's standard warranty, from date of Substantial Completion; agreeing to replace the water repellent coating materials, at no cost to the owner.
- B. Maintenance Warranty: Two year warranty, from date of Substantial Completion, signed jointly by Contractor and coating installer; agreeing to maintain the water repellent coating free from the penetration of moisture, at no cost to the owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND MATERIALS

- A. Acceptable Manufacturers:
 - 1. TK Products, Div. of Sierra Corporation
11400 West 47th Street
Minnetonka, MN 55343
800.441.2129 or 952.938.7223
(Specified Product)
 - 2. Tamms Industries
1222 Ardmore Avenue
Itasca, IL 60143.
 - 3. Thoro System Products
Shakopee, MN
1-800-433-9517
 - 4. ICI Paint
Holland, MI 49423
616-335-3259
Kevin Lastacy

2.2 COLORS

- A. Colors: As specified.

2.3 MIXING

- A. Mix materials according to manufacturer's printed instructions.

PART 3 - EXECUTION

3.1 GENERAL

- A. Inspect substrate to receive coating and submit approval certification as specified herein.
- B. Notify manufacturer of intent to start work of this Section, if required by warranty.
- C. Beginning of installation means acceptance of existing conditions.

3.2 PROTECTION

- A. Protect finished surfaces, work of other trades, and property of the owner from damage and defacement. Cover adjacent finished surfaces and fixed equipment with drop cloths.

3.3 SURFACE PREPARATION

- A. Prepare surfaces accordingly to manufacturer's instructions.
- B. Make necessary repairs with repair compound installed according to manufacturer's instructions.
- C. Coordinate application of protective coating with installation of control joint sealant. Do NOT paint concrete joint surfaces to which sealant is to be applied.
- D. The minimum surface preparation required is pressure washing at 3,000 psi with clean water within 24 hours before applying primer and finish protective coating materials. Acid etch or other surface preparation if required by coating manufacture for warranty
- E. Apply finish materials to surfaces that are thoroughly cured, even, clean and dry, free of dust, efflorescence, construction chemicals and residue, and properly prepared to receive the intended finish.

3.4 APPLICATION

- A. General: Apply materials according to manufacturer's instructions.
- B. Protective Coating for Concrete and Concrete Masonry Units:
 1. Application Rates: As required for a uniform color finish and per manufactures instructions. The finish coats must provide a minimum thickness of 12 mills DFT
 2. Apply material with airless type sprayer as approved by finish system manufacturer. Back roll if recommended by manufacture or required to get complete coverage
- C. Finish coating shall be uniform in appearance, color and evenness, without excessive build-up.

3.5 CLEAN-UP

- A. During application, promptly remove finish materials where spilled, splashed or spattered on adjacent surfaces.
- B. Maintain premises free of accumulation of tools, equipment, surplus materials and debris.
- C. Place cloths, and material which may constitute a fire hazard in closed metal containers and remove daily from site.

3.6 FINISH SCHEDULE

- A. Provide exterior finish systems as indicated on Drawings as follows:

EFS-1: Exposed CMU walls

EFS-2: Cornice and Front Facade

2 coats breathable elastomeric over the "field" system manufactured by the same company as the "field" system.

EFS-3: Exterior Gypsum Board Soffit Sheathing

1 coat primer TK-323.

1 coat Protective Textured Coating (Fine & Texture) TK-5321-06.

EFS-4: Pre-cast or Site Cast Concrete Wall Panels:

1 coat Primer as recommended and if required by finish coat manufacturer.

1 coat coarse texture elastomeric:

TK Products Tri-Lastic TK 5612

Tamms Tammolastic

Thoro Thorolastic – Course

ICI Decra-Flex Course 2290

1 coat smooth texture elastomeric:

TK Products Tri-Lastic TK 5610

Tamms Tammolastic

Thoro Thorolastic
ICI Decra-Flex Smooth #2260

END OF SECTION

SECTION 07200 - INSULATION**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Fire safing insulation.
- B. Board insulation at perimeter foundation wall.
- C. Sound attenuation blanket product specifications.
- D. Blanket/batt insulation.
- E. Sheet vapor and air barrier.
- F. Masonry cavity-wall fill insulation.

1.2 RELATED SECTIONS

- A. Section 09250 - Gypsum Board Systems: Sound attenuation insulation.

1.3 REFERENCES

- A. ASTM C516 - Vermiculite Loose Fill Insulation.
- B. ASTM E84 - Surface Burning Characteristics of Building Materials.
- C. ASTM C665 - Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- D. ASTM C764 - Mineral Fiber Loose Fill Insulation.
- E. FS HH-I-558 - Insulation, Board, Blanket, Felt, Sleeving (Pipe and Tube Coverings) and Pipe Cover Insulation.
- F. UL 723 - Surface Burning Characteristics of Building Materials.

1.4 SYSTEM DESCRIPTION

- A. Materials of this Section shall provide a continuous thermal, vapor and air barrier where required, at building enclosure elements.

1.5 SUBMITTALS

- A. Material and Equipment Submittals:
 - 1. Manufacturer's installation instructions.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

- A. Surface Burning Characteristics:
 - 1. Comply with applicable codes for Class I (Class A) flame/smoke ratings of 25 or less/450 or less for insulation types and accessories other than foamed plastic; when tested according to ASTM E84 (UL 723).
 - 2. Comply with applicable codes for Class II (Class B) flame/smoke ratings of 75 or less/450 or less for foamed plastic insulation types; when tested according to ASTM E84 (UL 723).

PART 2 - PRODUCTS**2.1 INSULATION MATERIALS**

- A. **INSUL-1:** Flat Board Roof Insulation and Tapered Board Insulation.

- B. **INSUL-2:** Extruded Polystyrene Board Insulation; ASTM C578, Type IV, extruded cellular polystyrene; 1.6 pcf density minimum; 25 psi minimum compressive strength; 0.3 percent maximum water absorption by volume; "k" factor of 0.20 at 75 deg. F; square edges, manufacturer's standard board size, thickness indicated with minimum "R" value of 11.0.
1. Amoco Foam Products Co., Amofoam CM.
 2. DiversiFoam Products, CertiFoam SE.
 3. Dow Chemical Company, Styrofoam SM.
 4. UC Industries, Foamular 250.
- C. **INSUL-3:** Sound Attenuation Insulation; ASTM C665, Type I, semi-rigid mineral fiber blanket, 1-1/2" minimum thickness.
1. Johns Manville, Sound-Shield Batts.
 2. Owens-Corning CorpSound Attenuation Batts.
 3. United States Gypsum, Thermafiber Sound Attenuation Blankets.
- D. **INSUL-4:** Glass Fiber Blanket/Batt Insulation (Unfaced); ASTM C665, Type I, preformed glass fiber blanket without facers.
1. CertainTeed Corporation, Unfaced Building Insulation.
 2. Johns Manville, Thermal-Shield Unfaced Insulation Blankets.
 3. Owens-Corning Fiberglass Corp., Unfaced Glass Fiber Insulation.
- E. **INSUL-5:** Glass Fiber Blanket/Batt Insulation (Foil Faced); ASTM C665, Type III, Class A preformed glass fiber blanket with foil facers.
1. CertainTeed Corporation, Foil Faced Building Insulation (FSK-25)
 2. Johns Manville, Thermal-Shield FSK-25 Foil Faced Wall Insulation Blankets.
 3. Owens-Corning Fiberglass Corp., FRK - Foil Faced Glass Fiber Insulation.
- F. **INSUL-6: FOAM IN PLACE INSULATION**
1. Core-fill 500, Tailored Chemical Products
 2. Air-Krete, Therma-krete

2.2 ACCESSORIES

- A. Vapor/Air Barrier: Flame retardant polyethylene sheets, 4 mil. minimum thickness.
- B. Polyethylene Tape: Flame retardant self-adhering type, 2" wide minimum.
- C. Foil Tape: Flame retardant pressure-sensitive type recommended by insulation manufacturer for application, 2" wide minimum.
- D. Adhesive: Type recommended by insulation manufacturer for application.
- E. Impaling Pins: Mechanical fasteners recommended by insulation manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify substrate and adjacent materials and insulation boards are dry and ready to receive insulation.

3.2 INSTALLATION - FOUNDATION PERIMETER

- A. Install extruded polystyrene boards (**INSUL-2**) on foundation wall perimeter, vertically from the bottom of concrete slab downward to minimum depth below finished exterior grade, down to building code designated frost line.. Butt edges and ends tight to adjacent board and to protrusions.

3.3 INSTALLATION –POLYSTYRENE BOARD WALL INSULATION

- A. Install **(INSUL-2)** expanded and extruded polystyrene board insulation with vertically aligned Z-furring channels spaced not over 16" o.c., and according to manufacturer's installation where covered with gypsum board.
 - 1. Provide full thickness of depth of furring shown on the Drawings.
- B. Securely anchor furring members to provide adequate support for gypsum board and other finish materials.
- C. Shim and level furring members and insulation as required to provide a true and even surface for gypsum board application.
- D. Provide corrosion-resistant sheet metal minimum 0.16" thick, or other material approved by local authorities, as a fire barrier at all exposed edges of insulation.

3.4 SOUND ATTENUATION INSULATION

- A. Install **(INSUL-3)** sound attenuation insulation in partitions and above suspended ceiling according to manufacturer's instructions as indicated on the drawings.
- B. Where **(INSUL-3)** is installed above suspended ceiling, hold back insulation minimum of 2 inches from light fixtures.

3.5 INSTALLATION - EXTERIOR WALLS

- A. Install glass fiber boards **(INSUL-5)** with adhesive applied according to manufacturer's instructions.
- B. Install with vapor barrier facing toward interior warm in winter side. Repair punctures in facing with foil tape. Seal edges and butt joints with tape to provide continuous vapor barrier.

3.6 INSTALLATION - BLANKET/BATT INSULATION

- A. Install batt insulation in accordance with manufacturer's instructions.
- B. Install batt insulation in exterior walls, roof and ceiling spaces without gaps or voids.
- C. Trim insulation neatly to fit spaces. Use batts free of damage.
- D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation. Leave no gaps or voids.
- E. Fill cracks and voids around framing and blocking, other voids in exterior walls, and voids around wood cants, curbs, and blocking in and about the roof. Wedge in place, completely filling voids.

3.7 INSTALLATION - VAPOR AND AIR RETARDERS

- A. Place vapor and air barrier on warm side of insulation by taping in place. Seal tears or cuts in barrier with polyethylene tape. Vapor barrier in locations not covered by gypsum board is part of insulation specified.
- B. Extend vapor and air barrier tight to full perimeter of adjacent window and door frames and other items interrupting the plane of membrane. Seal in place with polyethylene tape.

END OF SECTION

SECTION 07210 – BUILDING INSULATION**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Rigid board cavity wall insulation where shown on drawings or required.
- B. Batt insulation used for thermal and sound insulation in stud walls and where shown on drawings or required.

1.2 RELATED WORK

- A. Section 07160 – Dampproofing Above Grade
- B. Section 07250 – Sprayed Fireproofing
- C. Section 07270 – Firestopping and Fire Safing
- D. Division 15 – Mechanical: Duct insulation

1.3 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer’s literature on each insulation type specified.
 - 2. Manufacturer’s installation instructions for each insulation type specified.
- B. Samples: Six (6) inch x six (6) inch piece of rigid insulation for Architect’s approval.
- C. Certifications:
 - 1. Manufacturer’s certification of compatibility of rigid insulation with Dampproofing mastic.
 - 2. Manufacturer’s affidavit that materials used in Project contain no asbestos.

PART 2 - PRODUCTS**2.1 APPROVED MANUFACTURERS/PRODUCTS**

- A. Specifications are based on any of the manufacturers listed below, with their product in parenthesis for the particular insulation application. Other manufacturers not listed must have a minimum of five (5) years experience manufacturing experience manufacturing products meeting or exceeding the specifications and comply with Division 1 regarding substitutions to be considered.
 - 1. Rigid Wall Insulation:
 - a. Extruded Polystyrene Foam Board:
 - 1) Dow Chemical Co. (Styrofoam Cavitymate Plus)
 - 2) Owens-Corning (Foamular CW25)
 - 3) Pactiv Building Products (GreenGuard-SB)
 - 2. Batt Thermal Insulation:
 - a. Walls: For use in partition thermal applications.
 - 1) CertainTeed Corp. (AcoustaTherm)
 - 2) Guardian Fiberglass, Inc. (Thermal Control Batts)
 - 3) Johns-Manville (Thermal-SHIELD Thermal Insulation)
 - 4) Knauf (Thermal Batt Insulation)
 - 5) Owens-Corning (Thermal Batt Insulation)
 - 3. Batt Acoustical Insulation (Sound Attenuation):
 - a. Walls: For use in partition acoustical applications.
 - 1) CertainTeed Corp. (Acousta Therm)
 - 2) Guardian Fiberglass, Inc. (Sound Control Batts)
 - 3) JohnsManville (Sound-SHIELD Sound Control Batts)
 - 4) Knauf (Sound Insulation)
 - 5) Owens-Corning (Sound Attenuation Batt Insulation)
 - 6) United States Gypsum Co. (Thermafiber Sound Attenuation Fire Blanket (SAFB) Insulation)

4. Safing Insulation: As specified in Section 07270, Fire Stopping and Fire Safing.

2.2 MATERIALS

- A. Rigid Wall Insulation: (In Exterior Cavity Walls)
 1. Extruded Polystyrene Foam Board:
 - a. Specification: ASTM C578, Type IV
 - b. Thermal Resistance: R=5.0 per inch minimum
 - c. Water Absorption (0/0 by volume): 0.1 maximum
 - d. Water Vapor Permeance (perm): 1.1 per inch
 - e. Compressive Strength: 25 psi minimum
 - f. Thickness: 1-1/2 inches, unless shown otherwise
 - g. Size: 16 inch x 96 inch sheets.
- B. Batt Insulation:
 1. Thermal Insulation:
 - a. Type: ASTM C665, Type 1, unfaced
 - b. Thickness/R-Values (minimum): 3-1/2 inch (R-11) or 6 inch (R-19) as shown on drawings.
 - c. Surface Burning Characteristics:
 - 1) Flame Spread: 25 or less
 - 2) Smoke Developed: 50 or less
 2. Acoustical (Sound Attenuation) Insulation:
 - a. Type: ASTM C6656, Type 1, unfaced
 - b. Surface Burning Characteristics:
 - 1) Flame Spread: 25 or less
 - 2) Smoke Developed: 50 or less
 - c. Thickness: 3-1/2 inch or 6 inch as shown on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Rigid Board Insulation:
 1. Install board insulation at exterior masonry walls in accordance with manufacturer's printed instructions.
 2. Cut insulation to fit snugly around obstructions such as vents, pipe or conduit.
 3. Install board insulation to back-up wall surface secured by veneer wall ties and mastic.
 4. Install board insulation with joints tight to veneer wall ties and to provide full coverage.
- B. Batt Insulation (Thermal and Sound):
 1. Walls:
 - a. Insulation shall be friction fit between studs and provide full coverage where indicated on drawings.
 - b. Insulation shall be tight within spaces in partitions, around cut openings, behind and around electrical and mechanical items within or behind partitions and tight to items passing through partitions.
 - c. Wall areas above ceiling: At sidewall insulation in ceiling cavity, install adhesive-mounted spike devices with metal caps at 2 feet-0 inches vertically and at four (4) inches from each side of blankets horizontally. Install blankets with four (4) foot dimension running vertically on spikes, keeping blankets tight to exterior wall without crushing into each other.

END OF SECTION

SECTION 7241 – EXTERIOR INSULATION AND FINISH SYSTEM**PART 1 GENERAL**

- 1.01 SUMMARY:** Provide a mechanically attached, Water Managed Exterior Insulation and Finish System, including Pre-Manufactured Foam Cornice Moulding as shown on the drawings, as specified in this Section, and as needed for a complete and proper installation.
- 1.02 RELATED WORK:** Section 06100- Rough Carpentry; product specification for plywood EIFS substrate. Section 09250- Gypsum Board Systems; product specification for EIFS substrate. (*renovation, if applicable*)
- 1.03 SUBMITTAL:** No product submittal is required for the work of this Section IF provided per the construction documents.
- 1.04 QUALITY ASSURANCE:** The Water Managed Exterior Insulation and Finish System manufacturer's specifications and recommended standard installation details shall be followed completely, and shall be considered a part of this Section as if the manufacturer's specification was included in its entirety.
- 1.05 WARRANTY:**
- A. Manufacturer's Warranty: The Contractor shall provide the Manufacturer's Standard 5-Year Product Warranty in the Building Maintenance Manuals submitted to Owner.
 - B. Installer's Warranty: The Contractor shall include a copy of the EIFS installer's warranty for all work provided, for a term of 1 year after the Date of Substantial Completion, in the Building Maintenance Manuals submitted to Owner.

PART 2 PRODUCTS**2.01 ACCEPTABLE WATER-MANAGED EIFS MANUFACTURERS:**

- A. Basis of Design: Provide Parex "EIFS Water Master Commercial VR System" Exterior Insulation and Finish System, for exterior cavity wall construction, by Parex, Inc., Redan, Georgia consisting of the following components (800) 537-2739:
 1. Sheathing: Glass Mat Faced Exterior Sheathing shall be Dens-Glass Gold Sheathing by G-P Gypsum Corporation, Atlanta GA (800/ 947-4497 Northeast US), subject to acceptance by the EIFS manufacturer as part of the warranted EIFS system. Paper-faced exterior gypsum sheathing is NOT an acceptable product substitution.
 2. Sheathing at Building Signage: Do NOT provide Glass Mat Faced Exterior Sheathing.
 3. Weather Resistive Secondary Barrier: Secondary weather resistive barrier shall be a system that includes Parex Keycoat Liquid Membrane Adhesive a fluid-applied flexible coating for G-P Dens-Glass Gold Sheathing; Parex Sheathing Tape 396 synthetic fiber tape to reinforce liquid membrane at sheathing joints; Parex Water Master Flashing Membrane 365 (30 mils thick).
 4. Flashing Trims: Manufacturer's standard, as designed and manufactured for the intended purpose.
 5. Exterior Insulation Board: Parex Water Master compatible EPS insulation board, board minimum thickness 1-1/2", with 3/4" deep v-groove reveals where shown on the drawings, leaving a minimum 3/4" EPS material thickness. EPS Board shall be manufactured by a company approved by Parex.
 6. Adhesive: Parex Key Coat Liquid Membrane Adhesive a full synthetic weather resistive membrane and adhesive for bonding Parex Water Master Insulation Board to Dens-Glas Gold Sheathing or cement fiberboard.
 7. Exterior Basecoat: Parex ABC-N1 Base Coat/Adhesive 302, 100% acrylic polymer base, ready to use or equivalent field mixed system by same manufacturer. Include Parex Primer 310 as per manufacturer's specifications.
 8. Reinforcing Mesh:
 - a. Above 8'-0" height at adjacent finish grade: Standard Reinforcing Mesh 355 (4.5 oz. Per square yard).

- b. Below 8'-0" height at adjacent finish grade: High Impact 14 Mesh (14 oz. Per square yard), applied as a secondary reinforcement under Standard Reinforcing Mesh at these wall areas.
 9. Textured Finish: Parex Exterior Textured Finish Coat, trowel applied, integrally colored, minimum installed thickness 1/16" over reinforcing, 3/16" maximum thickness.
 10. Colors/ Textures:
 - a. Drawing Key Symbol "EIFS-1": Color to match Dryvit Color #449 Buckskin; Texture "Parex Sand Fine".
 - b. Drawing Key Symbol "EIFS-2": Color to match Dryvit Color #111 Prairie Clay; Texture "Parex Sand Fine".
- B. Acceptable Alternative Water Managed EIFS: Provide Outsulation, by Dryvit Systems Inc., Warwick RI (401/ 822-4100).
1. Sheathing: Glass Mat Faced Exterior Sheathing shall be Dens-Glass Gold Sheathing by G-P Gypsum Corporation, Atlanta GA (800/ 947-4497 Northeast US), subject to acceptance by the EIFS manufacturer as part of the warranted EIFS system. Paper-faced exterior gypsum sheathing is NOT an acceptable product substitution.
 2. Sheathing at Building Signage: Do NOT provide Glass Mat Faced Exterior Sheathing.
 3. Air/ Weather Barrier: Dryvit "Backstop" acrylic Air/ Weather Barrier.
 4. Flashing Trims: Manufacturer's standard, as designed and manufactured for the intended purpose.
 5. Exterior Insulation Board: Dryvit OMD Exterior grooved EPS insulation board, board thickness minimum 1-1/2" with 3/4" EPS deep v-groove reveals where shown on the drawings, leaving a minimum 3/4" EPS material thickness. EPS Board shall be aged/ air-dried for the equivalent of six weeks prior to installation.
 6. Exterior Insulation Board: To be adhered to masonry substrate.
 7. Exterior Basecoat: Dryvit Exterior Basecoat.
 8. Reinforcing Mesh:
 - a. Above 8'-0" height at adjacent finish grade: Dryvit Standard Reinforcing Mesh (4.3 oz. per square yard).
 - b. Below 8'-0" height at adjacent finish grade: Dryvit Panzer 15 Reinforcing Mesh (15 oz. per square yard), applied as a secondary reinforcement under USG Standard Reinforcing Mesh at these wall areas.
 9. Textured Finish: Dryvit Exterior Textured Finish, trowel applied, minimum installed thickness 1/16" over reinforcing, 3/16" maximum thickness.
 10. Colors/ Textures:
 - a. Drawing Key Symbol "EIFS-1": Dryvit Color #449 Buckskin; Texture "Dryvit Sandblast"
 - b. Drawing Key Symbol "EIFS-2": Dryvit Color #111 Prairie Clay; Texture "Dryvit Sandblast".
- C. Acceptable Alternative Water Managed EIFS: Provide Senerflex by Senergy, Cranston RI (800/ 221-9255).
1. Sheathing: Glass Mat Faced Exterior Sheathing shall be Dens-Glass Gold Sheathing by G-P Gypsum Corporation, Atlanta GA (800/ 947-4497 Northeast US), subject to acceptance by the EIFS manufacturer as part of the warranted EIFS system. Paper-faced exterior gypsum sheathing is NOT an acceptable product substitution.
 2. Sheathing at Building Signage: Do NOT provide Glass Mat Faced Exterior Sheathing.
 3. Weather Resistive Barrier Membrane: Tyvek StuccoWrap Weather-Resistant Barrier, by Dupont Tyvek, Wilmington DE (800/ 448-9835).
 4. Flashing Trims: Manufacturer's standard, as designed and manufactured for the intended purpose.
 5. Exterior Insulation Board: EPS insulation board, ASTM C578 Type 1, board thickness minimum 1-1/2" with 3/4" deep v-groove reveals where shown on the drawings, leaving a minimum 3/4" EPS material thickness. EPS Board shall be aged/ air-dried for the equivalent of six weeks prior to installation.
 6. Exterior Insulation Board: To be adhered to masonry substrate.
 7. Exterior Basecoat: Senerflex Standard Base Coat, 100% acrylic, mixed with portland cement.
 8. Reinforcing Mesh:

- a. Above 8'-0" height at adjacent finish grade: Flexguard 4 Standard Reinforcing Mesh.
 - b. Below 8'-0" height at adjacent finish grade: Flexguard 15 Reinforcing Mesh, applied as a secondary reinforcement under Flexguard 4 Standard Reinforcing Mesh at these wall areas.
9. Textured Finish: Senerflex Exterior Textured Finish, 100% acrylic, trowel applied, minimum installed thickness 1/16" over reinforcing, 3/16" maximum thickness.
 10. Colors/ Textures:
 - a. Drawing Key Symbol "EIFS-1".
 - b. Drawing Key Symbol "EIFS-2".
- D. Acceptable Alternative Water Managed EIFS: Provide Sto Essence by Sto Corporation, Atlanta, GA (800/ 221-2397).
1. Sheathing: Glass Mat Faced Exterior Sheathing shall be Dens-Glass Gold Sheathing by G-P Gypsum Corporation, Atlanta GA (800/ 947-4497 Northeast US), subject to acceptance by the EIFS manufacturer as part of the warranted EIFS system. Paper-faced exterior gypsum sheathing is NOT an acceptable product substitution.
 2. Sheathing at Building Signage: Do NOT provide Glass Mat Faced Exterior Sheathing.
 3. Weather Resistive Barrier Membrane: Sto Air Barrier Membrane.
 4. Flashing Trims: Manufacturer's standard, as designed and manufactured for the intended purpose.
 5. Exterior Insulation Board: EPS insulation board, ASTM C578 Type 1, board thickness minimum 1-1/2" with 3/4" deep v-groove reveals where shown on the drawings, leaving a minimum 3/4" EPS material thickness. EPS Board shall be aged/ air-dried for the equivalent of six weeks prior to installation.
 6. Adhesive: Sto BTS-Plus, one component, polymer-modified, cement-based high build adhesive.
 7. Exterior Basecoat: Sto BTS-Plus, one component, polymer-modified, cement-based basecoat, mixed with less than 33% portland cement content by weight.
 8. Reinforcing Mesh:
 - a. Above 8'-0" height at adjacent finish grade: Sto Mesh 4.8 oz/ sq. yd. Standard Reinforcing Mesh.
 - b. Below 8'-0" height at adjacent finish grade: Sto Armor Mat 15 oz/ sq. yd. Reinforcing Mesh, applied as a secondary reinforcement under Standard Reinforcing Mesh at these wall areas.
 9. Textured Finish: StoSilco Lit Silicone enhanced, textured wall coating.

2.02 PRE-MANUFACTURED FOAM MOULDING: *(if applicable)*

- A. Pre-manufactured Foam Mouldings shall be provided as manufactured by the following:
 1. Foam Factory Inc., Fort Lauderdale FL (954/ 485-6700).
 2. Canamould Extrusions Inc./ Max Products Corporation, Birdsboro PA (800/ 238-2541).
 3. FSI Products, Allentown PA (800/711-3626).
 4. Other manufacturer, subject to Architect via Product Substitution requirements per Section 01340-Submittals.
- B. Provide profile as detailed on the drawings.
- C. Pre-manufactured Foam Cornice Moulding shall be finished with EIFS finish coat as recommended by the manufacturer.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS: The Contractor shall examine the areas and conditions under which work of this Section will be provided, shall correct conditions detrimental to timely and proper completion of the work, and shall NOT proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION:

-
- A. The Water Managed EIFS manufacturer's specifications and recommended standard installation details shall be followed completely, and shall be considered a part of this section as if the manufacturer's specification was included in its entirety.
 - B. Install the work of this section in accordance with the shop drawings and with pertinent requirements of governmental agencies having jurisdiction, anchoring all components firmly into position straight, level, and plumb within a tolerance of 1:1000 vertical and horizontal.
 - C. The overall minimum base coat thickness shall be sufficient to fully embed the mesh in multiple base coat applications.
 - D. EIFS surfaces in contact with sealants shall be coated with manufacturer-approved sealer.
 - E. EIFS panel tolerance: Maximum variance from plane shall be 1/4" within a 4-foot radius.

END OF SECTION

SECTION 07270 – FIRESTOPPING AND FIRE SAFING**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Non-combustible Firestopping and fire safing materials, and accessories as shown on drawings, or if not shown, as required, including, but not limited to the following:
 - 1. Intumescent Caulks, Elastomerics, Sealants, Compounds, Putties, Joint Sprays, Wrap Strips, and Coatings
 - 2. Silicone Sealants
 - 3. Mortar Materials (Cementitious)
 - 4. Firestopping Foam Materials
 - 5. Fire Block Materials
 - 6. Pillow Materials
 - 7. Mat Materials
 - 8. Cast-in-place Devices, Collars, and other materials, including fire/smoke stop systems, which meet the specified requirements.
- B. General description of the work in this section:
 - 1. Only tested firestop systems shall be used in specific locations as follows:
 - a. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
 - b. Blank openings through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
 - c. Openings and penetrations in fire-rated partitions or walls containing fire doors.
 - d. Openings around structural members which penetrate floors or walls.

1.2 RELATED WORK

- A. Section 03300 – Cast-In-Place Concrete
- B. Section 07210 – Building Insulation
- C. Section 07250 – Sprayed Fireproofing
- D. Section 07900 – Building Sealants
- E. Division 15 – Mechanical: Requirements for penetrations through fire rated construction.
- F. Division 16 – Electrical: Requirements for penetrations through fire rated construction.

1.3 REFERENCES

- A. ASTM International (ASTM)
 - 1. C665, Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
 - 2. E84, Standard Test Method for Surface Burning Characteristics of Building Materials
 - 3. E119, Standard Test Methods for Fire Tests of Building Construction and Materials
 - 4. E814, Standard Test Method for fire Tests of Through-Penetration Fire Stops
 - 5. E2174, Standard Practice for On-Site Inspection of Installed Fire stops
- B. National Fire Protection Association (NFPA)
 - 1. 70, National Electric Code
 - 2. 101, Life Safety Code
- C. Underwriters Laboratories Inc. (UL)
 - 1. 263, Fire Tests of Building Construction and Materials
 - 2. 1479, Fire Test of Through-Penetration Firestops
 - 3. 2079, Tests for Fire Resistance of Building Joint Systems
 - 4. UL Fire Resistance Directory:
 - a. Firestop Devices (XHJI)

- b. Fire Resistance Ratings (BXRH)
- c. Through-Penetration Firestop Systems (XHEZ)
- d. Fill, Voids, or Cavity Material (XHHW)
- e. Forming Materials (XHKU)
- f. Joint Systems (XHBN)

D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

1.4 PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS

A. Firestopping Materials:

1. Shall be rated as non-combustible when tested in accordance with ASTM E119 to achieve fire rating noted on the drawings and provide a fire rating equal to that of construction being penetrated. If no such fire rating is noted on the drawings, the fire rating shall be required by the authorities having jurisdiction.
2. If such materials are used in a through-penetration seal condition, they shall be approved for such use, with all required devices and accessories forming an assembly or included in the test, when tested in accordance with ASTM E814 or UL 1479.
3. Tests shall be performed by an approved testing agency to indicate compliance with specified requirements and the resulting approval number shall be the latest or current test approved by authorities having jurisdiction. For those firestop applications that exist for which no UL tested System is available through a manufacturer, an engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council.

B. Fire safing Materials:

1. Shall be tested and rated non-combustible to achieve fire rating noted on the drawings, or if not noted, as required by authorities having jurisdiction.
2. If such materials are used in an assembly, they shall be approved for such use, with all required devices and accessories forming an assembly or included in the test.
3. Tests shall be performed by an approved testing agency to indicate compliance with specified requirements and the resulting approval number shall be the latest or current test approved by authorities having jurisdiction.
4. Proposed fire safing materials and methods shall conform to applicable governing codes having local jurisdiction.

C. Definitions: As they appear in this Section:

1. Combustible: Penetrations composed of any material which will burn or melt in a fire, including, but not limited to the following:
 - a. Nonmetallic pipes made of glass or plastic.
 - b. Metallic pipes made of lead or aluminum.
 - c. Electrical, data, communication, security, and telephone cables.
2. Non-combustible: Penetrations composed of any material which will not burn or melt in a fire, including, but not limited to the following:
 - a. Metallic pipes made of steel, iron or copper.
3. Approved Testing Agencies: Shall be UL or other testing agency licensed and equipped to conduct the required fire tests and approved by authorities having jurisdiction.
4. Authorities Having Jurisdiction: Shall be the person or entity responsible for applicable governing code enforcement.

D. Manufacturer Qualifications: Those listed in Paragraph 2.1, A. or company specializing in manufacturing the products specified in this Section with minimum of five (5) years experience. Refer Division 1 for substitutions.

E. Installer Qualifications: Company specializing in performing the Work of this Section with minimum three (3) years experience installing tested and classified firestop and fire safing systems or manufacturer certification and approval.

F. Standards: All firestop and fire safing systems shall have a flame (F) rating and temperature (T) rating conforming to applicable building codes and in accordance with Drawings and Specifications.

G. Single Source Responsibility: Obtain Firestopping and fire safing materials from a single manufacturer for each different product required.

H. No Firestopping or fire safing materials shall be concealed or covered until they have been observed and approved for use by the Architect and/or authorities having jurisdiction.

1.5 CONTRACTOR'S RESPONSIBILITIES

- A. As scope and performance documents, the Drawings and Specifications do not necessarily indicate or describe all the Work required for the performance and completion of the Work. Contracts will be let on the basis of such documents with the understanding that the Contractor shall furnish and install the items required for proper completion of the Work without adjustment to price or schedule. Work shall be of sound, quality construction and the Contractor shall be solely responsible for the inclusions of adequate labor and materials to cover the proper and timely furnishing and installation of the Firestopping and fire safing indicated, described, or implied.
- B. As a performance specification, the criteria for the solution of the Firestopping and fire safing indicated on the Drawings or specified herein are for the sole purpose of defining the design intent and performance requirement. The details shown, if any, are intended to emphasize the acceptable performance requirements for this Project. To avoid any misunderstanding or lack of interpretation, the Contractor is hereby advised that the responsibility for all Firestopping and fire safing are totally his and that designs and resolutions proposed by the Contractor through his submittals and related documentation shall be demonstrated throughout the Work and warranty period specified herein.
- C. Design proposal submissions which follow exactly the details indicated on the Drawings, will not relieve the Contractor of his responsibility for the design, furnishing, installation, or performance of the Work of this Section.
- D. In the event of a controversy over any requirements of this Section, the decision of the Architect will take precedence.

1.6 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's technical data on product characteristics, performance, and limitation criteria for each material including UL firestop systems to be used.
 - 2. Manufacturer's installation instructions.
 - 3. Manufacturer's Material Data Sheets (MSDS)
- B. Shop Drawings: Manufacturer's shop drawings or detail sheets indicating each condition that requires a penetration or joint seal. Details must be in accordance with the proposed approved system. Include materials to be used, anchorage, methods of installation and relationship to all adjacent construction.
- C. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in drawing.
- D. Certifications:
 - 1. Manufacturer's certification of compliance indicating approval of authorities having jurisdiction for combustibility and use of materials, and that their installation conforms to shown or required fire rating.
 - 2. Manufacturer's affidavit that materials used in Project contain no asbestos.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.
- B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
- C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.
- D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- E. Do not use damaged or expired materials.

1.8 INSTALLER QUALIFICATIONS

- A. Engage an experienced Installer who is certified, licensed, and otherwise qualified by the Firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

B. Installer Training: A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

1.9 REGULATORY REQUIREMENTS

- A. Conform fire resistance ratings and surface burning characteristics of authorities having jurisdiction.
- B. Provide certificate of compliance from manufacturer indicating approval of authorities having jurisdiction for combustibility and use of materials, and that their installation conforms to shown or required fire rating.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not use materials that contain flammable solvents.
- B. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- C. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
- D. During installation, provide masking and drop cloths to prevent Firestopping materials from contaminating any adjacent surfaces.
- E. Provide ventilation in areas to receive solvent cured materials.

1.11 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01110 – Notification of Architect Requirements

1.12 SEQUENCING

- A. Sequence Work to permit Firestopping and fire safing materials to be installed after adjacent and surrounding work is complete.

1.13 WARRANTY

- A. Warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.
- B. Defects shall include, but not be limited to:
 1. Use of incorrect material within the installation
 2. No mineral wool insulation within a system that requires it.
 3. Use of mineral wool insulation when ceramic fiber insulation is required.
 4. Incorrect amount of material is installed within system.
 5. No use of an accessory seal within a system that requires one.
 6. Use of an incorrect system with a firestop or fire safing installation.
 7. Failure to meet specified performance or quality assurance requirements.

PART 2 - PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS/PRODUCTS**

- A. Subject to compliance with through penetration firestop systems listed in Volume II of the UL Fire Resistance Directory (XHEZ), manufacturers specified are approved for use in the Project. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1.
 1. Hilti, Inc.
 2. Nelson Firestop Products
 3. Tremco Inc.
 4. 3M Fire Protection Products
- B. To maintain clarity of products, specifications are based on specified products manufactured by Hilti, Inc.; Tulsa, OK. Listed manufacturers providing equivalent products are acceptable for use on this project.
- C. It is recognized that the manufacturers listed may not produce all of the specified types of products, therefore, products from several manufacturers may be used throughout the project as long as consistent use of each individual product is maintained throughout the project, they meet the requirements specified herein for the intended use, and are approved for that use by authorities having jurisdiction. Products which are combined to form a UL listed assembly must be provided as tested and approved as shown in the Fire Resistance Directory.

2.2 MATERIALS AND COMPONENTS

- A. General:

1. Any of the following materials, either by itself or in combination with other materials may be used on the Project provided they:
 - a. Satisfy the Firestopping and fire safing requirements for use in the required application on the Project.
 - b. Meet the performance and quality assurance requirements specified herein.
 - c. Are approved for use in that application by the authorities having jurisdiction.
 2. Materials shall comply with ASTM E814 (UL 1479) or ASTM E119 (UL 263), and shall be manufactured of non-toxic, non-hazardous, asbestos free materials. Product shall bear proper independent test laboratory label/logo and shall conform to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.
- B. Primers: Conform to firestop manufacturer's recommendations for primers required for various substrates and conditions.
- C. Back-Up (Damming) Materials: Conform to firestop manufacturer's recommendations for back-up (damming) materials. Material may be removable or permanent as recommended by manufacturer to suit application and as required by UL testing or other testing agency approved by authorities having jurisdiction.
- D. Retainers: Steel angles, clips, sheet metal, and impaling fasteners to support damming material and fire safing material and where required by UL testing or other testing agency approved by authorities having jurisdiction.
- E. Adhesives and Fasteners: Conform to firestop manufacturer's recommendations for adhesives and fasteners required for various substrates and conditions and to suit intended use. Materials must conform to those required by UL testing or other testing agency approved by authorities having jurisdiction.
- F. Firestopping Fill, Void, and Cavity Materials: Shall conform to those required by UL testing or other testing agency approved by authorities having jurisdiction, including, but not be limited to the following. Refer to list of approved manufacturers:
1. Cast-in place firestop devices for use with combustible and non-combustible pipes (closed and open piping systems) and cable bundles penetrating concrete floors, the following products are acceptable:
 - a. "CP 680 Cast-In Place Firestop Device" manufactured by Hilti, Inc.
 - 1) Add Aerator adaptor when used in conjunction with aerator ("sovent") system.
 - b. "CP 681 Tub Box Kit" for use with tub installations manufactured by Hilti, Inc.
 - c. "CP 682 Cast-In Place Firestop Device" for use with noncombustible penetrants manufactured by Hilti, Inc.
 2. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
 - a. "FS-ONE Intumescent Firestop Sealant" manufactured by Hilti, Inc.
 - b. "CP 604 Self-leveling Firestop Sealant" manufactured by Hilti, Inc.
 - c. "CP 620 Fire Foam" manufactured by Hilti, Inc.
 - d. "CP 606 Flexible Firestop Sealant" manufactured by Hilti, Inc.
 - e. "CP 601s Elastomeric Firestop Sealant" manufactured by Hilti, Inc.
 3. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
 - a. "CP 601s Elastomeric Firestop Sealant" manufactured by Hilti, Inc.
 - b. "CP 606 Flexible Firestop Sealant" manufactured by Hilti, Inc.
 - c. "FS-ONE Intumescent Firestop Sealant" manufactured by Hilti, Inc.
 4. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
 - a. "FS-ONE Intumescent Firestop Sealant" manufactured by Hilti, Inc.
 5. Foams, Intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
 - a. "FS-ONE Intumescent Firestop Sealant" manufactured by Hilti, Inc.
 - b. "CP 620 Fire Foam" manufactured by Hilti, Inc.
 - c. "CP 601s Elastomeric Firestop Sealant" manufactured by Hilti, Inc.
 - d. "CP 606 Flexible Firestop Sealant" manufactured by Hilti, Inc.
 6. Non-curing, re-penetrable, intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:
 - a. "CP 618 Firestop Putty Stick" manufactured by Hilti, Inc.
 - b. "CP 658T Firestop Plug" manufactured by Hilti, Inc.
 7. Wall opening protective materials for use with UL listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
 - a. "CP 617 Firestop Putty Pad" manufactured by Hilti, Inc.
 8. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

- a. "CP 643N Firestop Collar" manufactured by Hilti, Inc.
- b. "CP 644 Firestop Collar" manufactured by Hilti, Inc.
- c. "CP 645/648 Wrap Strips" manufactured by Hilti, Inc.
- 9. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
 - a. "CP 637 Firestop Mortar" manufactured by Hilti, Inc.
 - b. "FS 657 FIRE BLOCK" manufactured by Hilti, Inc.
 - c. "CP 620 Fire Foam" manufactured by Hilti, Inc.
 - d. "CP 675T Firestop Board" manufactured by Hilti, Inc.
- 10. Non curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
 - a. "FS 657 FIRE BLOCK" manufactured by Hilti, Inc.
 - b. "CP 675T Firestop Board" manufactured by Hilti, Inc.
- 11. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:
 - a. "FS 657 FIRE BLOCK" manufactured by Hilti, Inc.
 - b. "CP 658T Firestop Plug" manufactured by Hilti, Inc.
- G. Fire Related Construction Joints and Other Gaps:
 - 1. "CP 601s Elastomeric Firestop Sealant" manufactured by Hilti, Inc.
 - 2. "CP 606 Flexible Firestop Sealant" manufactured by Hilti, Inc.
 - 3. "CP 672 Firestop Joint Speed Spray" manufactured by Hilti, Inc.
- H. Fire Safing Materials: Comply with ASTM C665, Type 1, high-melt mineral-fiber insulation with nominal density of 4.0 lbs per cubic foot and having a flame spread rating of 15 and smoke developed rating of 0. Size shall be 4 inches thick x 24 inches wide x 48 inches long, unless noted otherwise.
 - 1. "Thermafiber Safing Insulation" manufactured by United States Gypsum Company (USG), or equal.
- I. Jacketing (For use with fire protection board): 0.016 inch aluminum or 0.010 inch stainless steel roll jacketing as shown, or if not shown, as required where high traffic requires high durability and good appearance, and as directed by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints and openings indicated or required to receive firestop and fire safing materials, for compliance with requirements for proper configuration, installation tolerances and other conditions affecting firestop and fire safing performance.
- B. Do not proceed with installation until unsatisfactory conditions are corrected.
- C. Beginning installation shall indicate acceptance of existing conditions. Work found to be defective or deficient due to uncorrected existing conditions prior to installation should be repaired or replaced at no additional expense to Owner.

3.2 PREPARATION

- A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 - 1. Verify penetrations are properly sized and in suitable condition for application of materials.
 - 2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
 - 3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by Firestopping materials.
 - 4. Install back-up (damming) materials to arrest liquid material leakage.
 - 5. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

3.3 COORDINATION

- A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

- B. Responsible trades to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.4 INSTALLATION

- A. General:
 - 1. Install firestop and fire safing materials in accordance with manufacturer's recommendations to provide F and T ratings as required by authorities having jurisdiction.
 - 2. Install firestop materials in accordance with UL Fire Resistance Directory.
 - 3. Install firestop and fire safing materials with sufficient pressure to properly fill and seal openings, then tool or trowel exposed surfaces.
- B. Firestopping Materials:
 - 1. Install primer and Firestopping material in sufficient thickness, with required accessories to achieve rating, to uniform density and texture, in accordance with manufacturer's instructions and authorities having jurisdiction.
 - 2. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.
 - 3. Consult with mechanical engineer and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
 - 4. Remove dam material after Firestopping material has cured or allow dam material to remain if required to maintain fire rating integrity or required by authorities having jurisdiction.
 - 5. Do not conceal or enclose any Firestopping materials until they have been examined and approved for use by the Architect and authorities having jurisdiction.
- C. Fire Safing Materials:
 - 1. Install fire safing in sufficient thickness, with retainer materials where shown or required to achieve fire rating in accordance with manufacturer's instructions and authorities having jurisdiction.
 - 2. Do not conceal or enclose any fire safing materials until they have been examined and approved for use by the Architect and authorities having jurisdiction.
- D. Fire Protection Board Materials:
 - 1. Install fire protection board in proper type, size, and density, with adhesives, fasteners, and jacketing materials where shown or required to achieve fire rating in accordance with manufacturer's instructions and authorities having jurisdiction.
 - 2. Do not conceal or enclose any fire protection board materials until they have been examined and approved for use by the Architect and authorities having jurisdiction.

3.5 PROTECTION OF FINISHED WORK

- A. Protect adjacent surfaces from damage by material installation.

3.6 CLEANING

- A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.
- B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.7 FIELD QUALITY CONTROL

- A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by applicable code authorities.
- C. Inspection of through-penetration Firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops".
- D. Perform under this section patching and repairing of Firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

END OF SECTION

SECTION 07527 – SBS-MODIFIED BITUMINOUS SHEET ROOFING

A. General

US Listing: Listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure and Class 60 wind uplift in the configuration required for Project.

1. FM Listing: Evaluated by Factory Mutual (FM) System for fire spread, Class I-90 wind uplift, and hail damage and listed in “Factory Mutual Approval Guide” for Class I construction.
2. Insulation Fire-Performance Characteristics: Provide insulation materials that are identical to materials whose fire-performance characteristics have been determined for the assemblies of which the insulation materials are a part by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
3. Submittals: Submit the following:
 - a. Product date for each type of product specified. Include date substantiating that materials comply with requirements.
 - b. Written certification from manufacturer of modified bituminous sheet roofing system certifying that Installer is approved by manufacturer to install specified roofing system.
4. Manufacturer Qualifications: Obtain primary products, including each type of roofing sheet, bitumen, membrane flashings, from a single manufacturer. Provide secondary products as recommended by manufacturer of primary products for use with roofing system specified.
5. Delivery, Storage, and Handling: Do not leave unused felts and other sheet materials on the roof overnight or when roofing work is not in progress unless protected from weather or other moisture sources.
6. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit unit of Work to be installed according to manufacturers’ recommendations and warranty requirements.
7. Special Project Warranty: Submit two executed copies of standard 2-year “Roofing Warranty” covering work of this Section, including roofing membrane, membrane flashing, roof insulation, and roofing accessories, signed and countersigned by Installer (Roofer) and Contractor.
8. Manufacturer’s Warranty: Submit executed copy of roofing manufacturer’s standard Limited Service Warranty agreement including flashing endorsement, signed by an authorized representative of modified bitumen sheet roofing system manufacturer, on for that was published with product literature as of date of Contract Documents, for the following period of time:
 - a. 12 years after date of Substantial completion.

B. Products

1. Manufacturer: Provide modified bituminous sheet roofing by one of the following:
 - a. Firestone.
 - b. Schuller International, Inc.
2. Polyisocyanurate-Foam Board Insulation: Rigid boards of minimum 2.0-pcf density polyisocyanurate-based foam core, bonded to roofing felt facer sheets. Provide in thickness to achieve R19, when tested according to ASTM C 518 after insulation is conditioned per RIC/TIMA 28101 Conditioning Procedure.
3. Insulation Overlay Board: Perlite board, ¾ inch thick; ASTM C 728.
4. Insulated Deck, Modified Bitumen Membrane/Fully Adhered (IMBF): Provide the following system:
 - a. Base Sheet: Styrene Butadiene Styrene Styrene (SBS)-modified bitumen base sheet, with glass-fiber reinforcing mat, dusted with fine mineral granules both sides.
 - b. Interply Bitumen: Roofing asphalt, complying with ASTM D 312, Type III.
 - c. Modified Bitumen Sheet Membrane/Mineral Surfaced: Styrene Butadiene Styrene (SBS)-modified asphalt sheets with continuous layer of mineral granules factory-applied to top exposed surface; manufacturer’s standard sheet thickness. Granule color: White.
 - (1) Sheet Reinforcing: Woven or nonwoven polyester
5. Flashing and Stripping: Modified bituminous sheet, as recommended by roofing membrane manufacturer.
6. Wood Members: Comply with requirements of Division 6 for wood members.
7. Cants:

- a. Perlite board, ASTM C 728.
 8. Tapered Edge Strips:
 - a. Rigid perlite board, ASTM C 728.
 9. Walkway Protection Boards: Mineral-surfaced bituminous composition boards, approximately ½ inch thick.
 10. Fasteners for Nailable Substrates: Tested by manufacturer for required pull-out strength where applicable and compatible with deck type and roofing products used. Provide either 1-inch-diameter nail heads or 1-3/8-inch-diameter by 30-gage sheet metal caps for nails used to secure base sheets, felts, or insulation boards.
 11. Fasteners for Steel Deck: Galvanized steel, fluoropolymer-coated steel, or nonferrous metal screws recommended by manufacturer for material to be fastened and substrate and complying with requirements of governing authorities and listing agencies.
- C. Execution
1. Install roofing system according to manufacturer's recommendations, NRCA recommendations, testing agency listings, local code requirements, and applicable insurance requirements.
 2. Asphalt Bitumen Heating: Heat and apply bitumen according to EVT Method as recommended by NRCA.
 3. Bitumen Mopping Weights: For interplay mopping, apply bitumen at the rate of 25 lb of asphalt per roof square (plus or minus 25 percent on a total-job average basis).
 4. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building and drains, or damaging roofing system components or adjacent building construction.
 5. Cutoffs: At end of each day's roofing installation, protect exposed edge of incomplete work.
 6. Insulation, General: Comply with insulation manufacturer's instructions and recommendations for handling, installing, and bonding or anchorage of insulation to substrate.
 7. Secure insulation to deck using mechanical fasteners over entire area of roofing.
 8. Two-Layer Installation: Where overall insulation thickness is 2 inches or greater, install required thickness in two layers with joints of second layer staggered from joints of first layer a minimum of 12 inches each direction. Install second layer in full mopping of hot asphalt.
 9. Roof Membrane Installation: Install the following courses:
 - a. Base sheet: One course, hot mopped.
 - b. Top sheet: One course modified bituminous sheet, hot mopped.
 10. Install membrane with ply sheets shingled uniformly to achieve required number of membrane plies throughout. Shingle in proper direction to shed water.
 11. Extend top sheet to 2 inches above top edge of cant strip and terminate. Nail edges of membrane to wood blocking at perimeter edges of roof prior.
 12. Install flashing at cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof.
 13. Install stripping where metal flanges are set on roofing.
 14. Allow for expansion of running metal flashing and edge trim which adjoins roofing. Do not seal or bond membrane or modified bituminous flashing or stripping to metal flanges over 3 feet in length.
 15. Roof Walkways: Install walkways where indicated on drawings.
 16. Composition Board Walkways: Set units in additional pour coat of hot bitumen after aggregate surfacing of modified bituminous sheet membrane.
 17. Protect roofing during remainder of construction period.
 18. Repair or replace (as required) deteriorated or defective work to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION

SECTION 07620 – ROOF RELATED SHEET METAL**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. It is the intent of this Section that the Work shall:
 - 1. conform to all applicable building code requirements and of authorities having jurisdiction;
 - 2. include all shop and field formed sheet metal work shown on drawings, specified or required, including, but not limited to:
 - a. Roof penetration sleeves and hood and umbrella counterflashing
 - b. Metal counterflashing
 - c. Expansion joint
 - d. Roof drains
 - e. Scuppers
 - f. Metal perimeter edge
 - g. Gutters, Downspouts, Splash Blocks and Splash Pans
 - h. One-way roof moisture relief vents
 - i. Metal gravity vents
 - j. Metal heat exhaust vents
 - k. Sanitary vent pipes
 - l. Pipe box
 - m. Copings, trim and miscellaneous sheet metal accessories.
 - 3. be part of the Work of Section 07527, Modified Bitumen Membrane Roofing System; and
 - 4. be performed by a single source contractor.

1.2 RELATED WORK

- A. Section 07527 – Modified Bitumen Membrane Roofing System
- B. Section 07721 – Roof Accessories
- C. All Sections of Work relating to or affecting the roofing system, including mechanical, plumbing and electrical items.

1.3 REFERENCES

- A. ASTM International (ASTM)
 - 1. A525, Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
 - 2. A526, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
 - 3. A527, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
 - 4. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - 5. B32, Standard Specification for Solder Metal
 - 6. C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
- B. FM Global (FM)
 - 1. Loss Prevention Data Sheets: I-49, Perimeter Flashing
- C. Federal Specifications (FS)
 - 1. QQ-L-201
- D. National Association of Architectural Metal Manufacturers (NAAMM)
- E. National Roofing Contractors Association (NRCA)
 - 1. Roofing and Waterproofing Manual
- F. Sheet Metal and Air Conditioning Contractors National Associations, Inc. (SMACNA)

1.4 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.

2. Manufacturer's installation instructions.

- B. Shop Drawings: Indicating sizes, configurations, details of attachment to related and adjacent work, materials, and finishes.
- C. Samples:
1. Full range of finish colors for Architect's selection.
 2. 12 inch long sample of each specified item with approved finish.
 3. Provide full size mockup of all shop built assemblies.

1.5 QUALITY ASSURANCE

- A. Single Source Responsibility: Fabricator and installer of roof-related flashing and accessories shall be the same as the membrane roof installer.
- B. Comply with governing codes and regulations of authorities having jurisdiction.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, handle and store materials in accordance with manufacturer's instructions.
- B. Handle and store materials and equipment in such a manner as to avoid damage.
- C. No storage of materials shall be permitted on roof areas other than those materials that are to be installed the same day. Any exception must be in written form. Do not place materials or equipment in such a manner as to overload structure.

1.7 WARRANTIES

- A. Manufacturer's Product Warranty:
1. Manufacturer's standard 20 year Kynar 500 or Hylar 5000 Finish warranty signed by the manufacturer, with guarantee covering any failure of the fluoropolymer finish during the warranty period.
 2. Failure is defined to include, but not be limited to:
 - a. Deterioration of finish, such as fading, discoloring, peeling, cracking, corroding, etc.
 - b. Leaking water within building or construction.
 3. Correction may include repair or replacement of failed product.
- B. Roofing Contractor's Warranty:
1. Contractor shall warrant the sheet metal work and related work to be free from defects in workmanship and materials, and that the metal flashings will be and remain watertight, for a period of five (5) years from date of Substantial Completion.
 2. Defects shall include, but not be limited to:
 - a. Leaking water or bitumen within building or construction.
 - b. Becoming loose from substrate.
 - c. Loose of missing parts.
 - d. Finish failure as defined above.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Manufacturers named within specification are approved for use on the Project providing:
1. their products meet or exceed the specifications;
 2. company has a minimum of five (5) years experience manufacturing products of the type specified;
 3. products have been tested in conjunction with roofing membrane system as an assembly and as such has obtained the same approval and rating as the roofing membrane system; and
 4. products are approved for use by the roofing membrane manufacturer.
- B. Substitutions shall be in accordance with Division 1 requirements regarding substitutions.

2.2 SHEET METAL MATERIALS

- A. General Requirements: Roofing sheet metal system shall have been tested in conjunction with roofing membrane system as an assembly and have the same approval and rating as the roofing membrane system.
- B. Prefinished Aluminum Sheet:
 - 1. Precoated type, aluminum conforming to Fed. Spec. QQ-A0250, ASTM B209.
 - 2. Finish: Kynar 500, color as selected by Architect from manufacturer's full line of standard colors.
 - 3. Thickness: Minimum 0.040 inch, except as otherwise indicated.
- C. Sheet Lead:
 - 1. Comply with FS QQ-L-201, Grade B
 - a. Four (4) pound minimum for use at roof drains and soil stacks.
 - 2. Stainless Steel: ASTM A167, Type 302/304 Soft Temper, No. 2D finish. Minimum thickness 24 gauge, except as otherwise noted.

2.3 FASTENERS

- A. Same metal as flashing/sheet metal or other non-corrosive metal or as noted below.
- B. Exposed fasteners shall be self-sealing and gasketed for weathertight installation. (ZAC type)
- C. Match finish of exposed heads with material being fastened.
- D. Mechanical Fasteners:
 - 1. Nails: Ring shank, minimum 1½ inches in length with ½ inch diameter head.
 - 2. Washers: Steel washers with bonded rubber sealing gasket.
 - 3. Screws: Self-tapping sheet metal type of stainless steel or compatible with material being fastened, with hooded integral EPDM washers (ZAC type).
 - 4. Rivets: Stainless steel and cadmium plated material, closed end type of sizes recommended by sheet metal manufacturer to suit application.
- E. Clips:
 - 1. Continuous Cleat (coping/fascia): Minimum 20 gauge, G-90 galvanized, stainless steel, or aluminum Match material of coping/fascia and provide one (1) gauge heavier.

2.4 RELATED MATERIALS

- A. Solder: ASTM B32, alloy grade 58, 50 percent tin, 50 percent lead.
- B. Flux:
 - 1. Phosphoric acid type, manufacturer's standard
 - a. For Use with Steel or Copper: Rosin flux
 - b. For Use with Stainless Steel: Acid-chloride type flux, except use rosin flux over tinned surfaces.
- C. Underlayment:
 - 1. 48 mil minimum, non-reinforced, homogeneous, waterproof, impermeable elastomeric sheeting manufactured by Nervastral, Inc. or Lexsuco.
- D. Adhesives: Type recommended by flashing sheet manufacturer seaming and adhesive application of flashing sheet to ensure adhesion and watertightness.
- E. Metal Accessories: Sheet metal clips, straps, anchoring devices, clamps and similar accessories required for the complete installation of work, matching or compatible with material being installed, non-corrosive, size and gauge recommended by installer to suit application and performance.
- F. Sealant:
 - 1. Type A:
 - a. Type: One-part, non-sag, moisture-curing polyurethane sealant.

- b. Approved Products/Manufacturers: “Chem-Calk 1200” manufactured by Bostik Construction Products Division, “795 Silicone Building Sealant” manufactured by Dow Corning Corporation, “895 Silicone” manufactured by Pecora Corporation, “Omniseal” manufactured by Sonneborn Building Products, “Spectrem 2” manufactured by Tremco Incorporated, or approved equal.
- G. Grout – Pitch Pans:
1. Type: Quick-setting, non-shrink, non-metallic, high strength formula complying with ASTM C1107.
 2. Approved Products/Manufacturers: “Sure Grip High Performance Group” manufactured by Dayton Superior Corporation, “Premier Quick-Trim” manufactured by L & M Construction Chemicals, Inc., “Masterflow” manufactured by Master Builders, Inc., “SonnogROUT 10K” manufactured by Sonneborn Building Products, or approved equal.
- H. Pitch Pan Filler:
1. Type: Pourable polyurethane sealer, approved by roofing system manufacturer.
 2. Approved Products/Manufacturers: “Quick Pitch Sealer” manufactured by U.S. Intec, “SPM Pourable Sealer” manufactured by Johns Manville, or approved equal.
- I. Termination Bar:
1. Material: Extruded aluminum bar with flat profile.
 2. Size: 1/8 inch thick by one (1) inch wide with factory punched ¼ inch x 3/8 inch oval holes spaced six (6) inches on center.
 3. Approved Product/Manufacturer: “TB 125” manufactured by TruFast Corp., or approved equal.
- J. Pipe Hangers and Supports: Refer to Section 07721, Roof Accessories.
- K. Splash Blocks: Concrete type, of size and profiles indicated; minimum 3,000 psi compressive strength at 28 days, with minimum five (5) percent air entrainment. Use at locations where roof drainage dumps on ground.
- L. Splash Pans: 22 gauge stainless steel, of size and profiles indicated. Use at locations where roof drainage discharges over adjoining, lower roof level(s).
- M. One-Way Moisture Relief Vents: Shall be fabricated from spun aluminum as recommended by Roofing Manufacturer.

2.5 FABRICATION

- A. Except as otherwise indicated, fabricate work in accordance with SMACNA Architectural Sheet Metal Manual and other recognized industry practices and reviewed shop drawings. Form all flashings, receivers and counterflashings in accordance with standards set forth in the NRCA roofing manual and SMACNA.
- B. Comply with manufacturer’s installation instructions and recommendations.
- C. Unless noted otherwise, fabricate perimeter edge/fascia, scuppers, gutters, downspouts, copings, counterflashings, wind clips, and trim from pre-finished galvanized sheet steel.
- D. Shop fabricate work to greatest extent possible. Fabricate inside and outside corners for metal edges, counterflashing, and coping caps.
- E. Fabricate items to size and dimensions as indicated on the drawings. Limit single-piece lengths to ten (10) feet.
- F. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work sufficient to permanently prevent leakage, damage or deterioration of the work.
- G. Integrate flashing in a manner consistent with detailing. Form work to fit substrates.
- H. Make angle bends and folds for interlocking metal with full regard for expansion and contraction to avoid buckling or fullness in metal after installation.
- I. Fabricate items with straight lines, sharp angles, smooth curves, and true levels. Avoid tool marks, buckling, and oil canning.
- J. Fold back edges on concealed side of exposed edge to form hem.

- K. Unless noted otherwise, lap joints minimum one (1) inch. Rivet and solder joints on parts that are to be permanently and rigidly assembled.
- L. Seams:
 - 1. Wherever possible, fabricate non-moving seams in sheet metal with flat-lock seams and end joints.
 - 2. Pre-finished Galvanized Steel: Seal pre-finished metal seams with rivets and silicone sealant.
 - 3. Metal Other than Aluminum: Tin edges to be seamed, form seams, and solder.
- M. On Kynar 500 or Hylar 5000 pre-finished metal, surface sand metal flanges prior to applying any primers. Prime all metal in contact with bituminous material.
- N. Backpaint all concealed metal surfaces with bituminous paint where expected to be in contact with cementitious materials or dissimilar metals.
- O. Expansion Provisions: Where lapped or bayonet type expansion provision in work cannot be used or would not be sufficiently waterproof or weatherproof, form expansion joints of intermeshing hooked flanges, not less than one (1) inch deep filled with mastic sealant concealed within joints.

2.6 FABRICATED ITEMS

- A. Metal Flashings: (Minimum ten (10') foot lengths)
 - 1. Through wall Receiver Tray: Minimum 24 gauge stainless steel.
 - 2. Counterflashing: Minimum 24 gauge pre-finished galvanized metal.
- B. Wind Clips: Minimum 24 gauge stainless steel (or match material of counterflashing), one (1) inch wide by length to engage counterflashing a minimum of ½ inch. To be installed at all wall flashings and at curb flashing lengths longer than 5 feet.
- C. Roof Penetrations:
 - 1. Umbrella Counterflashing: Two-piece construction of minimum 24 gauge stainless steel, fabricated in accordance with drawings or project requirements.
 - 2. Pitch Pans:
 - a. 24 gauge stainless steel.
 - b. Fabricate to provide installed minimum clear inside perimeter dimension of two (2) inches on each side of penetrating element.
 - c. Fabricate pans to at least six (6) inches above the finished roof membrane and with ¼ inch hem at top edge and with four (4) inch flanges. Round all corners of flange.
 - d. Fabricate metal bonnets for all pans, NO EXCEPTIONS. Fabricate bonnets with metal compatible with metal to which bonnet is to be attached. On beams and other steel, weld in place bonnets fabricated from 1/5 inch steel plate. Draw band bonnets fabricated from 22 gauge stainless steel may be used on circular projections.
- D. Metal Edge:
 - 1. Minimum 0.040 inch thick pre-finished aluminum formed in maximum ten (10) foot lengths, with six (6) inch wide cover plates of same profile, four (4) inch flange, maximum seven (7) inch fascia, ¾ inch gravel stop.
 - 2. Provide expansion slip joints at maximum 20 feet on center.
 - 3. Shop fabricate all interior and exterior corners. Fabricate exterior corners with 18 inch minimum to four (4) foot maximum legs. Lap, rivet, and seal prior to delivery to jobsite.
 - 4. Fabricate to sizes and dimensions as indicated on drawings with a minimum one (1) inch coverage past top of wall. Refer to SMACNA Fig. 2-5A.
 - 5. Provide mock-up for Architect's approval prior to fabrication.
- E. Continuous Cleats: Continuous strips, same material and profile, minimum one gauge heavier of item which cleats attach.
- F. Vent Hoods, Sleeves, Penetration Flashings, and Accessories: Minimum 24 gauge stainless steel, or as shown or directed otherwise.
- G. Angle Termination Bar: Aluminum pressure bar 1/8 inch x one (1) inch.
- H. Vent Pipe Flashing: Four (4) pound lead. Provide proper size to fold down inside of pipe a minimum of one (1) inch.
- I. Roof Drain Flashing: Four (4) pound lead, minimum 30 inches by 30 inches

- J. Coping:
1. Minimum 0.040 inch thick pre-finished aluminum, with six (6) inch wide cover plates of same profile.
 2. Fabricate as outlined in SMACNA; Refer to Figure 3-4 A.
 3. Provide tapered substrate to slope to one (1) side, and cover with waterproof membrane.
 4. Install with continuous cleat one (1) side and fasten other side.
- K. Gutters/Downspouts/Collector Heads:
1. Gutters and Downspouts: Minimum 0.040 inch thick pre-finished aluminum formed in maximum ten (10) foot lengths, with six (6) inch wide cover plates. Minimum five (5) inch x six (6) inch box gutter (verify size meets rainfall data per SMACNA).
 2. Gutter/Downspout Straps: minimum 0.040 inches thick pre-finished (match color) aluminum. Hem both sides.
 3. Gutter Supports: minimum 0.040 inches thick pre-finished (match color) aluminum hemmed around 1/8 inch galvanized bent steel bracket.
 4. Gutter Screen: Stainless steel 1/4" diamond wire screen enclosed in a pre-finished steel frame.
 5. Collect Heads: minimum 0.040 inches thick pre-finished (match color) aluminum. As outlined SMACNA; Refer to Figure 1-25F and Figure 1-28 with alternate Section A-A.
- L. Pipe Box cover: 24 gauge stainless steel.
- M. Heat Exhaust Curbs and Hood: 22 gauge stainless steel.
- N. Expansion Joint Cover: Minimum 24 gauge stainless steel (Provide pre-finished galvanized metal at perimeter edge end termination.)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify substrates are smooth and clean to extent required to perform sheet metal work.
- B. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set in place.
- C. Verify that reglets, nailers, cants, and blocking to receive sheet metal are in place and free of concrete and soil.
- D. Do not start work until conditions are satisfactory.

3.2 PREPARATION

- A. Field measure site conditions prior to fabrication work.
- B. Install starter and edge strips, and cleats before starting installation.

3.3 INSTALLATION

- A. Install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from objectionable wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form ¼ inch hem on concealed side from view. Finished work shall be free from water retention and leakage under all weather conditions. Pre-fabricated corners or transitions are required at changes in direction, elevation, or plane and at intersections. Locate field joints not less than 12 inches, not more than three (3) feet from actual corner. Laps shall be one (1) inch, riveted and soldered at following locations:
 1. Pre-fabricated corners;
 2. transitions;
 3. changes in direction, elevation, and plane, and
 4. at intersections.
- B. Anchor units of work securely in place to prevent damage or distortion from wind or buckling. Provide for thermal expansion of metal units; conceal fasteners wherever possible; and set units true to line and level as indicated. Install work with laps, joints, and seams which are permanently watertight and weatherproof.
- C. Install fabricated sheet metal items in accordance with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.

- D. Separations: Provide for separation of metal from dissimilar metal or corrosive substrates by coating concealed surfaces with zinc chromate, bituminous coating, or other permanent separation at locations of contact as recommended by manufacturer or fabricator. Do not use materials which are incompatible with roofing system.
- E. Continuous Cleat: At exposed edges of perimeter edge, fascias, cap flashings, and where required, attach continuous cleat at six (6) inches on center with appropriate fasteners.
- F. Gravel Guard/Fascia:
1. Install with expansion joints 10 feet o.c., ½ inch expansion leeway, with cover plate.
 2. Set in asphalt mastic and fasten into nailer at 3 inches o.c. staggered.
 3. Buff sand Kynar surface of flange and prime.
 4. Strip in flange with specified stripping plies set in hot bitumen extending 3 inches from outer edge of flange to at least 3 inches inward towards gravel stop. Provide finish stripping ply of modified bitumen base ply in hot bitumen extending 6 inches from the outer edge of the flange and butt base of gravel stop.
- G. Counterflashing:
1. Do not use surface mount counterflashing except as noted in drawings.
 2. Set in through wall with receiver and spring lock counterflashing, as detailed in drawings and to NRCA roofing manual, SMACNA standards.
 3. Coordinate installation of through-wall flashing with the masonry contractor.
 4. Seal through-wall in conjunction with masonry wall waterproofing.
 5. Install wind clips 30 inches o.c. at all counterflashing over five (5) feet in length.
- H. Pitch Pans, Metal Flanges:
1. Apply mastic under pitch pan or metal flashing flange at least ½ pound per linear foot.
 2. Prime all metal flanges with asphalt primer prior to flashing installation.
 3. Clean all projections enclosed in pitch pans in any manner suitable and coated with a rust inhibitive coating as approved by the Architect. Coating shall be allowed to dry prior to pitch pan fill.
 4. Fill bas of pitch pans with grout or cementitious binder and allow to cure.
 5. Top Finish Fill: Self-leveling, one-part urethane; at least two (2) inches to top of pitch pan sides.
 6. Strip in pitch pan flanges with two strips of specified stripping plies set in hot bitumen extending three (3) inches from the outer edge of the flange to at least three (3) inches inward toward base of pitch pan. Provide finish stripping ply of SBS modified bitumen membrane in hot bitumen extending six (6) inches from the outer edge of the flange and butt to base of pitch pan.
- I. Sanitary Vent Stacks:
1. Prime top and bottom flanges of lead flashing sleeve. Set flange in uniform troweling of plastic roof cement. Prime top side of flange to receive strip-in membrane.
 2. Fold lead sleeve down inside of pipe a minimum of one (1) inch. Apply a continuous bead of sealant on inside of pipe prior to folding lead sleeve.
- J. Roof Drains:
1. After membrane installation, prime bottom of lead flashing sheet and set in uniform bed of plastic roof cement at specified locations.
 2. Extend lead flashing into drain bowl or pipe a minimum of two (2) inches and over top of piping/bowl connection, if possible. Apply a continuous bead of specified Type A sealant, at intersection of pipe and drain bowl.
 3. If drain bowl and pipe connection is contaminated with bituminous material, strip-in area with three (3) coursing of plastic roof cement and fabric.
 4. Prime top of lead flashing sheet to receive strip-in membrane.
- K. Gutters/Downspouts:
1. Install gutters as detailed.
 2. Install downspouts plumb and level, attached to columns or wall with straps located at top and bottom of downspout and maximum ten (10) feet on center.
 3. Install splash pad or block under discharge port of downspouts. Install splash pan over a protection (walkway) pad for downspouts located at roof level.
 4. End Caps, Downspout Outlets, Gutter and Downspout Straps, Support Brackets and joint fasteners to be manufactured to suit profile and dimension of gutter and downspout.
 5. Install all anchoring devices as outlined in SMACNA.
 6. Expansion Joints: Lap or Butt type per SMACNA, locate every 50 linear feet.

- L. Expansion Joint:
1. Construct wood curbs as shown on drawings and as outlined in the NRCA and SMACNA Manuals.
 2. Install underlayments, form envelope, and secure underlayment to curb. Fill envelope with compressible insulation.
 3. Securely fasten expansion joint cover to curb with grommetted fasteners spaced six (6) inches on center.
 4. Taper expansion joint down at the metal edge.
- M. Coping:
1. Install wood nailers as shown on drawings.
 2. Install metal cleats with appropriate fasteners spaced six (6) inches on center.
 3. Install underlayment over the wood substrate. Lap ends minimum of six (6) inches and secure membrane in place. Seal laps with appropriate adhesive.
 4. Install metal coping allowing ½ inch spaces between segments. Lock coping onto cleat and install appropriate fasteners through the interior fascia spaced 24 inches on center in enlarged holes.
 5. Install cover plate centered over coping joint in continuous beads of specified Type B sealant, placed approximately one (1) inch from cover edges. Refer to SMACNA for alternate joints s required by length.
 6. Install appropriate fastener through neoprene washer and cover plate between coping segments.
 7. Accommodate building wall expansion joints by terminating coping joints and cleats either side of expansion joint. Do not run coping or cleats continuous across joins. Install coping cover plate to span across joint and lap coping on each side of joint a minimum of four (4) inches. Fasten cover plate on one (1) side of joint only. (Provide wall flashing membrane up and over parapet wall in accordance with manufacturer's detail.)

3.4 CLEANING AND PROTECTION

- A. Remove flux and residual acid immediately by neutralizing with baking soda and washing with clean water. Leave work clean of stains.
- B. Remove scraps and debris and leave work area clean.
- C. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes. Paint areas where finish is damaged on pre-finished metal be painting with a compatible paint in color to match undamaged finish.
- D. Prime soldered are of phosphatized metal after cleaning to prevent rusting.
- E. Paint metal flashings that have been soiled with bitumen with aluminized paint.
- F. Clean other work damaged or soiled by Work of this Section.
- G. Protect finished work from damage.

END OF SECTION

SECTION 07721 – ROOF ACCESSORIES**PART 1 - GENERAL****1.1 INSTALLATION RESPONSIBILITY**

- A. In addition to the items normally a part of this Section, coordinate the installation of roof accessory curbs and pipe flashings and equipment supports that may be specified elsewhere.
- B. Coordinate the work specified herein with the following Work:
 - 1. Roofing
 - 2. Roofing sheet metal
 - 3. Mechanical equipment
 - 4. Plumbing

1.2 REFERENCES

- A. Federal Specifications (FS)
 - 1. TT-S-00227E
- B. National Roofing Contractors Association (NCRA)
- C. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
 - 1. Architectural Sheet Metal Manual

1.3 SUBMITTALS

- A. Product Data: Submit schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, product variations, and accessories.
- B. Shop Drawings: Indicate size, material, and finish. Show locations and installation procedures. Include details of joints, attachments, and clearances.

1.4 WARRANTY

- A. Warranty the Work specified herein for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- B. Defects shall include, but not be limited to, the following:
 - 1. Noticeable deterioration of finish
 - 2. Leakage of water into the building or within the construction.

PART 2 - PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS**

- A. Specifications are based on products of named manufacturers. Other manufacturers must have a minimum of five (5) years experience manufacturing products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.

2.2 PREFABRICATED ROOF CURBS

- A. Frames:
 - 1. Material: ASTM A 653 G90 hot-dipped galvanized steel.
 - a. Minimum 18 gauge, and as engineered by manufacturer.
 - b. Minimum 18 gauge for curbs supporting HVAC units
 - c. Minimum 20 gauge for expansion joint curbs.
 - 2. Corners: Mitered and welded (welds are micro sealed and prime painted after fabrication). Bolted connections not accepted.
 - 3. Base Plates: Integral to frame and welded.

4. Internally reinforced with galvanized 1 inch by 1 inch by 12 gauge angles for curbs exceeding 3 foot length. Reinforce internal bulkhead at equipment curbs to support lateral loads.
 5. Wood Nailers: Factory installed, pressure treated. Size and width as suitable for support of items installed on curbs.
- B. Insulation: Factory installed 1-1/2 inch thick three-pound density fiberglass insulation.
 - C. Curb Height: Minimum 8 inch above finished roof.
 - D. Construct curbs to match roof slope with plumb and level top surface for mounting mechanical equipment.
 - E. Gasketing: ¼ inch thick, one (1) inch wide at roof top units
 - F. Counterflashing: 18 gauge galvanized steel
 - G. Counterflashing Cap: Stainless steel
 - H. Cants:
 1. Non-canted curb style installs either under or on top of metal decks with insulation.
 2. Cants shall be provided under Section 07512 – Roofing
 - I. All insulated roof curbs shall be structural and shall include calculations signed and sealed by a registered Structural Engineer. Refer to installation drawings for any additional structural requirements. If curbs do not span a minimum of two bar joists, only two angles will be required. Coordination with Architect's Structural Engineer for mechanical equipment weight loading on the roof structure shall be by the Architect.
 - J. Approved Manufacturers:
 1. The Pate Co.
 2. Custom Curb, Inc.
 3. Roof Products, Inc.

2.3 PIPE SUPPORTS

- A. Gas Pipe Supports:
 1. Provide strut and hanger type support with recycled plastics and carbon black for UV protection bases (10 inches x 16 inches x 3 inches; 6 lbs. each); Model Type PP-10 with strut & hanger for lines 2-1/2 inches and smaller, Model Type PS-1-2 with hanger for lines 3 inches and larger.
 2. As manufactured by Portable Pipe Hanger, Inc.; MAPA; or Architect approved equal.
- B. Electrical Conduit/Condensate Lines:
 1. Provide strut type support with recycled plastics and carbon black for UV protection bases (10 inches x 16 inches x 3 inches; 6 lbs. each), install with hold clips; Model Type PP-10 with strut.
 2. As manufactured by Portable Pipe Hanger, Inc.; MAPA; or Architect approved equal.
- C. Chill Water Lines:
 1. Provide strut and hanger type support with recycled plastics and carbon black for UV protection bases (size as required); Model Type PS-1-2 and Model Type PSE-2-2 as required.
 2. As manufactured by Portable Pipe Hanger, Inc.; MAPA; or Architect approved equal.
- D. Installation:
 1. Locate as indicated by Drawing at no greater than 8 feet-0 inches o.c.
 2. Provide protective traffic pads below each support, tacked in place with approved mastic or adhesive.
 3. Install hold down clips if indicated on the drawings or required.

2.4 ROOF TO ROOF EXPANSION JOINT

- A. Stainless Steel expansion joint covers on new wood curbs, as detailed on drawings and outlined in the NRCA and SMACNA manual.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install roof accessories in accordance with manufacturer's printed instructions and approved shop drawings. Installation of Portable Pipe Hangers shall not exceed six (6) feet on center.
- B. Coordinate with roofing operation for watertight integrity.
- C. Finished installation shall be water and air tight. Install sealant conforming to FS TT-S-00227E, Type 11, Class A.

END OF SECTION

SECTION 07900 - BUILDING SEALANTS**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Exterior sealants and sealants for moving joints, except for joints in those systems listed under Related Work.
- B. Interior sealants and caulking.

1.2 RELATED WORK

- A. Section 03300 – Cast-In-Place Concrete: Sealants used in conjunction with concrete paving.
- B. Division 7 – Roofing Sections: Sealants used in conjunction with roofing.
- C. Section 07620 – Sheet Metal Flashing, Gutters, Downspouts and Trim: Sealants used in conjunction with sheet metal items.
- D. All sections of work requiring Work of this Section.

1.3 REFERENCES

- A. Federal Specifications (FS)
 - 1. TT-S-00227E
- B. ASTM International (ASTM)
 - 1. C793, Standard Test Method for Effects of Accelerated Weathering on Elastomeric Joint Sealants
 - 2. C794, Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
 - 3. C834, Standard Specification for Latex Sealants
 - 4. C920, Standard Specification for Elastomeric Joint Sealants

1.4 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's installation instructions
- B. Sample: On site sample for Architect's approval of colors
- C. Certification: Manufacturer's affidavit that materials used Project contain no asbestos.

1.5 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01110 – Notification of Architect Requirements

1.6 WARRANTY

- A. Warrant the work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- B. Defects shall include, but not be limited to:
 - 1. Leaking
 - 2. Cracking, splitting or releasing from substrate
 - 3. Deterioration or color change

PART 2 – PRODUCTS**2.1 APPROVED MANUFACTURERS**

- A. Specifications are based on the products or materials or the named manufacturer, otherwise selection may be made from any manufacturer listed below whose products meet or exceed the specifications. Other manufacturers must have a minimum of five (5) years experience manufacturing the products meeting or exceeding the specifications and comply with Division 1 requirements regarding substitutions to be considered.
1. Typical Sealants:
 - a. Bostik
 - b. Pecora, Inc.
 - c. Sonneborn
 - d. Sika
 - e. Tremco Incorporated
 2. Silicone Sealants at Appliances:
 - a. Pecora, Inc.
 - b. General Electric Co.
 - c. Dow Corning

2.2 MATERIALS

- A. Caulking for Exposed Non-Working Interior Locations:
 1. Type: Paintable Acrylic Latex conforming to STM C834, vertical grade.
- B. Sealant for All Working Joints and Exposed Exterior Locations:
 1. Type: Two component, polyurethane, non-sag, conforming to FS TT-S-00227E, Type II, Class A and ASTM C920, Type M, Grade NS, Class 25.
 2. Refer to drawings and Section 04200, Unit Masonry for locations. Provide full sealant joints at building expansion joints.
- C. Sealant at All Kitchen Appliance Locations:
 1. Type: One-part silicone sealant conforming to FS TT-S-001543A, and ASTM C920, Type S, Grade NS, Class 25.
 2. Locate at all Kitchen appliances.
 3. Approved Product/Manufacturer: Sanitary SCS1700 Sealant manufactured by General Electric Company, Pecora Corp., Dow Corning, or Architect approved equal.
- D. Primers, Cleaners, Top Coats: Use only materials listed as suitable in resistance to staining, compatibility and durability before proceeding.
- E. Expanded Polyethylene Joint Filler; Provide flexible, compressible, closed-cell, polyethylene of not less than 10 psi compression deflection (25 percent); except provide higher compression deflection strength as may be necessary to withstand installation forces and provide proper support for sealants, surface water absorption of not more than 0.1 pounds per square foot, as manufactured by Sonneborn, or pre-approved equal.
- F. Sealant Backer Rod: Provide compressible rod stock of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable, non-absorptive material as recommended by sealant manufacturer for back-up of and compatibility with sealant. Where used with hot-applied sealant, provide heat-resistant type which will not be deteriorated by sealant application temperature as indicated.
- G. Bond Breaker Tape: Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.

PART 3 - EXECUTION

3.1 APPLICATION

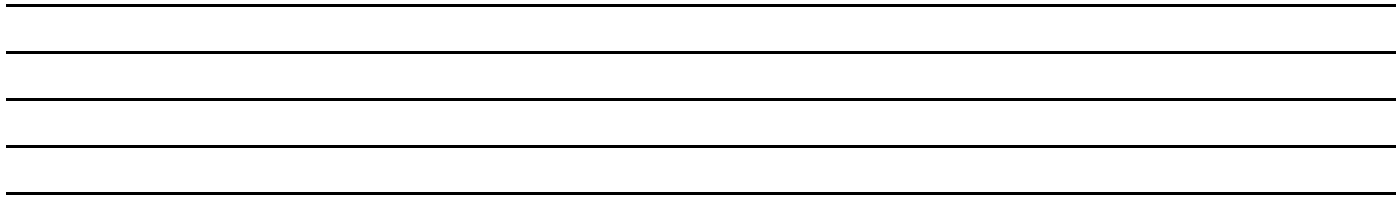
- A. Temperatures: Do not install sealants when air temperature is less than 40 degrees F. Sealants may be warmed to ease installation when recommended by the manufacturer.
- B. Tooling: Tool exposed joints to a slightly concave surface using slicking materials recommended by the manufacturer. The tooling procedure shall press sealant against the sides of the groove. No materials shall be left "feathered" out or smeared on the abutting materials. If necessary, protect adjacent surfaces with tape. Completed joints shall have a

uniform professional appearance. Use an anti-tack compound on sealant that does not set up fast enough to avoid dust collection.

- C. Sealant Back-Up: Provide a back-up filler where groove depth is too great to fill with sealant. Review joint design with Architect.

Compressive Filler: Seal vertical expansion joints with fillers. Provide compressible filler twice the width of the joint and with a depth of 1-1/2 times the compressed width. Lap ends 2 inch minimum. Seal ends together in such a manner to allow natural drainage. Install filler by compressing material and sliding into joint. Align filler on one face of the joint before it expands to the full joint width.

END OF SECTION



**DIVISION 8
DOORS AND WINDOWS**



SECTION 08110 - STEEL DOORS AND FRAMES**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Provide Fire-rated and Non-rated steel doors and frames.
- B. Interior window frames.
- C. Glazing stops.

1.2 RELATED WORK

- A. Section 04300 - Unit Masonry System: Masonry mortar fill of steel frames.
- B. Section 08710 - Hardware: Hardware for doors and frames.
- C. Section 08800 - Glazing: Glass and glazing for doors and frames.
- D. Section 09900 - Painting: Field painting of doors and frames.

1.3 REFERENCES

- A. ANSI A224.1 - Test Procedure and Acceptance Procedure for Prime Painted Steel Surfaces.
- B. ASTM A366 - Steel Carbon, Cold-Rolled Sheet, Commercial Quality.
- C. ASTM A653-96, "Spec for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process."
- D. ASTM E152 - Methods of Fire Tests of Door Assemblies.
- E. DHI (Door Hardware Institute) - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
- F. NFPA 80 - Fire Doors and Windows.
- G. NFPA 252 - Fire Tests for Door Assemblies.
- H. SDI-100 - Standard Steel Doors and Frames.
- I. SDI-105 - Recommended Erection Instructions for Steel Frames.
- J. UL 10B - Fire Tests of Door Assemblies.
- K. UL 10C: Fire Tests of Door Assemblies.
- L. ADAAG - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities.
- M. FM – Doors and Frames shall comply with Factory Mutual Requirements.

1.4 QUALITY ASSURANCE

- A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications Standard Steel Doors and Frames" ANSI/SDI-100 and as herein specified.
- B. Applicator: Company specializing in installing overhead doors with three years documented experience.
- C. Fire rated door and frame construction to conform to ASTM E152.
- D. Installed frame and door assembly to conform to NFPA 80 for fire rated class indicated in Schedule.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire rated frames and doors. Provide completed installation to maintain required fire rating of opening.
- B. Fire-Rated Door Assemblies: Construct fire rated doors and frames according to requirements of UL 10B. Each fire rated door and frame shall bear the appropriate UL labels.
- C. Fire-Rated Door Assemblies: Comply with positive pressure requirements of UL 10C and UBC 7-2. Door assemblies shall bear the UL Label and supplemental " S" positive pressure fire label.
- D. Comply with Dade County Protocols PA-201, PA-202 and PA-203 for hurricane impact resistance, static wind, water infiltration, air infiltration and cyclic wind load.

1.6 SUBMITTALS

- A. Material and Equipment Submittals:
 - 1. Shop Drawings:
 - a. Provide schedule of doors and frames using same opening numbers referenced on the drawings.
 - b. Indicate frame gauge and configuration, fire label, anchor types and spacings, location of cutouts for hardware, and reinforcement.
 - c. Indicate door elevations, hardware group, core material, internal reinforcement, closure method, and cut outs for glazing and louvers.

1.7 DELIVERY, STORAGE AND PROTECTION

- A. Protect products as follows:
 - 1. Protect doors and frames with resilient packaging sealed with heat shrunk plastic.
 - 2. Break seal on-site to permit ventilation.

PART 2 - PRODUCTS

2.1 GENERAL

- A. It is the intention of the designers that the system meet the requirements of ADAAG.

2.2 STEEL DOORS

- A. Exterior Doors: SDI-100 Grade III, Model 4; minimum 14 gauge zinc coated galvanized steel sheet faces complying with ASTM A525, A60; seamless, composite construction; Fiberglass batting insulation, 18 gauge vertical stiffeners, full length hinge reinforcement. Exterior doors shall have a minimum "U" value of 0.24
- B. Interior Non-Fire-Rated Doors: SDI-100 Grade II, Model 4; minimum 18 gauge cold rolled steel sheet complying with ASTM A366; seamless, composite construction; honeycomb core laminated to the inside of both face sheets.
- C. Interior Full-Glazed Door: SDI-100 Grade II, Model 4; minimum 18 gauge cold rolled steel sheet complying with ASTM A366; seamless, composite construction; fully welded stile and rails.
- D. Interior Fire-Rated Doors: SDI-100 Grade II, Model 4; minimum 18 gauge cold rolled steel sheet complying with ASTM A366; seamless, composite construction; mineral fibercore.
 - 1. Provide interior fire-rated doors with UL label as indicated on Opening Schedule.

2.3 STEEL FRAMES

- A. Exterior Frames: Minimum 12 gauge galvanized steel complying with ASTM A525, A60.
- B. Interior Frames: Minimum 16 gauge cold rolled steel complying with ASTM A366 at all other locations.

2.4 ACCESSORIES

- A. Glazing Stops: Provide for glazed lites as indicated on Drawings complying with SDI vision panel designations V, N and G. Construct glazing stops of not less than 18 gauge steel. Fit and install stops in the factory. Form neat hairline joints.
 - 1. Provide intumescent glazing system for fire rated doors to comply with requirements of UL 10C and UBC 7-2.
 - 2. Acceptable Manufacturers and Products:
 - a. Zero: Intumet Glazing Tape FS1001.
 - b. Zero: Intumet Glazing Strips FS3003.
 - c. Comparable products from other manufacturers.
- B. Rubber Silencers: Resilient rubber.

2.5 FABRICATION

- A. Fabricate exterior and double door frames fully welded with corners and stops fully mitred. Grind exposed surfaces smooth with no joints anywhere on the frame.
- B. Fabricate interior frames knocked-down with mitred corners.
- C. Provide frames of required throat depth for wall thickness.
- D. Fabricate frames and doors with hardware reinforcement plates welded in place. Hinge reinforcement shall be not less than 7 gauge plated steel. Other reinforcements shall be minimum of 12 gauge steel. Comply with SDI-100 for minimum hardware reinforcing requirements. Provide mortar guard boxes.
- E. Fabricate doors without seams on faces or vertical edges of door. Door cores shall have 18 gauge vertical stiffeners spaced no more than 6" o.c. extending full width of door, spot welded to face sheets at 5" o.c. Continuously weld vertical edge seams, and grind smooth.
- F. Reinforce frames wider than 48" with roll formed steel channels fitted tightly into frame head, flush with top.
- G. Prepare frame for silencers. Provide three single rubber silencers on strike jamb for single doors, and two single silencers on frame head at double doors.
- H. Attach fire rated label to each frame and door unit, where required.
- I. Reinforce top and bottom edges with a minimum 16 gauge channel welded to face sheets.
- J. Reinforce top hinge with "high frequency hinge" reinforcing straps.
- K. Close top edge of exterior door flush with inverted 16 gauge steel channel closure. Seal joints watertight.
- L. Provide fixed glazing stops on outside of exterior doors and on secure side of interior doors.
- M. Provide floor clips for frames. Provide jamb anchors spaced not over 30" on center for frames. Furnish temporary spreader bars and bracing.
- N. Thoroughly clean, phosphate treat, and apply one coat of rust inhibitive primer containing at least 50% rust inhibitive pigments. Prime frames under removable glazing stops and prime back side of removable stops.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install frames in accordance with SDI-105.
- B. Install doors in accordance with DHI "The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames, and Builders Hardware".
- C. Install fire rated doors and frames in accordance with NFPA 80.
- D. Coordinate with masonry and wallboard wall construction for anchor placement.
 - 1. Masonry Construction: Install frames up to 60" high in masonry construction with minimum 2 jamb anchors each jamb; add an additional anchor for every 30" or fraction thereof.
 - 2. Wallboard Construction: Install frames up to 60" high in wallboard construction with minimum 3 jamb anchors each jamb; add an additional anchor for every 24" or fraction thereof.
- E. Coordinate installation of glass and glazing.

3.2 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16" measured with straight edge, corner to corner.

3.3 ADJUSTING AND CLEANING

- A. Adjust hardware for smooth and balanced door movement.

END OF SECTION

SECTION 08305 - ACCESS DOORS**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Non-rated access doors and frames.

1.2 RELATED SECTIONS

- A. Section 09250 - Gypsum Board Systems: Openings in partitions and ceilings.
- B. Section 09900 - Painting: Field paint finish.

1.3 SUBMITTALS

- A. Material and Equipment Submittals:
 - 1. Shop Drawings: Include sizes, types, finishes, scheduled locations, and details of adjoining work.
 - 2. Product Data.

PART 2 - PRODUCTS**2.1 NON-FIRE RATED ACCESS PANELS**

- A. Gypsum Board Access Panels: 16 gauge steel or 0.060" extruded aluminum frame with drywall flange and 14 gage steel door panels; concealed continuous steel piano hinge which allows 175 deg. opening; cylinder lock. Provide manufacturer's standard factory applied baked enamel primer.
 - 1. Cesco Products, Inc., SR-III.
 - 2. J.L. Industries, Model WB.
 - 3. Karp Associates, Inc., Model KDW.
 - 4. Milcor, Inc., Style DW.
 - 5. Nystrom, Inc., WB Series.

PART 3 - EXECUTION**3.1 INSPECTION**

- A. Verify rough openings for door and frame are correctly sized and located.
- B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

- A. Install frame plumb and level in wall and ceiling openings.
- B. Position to provide convenient access to concealed work requiring access.
- C. Secure rigidly in place in accordance with manufacturer's instructions.

END OF SECTION

SECTION 08410 - ALUMINUM STOREFRONTS**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Storefront framing system.
- B. Fixed window framing.
- C. Anchors, brackets, and attachments.

1.2 PRODUCTS FURNISHED AND INSTALLED (BUT SPECIFIED UNDER OTHER SECTIONS)

- A. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.
- B. Section 08800 - Glass and Glazing.

1.3 RELATED SECTIONS

- A. Section 07200- Insulation: Insulation for window perimeter stuffing.

1.4 REFERENCES

- A. Aluminum Association.
 - 1. AAMA 607.1 - Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
- B. ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.
- C. ASTM E283 - Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.
- D. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- E. ASTM E331 - Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- F. ADAAG - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities.

1.5 PERFORMANCE

- A. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 F deg. without causing detrimental effects to system or components.
- B. Design and size members to withstand dead loads and live loads caused by pressure and suction of wind to a design pressure of 27 lb/sq ft and a suction of 27 lb/sq ft. as measured in accordance with ASTM E330.
- C. Limit mullion deflection to 1/175, or flexure limit of glass with full recovery of glazing materials, whichever is less.
- D. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior.
- E. Limit air infiltration through storefront framing assembly to 0.06 CFM/sq ft of assembly surface area, measured at a reference differential pressure across assembly of 0.3 inches water gage as measured in accordance with ASTM E283. System shall demonstrate no water penetration at a test pressure of 6.24 psf as measured in accordance with ASTM E331.
- F. Limit air infiltration through aluminum entrance assembly to 0.50 CFM per linear foot of perimeter crack for single doors and 1.0 CFM per linear foot of perimeter crack for pairs of doors, measured at a reference differential pressure across assembly 1.57 as measured in accordance with ASTM E283.

- G. System to accommodate, without damage to system or components, or deterioration of perimeter seal: Movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.

1.6 SUBMITTALS

A. Material and Equipment Submittals:

1. Shop Drawings: Include elevations; system and component dimensions; components within assembly; framed opening requirements and tolerances; anchorage and fasteners; reinforcement; glass and infills; detailed door hardware schedule; and affected related work.
2. Product Data: Submit for each item of hardware scheduled for aluminum entrances.
3. Manufacturer's Installation Instructions.

B. Closeout Submittals:

1. Warranty: As specified in this Section.

1.7 PREINSTALLATION CONFERENCE

A. Convene a pre-installation conference under provisions of Section 01200 one week prior to commencing work of this Section.

1. Attendance required of Contractor, system installer, and parties directly affecting work of this Section.
2. Review conditions of installation, installation procedures and coordination required with Related Work.

1.8 QUALITY ASSURANCE

A. Manufacturer and Installer: Engage an authorized representative of automatic entrance system manufacturer with not less than 3 years experience.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, store, and protect system components under provisions of Section 01600.
- B. Provide wrapping to protect prefinished aluminum surfaces.

1.10 WARRANTY

- A. Provide one year manufacturer's warranty to cover complete system for failure to meet specified requirements.

PART 2 - PRODUCTS

2.1 STOREFRONT FRAMING

- A. Storefront Framing: Aluminum extrusions conforming to ASTM B221, alloy G.S.10A-T5; non-thermally broken, center glazing system, shear block assembly; min. 1-3/4" to 2" x 4-1/2" profile for 1/4" to 1" insulated glazing or as required for code-required loadings.
 1. Kawneer Company, Inc., Trifab 450 (451).
 2. CMI Architectural Products, Inc.
 3. International Aluminum Corporation, US Aluminum.
- B. Provide head receptor with weather stripping, and other special shapes as shown.
- C. Glazing may be from interior or exterior.

2.2 FINISHES

- A. Dark Bronze Anodized Aluminum Finish: Architectural Class II coating conforming to Aluminum Association Standard AA-M12C22A31, 0.4 mil minimum, electrolytically deposited anodic coating.

2.3 GLASS AND GLAZING MATERIALS

- A. Glazing Materials: As specified in Section 08800.

2.4 SEALANT MATERIALS

- A. Sealant and Backing Materials: As specified in Section 07900.

2.5 ACCESSORIES

- A. Fasteners: Aluminum or non-magnetic stainless steel, warranted by manufacturer to be non-corrosive and compatible with aluminum components. Avoid use of exposed fasteners. Provide matching Phillips flat-head screws for exposed fasteners.
- B. Glazing Accessories: Manufacturer's standard elastomeric glazing gaskets and setting blocks designed specifically for specified system.
- C. Glazing Tape: Tremco SST-800, thickness and width as recommended by aluminum window framing manufacturer.

2.6 FABRICATION

- A. Fabricate frames allowing for minimum clearances and shim spacing around perimeter of assembly. Shop fabricate frame components where possible.
- B. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof.
- C. Develop drainage holes with moisture pattern to exterior.
- D. Prepare components to receive anchor devices. Fabricate anchorage items.
- E. Arrange fasteners, attachments, and jointing to ensure concealment from view.
- F. Prepare components with required internal reinforcement for door hardware.

PART 3 - EXECUTION**3.1 INSPECTION**

- A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.
- B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

- A. Install frames in accordance with manufacturer's instructions, or more stringent requirements indicated.
- B. Use anchorage devices to securely attach frame assembly to structure.
- C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- D. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.
- E. Install glass in accordance with Section 08800, using dry method of glazing.

- F. Install perimeter sealant and backing materials, in accordance with Section 07900.

3.3 CLEANING

- A. Remove protective material from prefinished aluminum surfaces.
- B. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08710 – FINISH HARDWARE**PART 1 – GENERAL**

It is intended that the hardware specified herein be complete for its intended use, and operate as a complete system to satisfy governing codes and requirements. Hardware shall be as scheduled on the drawings. Where items of hardware not definitely or correctly specified are required for the completion of the work, a statement of such omission, error or other discrepancy should be directed to the Architect prior to the date specified for receipt of proposals, for clarification by addendum; or furnish and include cost of such items in the type and quantity established by this specification, and appropriate to the service intended by the owner.

1.1 SECTION INCLUDES

- A. Finish Hardware.
- B. Thresholds.
- C. Gaskets.
- D. Padlocks.
- E. Power Supplies for Electrical Hardware Items.

1.2 RELATED SECTIONS

- A. Section 08110 – Steel Doors and Frames.
- B. Section 08305 - Access Doors.
- C. Section 08410 – Aluminum Entrances and Storefronts.
- D. Section 16050 – Basic Electrical Materials and Methods.

1.3 REFERENCES

- A. ANSI: American National Standards Institute.
- B. BHMA: Builders' Hardware Manufacturer's Association.
- C. BOCA: Building Officials and Code Administrators.
- D. DHI: Door and Hardware Institute.
- E. NFPA: National Fire Protection Association.
- F. SBCCI: Southern Building Code Congress International.
- G. UBC: Uniform Building Code.
- H. IBC: International Building Code.
- I. UL: Underwriter's Laboratories.

1.4 SUBMITTALS

- A. Submittal Procedures.
 - 1. Shop Drawings.
 - 2. 3 copies of a hardware schedule prepared under the supervision of a certified Architectural Hardware Consultant (AHC):
 - a. Submit under DHI vertical format in order of specification hardware groups with like doors grouped together.
 - b. List hardware items.
 - c. Indicate locations and mounting heights of each type of hardware.
 - d. Indicate electrical characteristics and connection requirements.
 - 3. Manufacturer's Literature:
 - a. 3 copies for hardware items.
 - b. Indicate applicable ANSI standard, ANSI grade level and UL approval information.
 - 4. Submit hardware templates to door and frame manufacturers for accurate hardware cutout sizing and location.
 - 5. Wiring Diagrams:
 - a. Complete wiring diagrams for each opening with electrified hardware.
 - b. Submit wiring diagrams at time of hardware schedule submission for approval and again with hardware delivery to the site.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with the following:
 - 1. ANSI A115: Specifications for metal door and frame preparations.
 - 2. ANSI A115-W: Specifications for wood door and frame preparations.
 - 3. ANSI A117.1: Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
 - 4. ANSI A156: Door Hardware Product Standards.
 - 5. Americans with Disabilities Act Accessibility Guidelines.

1.6 QUALIFICATIONS

- A. Hardware Supplier: Company specializing in supplying commercial and institutional door hardware with minimum of 5 years experience.
- B. Hardware Supplier Personnel: Employ a certified Architectural Hardware Consultant to prepare the Work of this Section. All submittal documents to be embossed or stamped with approved DHI certification device.

1.7 REGULATORY REQUIREMENTS

- A. ADA Requirements:
 - 1. 4.13 Doors.
- B. BOCA Requirements:
 - 1. Section 1017 – Means of Egress Doors.
 - 2. Section 716.5 – Fire Doors; Closing Devices.
- C. NFPA Requirements:
 - 1. 80 – Fire Doors and Windows.
 - 2. 101 – Code for Safety to Life from Fire in Buildings and Structures.
 - a. 502.1.5 – Locks, Latches and Alarm Devices.
 - b. 5-2.1.7 – Panic Hardware and Dire Exit Hardware.
 - c. 5-2.1.8 – Self-Closing Devices.
 - 3. 252 – Fire Tests of Door Assemblies.
- D. SBCCI Requirements:
 - 1. Section 1012 – Doors.
 - 2. Section 705 – Protection of Openings.
- E. UBC Requirements:
 - 1. Section 1004 – Doors.
 - 2. Section 713 – Fire-Resistive Assemblies for Protection of Openings.

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- F. UL Requirements:
 - 1. 10B – Fire Tests of Door Assemblies.
 - 2. 10C – Fire Tests of Positive Pressure Door Assemblies.
 - 3. 14B – Sliding Hardware for Standard, Horizontally Mounted Tin-Clad Fire Doors.
 - 4. 14C – Swinging Hardware for Standard Tin-Clad Fire Doors Mounted Singly and in Pairs.
 - 5. 305 – Panic Hardware.

 - G. Products requiring electrical connections: Listed and Classified by Underwriters Laboratories, Inc., or a testing firm acceptable to the authority having jurisdiction.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Product Requirements.
 - 1. Label each hardware package with door opening number to match hardware schedule.
 - 2. Deliver keys to the Owner directly from hardware supplier.

1.9 SEQUENCING AND SCHEDULING

- A. Coordinate the Work with other directly affected Sections involving manufacture or fabrication of reinforcement for door hardware.

PART 2 - PRODUCTS**2.1 ACCESSORIES**

- A. Provide fasteners manufactured to conform to the ANSI standards noted.
- B. Provide concealed fasteners wherever possible.
- C. Exposed fasteners shall match finish of hardware being attached.
- D. Hardware shall not be attached with self-tapping or sheet metal screws.
- E. Hardware and fastenings for fire doors shall be UL approved and listed.
- F. Secure closers, closer arms, holders, holder arms, and door stops with sex bolts with smooth head to interior.

2.2 FINISHES

- A. Per documents.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verify that dimensions are as indicated on Shop Drawings or as instructed by the manufacturer.
- B. Verify that door frames are plumb.
- C. After hanging doors, verify that it does not bind before installing lock or locksets.
- D. Verify that electric power is available to power operated devices and that it has the correct characteristics.
- E. Verify materials for compliance with specifications and approvals.
- F. Verify that doors and frames are properly prepared for hardware.

3.2 INSTALLATION

- A. Before hardware installation, general contractor/construction manager shall coordinate a hardware installation seminar with a 1-week notice to all parties involved. The seminar is to be conducted on the installation of hardware, specifically of locksets, closers, exit devices, continuous hinges and overhead stops. Seminar is to be held at the job site and attended by installers of hardware (including low voltage hardware) for aluminum, hollow metal and wood doors. Training to include use of installation manuals, hardware schedule, templates and physical products samples.
- B. Install hardware in compliance with manufacturer's printed instructions.
- C. Install hardware on fire-rated openings in accordance with manufacturer's instructions to maintain rating.
- D. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Install closers on room side of corridor doors, stair side of stairways and interior side of exterior doors.
- F. Cut and fit thresholds to the profile of door frames. Cut smooth openings for threshold bolts and similar items.
- G. Mounting Heights: Install hardware at mounting heights conforming to BHMA recommendations, except that no piece of operable hardware shall be higher than 4 feet above the finished floor.
- H. Mount surface bolt with edge of plate flush with latch side edge of door.
- I. Deliver maintenance tools, special wrenches and accessories furnished with hardware, directly to the Owner.

3.3 FIELD QUALITY CONTROL

- A. Quality Assurance.
1. Verify that each door has its specified hardware.
 2. Verify that UL listed hardware is installed in fire-rated openings.
 3. Verify that exposed fasteners are located only where permitted.
 4. Verify that finishes of fasteners match hardware finish.

3.4 ADJUSTING

- A. Execution Requirements.
1. After the building HVAC system is operating, adjust the hardware to operate smoothly.
 2. Verify that lockset latch bolts and deadbolts operate freely in their strikes.
 3. Adjust multi-sized closers to the proper size in accordance with BOCA Section 1017.4.
 4. Adjust multi-sized closers to the proper size in accordance with SBCCI Section 1012.1.2.
 5. Adjust multi-sized closers to the proper size in accordance with UBC Section 1004.2.
 6. Verify that screws are set in non-removable pin hinges.
 7. Adjust coordinators, latch bolts and automatic flush bolts.
 8. Adjust weather seal to provide tight seals.

END OF SECTION

SECTION 08800 - GLAZING**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Glass and glazing for automatic aluminum entrances and storefronts.
- B. Glazed interior walls
- C. Glazed doors and sidelites.

1.2 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Sealant and back-up materials.
- B. Section 08110 - Steel Doors and Frames: Glazing accessories.
- C. Section 08410 – Aluminum Entrance and Storefronts.

1.3 REFERENCES

- A. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.
- B. ASTM C1036 - Specification for Flat Glass.
- C. ASTM C1048 - Specification for Heat Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
- D. ASTM E773 - Test Method for Seal Durability of Sealed Insulating Glass Units.
- E. ASTM E774 - Specification for Sealed Insulating Glass Units.
- F. CPSC 16CFR-1201 - Consumer Product Safety Commission, Safety Standard for Architectural Glazing Materials.
- G. FS DD-M-411 - Mirrors, Plate Glass, Framed and Unframed.
- H. Flat Glass Marketing Association (FGMA) Glazing Manual.
- I. Insulated Glass Certification Council (IGCC).

1.4 QUALITY ASSURANCE

- A. Comply with safety glazing requirements of ASTM Z97.1 and CPSC 16CFR1201.
- B. Conform to Flat Glass Marketing Association (FGMA) Glazing Manual for glazing installation methods.
- C. Provide insulating glass units permanently marked with certification label of Insulating Glass Certification Council (IGCC) indicating compliance with Class CBA.

1.5 SUBMITTALS

- A. Material and Equipment Submittals:
 - 1. Product Data:
 - a. Glass Units: Provide product data indicating compliance with specified requirements. Include information on size limitations, special handling or installation requirements.
 - b. Glazing Sealant: Provide data on glazing sealant. Identify colors available.
- B. Quality Assurance Submittals:

1. Manufacturer's Certificate: Submit sealed glass unit manufacturer's certificate indicating units meet or exceed specified requirements.

C. Closeout Submittals:

1. Warranty: As specified in this Section.

1.6 WARRANTY

A. Insulating Glass: Provide written ten year manufacturer's warranty, including coverage of sealed glass units from seal failure due to manufacturing defects, as evidenced by interpane dusting or misting, and replacement of same.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - FABRICATED GLASS PRODUCTS

- A. Cardinal IG.
- B. Falconer Glass Industries.
- C. Guardian Industries Corp.
- D. Old Castle Glass
- E. Pelkington
- F. PPG Industries Inc.
- G. Viracon, Inc.

2.2 GLAZING ACCESSORIES

- A. Silicone Glazing Sealant (SLNT-7): Specified in Section 07900.
- B. Setting Blocks: Neoprene; 80-90 Shore A durometer hardness.
- C. Edge Blocks/Shims: Neoprene; 60-70 Shore A durometer hardness.
- D. Glazing Tape: Preformed butyl compound coiled on release paper; properly sized for application; black/bronze color. Tremco, 440 Tape.
- E. Glazing Clips: Manufacturer's standard type.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready for work of this Section.
- B. Beginning of installation means acceptance of substrate.

3.2 ALUMINUM (AUTOMATIC) ENTRANCES AND STOREFRONTS

- A. Glaze aluminum entrances and storefronts in accordance with manufacturer's glazing instructions.

3.3 INTERIOR DRY METHOD (TAPE AND TAPE)

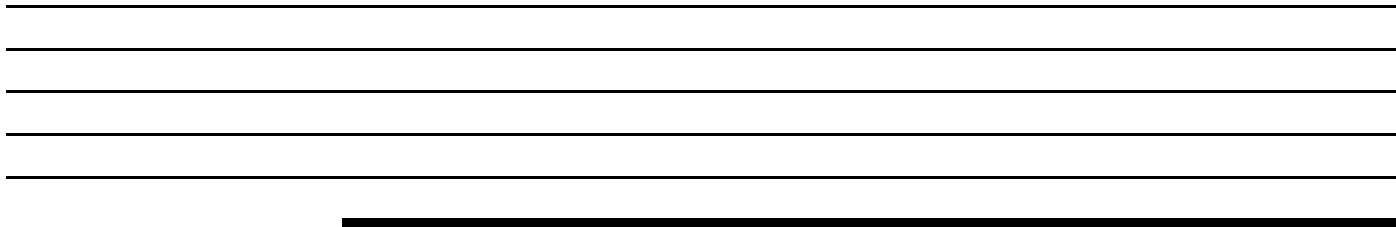
- A. Cut glazing tape to length and set against permanent stops, projecting 1/16" above sight line.
- B. Place setting blocks at 1/4 points.
- C. Rest glass on setting blocks and push against tape for full contact at perimeter of pane.
- D. Place glazing tape on free perimeter of pane in same manner described above.

- E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- F. Knife trim protruding tape.

3.4 CLEANING

- A. After installation, mark pane with an "X" by using plastic tape or removable paste.
- B. Remove glazing materials from finish surfaces.
- C. Remove labels after work is completed.

END OF SECTION



DIVISION 9
FINISHES

SECTION 09250 - GYPSUM BOARD SYSTEMS**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Metal non-load bearing stud wall framing.
- B. Metal channel ceiling framing.
- C. Suspended gypsum board system.
- D. Gypsum board and accessories.
- E. Glass mat gypsum sheathing for use under EIFS.
- F. Taped and sanded joint treatment.
- G. Soffit Vents

1.2 PRODUCTS FURNISHED AND INSTALLED (BUT SPECIFIED UNDER OTHER SECTIONS)

- A. Section 07200 - Insulation: Acoustical and Thermal Insulation.
- B. Section 07900 - Joint Sealers: Acoustical Sealant.

1.3 RELATED SECTIONS

- A. Section 05400 - Cold Formed Metal Framing: Load bearing framing systems.
- B. Section 05500 – Welded Wire Mesh.
- C. Section 06100 - Rough Carpentry: Wood blocking and framing.
- D. Section 08110 - Steel Doors and Frames.
- E. Section 08305 - Access Doors: Metal access panels.
- F. Section 09900 - Painting: Surface finish.

1.4 REFERENCES

- A. ASTM A641 - Zinc-Coated (Galvanized) Carbon Steel Wire.
- B. ASTM C36 - Gypsum Wallboard.
- C. ASTM C79 - Gypsum Sheathing Board.
- D. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.
- E. ASTM C630 - Water Resistant Gypsum Backing Board.
- F. ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
- G. ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.
- H. ASTM C840 - Application and Finishing of Gypsum Board.
- I. ASTM C1002 - Steel Screws for the Application of Gypsum Board.

- J. ASTM D226 - Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- K. GA-201 - Gypsum Board for Walls and Ceilings.
- L. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.

1.5 QUALITY ASSURANCE

- A. Applicator: Company specializing in gypsum board systems work with 3 years documented experience.

1.6 SUBMITTALS

- A. Material and Equipment Submittals.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and protect products at the site.
- B. Deliver materials in original packages, containers or bundles bearing brand name, applicable standard designation, and name of manufacturer.
- C. Store materials under cover and keep them dry and protected from damage. Stack gypsum board flat to prevent sagging.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C840.
 - 1. No finishing shall be started until the interior temperature has been maintained at a minimum of 50 deg. F. for a period of at least 48 hours.
 - 2. Provide adequate ventilation to eliminate excessive moisture.

PART 2 - PRODUCTS

2.1 FRAMING MATERIALS

- A. Metal Studs and Tracks: ASTM C645; non-load bearing, galvanized sheet steel, "C" shape, punched for utility access, 25 gage unless otherwise required to comply with specified deflection.
 - 1. Dale Industries, Inc., DWS Drywall Studs.
 - 2. Gold Bond Building Products, Gold Bond Screw Studs.
 - 3. Universal Industries, Unimast (USG), CS Channel Stud.
- B. Metal Furring Channels: ASTM C645, 25 gage minimum, galvanized steel, hat-shaped, 7/8" or size as indicated on Drawings.
 - 1. Dale Industries, Inc., DWC Drywall Furring Channel.
 - 2. Gold Bond Building Products, Screw Furring Channel.
 - 3. Universal Industries, Unimast (USG), Metal Furring Channel.
- C. Z-Furring Channels: ASTM C645, 25 gage minimum, galvanized steel, Z-shaped, 1-1/2" deep or as indicated.
 - 1. Dale Industries, Inc., Z-Furring Channel (ZFC).
 - 2. Gold Bond Building Products, Z-Furring Channel.
 - 3. United States Gypsum, USG Z-Furring Channel.

- D. Metal Suspended Ceiling Main Runners: Cold rolled, 16 gauge steel channels with rust inhibitive painted finish, 1-1/2".
1. Dale Industries, Inc., CRC Cold Rolled Channel.
 2. Gold Bond Building Products, Cold Rolled Steel Channel.
 3. Universal Industries, Unimast (USG), Cold Rolled Channel.

2.2 SUSPENDED GYPSUM BOARD CEILING SYSTEM

- A. Non-Fire Rated Double Web Direct Hung Drywall System: Including hanger wires, furring runners, furring tees, and cross tees.
1. Chicago Metallic, 640 Furring System.
 2. National Rolling Mills, DFR 8000 Drywall Furring System.
- B. Fire Rated Double Web Direct Hung Drywall System: Including hanger wires, furring runners, furring tees, and cross tees.
1. Chicago Metallic, 650 Furring System.
 2. National Rolling Mills, DFR 8000 Drywall Furring System.

2.3 GYPSUM BOARD MATERIALS

- A. Standard Gypsum Board: ASTM C36; 5/8" thick unless indicated otherwise, maximum permissible length; ends square cut, tapered and rounded edges.
1. Georgia-Pacific, G-P Gypsum Board (RE).
 2. Gold Bond Building Products, Sta-Smooth Gypsum Wallboard.
 3. United States Gypsum, Sheetrock SW Edge Gypsum Panels.
- B. Fire Rated Gypsum Board: ASTM C36; Type X, UL rated fire resistant type; 5/8" thick unless indicated otherwise, maximum permissible length; ends square cut, tapered and rounded edges.
1. Georgia-Pacific, G-P Firestop (RE).
 2. Gold Bond Building Products, Fire Shield Wallboard, Sta-Smooth.
 3. United States Gypsum, Sheetrock Firecode "C" Core SW Edge Gypsum Panels.
- C. Moisture Resistant Gypsum Board: ASTM C630; 5/8" thick unless indicated otherwise, maximum permissible length; ends square cut, tapered edges.
1. Gold Bond Building Products, MR Board.
 2. United States Gypsum, Sheetrock WR Gypsum Panels.
- D. Moisture Resistant Fire Rated Gypsum Board: ASTM C630, Type X, UL rated fire resistant type; 5/8" thick unless indicated otherwise, maximum permissible length; ends square cut, tapered and rounded edges.
1. Georgia-Pacific, G-P Firestop Tile Backer Board.
 2. Gold Bond Building Products, MR Fire Shield Board.
 3. United States Gypsum, Sheetrock WR Firecode "C" Gypsum Panels.
- E. Exterior Gypsum Ceiling Board: Standard type, 5/8" thick, maximum permissible length; ends square cut, tapered and beveled edges.
1. Gold Bond Building Products, Soffit Board.
 2. United States Gypsum, Exterior Gypsum Ceiling Board.

2.4 GLASS MAT FACED GYPSUM SHEATHING

- A. General: Sheathing for all areas to receive EIFS are to have glass mat faced gypsum sheathing, 1/2" material for 16" or less spacing o.c. and 5/8" material for greater than 16" o.c. spacing or where adjacent material is 5/8" thick, with the following attributes:
1. Core: Silicone-treated water resistant gypsum.

2. Facing: inorganic glass mat with alkali-resistant coating.
3. Compliance: ASTM C1177.

B. Manufacturer's and Products:

1. G-P Gypsum Corporation, a subsidiary of Georgia-Pacific Corporation, type 'Dens-Glass Gold'.
2. Comparable products by other manufacturer's that meet or exceed the properties of the specified product, and are reviewed and approved by the Architect.

2.5 JOINT MATERIALS

A. Regular and Fire Rated Interior Gypsum Board Joint Material: Ready mixed, drying type, vinyl based joint material conforming to ASTM C475.

1. Georgia-Pacific, G-P Bedding Compound with G-P Tape, G-P Topping Compound.
2. Gold Bond Building Products, Sta-Smooth Joint Compound with Q-W Tape, Topping Compound.
3. United States Gypsum, Ready-Mixed Joint Compound-Tapping with Perf-A-Tape, Ready-Mixed Joint Compound-Topping.

B. Moisture Resistant Gypsum Board Joint Material: Factory prepackaged, job mixed, chemical hardening type joint material conforming to ASTM C475.

1. Georgia-Pacific, G-P Speed Set 90 with G-P Tape.
2. Gold Bond Building Products, Sta-Smooth 90 Joint Compound with Q-W Tape.
3. United States Gypsum, Sheetrock Brand Durabond 90 Joint Compound with Perf-A-Tape.

C. Exterior Gypsum Ceiling Board:

1. United States Gypsum, Durabond Joint Compound.

2.6 ACCESSORIES

A. Corner Beads: ASTM C1047, Cornerbead, galvanized steel corner bead with 1-1/4" perforated legs.

1. Clinch-On Products, Cornerbead.
2. Gold Bond Building Products, Wall Board Corner Bead.
3. United States Gypsum, Dur-A-Bead No. 103.

B. Control Joints:

1. Gold Bond Building Products, E-Z Strip.
2. United States Gypsum, Control Joint No. 93.

C. Edge Trim: ASTM C1047, LC Bead, galvanized steel "J"-shaped channel.

1. Clinch-On Products, Inc., U-Bead.
2. Gold Bond Building Products, No. 100 Wallboard Casing.
3. United States Gypsum, 200-A Metal Trim.

D. Plastic Corner Beads: High impact PVC plastic corner beads conforming to ASTM D3678.

E. Laminating Adhesive: Joint compound specifically recommended by gypsum board manufacturer for laminating gypsum board.

F. Screws: ASTM C1002.

G. Hanger Wire: ASTM A641, soft, Class 1 galvanized.

H. Building Paper: ASTM D226, 15 lb. asphalt felt.

I. Sound Attenuation Insulation: Specified in Section 07200.

J. Acoustical Sealant: Specified in Section 07900.

- K. Exterior Soffit Vents: Provide continuous strip type, approx. 6" wide or as indicated, rolled-formed 0.19" aluminum; punched ventilation slots, 8 x 8 aluminum wire mesh insect screen. Prefinished with thermoset acrylic enamel paint.
- L. Continuous side wall vent: Provide continuous weather proof side wall vent at back side of entry wedge, approximately 4" high x full length of wedge Model WP238, with insect screen, prime painted as manufactured by Reliable Products, Hart & Cooley, Inc., Geneva, AL, 800.624.3914, or equal.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on Drawings.
- B. Beginning of installation means acceptance of substrate.

3.2 METAL FRAMING INSTALLATION

- A. Install framing in accordance with ASTM C754 and stud manufacturer's printed installation instructions where more stringent requirements are specified.
- B. Metal stud spacing: max. 24" on center, unless otherwise indicated.
- C. Isolate framing system from transfer of structural loading to system, both horizontally and vertically.
- D. Provide slip or cushioned type joint to attain lateral support and avoid axial loading.
- E. Do not bridge building expansion joints with support system. Frame both sides of joint.
- F. Door Opening Framing: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.
- G. Blocking: Bolt or screw wood blocking to studs. Wood blocking is required for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, items of finish hardware including wall mounted door stops, and other locations as indicated.
- H. Coordinate installation of bucks, anchors, blocking, electrical and mechanical work placed in or behind partition framing.
- I. Where partition is to receive gypsum board on only one side, provide horizontal strap bracing at 4'-0" o.c. vertical per manufacturer's recommendations.
- J. Minimum Adjacent Tenant Demising Wall Assemble: Provide a staggered 6" 20 gauge metal stud partition with an 8" track. Studs spaced 16 o.c. wall at each face apart. Fasten 6" x 6" x 6 gauge welded wire mesh with 6" laps or 3.4# metal lath full height with 2" laps to each outside face of metal studs and covered with 5/8" type X gypsum board. Fill cavity with 6" unfaced sound batt insulation for floor to underside of roof deck where indicated. Set track in acoustical caulk. Seal all openings in wall with fire caulk.

3.3 WALL FURRING INSTALLATION

- A. Erect wall furring for direct attachment to concrete block and concrete walls.
- B. Erect furring channels vertically. Space furring channels maximum 16" on center, or as otherwise indicated on Drawings.
- C. Secure in place on alternate channel flanges at maximum 24" on center.
- D. Where metal studs are used as furring members, secure stud to wall using metal clips spaced a maximum of 24" oc.

3.4 CEILING FRAMING INSTALLATION

- A. Install in accordance with ASTM C754.
- B. Space main runners 4'-0" oc maximum.
- C. Space hangers 4'-0" oc maximum along main runners. Coordinate location of hangers with other work.
- D. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.
- E. Install ceiling framing independent of walls, columns, and above-ceiling work.
- F. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24" past each end of openings.
- G. Laterally brace entire suspension system.

3.5 ACOUSTICAL ACCESSORIES INSTALLATION

- A. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
- B. Install acoustical sealant within partitions in accordance with manufacturer's instructions.

3.6 GYPSUM BOARD INSTALLATION

- A. Install gypsum board in accordance with GA 201 and GA 216.
- B. Erect single layer standard gypsum board in most economical direction, with ends or edges occurring over firm bearing.
- C. Erect single layer fire rated gypsum board vertically, with edges or ends occurring over firm bearing.
- D. Use screws when fastening gypsum board to metal furring or framing. Drive screws to provide screw head penetration without breaking the surface paper or stripping the member around the screw shank.
- E. Double Layer Applications:
 - 1. Secure second layer to first with laminating adhesive and sufficient mechanical support to hold in place. Apply laminating adhesive in accordance with manufacturer's instructions.
- F. Erect exterior gypsum ceiling board perpendicular to supports, with staggered end joints over supports.
- G. Moisture Resistant Gypsum Board:
 - 1. Provide moisture resistant gypsum board at the following areas, and as otherwise indicated on the Drawings:
 - a. Walls scheduled to receive tile.
 - b. Walls adjacent to mop receptors and utility sinks.
 - 2. Treat cut edges, holes, and fasteners in moisture resistant gypsum board and exterior gypsum ceiling board with sealer recommended by gypsum board manufacturer.
 - 3. Apply water-resistant gypsum board with the factory finished edge spaced a minimum of 1/4" above the lip of receptor pans, or mop basin.
- H. Place control joints 30'-0" oc maximum, consistent with lines of building spaces or as indicated on Shop Drawings.
- I. Do not bridge building expansion joints with gypsum board. Install expansion joints as required.
- J. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

3.7 JOINT TREATMENT

- A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes in accordance with GA-216 and joint compound manufacturer's instructions.
- B. Feather coats onto adjoining surfaces so that camber is maximum 1/32".
- C. Tape surfaces behind adhesive applied ceramic tile using specified joint compound. Final finishing is not required on joints behind ceramic tile.
- D. Tape and finish exterior gypsum ceiling board with specified joint compound in accordance with GA-216 and joint compound manufacturer's instructions.

3.8 GLASS MAT FACED GYPSUM SHEATHING (AT EIFS)

- A. Screw attach gypsum sheathing to framing using fasteners approved by the EIFS manufacturer. Provide size and spacing as recommended by sheathing manufacturer.
- B. Seal joints of sheathing as recommended by EIFS manufacturer.

3.9 TOLERANCES

- A. Maximum Variation from True Flatness: 1/8" in 10 feet in any direction, non-cumulative.

PART 4 - SCHEDULES**4.1 STUD GAUGE/LIMITING HEIGHT SCHEDULE**

- A. Table below is based on Universal Industries, Unimast (USG) Corporation's limiting height tables for studs. (System Folder SA-923 - 1990 edition), requirement for 5 psf lateral pressure and 1/240 allowable deflection for flexible finishes, with 1 layer of gypsum board per side of stud.
- B. Adjust gauge and maximum height for other acceptable manufacturers to conform to manufacturer's current printed specifications.

<u>Stud Type</u>	<u>Stud Gauge</u>	<u>Stud Spacing</u>	<u>Maximum Height</u>
1-5/8"			
158ST25	25	16"	9'-6"
158ST25	25	24"	7'-3"
2-1/2"			
212ST25	25	16"	12'-6"
212ST25	25	24"	10'-9"
212ST22	22	16"	13'-0"
212ST22	22	24"	11'-6"
212ST20	20	16"	14'-0"
212ST20	20	24"	12'-3"

3-5/8"

358ST25	25	16"	16'-0"
358ST25	25	24"	13'-6"
358ST22	22	16"	17'-3"
358ST22	22	24"	15'-0"
358ST20	20	16"	18'-3"
358ST20	20	24"	16'-0"

4"

400ST25	25	16"	17'-3"
400ST25	25	24"	14'-3"
400ST22	22	16"	18'-6"
400ST22	22	24"	16'-3"
400ST20	20	16"	19'-6"
400ST20	20	24"	17'-3"

6"

600ST25	25	16"	20'-0"
600ST25	25	24"	15'-0"
600ST22	22	16"	25'-3"
600ST22	22	24"	22'-0"
600ST20	20	16"	26'-6"
600ST20	20	24"	23'-3"

END OF SECTION

SECTION 09900 - PAINTING**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Surface preparation.
- B. Installation of finish as scheduled.

1.2 RELATED SECTIONS

- A. Section 07183 – Exterior Finish Systems; painting exterior walls and soffits.
- B. Section 07241 – Exterior Insulation and Finish System.

1.3 REFERENCES

- A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
- B. ASTM D2016 - Test Method for Moisture Content of Wood.

1.4 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of term used in this Section.

1.5 QUALITY ASSURANCE

- A. Applicator: Company specializing in commercial painting and finishing with 3 years experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame, fuel, smoke rating requirements for finishes.

1.7 SUBMITTALS

- A. Material and Equipment Submittals:

- 1. Product data.
- 2. Samples: Submit two 6" x 6" samples illustrating range of colors and textures available for each surface finishing product scheduled for selection and approval.
- 3. Manufacturer's application instructions.

- B. Closeout Submittals:

- 1. Extra Materials: Provide 1 gallon of each product used on the project. Paint to be in clean 1 gallon cans neatly marked, showing manufacture, application instructions, color name, number and/or formula and product type.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and protect products to site.
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.
- C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.
- D. Store paint materials at minimum ambient temperature of 45° F and a maximum of 90° F, in well ventilated area, unless required otherwise by manufacturer's instructions.

- E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 ° F for 24 hours before and during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.
- C. Minimum Application Temperatures for Latex Paints: 50 °F unless required otherwise by manufacturer's instructions.
- D. Minimum Application Temperature for Varnish Finishes: 65 ° F for interior or exterior, unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 - PRODUCTS

2.1 PRIMERS

- A. Inhibitive Metal Primer:
 - 1. Benjamin Moore, Acrylic Metal Primer M04.
 - 2. ICI, "Devflex" 4020 DTM Interior/Exterior Waterborne Primer.
 - 3. Sherwin-Williams, Pro-Cryl Universal Water Based Primer B66-310.
- B. Latex Block Filler:
 - 1. Benjamin Moore, Moorcraft Super Craft Latex Block Filler 285.
 - 2. CI.-DeVoe Blox Filler 4000-1000
 - 3. Sherwin-Williams, PrepRite Block Filler B25W25.
- C. Galvanized Metal Primer:
 - 1. Benjamin Moore, Acrylic Metal Primer M04
 - 2. ICI, "Devflex" 4020 DTM II Interior/Exterior Waterborne Primer.
 - 3. Sherwin-Williams Pro-Cryl Universal Primer B66-310
- D. Interior Primer/Sealer:
 - 1. Benjamin Moore, Moorcraft Super Spec Latex Enamel Undercoater & Primer 253.
 - 2. ICI, 1000-1200 "Dulux Ultra" Basecoat Interior Latex Wall Primer.
 - 3. Sherwin-Williams, PrepRite 200 Latex Primer, B28W200.
- E. Interior Wood/MDO Primer
 - 1. Benjamin Moore
 - 2. ICI Ultra-Hide Interior Wood Undercoater
 - 3. Sherwin-Williams Prep Rite Classic Primer B28W101
- F. Exterior Primer:
 - 1. Benjamin Moore Moorcraft Latex Exterior Primer 169.
 - 2. ICI- Dulux Professional 2000-1200 Exterior 100% Acrylic Latex Primer
 - 3. Sherwin-Williams A-100 Ext. Latex Wood Primer B42W1

2.3 FINISH PAINTS

A. Exterior Gloss Alkyd Enamel:

1. Benjamin Moore, Impervo Enamel 133.
2. ICI- DeVoe Coatings DevFlex4208 Int/Ext Waterborne Acrylic Gloss
3. Sherwin-Williams All Surface Enamel Gloss A41 series.

B. Interior Eggshell (Satin) Latex Enamel:

1. Benjamin Moore, Moorecraft Super Spec 27 Latex Eggshell Enamel.
2. ICI Ultra-Hide 1512 Alkyd Eggshell Interior Wall and Trim Enamel.
3. Sherwin-Williams Pro-Mar 200 Latex Low Sheen ES B20w/200 series.

C. Interior Waterborn Acrylic Semi-Gloss:

- 1 Benjamin Moore Waterborn Satin Inpervo 314
- 2ICI, LifeMaster Pro 4216 High Performance Waterborne Acrylic Semi-gloss Enamel
- 3Sherwin-Williams, Pro Classic Waterborne Acrylic Semi-Gloss B3 Series.

D. Dry Fallout Spray:

1. Benjamin Moore, Sweep-Up Spray Latex Flat M53.
2. ICI-1280 Spraymaster Pro Uni-Grip WB Aquacrylic Dryfall Flat Primer / Finish.
3. Sherwin-Williams, Waterborne Acrylic Flat_Dryfall _B24W1.

E. Exterior Traffic Marking Paint

1. Benjamin Moore.
2. ICI.
3. Sherwin-Williams Hotline Traffic Marking Paint TM215/TM2153.

2.4 MISCELLANEOUS MATERIALS

Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified of commercial quality.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions that may potentially affect proper application or final appearance.
- C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 1. Plaster and Gypsum Wallboard: 12 percent.
 2. Masonry: 12 percent.
 3. Interior Located Wood: 15 percent, measured in accordance with ASTM D2016.
- D. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

- A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.
- B. Correct minor defects and clean surfaces that affect the work of this section.

- C. Shellac and seal marks which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach or commercial mildew removers. Rinse with clean water and allow surface to dry.
- E. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing.
- F. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.
- G. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- H. Copper Surfaces Scheduled for a Paint Finish: Remove contamination by steam, high pressure water, or solvent washing.
- I. Gypsum Board Surfaces: Latex fill minor defects. Spot prime defects after repair.
- J. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- K. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil, grease and form release agents with a solution of tri-sodium phosphate or appropriate commercial solvent; rinse well and allow to dry. Remove stains caused by weathering or corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- L. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- M. Uncoated Steel and Iron Surfaces: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- N. Shop primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- O. Interior Wood Items Scheduled to Receive Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
- P. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied.
- Q. Before applying any finish to MDF doors, thoroughly clean and block-sand to remove all surface imperfection
- R. Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.3 PROTECTION

- A. Protect elements surrounding the work of this Section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this Section.
- C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
- D. Remove empty paint containers from site.

3.4 APPLICATION

- A. Apply products in accordance with manufacturer's instructions or more stringent requirements specified herein.
- B. Do not apply finishes to surfaces that are not dry.

- C. Apply each coat to uniform finish.
- D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- E. Sand lightly between coats to achieve required finish.
- F. Allow applied coat to dry before next coat is applied.
- G. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- H. Prime back surfaces of interior and exterior woodwork with primer paint.
- I. Prime back surfaces of interior wood work scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.
- J. Interior stripping – apply to floor after Duro-Nox treatment has cured and prior to Duro-Polish. Acid etching not required.

3.5 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Paint shop primed equipment.
- B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- C. Prime and paint equipment visible in exposed finished areas, including insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are pre-finished.
- D. Replace identification markings on mechanical or electrical equipment when painted accidentally.
- E. Paint exposed conduit and electrical equipment occurring in finished areas.
- F. Paint (use clear sealer if required by code officials) both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
- G. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

3.6 CLEANING

- A. As work proceeds, promptly remove paint where spilled, splashed, or spattered.
- B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.
- C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

PART 4 – SCHEDULES

4.1 PT-14: MDO doors

1 coat	Interior Latex Wood/MDO Primer
2 coats	Waterborn Acrylic Semi-Gloss

END OF SECTION

SECTION 09965 - THOROLASTIC**PART 1 - GENERAL**

1.1 SUMMARY

A. Section Includes:

1. Application of high-build, water-based, elastomeric, 100 percent acrylic, waterproof coating designed to bridge dynamic cracks and retain flexibility.

B. Related Sections:

1. Section 03300 – Cast-in-Place Concrete.
2. Section 03470 – Precast Structural Concrete.
3. Section 04300 – Unit Masonry Assemblies.
4. Section 07241 – Exterior Insulation and Finish System.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements:

1. General Properties:

- a. Over 300 percent ultimate elongation.
- b. Up to 98 percent elongation recovery.

B. Thorolastic® Smooth-Applied at 16 mils DFT:

1. Ultimate Elongation: 344 percent per ASTM D412.
2. Elongation recovery, per ASTM D412:
 - a. After 10 Minutes: 96.9 percent.
 - b. After 24 Hours: 98.4 percent.
3. Tensile Strength: 220 psi (1.5 MPa) per ASTM D412.
4. Crack Bridging per PR EN 1062-7:
 - a. At minus 77 degrees F (minus 60 degrees C): 12 mils (0.3 microns).
 - b. At 32 degrees F (0 degrees C): 19.5 mils (0.5 microns).
 - c. At 73 degrees F (23 degrees C): 27 mils (0.7 microns).
5. Flexibility: Passed per ASTM D522. 1/8 inch mandrel at minus 30 degrees F (minus 34 degrees C).
6. Pull-Off Strength Adhesion: 210 psi (1.4 MPa) per ASTM D4541.
7. Wind-Driven Rain, TT-C-555B: Passed.
8. Water-Vapor Permeance: 10 perms per ASTM E96.
9. Carbon-Dioxide Diffusion per PR EN 1062-6:
 - a. R (equivalent air layer thickness): 263 feet (80 m).
 - b. Sc (equivalent concrete thickness): 8 inches (20 cm).
10. Accelerated Weathering at 5,000 Hours: Passes per ASTM G23, Type D.
11. Visual Color Change at 5,000 Hours: Passes per ASTM D1729.
12. Chalking at 5,000 Hours: Passes per ASTM D4214.
13. Freeze/Thaw Resistance at 60 Cycles: Passed per ASTM C67.
14. Salt Spray Resistance: Passes per ASTM B117 at 300 hours.
15. Dirt Pick-Up: 94.33 percent per ASTM D3719.
 - a. After 6 months exposure: Passed.
16. Fungus Resistance: No growth per ASTM D3273.

C. Approximate Coverage Rates:

1. Rate: 50 to 100 square feet per gallon (1.2 to 2.4 sm per L).

D. Wet Film Thickness (WFT):

1. Smooth: 16 to 32 mils (406 to 813 microns).

2. Fine: 16 to 32 mils (406 to 813 microns).
3. Coarse: 16 to 32 mils (406 to 813 microns).

E. Dry Film Thickness (DFT):

1. Smooth: 8 to 16 mils (203 to 406 microns).
2. Fine: 9 to 18 mils (229 to 457 microns).
3. Coarse: 9 to 19 mils (229 to 483 microns).

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical bulletins and MSDS on each product.
- B. Submit list of project references as documented in this Specification under Quality Assurance Article. Include contact name and phone number of person charged with oversight of each project.
- C. Quality Control Submittals:
 1. Provide protection plan of surrounding areas and non-cementitious surfaces.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Company with minimum 15 years of experience in manufacturing of specified products and systems.
2. Applicator Qualifications: Company with minimum of 5 years experience in application of specified products and systems on projects of similar size and scope, and is acceptable to product manufacturer.
 - a. Successful completion of a minimum of 5 projects of similar size and complexity to specified Work.

B. Field Sample:

1. Install at Project site or pre-selected area of building an area for field sample, minimum 4 feet by 4 feet (1.2 m by 1.2 m), using specified system.
2. Apply material in strict accordance with manufacturer's written application instructions.
3. Manufacturer's representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.
4. Field sample will be standard for judging workmanship on remainder of Project.
5. Maintain field sample during construction for workmanship comparison.
6. Do not alter, move, or destroy field sample until Work is completed and approved by Architect.
7. Obtain Architect's written approval of field sample before start of material application, including approval of aesthetics, color, texture, and appearance.

C. Preconstruction Field-Adhesion Testing:

1. Perform adhesion per ASTM D3359, Measuring Adhesion by Tape, Method A. Minimum adhesion rating of 4A is required on 0 to 5 scale.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:

1. Ensure that substrate surface and ambient air temperature are minimum of 40 degrees F (4 degrees C) and rising at application time and remain above 40 degrees F (4 degrees C) for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.

2. Do not apply material if snow, rain, fog, and mist are anticipated within 12 hours after application. Allow surfaces to attain temperature and conditions specified before proceeding with coating system application.
3. Do not apply over sealant joints.
4. Do not apply to horizontal traffic-bearing surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products from the following manufacturer:
 1. Degussa Building Systems
889 Valley Park Drive
Shakopee, MN 55379
Customer Service: 800-433-9517
Technical Service: 800-243-6739
Direct Phone: 952-496-6000
Internet: www.degussabuildingsystems.com
- B. Specifications and Drawings are based on manufacturer's proprietary literature from Degussa Building Systems. Other manufacturers shall comply with minimum levels of material, color selection, and detailing indicated in Specifications or on Drawings. Architect will be sole judge of appropriateness of substitutions.

2.2 MATERIALS

- A. Water-based, 100 percent acrylic, elastomeric, waterproofing coating consisting of water, acrylic emulsion, fillers, and other proprietary ingredients.
- B. Thorolastic Smooth:
 1. Density: 11.2 pounds per gallon (1.34 kg/L) to 12.2 pounds per gallon (1.46 kg/L) per ASTM D1475.
 2. Solids Content, per ASTM D5201:
 - a. By Weight: 64.2 percent.
 - b. By Volume: 50 percent.
 3. Viscosity: 127 KU to 135 KU per ASTM D562.
 4. VOC Content: 0.32 pounds per gallon (38 g/L) to 0.42 pounds per gallon (50 g/L) per ASTM D3960.
- C. Thorolastic Fine:
 1. Density: 10.2 pounds per gallon (1.22 kg/L) to 11.2 pounds per gallon (1.34 kg/L) per ASTM D1475.
 2. Solids Content, per ASTM D5201:
 - a. By Weight: 65.5 percent.
 - b. By Volume: 56 percent.
 3. Viscosity: 127 KU to 135 KU per ASTM D562.
 4. VOC Content: 0.32 pounds per gallon (38 g/L) to 0.42 pounds per gallon (50 g/L) per ASTM D3960.
- D. Thorolastic Coarse:
 1. Density: 9.9 pounds per gallon (1.19 kg/L) to 10.9 pounds per gallon (1.31 kg/L) per ASTM D1475.
 2. Solids Content, per ASTM D5201:
 - a. By Weight: 64.5 percent.
 - b. By Volume: 58 percent.
 3. Viscosity: 127 KU to 135 KU per ASTM D562.
 4. VOC Content: 0.32 pounds per gallon (38 g/L) to 0.42 pounds per gallon (50 g/L) per ASTM D3960.

DELETE COLORS BELOW NOT REQUIRED FOR PROJECT.

5. Colors:
 - a. Pastel.

- b. Medium.
- c. Ultra.
- d. Neutral.
- e. 48 standard colors through Elements color program.

DELETE TEXTURES BELOW NOT REQUIRED FOR PROJECT.

- 6. Textures:
 - a. Smooth.
 - b. Fine.
 - c. Coarse.
- 7. Acceptable Product: Thorolastic® by Degussa Building Systems.

2.3 MIXING

- A. Mechanically mix sealer with slow-speed drill and mixing paddle to ensure color uniformity and to minimize air entrapment.
- B. In multi-pail applications, mix contents of each new pail into partially used pail to ensure color consistency and smooth transitions from pail to pail.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Protect adjacent Work areas and finish surfaces from damage during coating system application.
- B. Ensure that substrate is sound, clean, dry, and free of dust, dirt, oils, grease, laitance, efflorescence, mildew, fungus, biological residues, chemical contaminants, and other contaminants that could prevent proper adhesion.
- C. Clean surface by using high-pressure waterblasting with or without abrasives added to water stream, to achieve surface with texture similar to 100 grit sandpaper.
- D. Some stains and surface contaminants may require chemical removal. When chemical cleaners are used, neutralize compounds and fully rinse surface with clean water. Allow surface to dry before proceeding.
- E. Ensure area being repaired is structurally sound and fully cured.
- F. Remove blisters and loose or delaminated areas.
- G. Sand or grind edges of previous coating to ensure adhesion and smooth transition to new material. Sand edges to featheredge.
- H. Wash down prepared surfaces and allow to completely dry.
- I. Concrete Surfaces:
 - 1. In addition to laitance and contaminants, remove form-release agents or previously applied sealers.
 - 2. Remove form tie wires and repair holes, small voids, and spalls using appropriate repair product approved by coating manufacturer.
 - 3. Abrasive-blast slick, dense concrete surfaces or use primer approved by coating manufacturer. Test surface for proper adhesion as specified in Part 1.
- J. Brick and Concrete Masonry Unit Surfaces:
 - 1. Remove fins and mortar droppings. Ensure mortar joints are sound and free of voids and cracks.
 - 2. Ensure there are no gaps, cracks, or voids greater than 2 mils (0.05 mm). Repoint or fill voids with appropriate patching product approved by manufacturer.
 - 3. Apply primer approved by coating manufacturer..

- K. Plaster and Stucco Surfaces:
1. Clean surfaces and remove debonded or delaminated plaster or stucco.
 2. Repair with material approved by coating manufacturer.
 3. Allow new plaster or stucco to cure minimum of 14 days at 70 degrees F (21 degrees C) and 50 percent relative humidity or until pH level has reached 10. Allow longer cure times if temperatures are lower or relative humidity is higher.
 4. After cleaning and profiling, prime chalky surfaces with primer approved by coating manufacturer and allow primer to dry.
- L. Exterior Insulation Finish System Surfaces:
1. Refasten or re-adhere delaminated or loose expanded polystyrene (EPS) insulation per manufacturer's approved methods.
 2. Replace or patch missing or damaged EPS to its original condition.
 3. Finish with trowel acrylic finish to match and blend with existing texture.
 4. Allow repaired areas to fully cure.
 5. Refer to EIFS manufacturer's product data sheet for appropriate repair and procedures.
- M. Existing Acrylic Coating Surfaces:
1. Sand or grind edges of existing coating to ensure adhesion and smooth transition of new material. Sand edges of area to featheredge.
 2. Wash down and allow to completely dry.
- N. Chalky Surfaces: Treat chalky surfaces, as defined by ASTM D4214, Test Method A, with water cleaning and application of primer approved by coating manufacturer.

3.2 DETAIL PREPARATION

- A. Apply joint sealant where appropriate on support columns and other details. Inspect expansion joints. Ensure there is no deteriorated sealant, adhesion loss, or non-elastomeric caulking in joints. Replace defective sealant with sealant approved by coating manufacturer.
- B. Apply and tool liberal amount of patching compound or form cant bead of sealant approved by coating manufacturer wherever there is change in direction, where 2 walls abut, and at column and wall intersections.
- C. If movement is anticipated where dissimilar substrates join (for example, stucco and concrete or brick and CMU), properly clean joint and seal with sealant approved by coating manufacturer.
- D. Inspect through-wall penetrations, including electrical, lighting, signage, plumbing, HVAC, and fire-sprinkler piping, for watertight seal. Repair with sealant approved by coating manufacturer.
- E. Inspect flashings, including cap flashing and roof flashing for watertight seal. Repair with sealant approved by coating manufacturer.
- F. Recaulking of existing windows is essential in waterproofing and renovation of existing structures. Inspect perimeter joints and mullions and recaulk with sealant approved by coating manufacturer.

DELETE THE FOLLOWING PARAGRAPH IF NO FLUSH OR SHEAR WINDOW CONDITIONS.

- G. Rout flush or shear window surface transitions to concrete or stucco to form 1/4-inch by 1/4-inch joint. Caulk with sealant approved by coating manufacturer. Allow sealant to cure before proceeding.
- H. Apply coat of brush-grade patching compound to stucco and masonry window sills (primed, if required). Create smooth surface that drains away from window.
- I. Cracks smaller than hairline can be bridged with knife-grade or brush-grade patching compounds.
- J. Chip or grind out nonmoving cracks larger than hairline. Remove dust and pack with knife-grade patching compound. Bridge crack with brush-grade patching compound. Brush narrow band directly into crack using

brush, sponge, or other means to match substrate texture and reduce telegraphing of patches through finish coat. On textured substrates, use texturized patching compound to minimize telegraphing.

- K. Rout out dynamic or moving cracks to minimum of 1/4 inch by 1/4 inch (6 mm by 6 mm), then fill with sealant approved by coating manufacturer. Once sealant is tooled and cured, proceed with crack repair as described previously.
- L. Repair cracks and treat back side of parapets in same manner as exterior walls, terminating at roof counter flashings. If top of parapet wall is exposed masonry, apply coat of patching compound to create smooth, well-draining surface. Recaulking of reglet may be required.

3.3 PRIMING

- A. Use primer only to stabilize existing substrates or coatings that are chalking or friable (powdery) after power washing. Ensure that primer for proper adhesion of coating material can bind existing surfaces or paint. Adhesion testing is specified in Part 1.
- B. Apply primers or block fillers acceptable to coating material manufacturer.
- C. Ensure CMU and other porous surfaces are clean, dry, and free of contaminants. Fill CMU faces with block filler and back roll to eliminate pinholes. Apply by working material into pores, crevices, and voids. Allow block filler to dry before proceeding, typically 24 to 48 hours. Coverage rate depends on porosity and texture of CMU surface. Apply to dry, cured CMU and mortar only.
- D. Apply coating after primer and block filler have sufficiently dried.
- E. Special substrates, such as insulated wall systems, may require different primer system. Contact coating manufacturer for specific recommendation.

3.4 APPLICATION

- A. General:
 - 1. For uniformity of color and texture, use consistent application techniques throughout Project.
 - 2. Apply coating material in 2 coats to achieve total dry film thickness (DFT) of 16 to 20 mils (406 to 508 microns).
 - a. More than 1 coat may be required when color difference between existing surface and new coating is significant.
 - 3. Maintain proper wet-film thickness (WFT) during application to ensure performance characteristics desired.
 - 4. Work to natural break in surfaces before stopping Work.
 - 5. Work from wet edge with 50 percent overlap.
 - 6. Use sufficient material to provide color uniformity, but avoid buildups and runs.
 - 7. Apply coating in manner to obtain pinhole-free, consistent film build on treated surfaces.
- B. Brush Application:
 - 1. Application by brush is recommended only for small inaccessible areas such as touch-ups.
 - 2. Use nylon brush only.
- C. Roller Application:
 - 1. Use a 3/4 inch to 1-1/4 inch (19 mm to 32 mm) nap roller cover (lamb's wool is preferred).
 - 2. Completely saturate roller and keep it loaded with coating to build required mils. Never dry roll.
 - 3. Roll coating in consistent fanlike pattern to achieve uniform mil thickness.
 - 4. Cross roll to achieve uniform thickness and maintain wet edge. Backroll material in 1 direction as stroke variations may result in uneven color and texture.
- D. Spray Application: Use airless spray equipment for the following conditions. Some substrates will require backrolling after spray application:
 - 1. Smooth Texture: Use airless equipment.

2. Fine and Coarse Textures: Use equipment capable of handling large perlite aggregate, such as rotator/stator or diaphragm pumps with 20 to 40 psi (0.14 to 0.28 MPa) air pressure at gun

3.5 CURING

- A. Drying time to touch is 6 hours at 70 degrees F (21 degrees C) and 50 percent relative humidity if applied at 18 to 20 mils WFT (457 to 508 microns). Recoat in minimum of 12 to 24 hours.

3.6 CLEANING

- A. Clean tools and equipment with soapy water.
- B. Clean up and properly dispose of debris remaining on Project site related to application.
- C. Remove temporary coverings and protection from adjacent Work areas.

END OF SECTION



**DIVISION 10
SPECIALTIES**



SECTION 10522 - FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Accessories.

1.2 RELATED SECTIONS

- A. Section 09900 - Painting: Field paint finish.

1.3 REFERENCES

- A. NFPA 10 - Portable Fire Extinguishers.
- B. ADAAG - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities.

1.4 QUALITY ASSURANCE

- A. Conform to NFPA 10 requirements for extinguishers.
- B. Provide fire extinguishers, [cabinets] and accessories by a single manufacturer.

1.5 SUBMITTALS

- A. Material and Equipment Submittals:
- B. Closeout Submittals:
 - 1. Maintenance Data: Include test, refill or recharge schedules, procedures, and re-certification requirements.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not install extinguishers when ambient temperatures may cause freezing.

PART 2 - PRODUCTS**2.1 GENERAL**

- A. It is the intention of the designers that the system meet the requirements of ADAAG.

2.2 EXTINGUISHERS

- A. **(FE-1)** Multi-Purpose Dry Chemical Type: UL-rated 4A-60B:C, 10 lb. nominal capacity, enameled steel tank with pressure gauge.
 - 1. Buckeye Fire Extinguishers,
 - 2. J.L. Industries, Cosmic 10.
 - 3. Walter Kidde, Excel Line XL 10 TCZ.
 - 4. Larsen's Manufacturing Company, MP10.
 - 5. Modern Metal Products, Wing 10H K.
- B. **(FE-2)** Carbon Dioxide Type: UL-rated 10B:C, 10 lb. nominal capacity, aluminum tank with pressure gauge.
 - 1. Buckeye Fire Extinguishers,
 - 2. J.L. Industries, Sentinel 10.
 - 3. Walter Kidde, Excel Line XL 10 TCZ.4.Larsen's Manufacturing Company, CD10.

4. Modern Metal Products, Coach 10HH K.

2.3 ACCESSORIES

- A. Fire Extinguisher Brackets: Manufacturer's standard bracket properly sized for type and capacity of extinguisher indicated. Provide manufacturer's standard finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install extinguisher mounting brackets plumb and level, 48" maximum inches from finished floor to handle of extinguisher.
- B. Secure fire extinguishers rigidly in place at mounting heights indicated, in accordance with manufacturer's instructions.
- C. Mount the equipment in accordance with the requirements of ADAAG for reach range and protruding objects.
- D. Verify all quantities and locations with the Fire Marshal prior to installation.

END OF SECTION

SECTION 10530 - Canopies**PART 1 - GENERAL**

- 1.1** Furnish a complete extruded aluminum canopy cover system including labor as shown on the drawing
- 1.2 SUBMITTALS**
- A. Furnish complete show drawings bearing the seal of a registered engineer showing the required live and wind loads of the project.
 - B. Submit samples of the finish and color selections.

PART 2 - MATERIALS**2.1 MANUFACTURERS**

- A. AVAdek Walkway Cover Systems & Canopies
9201 Winkler, Houston, TX 77017
Phone: 713-944-0988
Fax: 713-944-5815
Email: sales@avadek.com
- B. Approved "equals" (submitted prior to bid opening).

2.2 PRODUCTS

- A. All components shall be 6063, 6061 or 6005 Alloy extruded aluminum.
- B. Aluminum members and deck shall be sized as shown on the drawings and shall meet the engineering requirements of the project.
- C. The finish shall be clear anodize aluminum.

PART 3 - EXECUTION**3.1 FABRICATION**

- A. Aluminum members shall have heliarc welded endplates and concealed connectors.
- B. The canopy deck is to have welded end closures at the deck terminations.
- C. The canopy shall be fabricated to drain through a gutter.
- D. Flashing shall be .040 aluminum fabricated to prevent leakage between the canopy and adjacent structures.

3.2 INSTALLATION

- A. Install the canopy in strict accordance with the manufacturer's recommendations.
- B. Erect canopy after concrete and masonry work in the vicinity is completed and washed down.
- C. Install columns and beams straight and true.
- D. Install raincaps over draining sections of the deck.
- E. Install flashing as required.
- F. Thoroughly clean canopy after installation.

END OF SECTION

SECTION 10990 - MISCELLANEOUS SPECIALTIES**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Fire Department Key Box.
- B. Installation of Owner furnished equipment and fixtures as indicated on the Owner supplied products schedule.

1.2 RELATED SECTIONS

- A. Division 16 - Electrical: Connection to fire department key box tamper switch.

1.3 REFERENCES

- A. Comply with requirements of local Fire Marshal.

PART 2 - PRODUCTS**FIRE DEPARTMENT LOCK BOX –**

Provide if required by Fire Marshall or Code Authorities

- A. Fire Department Lock Box: Model 3200-RTS Recessed Mounted with Model 3200-RMK Recessed Mounting Kit Heavy Duty Knox Box with tamper switches manufactured by The Knox Company. Color: Black. Or as required; box must be recessed in wall and wired for tamper switches.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install miscellaneous specialties in accordance with manufacturer's standards.
 - 1. Fire Department Lock Box: The preferred and required mounting unless required otherwise by local authority Fire Department Lock Box is recessed in masonry concrete, as high as possible, with tamper switch for monitoring the security system. Do not mount on blue wedge. Architect/Contractor to locate and install as directed by local Fire Marshal.
 - 2. Install Owner furnished equipment and fixtures in accordance with manufacturer's and or material supplier's printed instructions, or as directed by the PDM.

END OF SECTION



**DIVISION 15
MECHANICAL**



SECTION 15010 - GENERAL PROVISIONS**PART 1 – GENERAL****1.1 CONDITIONS OF THE CONTRACT**

- A. The Conditions of the Contract (General, Supplementary and other Conditions) and the General Requirements (Sections of Division 1) are hereby made a part of Division 15.
- B. The articles contained in this Section are intended to supplement the Sections outlined above. Where they amend, modify, supersede or void any part of the above, then they shall take precedence but that part remaining unchanged shall still apply.

1.2 EXAMINATION AND LOCATION OF SITE

- A. The work covered by these Specifications is located in **Baytown, Texas**.
- B. The Contractor shall satisfy himself/herself by a personal examination of the site as to all local conditions affecting the performance of the Contract. This Contractor is deemed to accept such conditions as the same are eventually found to exist and to waive all claims for extra compensation arising from unforeseen difficulties encountered except as the same are expressly provided for in either the Specifications or the Contract.
- C. Professions of ignorance regarding the requirements of the work will in no way serve to modify the provisions of the Contract or Specifications.

1.3 NATIONAL ACCOUNTS

- A. Refer to drawings.

1.4 EXAMINATION OF DOCUMENTS

- A. These documents may require modification based upon actual site conditions, local codes and local authority having jurisdiction. Any and all modifications must be coordinated with The Owner prior to performing work.
- B. The Contractor shall also carefully read the Plans and Specifications before submitting bids on the work to be done. If any Contractor contemplating submitting a bid for the proposed Contract is in doubt as to the true meaning of any part of the Specifications or other proposed Contract Documents, he/she may submit to the Engineer a written request for an interpretation thereof. The person submitting a request shall be responsible for its prompt delivery.
- C. Any interpretation of the proposed documents will be made **ONLY** in writing duly issued, a copy of which will be mailed or delivered to each bidder receiving a copy of the Plans and Specifications and to such other prospective bidders as have requested that they be furnished with a copy of each.
- D. These Specifications and the corresponding Drawings form a complete set of Plans for the work of this project and neither shall be considered complete without the other. Where an item is mentioned in one and not in the other, it shall be considered as binding to this Contract as though mentioned in both.
- E. It is the intent of the Plans and Specifications to form a guide for a complete installation. Everything necessary for the completion and successful operation of the installation, whether or not herein definitely specified or indicated on the Drawings, shall be furnished and installed as well and as faithfully as if so specified or indicated without additional cost to The Owner. These Drawings shall not be scaled to obtain exact dimensions. Reference shall be made to the Architectural Drawings where dimensions are noted.
- F. Should the Drawings disagree in themselves, or with the Specifications, the better quality or greater quantity of work or materials shall be provided. If any errors, discrepancies or omissions appear in the Drawings, Specifications or other

Contract Documents, the Contractor shall notify the Engineer in writing of such errors or omissions. In the event of the Contractor failing to give such notice before construction and/or fabrication of the work, he/she will be held responsible for the results of any such errors, discrepancies or omissions and the cost of rectifying it.

1.5 MODIFICATIONS TO PLANS AND SPECIFICATIONS

- A. Throughout the course of the work, minor changes and adjustments to the Plans and Specifications may be requested by the Engineer. The Contractor shall make such adjustments without additional cost to the Owner, where such adjustments are necessary to the proper installation or operation and within the intent of the Contract Documents, e.g., raising or lowering a pipe or duct for clearance, etc. The Contractor shall obtain approval from the Architect on mounting heights of all ductwork prior to installation.

1.6 ROOFING

- A. The Mechanical Contractor shall coordinate the cutting and patching of the roof for the installation of mechanical equipment, curbs, burglar bar assemblies, piping, ductwork, etc., with the General Contractor.

1.7 OTHER WORK

- A. Other work will be performed by separate trades. Each Contractor shall give careful consideration to the work of the other contractors and shall organize his work so that it will not interfere with the work of other trades. Each must consult the Drawings and Specifications for correlating information of the other trades.

1.8 REGULATIONS AND CODES

- A. The work, materials and equipment covered by these Specifications shall comply in all respects with the requirements of State, County and City applicable ordinances, regulations and codes. This shall not be construed to permit a lower grade of construction where Plans and Specifications call for workmanship or materials in excess of code requirements. In addition, the following published standards shall be adhered to:
 1. American National Standards Institute
 2. American Public Health Association
 3. American Society of Heating and Air Conditioning Engineers
 4. American Society of Mechanical Engineers
 5. American Society of Testing Materials
 6. American Welding Society
 7. National Board of Fire Underwriters
 8. National Fire Prevention Association
 9. Underwriter's Laboratory
 10. National Electrical Code
 11. Current Edition of NFPA Standards

1.9 PERMITS, LICENSES, FEES AND SERVICE CHARGES

- A. All licenses, fees and service charges required in connection with this work shall be secured and paid for by the Contractor.
- B. Permits and connection costs are to be paid by the installing Contractor and upon completion of the work he/she shall furnish the Owner with proof of acceptance of the work from the proper local or State Department having jurisdiction.

1.10 OPERATING INSTRUCTIONS AND MANUALS

- A. The Mechanical Contractor shall prepare two complete files of maintenance and operating instructions, which cover all mechanical systems and equipment furnished and installed for this project.

Data shall be placed in an 8-1/2 inch by 11-inch heavy-duty, three-ring binder. Data shall include a complete table of contents, approved shop drawings, maintenance instructions, catalog brochure information and replacement parts list.

Drawings shall be neatly folded to approximately 8½ inch by 11-inch size and inserted individually into mylar sheet protectors, which shall be properly punched and inserted into the binder. The following information shall be typed on the filing tab page: item, manufacturer, contractor's order number, supplier's order number and manufacturer's order number. The completed files shall be delivered to the Engineer's office for approval that will deliver same to Owner.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new and of the best quality, conform to the requirements of Local and State Codes governing the work involved and shall be made by nationally recognized and substantially established manufacturers.
- B. Any equipment installed on this project which is damaged before or after installation shall be either replaced or repaired to the satisfaction of the Owner.

2.2 SUBSTITUTE MATERIAL

- A. Wherever Specified materials, device or equipment is referred to by the trade name, or other specific manner, followed by the clause "no substitute", it is understood that no other material or equipment is approved.
- B. Equipment and material modifications are approved only if listed in the specification. If no manufacturer is given, materials shall meet the grade and quality required and will be approved in shop drawings.
- C. This Contractor shall pay, provide, install and be responsible for extra materials required by himself/herself or any other trade due to the use of alternate approved equipment that has installation requirements different than the specified equipment. This Contractor shall pay for any redesign work associated with the installation requirements of the substituted equipment, providing either revised drawings or sketches prepared by himself/herself or the Engineer. All redesign work shall be approved by the Engineer.
- D. Final approval of certain materials and equipment will be based on the manufacturer's shop drawings. The Engineer's approval of shop drawings shall not relieve the Contractor from responsibility for deviations from the Drawings or Specifications unless he/she has, in writing, called the Engineer's attention to such deviations at the time of submission, nor shall it relieve him/her of the responsibility for error in the drawings.

2.3 PRODUCT DATA AND SHOP DRAWINGS

- A. This Contractor shall provide the Engineer with a minimum of five (5) certified copies of product data and shop drawings for equipment as noted in the Specifications for his approval, three of which will be returned to the Contractor for his files and maintenance and operating instruction brochures. Regardless of the number of shop drawings submitted, only two will be retained by the Engineer for his use. If the Contractor needs more than three (3) copies of certain shop drawings for his use, he/she shall submit as many additional sets of the particular drawings as he/she requires in addition to the minimum number listed above. The Contractor shall examine, mark up as required and approve all shop drawings prior to their submission to the Engineer. Shop drawings shall be processed with a minimum delay and shall be transported between offices by first class mail.

PART 3 – EXECUTION

3.1 PIPING AND DUCTWORK

- A. All piping and ductwork shall be installed in a neat and workmanlike manner, shall be run plumb and level against ceilings and walls, shall clear doors and walkways, and shall be run parallel with building construction lines. Piping shall be coordinated with the ventilation and electrical work so all may be properly installed.

- B. Wherever possible all piping and ductwork shall run horizontally within the vertical height of the roof structure. All ductwork shall be suspended from the top chords of the roof structure. All ductwork and piping shall be supported and braced for gravity loads and to resist seismic movements as required by applicable codes. Do not suspend any items from the metal roof deck.
- C. It is deemed that the Contractor shall be responsible for the miscellaneous small piping, ductwork and accessories not specifically called for in these Specifications but essential for the complete and satisfactory installation and operation of this Contract.

3.2 CONNECTIONS AND LAYOUT

- A. It shall be the responsibility of this Contractor to make connections at terminal points of the Contract. The piping, ductwork and equipment may be shown with excess clearance for clarity. However, the Contractor shall group piping and ductwork, arrange all equipment to present a neat and workmanlike appearance and to avoid the blocking of passageways or interfering with other trades. All exposed piping and ductwork shall be installed parallel to building construction lines, unless noted otherwise.
- B. Where connections are made to equipment furnished by others, this Contractor shall obtain exact location of connections from persons furnishing said equipment and shall make the final connections.

3.3 COORDINATION

- A. Coordinate work of the various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.
- B. Execute cutting and patching to integrate elements of Work, uncover ill-timed, defective, and non-conforming work, provide openings for penetrations of existing surfaces, and provide samples for testing. Seal penetrations through floors, walls and ceilings.

3.4 STORING MATERIALS

- A. All materials and equipment for the work of this Contract shall be stored in approved locations away from damaging traffic and interference with other trades.
- B. It shall be the responsibility of this Contractor to avoid damage to this equipment, materials and work from any source. This shall include restoration to original conditions should damage occur.

3.5 CLEANLINESS AND CLEANING UP

- A. The Contractor shall keep his materials and work tidy at all times keeping area free from an accumulation of rubbish and waste. When the work is sufficiently advanced and is enclosed, the job shall be kept "broom clean" and upon completion he/she shall remove all miscellaneous unused material and shall leave the job in an acceptable condition ready for occupancy.

3.6 TESTS

- A. All required tests shall be made in the presence of the proper inspectors and the Engineer or their authorized representative and Owner's representative. All tests shall be made by the Contractor at his own expense and he/she shall furnish to the Engineer and Owner a certificate that satisfactory tests have been made.
- B. Tests to be made as described elsewhere in these Specifications. Test certificates and approvals shall be bound in the maintenance brochures.
- C. Trane to perform final factory start-up on all rooftops and unit heaters. Mechanical contractor to perform any required temporary start-ups as required for heating and/or cooling during construction period.

3.7 TESTING, ADJUSTING AND BALANCING

- A. Trane shall provide the services of an Independent Test and Balance Agency (ITBA) who will be responsible for the Test and Balance of all environmental systems installed or modified under this Contract.
- B. Contractor shall provide all necessary balancing dampers as specified and shown on the drawings for proper balancing of all systems.
- C. Contractor shall prepare the system for Test and Balance as follows:
 - 1. Install, start up, all HVAC systems per Drawings and Specifications and have fully operational with all installation deficiencies corrected on or before the commencement of Testing, Adjusting and Balancing.
 - 2. Verify that all ductwork is clean and sealed tight against leaks.
 - 3. Verify that new filters have been installed no more than one day prior to Starting Test and Balance procedure.
 - 4. Verify that all controls, dampers, and actuators are installed, adjusted, and calibrated.
 - 5. To maintain schedules and prevent return trips, have experienced personnel available to correct HVAC system deficiencies while ITBA is scheduled on site.
 - 6. Secure control dampers after Test and Balance as directed by ITBA.
 - 7. Provide all necessary equipment required to access all HVAC equipment being tested and balanced.
- D. Upon completion of system Test and Balance, a copy of the ITBA report will be forwarded to Contractor. If HVAC system deficiencies exist, a letter listing those deficiencies will also be forwarded immediately to the Contractor for correction. If the Contractor fails to respond or correct these deficiencies within seven days upon receipt of the letter, owner will authorize repairs as judged necessary and take the necessary contractual action to recover adequate compensation for the repair expenses.
- E. All specified equipment will be Tested, Adjusted and Balanced by the ITBA in accordance with the governing Associated Air Balance Councils' Procedural Standards.
- F. ITBA Procedures:
 - 1. Make a preliminary system check on all HVAC, control, and Energy Management systems and equipment to be tested to determine that equipment, ductwork, etc. is installed and will operate. Deficiencies shall be immediately reported to the General Contractor's job site superintendent.
 - 2. Inspect and test all Energy Management (if applicable), electronic thermostat modules using ETM Interface analyzer, for the following control functions.
 - a. Fan control
 - b. Stage 1 cooling control
 - c. Stage 2 cooling control
 - d. Stage 1 heating control
 - e. Stage 2 heating control
 - f. Economizer control
 - 3. Record readings and testing data for inclusion into final report.
 - 4. The following testing and balancing shall be performed. All readings shall be recorded for inclusion into the final report as follows:
 - a. Test and adjust fan speeds to deliver the design CFM and record RPM and full load amperes at design CFM. Record voltage at each unit. Exhaust fans included.
 - b. Test and adjust system for design CFM outside air.
 - c. Test and record suction and discharge external static pressures at respective plenums. Seal access holes with rubber or metal snap-in plugs. The use of duct tape to seal access holes will not be permitted.
 - d. Test and record entering air temperatures. (Dry bulb heating and cooling; Wet bulb cooling.)
 - e. Test and record outside air Dry Bulb and Wet Bulb temperatures.
 - f. Test and record outside air Dry Bulb and Wet Bulb temperatures.
 - g. Test and adjust the volume dampers in the main duct runs to each diffuser, grille, and register to provide $\pm 10\%$ of design CFM requirements.
 - h. Identify each diffuser, grille and register to location and area.
 - i. Record unit Data and Motor Data for each air system tested on appropriate test report forms.
 - j. Visually inspect and test when possible, smoke sensing devices for proper installation and function.

- k. Test and record refrigerant pressures and temperatures.
5. Verify and record proper operation of all stages of gas heating sections or gas radiant heaters.

G. Report Procedures:

1. If any air system or outlet is not within 10% of the design capacity at design RPM, determine the reason. Check ductwork and plenums for leaks; coil and filter for excessive pressure drop, etc.; listed on HVAC Deficiency Report.
2. Before leaving job site, the ITBA shall provide the Mechanical Contractor's Representative a neat, legible deficiency list all remaining HVAC system deficiencies for correction. The content of this HVAC Deficiency Report shall be provided to the engineer.
3. The ITBA shall submit four bound copies of the final Testing and Balancing Report. All data shall be recorded on appropriate forms and shall be reviewed and approved by a Registered Professional Engineer. The report shall include all data provided by the Mechanical Contractor; a summary sheet of all deficiencies with status (corrected or not corrected at time of report) and recommendations. This report shall be submitted within seven days of final Test and Balance.

3.8 STARTING OF SYSTEMS

- A. Coordinate sequence for start-up of various items of equipment.
- B. Notify Owner seven days prior to start-up of each item of equipment.
- C. Have Contract Documents, shop drawings, product data, and operation and maintenance data at hand during entire start-up process.
- D. Verify that each piece of equipment has been checked for proper lubrication, drive rotation, belt tension, control sequence, and other conditions, which may cause damage.
- E. Verify control systems are fully operational in automatic mode. Verify the operation of every control point on the EMS system.
- F. Verify wiring to motors and controls required by mechanical work is complete.
- G. Motors: Verify that motor amperage agrees with nameplate value. Inspect for conditions, which produce excessive current flow and which exist due to equipment malfunction. Take corrective action.
- H. Execute start-up under supervision of responsible manufacturer's representative and Owner.
- I. Place equipment in operation in proper sequence.

3.9 SYSTEMS DEMONSTRATION

- A. Verify equipment has been inspected and put into operation, and equipment and systems are fully operational.
- B. Have copies of completed operation and maintenance manuals at hand for use in demonstrations and instructions.
- C. Demonstrate operation and maintenance of equipment and systems to Owner's personnel one week prior to date of final inspection. For equipment requiring seasonal operation, perform instructions for other seasons within six months.
- D. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

END OF SECTION

SECTION 15050 - BASIC MECHANICAL MATERIALS AND METHODS**PART 1 – GENERAL****1.1 WORK INCLUDED**

- A. Pipe, duct, and equipment hangers, supports, and associated anchors.
- B. Sleeves and seals.
- C. Flashing and sealing equipment and pipe stacks.

1.2 RELATED SECTIONS

- A. Section 15400 - Plumbing

1.3 NATIONAL ACCOUNTS

- A. Refer to Drawings.

PART 2 – PRODUCTS**2.1 PIPE HANGERS AND SUPPORTS**

- A. Hangers for Pipe Sizes ½ to 1½ inch: Malleable Iron adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for hot pipe sizes 6 inches and over.
- D. Wall Support: Welded steel bracket and wrought steel clamp.
- E. Vertical Support: Steel riser clamp.
- F. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- G. Shield for Insulated Piping 2 inches and smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.
- H. Shield for Insulated Piping 2½ Inches and Larger: Pipe covering protective saddles.
 - I. Gas and condensate piping on roof shall be supported on polyethylene high-density U.V. resistant quick “pipe” block with foam pad, manufactured by Nelson-Olsen Inc., distributed by Bongard Corporation, 651.982.9802, or Erico Pipe Piers, (888) 333-0852, Model No. 647. Recommended installation is for all quick “pipe” blocks to be freestanding. (When gas and condensate piping are run on the roof, coordinate height of quick “pipe” blocks at cross over points.)

2.2 HANGER RODS

- A. Steel hanger rods: Threaded both ends, threaded one end, and continuous threaded.

2.3 INSERTS

- A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection; size inserts to suit threaded hanger rods.

2.4 DUCT HANGERS AND SUPPORTS

- A. Hangers: Galvanized steel band iron or rolled angle and 3/8-inch rods.
- B. Cable: Grade AISI 316 zinc galvanized BS 302 steel braided cable. Use Gripple Hang-Fast cable system. Contact at 866-474-7753; Gripple Inc., 313 Oswalt Avenue, Batavia, IL 60510.
- C. Wall Supports: Galvanized steel band iron or fabricated angle bracket.

2.5 SLEEVES

- A. Sleeves for Pipes through Non-fire Rated Floors: Form with steel pipe or 18 gauge galvanized steel.
- B. Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or 18 gauge galvanized steel.
- C. Rectangular Ducts: Form with galvanized steel.
- D. Sleeves for pipes and ducts through fire-rated walls and ceilings: Comply with UL requirements for the rating of the wall or ceilings being penetrated.

2.6 FABRICATION

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Design hangers to be removable and replaceable without disengagement of supported pipe.
- C. Provide copper plated hangers and supports for copper piping.

2.7 FINISH

- A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

2.8 FLASHING

- A. Metal Flashing: 26-gauge galvanized steel.
- B. Flexible Flashing: 47-mil thick sheet butyl; compatible with roofing.
- C. Caps: Steel, 22-gauge minimum.

PART 3 – EXECUTION

3.1 PIPE SUPPORTS AND ANCHORS

A. Support horizontal piping as follows:

PIPE SIZE (in)	Max Hanger Spacing (ft)		HANGER DIA (in)
	STEEL	COPPER	
1/2.....	5	5	3/8
3/4.....	6	6	3/8
1.....	7	6	3/8
1-1/4	7	7	3/8
1-1/2	9	8	3/8
2.....	10	9	3/8
2-1/2	11	10	1/2
3.....	12	10	1/2
4.....	14	12	5/8
6.....	14	12	3/4
8.....	14	14	7/8
10.....	14	14	7/8
12.....	14	14	7/8

- B. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
- C. Place a hanger within 12 inches of each horizontal elbow.
- D. Use hangers with 1 1/2-inch minimum vertical adjustment.
- E. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- F. Support riser piping independently of connected horizontal piping.

3.2 DUCT HANGERS AND SUPPORTS

- A. Hanger Minimum Sizes:
 - 1. Up to 30 inches wide: 1 inch x 16 ga. at 10 feet spacing.
 - 2. 31 inches to 48 inches wide: 1 1/2 inches x 16 ga. at 10 feet spacing.
 - 3. Over 48 inches wide 1 1/2 inches x 16 ga. at 8 ft. spacing.
- B. Horizontal Duct on Wall Supports Minimum Sizes:
 - 1. Up to 18 inches wide: 1 1/2 inches x 16 ga. or 1 inch x 1 inch x 1/8 inch at 8 feet spacing.
 - 2. 19 inches to 40 inches wide: 1 1/2 inches x 1 1/2 inches x 1/8 inch at 4 feet spacing.
- C. Vertical Duct on Wall Supports Minimum Sizes:
 - 1. At 12 foot spacing.
 - 2. Up to 24 inches wide: 1 1/2 inches x 16 ga.; 25 inches to 36 inches wide: 1 inch x 1 inch x 1/8 inch.
 - 3. 25 inches to 48 inches wide: 1 1/4 inches x 1 1/4 inches x 1/8 inch.
- D. Aircraft Cable on ductwork at entrance:
 - 1. Gripple Hang-Fast cable system size #2 (5/64 inch) - galvanized steel braided cable with fasteners.
 - 2. 3/16 inch braided aircraft cable.

3.3 SLEEVES

- A. Set sleeves in position in structure. Provide reinforcing around sleeves.

- B. Extend sleeves through floors two inches above finished floor level. Caulk sleeves full depth and provide floor plate.
- C. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with approved firesafe stuffing insulation and seal. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- D. Install chrome plated steel escutcheons at finished surfaces.

3.4 FLASHING

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate waterproofed walls and floors.
- B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one-inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counterflash and seal.
- C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.
- D. Seal floor drains watertight to adjacent materials.

3.5 EXCAVATION AND BACKFILLING

- A. Excavation shall be of sufficient depth to permit placing the piping as shown on the Drawings and shall be of sufficient width to permit the construction of all piping and the inspection of same on all sides.
- B. All excavation for piping shall be made to firm soil with all excess soil to be removed from the site.

END OF SECTION

SECTION 15250 - MECHANICAL INSULATION**PART 1 – GENERAL****1.1 WORK INCLUDED**

- A. Piping insulation.
- B. Ductwork insulation.
- C. Jackets and accessories.

1.2 RELATED SECTIONS

- A. Section 15400 – Plumbing

1.3 NATIONAL ACCOUNTS

- A. Refer to Drawings.

1.4 REFERENCES

- A. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- B. ANSI/ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
- C. UL 723/ASTM E84 - Surface Burning Characteristics of Building Materials.
- D. ASTM C534 - Closed Cell Tubing Pipe Insulation.

1.5 QUALITY ASSURANCE

- A. Materials: Flame spread/fuel contributed/smoke developed rating of 25/50/50 in accordance with UL 723 and ASTM E-84. All materials shall be labeled with certified label indicating rating.

1.6 SUBMITTALS

- A. Submit product data under provisions of Section 15010.
- B. Include product description, list of materials and thickness for each service, and locations.

PART 2 – PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS**

- A. Owens/Corning.
- B. Manville.
- C. Knauf.

2.2 PIPING INSULATION

- A. Type A: Heavy density, sectional glass fiber insulation; ANSI/ASTM C547; "k" value of 0.24 at 75 degrees F; noncombustible.
- B. Type B: Closed Cell flexible tubing insulation; ASTM C-177; "k" value of 0.28 at 75 degrees F; noncombustible.

2.3 JACKET

- A. Interior Applications:
 - 1. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.
 - 2. PVC Jackets: One-piece, premolded type for fittings.

2.4 DUCTWORK INSULATION

- A. Type A: Rigid glass fiber; ANSI/ASTM C612, Class 1; "k" value of 0.24 at 75 degrees F; 0.002 inch foil scrim facing for air conditioning ducts and plenums.
- B. Type B: Flexible glass fiber ductliner; ANSI/ASTM C553; "k" value of 0.24 at 75 degrees F; 1.5 lb/cu ft minimum density; coated air side for maximum 4,000 ft/min air velocity.
- C. Type C: Faced duct wrap insulation; ANSI/ASTM C518-70; "k" value of 0.30 at 75 degrees F; for round air conditioning ducts.

2.5 ACCESSORIES

- A. Adhesives: Waterproof, Compatible with insulation.

PART 3 – EXECUTION**3.1 PREPARATION**

- A. Install piping insulation after piping has been tested and approved.

3.2 PIPING INSULATION INSTALLATION

- A. Install materials in accordance with manufacturer's instructions. Continue insulation with vapor barrier through penetrations. In exposed piping, locate insulation and cover seams in least visible locations. Neatly finish insulation at supports, protrusions, and interruptions.
- B. Except in return air plenums, insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with PVC jackets.
- C. In return air plenums, insulate fittings with insulating cement. Finish with canvas jacket. Do not use PVC jackets.

3.3 DUCTWORK INSULATION INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Provide insulation with vapor barrier when air conveyed may be below ambient temperature.
- C. Exterior Insulation (Type A) Application:
 - 1. Secure insulation and vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.

2. Secure insulation without vapor barrier with staples, tape, or wires.
3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

D. Liner (Type B) Application:

1. Adhere insulation with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners on 15-inch centers maximum on top and side of ductwork with dimension exceeding 20 inches. Seal and smooth joints. Do not use nail-type fasteners. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
2. Ductwork dimensions indicated are net inside dimensions required for airflow. Increase ductwork to allow for insulation thickness.

E. Exterior Insulation (Type C) Application:

1. Wrap insulation with vapor barrier tightly around ductwork with circumferential joints butted and longitudinal joints overlapped a minimum of 2".
2. Adhere insulation to metal with insulation bonding adhesive.
3. Secure circumferential and longitudinal joints with staples and tape with 3" wide (minimum) foil reinforced tape.

3.4 INSULATION SCHEDULE

A. Piping:

1. Insulate all hot water and cold water piping with one inch thick Type "A" or "B" pipe insulation.
2. Insulate all under-floor water piping with ¾" thick Type "B" pipe insulation.
3. Insulate all horizontal storm piping and roof drain bodies with 1" thick Type "A" pipe insulation.
4. Insulate sink supply lines and waste line with molded cover insulating kit.

B. Ductwork:

1. Insulate with a 1" Type "B" insulation, from Roof Top Unit to supply drop box and return elbow.
2. All supply and return ductwork in non air-conditioned spaces shall be insulated with Type "C" 1½" external duct wrap.
3. All exhaust ductwork, which penetrates the building shell: Insulate with type "C" from penetration to 10'-0" inside of building.

END OF SECTION

SECTION 15300 – FIRE SPRINKLER SYSTEM**PART 1 – GENERAL****Scope of Work**

- A complete wet pipe automatic fire sprinkler system for the entire project.

Submittals

- The contractor shall prepare all shop drawings, product literature, etc. as required to properly coordinate and construct the project, and as per the requirements of the Project Manual.
- Base drawings on Professional of Record's drawings and details and show, in detail, all structural and metal work included in the contract.

No work requiring a shop drawing or sample submission shall be commenced until the submission has been reviewed by the Professional of Record.

PART II - PRODUCTS**General**

The Sprinkler Contractor is directed to the fact that these specifications are performance: Meaning that at the time of submission of bid the contractor has contacted all governing agencies as to the scope of the work to be done for the entire project as outlined here-in. This shall include contacting all Fire Marshall's having jurisdiction, water departments (private and public) etc. and including in his bid an amount to do such work required by them. Submission of bid shall so indicate that all agencies have been contacted. In his bid include all required work such as back-flow prevents, concrete vaults, fire department connections fire hose cabinets, booster pumps, etc. to provide a complete and working system ready to use when the building is occupied by the Owner. Determine in advance of the bid the street pressure and incorporate the required devices and piping to meet all of the requirements of NFPA and Fire Marshal's requirements.

The work in the section includes, but is not necessarily limited to, the following principal items:

- Design and installation of a complete automatic fire sprinkler system for the areas specified above in accordance with all insurance carriers and authorities having jurisdiction.
- Securing all necessary permits and inspections. Fees by governing agencies shall be paid.
- Field verification of all dimensions, existing equipment, valves, and sprinklers. No extra charges or compensation will be allowed for any differences between actual dimensions and measurements indicated.
- Providing a letter of acceptance from the appropriate agency having jurisdiction and completed printed instructions on operation of system to the Owner.
- Five complete sets of shop drawings approved by all agencies having jurisdiction submitted to Professional of Record for review, prior to fabrication or installation of sprinkler system.
- All excavation and backfill for piping work in strict accordance with these specifications, cutting and patching of work to accommodate piping, and protection of work and materials. Excavation, backfilling, and compaction shall be as specified in Division 2.
- All underground piping (which pertains to the fire protection system) to 5 feet outside of building as indicated on the drawings and/or as necessitated by the design, including all required pipe, valves, etc. Final connection to the main provided by others.
- A hydraulically calculated system shall be used.
- Provide automatic sprinkler protection in all areas per NFPA-13 and all authorities having jurisdiction.

- Furnishing miscellaneous materials such as brackets, hangers, steel supports for equipment, concrete thrust-blocks, expansion joints, inspector's test connection, etc. All piping shall be braced for seismic requirements as determined by local governmental agencies.
- Electrical connections to fire alarm system shall be provided by electrical/alarm contractor.
- The design, equipment, materials, installation, and workmanship shall be in strict accordance with the required and advisory provision of NFPA 13. Each system shall include all materials, accessories, and equipment inside and outside the buildings necessary to provide each system complete and ready for use.
- Water flow test must have been completed within 3 months.
- Each system shall be designed and installed to give full consideration to built-in spaces, piping, electrical equipment, ductwork, and all other construction and equipment to afford complete coverage and be free from operating and maintenance difficulties, all in accordance with detailed drawings to be submitted by the contractor for approval. Devices and equipment shall be of a make and type listed by the Underwriters' Laboratories, Inc., or approved by the Factory Mutual Laboratories.
- The work for the building shall begin at connection to the underground C.W. main, 5 feet outside the building. Underground system shall be flushed and approved prior to final connection to overhead A.S. system.
- *Instruction Manuals:* Contractor shall furnish instruction manuals, containing complete instructions for the specific make and model of the alarm valve furnished. One copy of each instruction manual shall be placed in a flexible oil resistant, protective binder and mounted in an accessible location in the vicinity of each alarm valve. Four additional copies of instruction manual shall be furnished to the General Contractor for incorporation into installation manual.

Design of Sprinkler Systems

Design of wet pipe sprinkler systems shall be by hydraulic calculations and shall conform to NFPA 13, insurance carrier requirements, all other authorities having jurisdiction, and to the requirements as specified hereinafter.

Sprinklers:

Sprinklers shall vary in size based on NFPA 13 requirements. Release element of each sprinkler shall be of the intermediate temperature of rating or higher as suitable for the individual location where it is installed.

Alarm Valve:

Valve shall be of the variable pressure type complete with all accessories and appurtenances necessary for the proper operation of each system and to prevent false alarms due to surges or other conditions in the supply to each system.

Alarms

Water Motor Alarm:

Provide alarms of the approved weatherproofed and guarded type, to sound locally on the flow of water in each sprinkler system to which it is connected, and shall be mounted on the outside of the outer walls of each building or at a location indicated on the Drawings.

Energize the 120 volt circuit providing power to the exterior audio device. The activation of the exterior audio device will be by contacts in the water flow switch. The device will continue to sound until water flow ceases.

Pressure Switch:

Provide switches with circuit opener or closer for the automatic transmittal of an alarm over the facility fire alarm system connected into the fire alarm system. Alarm actuating devices shall be of the mechanical diaphragm controlled water flow type without retard feature, which instantly recycles when pressure is released on the diaphragm. Coordinate the required voltage of switch with the electrical contractor and assume the switch will be 24V wiring.

Alarm Notification Devices

The audio notification device shall be provided as indicated on the drawings. The bell notification assembly shall consist of a weatherproof box, coverplate and alarm bell which shall exceed 90 dBA at 10 feet with a red grille. The audio notification

device shall operate on 120 vac power from the building electrical system and shall be controlled by a relay activated by contacts in the water flow switch. The device shall be mounted in a semi-flush, box. Provided by sprinkler contractor.

Valves:

Valves shall be provided as required by NFPA 13 and of types approved for fire service. Gate valves shall be flanged clear opening swing check type with flanged inspection and access cover plate. Provide an OS&Y valve in each riser, located beneath each wet pipe alarm valve.

Identification Signs:

Properly lettered, code approved metal signs conforming to NFPA 13 shall be attached to each valve and alarm device.

Test Connection:

Test connections shall be provided 6' above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device and shall be located at the hydraulically most remote part of each system. Test connection shall be piped to a location where the discharge will be readily visible and where water may be discharged without damage.

Main Drains:

Drains shall be piped to discharge at safe points outside each building or to sight cones attached to drains of adequate size to readily care for the full flow from each sprinkler drain under maximum pressure. Auxiliary drains shall be provided as required by NFPA 13.

Sleeves:

Standard weight zinc coated steel pipe sleeves shall be provided for all pipes passing through masonry walls, floors, and ceilings. Sleeves shall extend completely through construction shall be firmly packed with oakum and caulked at both ends with insulating cement.

Fire Department Connections and Valves

Fire Department Inlet Connections: Connections shall be provided 3' above grade, of the approved 2-way type with local Fire Department hose threads with plug and chain. Connection shall be wall mounted as indicated on the architectural drawings with approved check valve and automatic drip if wall mounted type. Connect to sprinkler riser in an approved manner. Connections must match threads of fire department having jurisdiction at job site.

Outside connections shall be labeled "wet sprinkler" for wet sprinkler system.

Maintenance Cabinet

Provide a 10-gauge metal cabinet with hinged, lock type door; with six (6) extra sprinklers of each type used; and wrenches necessary to change sprinklers. Cabinet shall be of ample size to contain the sprinklers and wrenches and shall be located on wall in vicinity of the fire riser.

Electrical Work**Wiring:**

Control and fire alarm wiring including connections to fire alarm systems, shall be provided under this Section and shall conform to NFPA 70. The conduit shall be rigid zinc coated steel.

Controllers:

Controllers shall be furnished with their respective pieces of equipment; and shall have all electrical connections provided under this Section. Coordinate the required voltage of control with the electrical contractor and assume the switch will be 24V wiring.

Underground Piping System**Pipe and Fittings:**

Piping under the building and less than 5' outside of the building walls shall be outside coated cement lined case iron pipe and fittings conforming to NFPA 24, with the joints anchored in accordance with NFPA 24.

Valves:

Valves shall be provided as required by NFPA 13 and of types approved for fire service. Gate valves shall conform to AWWA C500 with cast iron body and bronze trim, and shall open by counter-clock-wise rotation.

Contractor Qualifications

Contractor performing work is to be a state licensed fire protection contractor and is to be regularly engaged in the installation of fire sprinkler systems. He may be required to furnish satisfactory evidence that he has the labor and equipment available to maintain a satisfactory schedule in doing the work.

Tests

Prior to connecting to overhead sprinkler piping, the underground main shall be flushed in the presence of a representative of the Rating Bureau or Professional of Record and meet with their approval. After completion of the installation, the entire system shall be tested for acceptance by the rating bureau. Contractor to provide certificate for both flushing and testing of system to insurance carrier as stated above and include in project closeout manual.

Acceptance

The Rating Bureau, after satisfying itself that the installation is satisfactory in all respects, will issue a letter of final acceptance. Letter shall be addressed to the Tenant/Owner and copies distributed to the Professional of Record; prepared in triplicate.

Caution

Sprinklers and piping shall be installed without conflict with plumbing, mechanical or electrical work.

Install additional sprinklers as required per NFPA-13 inspections, etc.

END OF SECTION

SECTION 15400 - PLUMBING**PART 1 – GENERAL****1.1 WORK INCLUDED**

- A. Pipe and pipe fittings.
- B. Valves.
- C. Plumbing Specialties.
- D. Plumbing Fixtures.
- E. Plumbing Equipment.
- F. Air Compressor

1.2 RELATED SECTIONS

- A. Section 15010 - Mechanical General Provisions.
- B. Section 15050 - Basic Mechanical Materials and Methods.
- C. Section 15250 - Mechanical Insulation.

1.3 NATIONAL ACCOUNTS

- A. Refer to drawings for Purchasing and Installation responsibilities.

1.4 REFERENCES

- A. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.
- B. ANSI/ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.
- C. ANSI/ASTM B32 - Solder Metal.
- D. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless.
- E. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperature.
- F. ASTM B88 - Seamless Copper Water Tube.
- G. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

1.5 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Plumbing Specialties and Fixtures: By same manufacturer for each product specified throughout.
- C. Trim: By same manufacturer for each product specified throughout.

1.6 SUBMITTALS

- A. Submit product data under provisions of Section 15010.

1.7 STORAGE AND HANDLING

- A. Store and protect products under provisions of Section 15010.

PART 2 – PRODUCTS**2.1 SANITARY SEWER, STORM SEWER AND VENT PIPING, BURIED WITHIN 5 FEET OF BUILDING OR AS SHOWN ON DRAWING**

- A. Exterior work beyond 5'-0" will be by site utility contractor, except at loading dock or unless shown otherwise on the drawings.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. PVC Pipe: Schedule 40
 - 1. Fittings: PVC
 - 2. PVC pipe may be used where allowed by code.

2.2 SANITARY SEWER, STORM SEWER AND VENT PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. PVC Pipe: Schedule 40
 - 1. Fittings: PVC
 - 2. PVC pipe may be used where code allows. PVC pipe shall not be used in air plenums.

2.3 DRAIN PIPING, ON ROOF (CONDENSATE)

- A. Provide hard drawn DWV copper pipe with red brass or wrought copper DWV fittings incorporating 1/8" pitch per foot for drain lines from cooling drain pans, modular cooling units and other miscellaneous drains except steam condensate drains. Support piping per Section 15050 part 2.1.I. (Condensate piping from roof top units to approved receptacle shall be run where code requires.)
- B. Schedule 40 PVC pipe fittings may be used for traps only where Code allows. (Condensate from roof top units to spill on roof where code allows.)

2.4 DRAIN PIPING INSIDE BUILDING, ABOVE GRADE (CONDENSATE)

- A. Provide hard drawn DWV copper pipe with red brass or wrought copper DWV fittings incorporating 1/8" pitch per foot for drain lines from cooling drain pans, modular cooling units and other miscellaneous drains except steam condensate drains.

2.5 WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ANSI/ASME B16.22, wrought copper. Joints: ANSI/ASME B32, solder, Grade 95TA.

2.6 NATURAL GAS PIPING

- A. Steel Pipe: ASTM A53, Schedule 40, black steel, seamless. Fittings: ANSI/ASME B16.3 150 psig malleable iron, or ASTM A234, forged steel welding type. Joints: Screwed for pipe size two inches and smaller; welded, for pipe size 2½" and larger.
- B. All exposed gas piping on wall and roof shall be painted to resist corrosion.

2.7 FLANGES, UNIONS AND COUPLINGS

- A. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
- B. Pipe Size Over 2 Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; neoprene gaskets for gas service; 1/16 inch thick preformed neoprene.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.8 VALVES - ACCEPTABLE MANUFACTURERS

- A. Lunkenheimer
- B. Crane
- C. Powell
- D. Apollo
- E. Milwaukee

2.9 BALL VALVES

- A. 3 Inches and Under: Bronze body, chrome plated stainless steel ball, Teflon seats and stuffing box ring, lever handle with insulation extension, solder or threaded ends, rated 150 PSI WOG for plumbing and 300 PSI WOG for compressed air.

2.10 SWING CHECK VALVES

- A. Up to 2 inches: Bronze 45-degrees, swing disc, solder ends, rated 125 PSI.

2.11 CLEANOUTS

- A. Interior Finished Floor Areas: Lacquered cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, as required, round with scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas;
 - 1. Josam Series 56000
 - 2. Watts CO-590-RD
 - 3. Zurn Z-2-1400

- B. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw;
 - 1. Josam Series 58700
 - 2. Wade
 - 3. Zurn 1468
- C. Interior Unfinished Accessible Areas: Caulked or threaded type.

2.12 SHOCK ABSORBERS

- A. Provide Water hammer shock absorbers made of stainless steel or other approved non-corrosive material. Absorbers shall be Josam, Jay R. Smith, Wade or Zurn, sized as follows.

P.D.I. &				
Plan	Smith	Wade	Zurn	Josam
<u>Symbol</u>	<u>Size</u>	<u>Size</u>	<u>Size</u>	<u>Size</u>
A.....	5005	W-5	#100	75001
B.....	5010	W-10	#200	75002
C.....	5020	W-20	#300	75003
D.....	5030	W-50	#400	75004

2.13 WALL HYDRANTS AND HOSE BIBBS

- A. Provide Woodford, Zurn, Josam, Wade or Jay R. Smith; brass with vacuum breaker, all internal parts of the hydrant renewable from the outside face, and 3/4" connections. Furnish loose key with each hydrant.
- B. Provide all other wall hydrants installed on outside walls or curbs with polished brass, exposed 3/4" nozzle, and bronze casing, Woodford Model 65 or equal hydrant by other manufacturers specified above.

2.14 ELECTRIC WATER HEATERS

- A. Automatic, electric, vertical storage type, 150-psig maximum working pressure. Glass lined steel tank, thermally insulated with 1½ inch thick foam; encased in corrosion-resistant steel jacket; baked-on enamel finish. Automatic water thermostat with temperature range from 110 to 170 degrees F, flanged or screw-in nichrome elements, enclosed controls and electrical junction box. Brass water connections and dip tube, drain valve, high-density magnesium anode, and ASME rated temperature and pressure relief valve. State Industries, Rheem, or A.O.Smith. Water heaters shall have capacity and performance as scheduled on drawings.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Verify adjacent construction is ready to receive rough-in work of this Section.

3.2 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

- B. Route piping in orderly manner and maintain gradient. Install piping to conserve building space and not interfere with use of space. Group piping whenever practical at common elevations.
Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Provide clearance for installation of insulation and access to valves and fittings. Provide access where valves and fittings are not exposed. Slope water piping and arrange to drain at low points.
- C. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.
- D. Excavate and backfill in accordance with Section 15050.
- E. Install valves with stems upright or horizontal, not inverted. Install unions at equipment or apparatus connections. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers. Install globe valves for throttling, bypass, or manual flow control services.
- F. Install specialties in accordance with manufacturer's instructions to permit intended performance.
- G. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- H. Install water hammer arrestors complete with accessible isolation valve, where shown on drawings.
- I. Install each fixture with trap, easily removable for servicing and cleaning. Provide chrome plated rigid or flexible supplies to fixtures with stops, reducers and escutcheons. Install components level and plumb. Install and secure fixtures in place. Seal fixtures to wall and floor surfaces with sealant, color to match fixture.
- J. Install all Plumbing Piping within the vertical height of the roof structure. All piping shall be suspended from the top chords of the roof structure. All plumbing piping shall be supported and braced for gravity loads and to resist seismic movements as required by applicable codes.
Do not suspend any plumbing items from the metal roof deck.

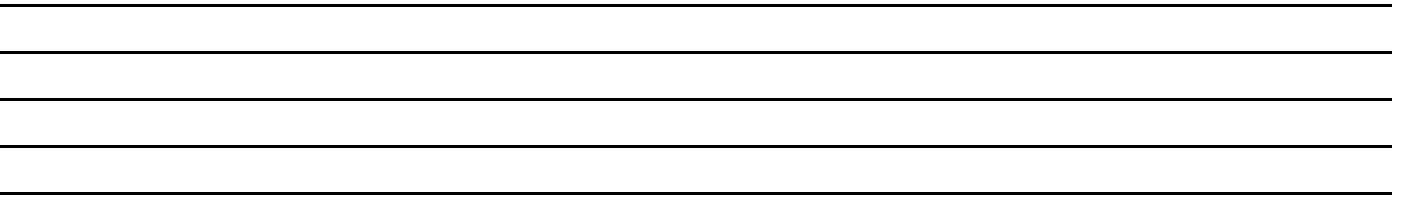
3.3 ADJUSTING AND CLEANING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise or overflow.
- B. At completion, clean plumbing fixtures and equipment.
- C. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/l residual. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets. Maintain disinfectant in system for 24 hours. Flush disinfectant from system until residual is equal to that of incoming water.
- B. Submit Certified results of Test to Owner.

END OF SECTION



DIVISION 16
ELECTRICAL



SECTION 16010 – GENERAL PROVISIONS**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. The Conditions of the Contract (General and other Conditions), General Requirements (Sections of Division 1) are hereby made a part of Division 16.
- B. The articles contained in this Section are intended to supplement the Sections outlined above. Where they amend, modify, supersede or void any part of the above, then they shall take precedence but that part remaining unchanged shall still apply.

1.2 EXAMINATION AND LOCATION OF SITE

- A. The work covered by these Specifications is located at Baytown, Texas.
- B. The Contractor shall satisfy himself by a personal examination of the site as to all local conditions affecting the performance of the Contract. This Contractor is deemed to accept such conditions as the same are eventually found to exist and to waive all claims for extra compensation arising from unforeseen difficulties encountered except as the same are expressly provided for in either the Specifications or the Contract.
- C. Professional ignorance regarding the requirements of the work will in no way serve to modify the provisions of the Contract or Specifications.

1.3 EXAMINATION OF DOCUMENTS

- A. These drawings and specifications have been prepared based upon the Owner's prototypical store. These documents may require modification based upon actual site conditions, local codes, and local authority having jurisdiction. Any and all modifications must be coordinated with The Owner prior to performing work.
- B. The Contractor shall also carefully read the Plans and Specifications before submitting bids on the work to be done. If any Contractor contemplating submitting a bid for the proposed Contract is in doubt as to the true meaning of any part of the Specifications or other proposed Contract Documents, he may submit to the Engineer a written request, a minimum of one (1) week prior to bid date, for an interpretation thereof. The person submitting a request shall be responsible for its prompt delivery.
- C. Any interpretation of the proposed documents will be made **ONLY** in writing duly issued, a copy of which will be mailed or delivered to each bidder receiving a copy of the Plans and Specifications and to such other prospective bidders as have requested that they be furnished with a copy of each.
- D. These Specifications and the corresponding Drawings form a complete set of Plans for the work of this project and **neither shall be considered complete without the other**. Where an item is mentioned in one and not in the other, it shall be considered as binding to this Contract as though mentioned in both.
- E. It is the intent of the Plans and Specifications to form a guide for a complete installation. Everything necessary for the completion and successful operation of the installation, whether or not herein definitely specified or indicated on the Drawings, shall be furnished and installed as well and as faithfully as if so specified or indicated without additional cost to the Owner. These Drawings shall not be scaled to obtain exact dimensions. Reference shall be made to the Architectural Drawings where dimensions are noted.
- F. Should the Drawings disagree in themselves, or with the Specifications, the better quality or greater quantity of work or materials shall be provided. If any errors, discrepancies or omissions appear in the Drawings, Specifications or other Contract Documents, the Contractor shall notify the Engineer in writing of such errors or omissions. In the event of the Contractor failing to give such notice before construction and/or fabrication of the work, he will be held responsible for the results of any such errors, discrepancies or omissions and the cost of rectifying same.

1.4 MODIFICATIONS TO PLANS AND SPECIFICATIONS

- A. Throughout the course of the work, minor changes and adjustments to the Plans and Specifications may be requested by the Engineer. The Contractor shall make such adjustments without additional cost to the Owner, where such adjustments are necessary to the proper installation or operation and within the intent of the Contract Documents, e.g., equipment voltage requirements or outlet locations.

1.5 GUARANTEES

- A. Furnish in writing a one (1) year guarantee, or longer as specified for particular equipment, that material and work are free from defects and faulty workmanship and that defective material or work shall be repaired or replaced without additional cost to the Owner. This shall include responsibility for damage to any part of premises caused by failures in the work furnished and installed under this Contract. The Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition and be reimbursed for expenditures without voiding the responsibilities of the Contractor during the guarantee period.

1.6 OTHER WORK

- A. Other work will be performed by separate trades. Each Contractor shall give careful consideration to the work of the other contractors and shall organize his work so that it will not interfere with the work of other trades. Each must consult the Drawings and Specifications for correlating information of the other trades. Inform other trades of clearances, openings, or restrictions required around electrical equipment. The lay-out of electrical systems may be altered to avoid conflicts prior to installation at no additional cost to the Owner. Report any conflicts to the Engineer immediately. Field verify dimensions, mounting heights, and other conditions prior to installation of electrical systems.

1.7 NATIONAL ACCOUNTS PROGRAM

- A. National Accounts Program (Contractor Purchased Materials): Refer to drawings, Materials Schedule, and individual specification sections for applicable products and vendor(s) with whom the Owner has entered into a "National Account Agreement".

1.8 REGULATIONS AND CODES

- A. The work, materials and equipment covered by these Specifications shall comply in all respects with the requirements of State, County and City applicable ordinances, regulations and codes. This shall not be construed to permit a lower grade of construction where Plans and Specifications call for workmanship or materials in excess of code requirements. In addition, the following published standards shall be adhered to:

American National Standards Institute
American Society of Testing Materials
National Fire Prevention Association
Underwriter's Laboratory
National Electrical Manufacturers Association
National Electrical Codes and other applicable codes
Factory Mutual System

1.9 PERMITS, LICENSES, FEES AND SERVICE CHARGES

- A. All licenses, fees and service charges required in connection with this work shall be secured and paid for by the Contractor. Permits and connection costs are to be paid by the installing Contractor and upon completion of the work he shall furnish the Owner with proof of acceptance of the work from the proper local or State Department having jurisdiction.
- B. Make all arrangements for and pay for all Utility Company service charges for new power and all Telephone Company service charges. This includes but is not limited to all charges for cutting, trenching, backfilling, patching, underground conduits, pull wires, cables, wire connections, transformer vaults, transformers, grounding, mounting pads, C.T. and connection cabinets, meters, meter wiring, disconnects etc. **All Utility Company and Telephone Company charges shall be included in the bid, without exceptions or exclusions.**

1.10 OPERATING INSTRUCTIONS AND MANUALS

- A. The Electrical Contractor shall prepare two complete files of maintenance and operating instructions which cover all electrical systems and equipment furnished and installed for this project.

Data shall be placed in an 8-1/2 inch by 11 inch heavy-duty, three-ring binder. Data shall include a complete table of contents, approved shop drawings, maintenance instructions, catalog brochure information and replacement parts list. Drawings shall be neatly folded to approximately 8-1/2 inch by 11 inch size and inserted individually into mylar sheet protectors, which shall be properly punched and inserted into the binder. The following information shall be typed on the filing tab page: item, manufacturer, contractor's order number, supplier's order number and manufacturer's order number.

- B. The completed files shall be delivered to the Engineer's office for approval who will deliver same to the Owner.

1.11 DEFINITIONS

- A. The following definitions apply only to Division 16 documents:

Furnish: Obtain and deliver to job site.

Install: Receive at job site, unload, store, set in place, and put in operation.

Provide: Furnish and install.

Connect: Provide service to the equipment and make all necessary attachments including lugs, fittings, devices, etc.

1.12 WORK INCLUDED

- A. Provide all material, equipment, labor, services, etc. as required for the installation of all electrical systems in compliance with the Contract Documents. These systems shall be left complete, functioning, and ready for use.
- B. The omission of specific reference to any material or labor required for, or reasonably associated with the installation of a complete system shall not be considered authorization to omit such work.
- C. Any changes or modifications that are required, because of a particular Manufacturer's or Subcontractor's requirements, shall be made at no additional cost to the Owner.
- D. Provide all electrical work indicated in the Contract Documents except for that which is specifically indicated as excluded.

1.13 STANDARDS

- A. All materials and equipment shall be installed in accordance with the manufacturer's recommendations and instructions.
- B. The installation shall comply with the regulations of the utility that serves the site.
- C. All work shall be performed in a neat and workmanlike manner by licensed electricians.
- D. The above requirements establish a minimum standard for the work. Where requirements of the Contract Documents exceed this minimum standard, comply with the requirements of the Contract Documents. If conflicts occur between the requirements of the Contract Documents and the minimum standards for the work, notify the Engineer before proceeding with the installation.

1.14 USE OF DRAWINGS

- A. The drawings are diagrammatic in nature and indicate approximate locations and general arrangement of equipment, systems, and building elements. Do not scale drawings. Refer to dimensioned drawings for exact locations of building elements, equipment, etc. Field measurements shall take precedence over dimensioned drawings where applicable.
- B. Any discrepancies between the electrical drawings and those of other Divisions shall be reported to the Engineer at once. The Engineer reserves the right to make minor changes in equipment locations as required to resolve such discrepancies, at no additional cost to the Owner.

- C. Obtain clarifications from the Engineer before proceeding, if any questions arise regarding the intent of the Contract Documents. If a clarification cannot be obtained quickly enough, the higher quantity or item of higher installed cost shall apply.
- D. For locations of connections to equipment furnished by others, consult the supplier of equipment.
- E. Do not install equipment that exceeds the dimensions indicated on the drawings and do not reduce the clearances indicated on the drawings without first consulting the Engineer.

1.15 QUALITY ASSURANCE

- A. For products or workmanship specified by Associations, Trade, Federal Standards, or other referenced Standards, comply with requirements of the Standard, except when more rigid requirements are specified or are required by governing regulations.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new and of the best quality, conform to the requirements of Local and State Codes governing the work involved and shall be made by nationally recognized and substantially established manufacturers.
- B. All materials and equipment used shall be listed and labeled by Underwriters Laboratories Inc. where UL testing and listing are available for the materials and equipment.
- C. Any equipment installed on this project which is damaged before or after installation shall be either replaced or repaired to the satisfaction of the Owner.

2.2 SUBSTITUTE MATERIAL

- A. Substitution of any materials, light fixtures, or equipment shall not be allowed.

2.3 EQUIPMENT FURNISHED AND INSTALLED BY OTHERS

- A. This Contractor shall verify actual nameplate electrical information of all equipment furnished and installed by others prior to installation of conduit, conductors and overcurrent protection. Notify Electrical Engineer of any discrepancies.

2.4 PRODUCT DATA AND SHOP DRAWINGS

- A. This Contractor shall provide the Engineer with a minimum of five (5) certified copies of product data and shop drawings for equipment as noted in the Specifications for his approval, three of which will be returned to the Contractor for his files and maintenance and operating instruction brochures. Regardless of the number of shop drawings submitted, only two will be retained by the Engineer for his use. If the Contractor needs more than three (3) copies of certain shop drawings for his use, he shall submit as many additional sets of the particular drawings as he requires in addition to the minimum number listed above. **The Contractor shall examine, mark up as required and approve all shop drawings prior to their submission to the Engineer.** Shop drawings shall be processed with a minimum delay and shall be transported between offices by first class mail.

PART 3 - EXECUTION

3.1 CONNECTIONS AND LAYOUT

- A. It shall be the responsibility of this Contractor to make all required connections unless noted otherwise. The conduit and equipment may be shown with excess clearance for clarity. However, the Contractor shall group conduit and arrange all equipment to present a neat and workmanlike appearance and to avoid the blocking of passageways or

interfering with other trades. All exposed conduit shall be installed parallel to building construction lines, unless noted otherwise.

- B. Where connections are made to equipment furnished by others, this Contractor shall obtain exact location of connections from persons furnishing said equipment and shall make the final connections.

3.2 COORDINATION

- A. Coordinate work of the various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.
- B. Execute cutting and patching to integrate elements of Work, uncover ill-timed, defective, and non-conforming work, provide openings for penetrations of existing surfaces, and provide samples for testing. Seal penetrations through floors, walls and ceilings.

3.3 STORING MATERIALS

- A. All materials and equipment for the work of this Contract shall be stored in approved locations away from damaging traffic and interference with other trades.
- B. It shall be the responsibility of this Contractor to avoid damage to this equipment, materials and work from any source. This shall include restoration to original conditions should damage occur.

3.4 CLEANLINESS AND CLEANING UP

- A. The Contractor shall keep his materials and work tidy at all times keeping area free from an accumulation of rubbish and waste. When the work is sufficiently advanced and is enclosed, the job shall be kept "broom clean" and upon completion he shall remove all miscellaneous unused material and shall leave the job in an acceptable condition ready for occupancy.

3.5 TESTS

- A. Industry standard tests of the electrical installation shall be performed by the Contractor at his expense. Test results shall be reported in writing to the Engineer.
- B. The Electrical contractor shall provide a Site test for the GFI Main Breaker at the service by a recognized manufacturer testing company followed up with a satisfactory written test report to the Engineer of Record and to the Owner prior to store opening
- C. The Electrical contractor shall provide infra-red scanning test on all reused existing panelboards, switchboards and transformer connections under load. The Electrical contractor shall be present at test. Test shall be done prior to store opening in project close-out. A satisfactory test result prior to project close-out shall be submitted in writing to the Engineer of Record and to the Owner.

3.6 STARTING OF SYSTEMS

- A. Coordinate sequence for start-up of various items of equipment.
- B. Notify the Owner seven days prior to start-up of each item of equipment.
- C. Have Contract Documents, shop drawings, product data, and operation and maintenance data at hand during entire start-up process.
- D. Verify that each piece of equipment has been checked for proper lubrication, drive rotation, belt tension, control sequence, and other conditions which may cause damage.
- E. Verify control systems are fully operational in automatic mode.
- F. Verify that tests, meter readings, and specific electrical characteristics agree with those specified by electrical equipment manufacturer.

- G. Verify wiring to motors and controls required by mechanical work is complete.
- H. Verify wiring and support systems for equipment installed under separate contracts is complete and checked.
- I. Motors: Verify that motor amperage agrees with nameplate value. Inspect for conditions which produce excessive current flow and which exist due to equipment malfunction. Take corrective action.
- J. Execute start-up under supervision of responsible manufacturer's representative and the Owner.
- K. Place equipment in operation in proper sequence.

3.7 SYSTEMS DEMONSTRATION

- A. Verify equipment has been inspected and put into operation and equipment and systems are fully operational.
- B. Have copies of completed operation and maintenance manuals at hand for use in demonstrations and instructions.
- C. Demonstrate operation and maintenance of equipment and systems to the Owner's personnel one week prior to date of final inspection. For equipment requiring seasonal operation, perform instructions for other seasons within six months.
- D. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.
- G. Demonstrate proper lighting control with energy management system.

END OF SECTION

SECTION 16050 – BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Conduit.
- B. Wire and Cable.
- C. Boxes.
- D. Wiring Devices.
- E. Modular Wiring System.

1.2 NATIONAL ACCOUNTS PROGRAM

- A. Refer to drawings for purchasing and installation responsibilities.

PART 2 - PRODUCTS

2.1 CONDUIT AND FITTINGS

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Electrical Metallic Tubing: ANSI C80.3, galvanized.
- C. Flexible Metal Conduit: Steel.
- D. Rigid Non-Metallic Conduit: NEMA TC2, Schedule 40 PVC or schedule 80 PVC as required by Authority Having Jurisdiction, with NEMA TC3 fittings and conduit bodies.
- E. Metal Fittings and Conduit Bodies: NEMA FB1, material to match conduit.

2.2 WIRE AND CABLE

- A. Wire or cable insulation: UL listed for specific application. The voltage rating of the wire or cable shall be greater than or equal to the applied system voltage.
- B. #12 AWG to #10 AWG copper wire: solid or stranded with type THHN, THWN, or XHHW insulation.
- C. #8 AWG and larger copper wire: Stranded with type THHN, THWN, or XHHW insulation.
- D. Aluminum wire shall not be permitted.
- E. Voltage Drop: For conductors sized per NEC on drawings, increase size by number of standard copper sizes shown in table to compensate for voltage drop, and increase conduit and grounding conductor sizes accordingly as per NEC. Contact Engineer of record for assistance if circuit length from source to load exceeds maximums shown.

CCT VOLTS/PH	CCT LENGTH FT.	UPSIZING
120/1	75-150	1
120/1	150-200	2
120/1	over 200	3
208/3 OR 277/1	150-200	1
208/3 OR 277/1	200-250	2
208/3 OR 277/1	over 250	3
480/3	300-450	1
480/3	450-550	2

- F. Metal-Clad (MC) Cable.
 - 1. Sheathing: continuous corrugated or smooth, aluminum. Interlocked type is not allowed.

2. Conductors: solid or stranded copper, rated 600 volts with type THHN, 90° C insulation.
3. Cable: conforming to UL standard 1569.
4. Cable shall include a full size grounding conductor. The grounding conductor shall be insulated for isolated ground or GFI circuits. Sheathing shall not be used in lieu of a grounding conductor.
5. Fittings shall be UL listed for use with the appropriate type of MC cable. Connectors intended for types NM, NMC, SE, USE, UF, or AC cables are not allowed.

2.3 BOXES

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, with 1/2 inch male fixture studs where required.
- B. Cast Boxes: Aluminum, deep type, gasketed cover, threaded hubs.
- C. Floor Boxes: Round Cast Iron, fully adjustable, 1 ¼ inches hubs, Hubbell #B2506 with brass cover plate, brass carpet flange, brass tile flange and flush fitting where approved by code. Verify part numbers with manufacture before ordering.
- D. Floor Boxes: Round Plastic, Hubbell #PFB1 and Hubbell #PFBA1A adapter with brass cover plate, brass carpet flange, brass tile flange and flush fitting where approved by code, and complies with UL 514A and UL 514C requirements. Verify part numbers with manufacturer before ordering.
- E. Duplex Floor Cover Plates:
 1. Brass Hubbell #SF3925 with carpet/tile flange
 2. Brass Hubbell #S3925 without carpet flange
 3. Brass Hubbell #S3082 carpet ring only
 4. Brass Hubbell #S5016 tile ring only
 5. Verify part numbers with manufacture before ordering.
- F. Combination Floor Cover Plates:
 1. Brass Hubbell #SF2725 with carpet/tile flange-1 inch
 2. Brass Hubbell #S2725 without carpet flange-1 inch
 3. Brass Hubbell #S3082 carpet ring only
 4. Brass Hubbell #S5016 tile ring only
 5. Verify part numbers with manufacture before ordering.
- G. Boxes in masonry walls; Steel City type GW, Raco number 580.
- H. FS or FD boxes:
 1. Appleton
 2. Crouse-Hinds
 3. Killark
 4. Red Dot
- I. Pull boxes: sized as indicated and/or as required by the NEC, constructed of code gauge baked enamel painted or galvanized steel, with hinged or screw covers. Screws shall be corrosion resistant. Boxes flush mounted in walls shall have oversized, flush type covers. Acceptable manufacturer: Hoffman or Steel City.

2.4 WIRING DEVICES

- A. General Purpose Wiring Devices: NEMA WD1, products of Hubbell, Pass & Seymour or Leviton.
- B. Wall Switches: AC general use quiet snap switch, 20 amp, 120-277 volts, gray colored toggle handle.
- C. Convenience Receptacle: Straight blade, NEMA 5-20R gray plastic face.
- D. GFCI Receptacles: Duplex convenience receptacle, NEMA 5-20R with integral ground fault current interrupter, gray plastic face and complies with UL 948 requirements.
- E. Isolated Ground Receptacles: Straight blade, NEMA 5-20R (unless noted), orange plastic face.
- F. Wall Plates: Brushed stainless steel.

- G. Weatherproof Cover Plates: Gasketed cast metal with hinged gasketed device covers.
- H. EDIT NOTE: DELETE FOLLOWING ARTICLE IF NOT USED

2.5 WIREWAYS

- A. Wireways: formed, code gauge, galvanized or baked enamel painted steel.
- B. Covers: continuous, hinged type with screw type enclosures.
- C. Hardware: corrosion resistant.

2.6 CONDUCTOR TERMINATIONS

- A. Acceptable manufacturers:
 - 1. 3M (Scotchlok)
 - 2. T & B (PL series)
 - 3. Buchanan
- B. Connectors for #8 and smaller wire shall be self insulating, spring action mechanical connectors.
- C. Connectors for #6 and larger copper wire shall be crimp on connectors, hydraulic compression connectors or set screw box lugs. Acceptable manufacturers: AMP, Burndy, O.Z. Gedney, 3M, T & B, IlSCO.
- D. Electrical tape: 3M (Scotch) or Plymouth.

PART 3 - EXECUTION

3.1 GENERAL

- A. All raceways, cables, boxes, devices, and equipment shall be concealed above finished ceilings, behind finished walls, or below finished floors, unless otherwise indicated.
- B. All raceways, boxes, devices, and equipment installed in unfinished areas are to be surface mounted or exposed unless otherwise indicated. In areas with exposed roof structure, mount raceways, supports, boxes, etc. above bottom of roof support structure if at all possible. In areas with exposed precast concrete ceilings, mount raceways, boxes, etc. tight to the precast ceilings.
- C. All raceways, boxes, devices, and equipment mounted on "I-Beam" type columns shall be mounted on inside surface of I Beams for physical protection.
- D. Where applicable, refer to architectural reflected ceiling plans for locations of light fixtures and other electrical devices and equipment.

3.2 CUTTING AND PATCHING

- A. Cut and patch all building materials as required to complete the installation of the electrical systems. Repair all building surfaces and materials that are altered by the electrical work. Seal around all conduit penetrations through walls, floors, and ceilings. Seal penetrations through fire rated walls or smoke barriers so as to maintain the rating of the barrier.
- B. Core drill all openings through precast concrete.
- C. Do not cut, penetrate, or otherwise alter any structural member without the written approval of the Engineer/Architect.

3.3 SLEEVES

- A. Provide schedule 40 galvanized steel pipe sleeves for all conduit penetrations through floors or exterior walls. The openings around the conduits and around the sleeves shall be made waterproof.
- B. Sleeves shall be positioned to be plumb, level, and true to building lines.

- C. Roof flashing provided by the Roofing Contractor. Electrical Contractor shall locate and coordinate all electrical and low voltage roof penetrations.

3.4 SUPPORTS

- A. Support electrical materials from the structural framing of the building. Do not use metal roof decking or metal floor decking for support.
- B. Support wall mounted equipment from masonry or metal framing. Anchors, hangers, and fasteners shall be adequate for the load to be supported. Plastic anchors are not allowed.

3.5 CONDUIT

- A. Size conduit for conductor type installed or for Type THW conductors, whichever is larger; 3/4 inch minimum size, or oversized as indicated.
- B. Arrange conduit to maintain headroom and present a neat appearance.
- C. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping. Exterior shroud conduit to be concealed in wall.
- D. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
- F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
- G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
- H. Cut conduit square using a saw or pipe-cutter; de-burr cut ends.
- I. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- J. Use conduit hubs or sealing lock nuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.
- K. Install no more than the equivalent of four 90 degree bends between boxes.
- L. Use conduit bodies to make sharp changes in direction, as around beams.
- M. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.
- N. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- O. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
- P. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.
- Q. Install expansion joints where conduit crosses building expansion joints.
- R. Where conduit penetrates fire-rated walls and floors, seal opening around conduit with UL listed foamed silicone elastomer compound.
- S. Route conduit through roof openings within curbs on RTU's for piping and ductwork where possible; otherwise, preformed flashing as approved by Roofing Manufacturer.
- T. All conduits under concrete slab on grade shall be a minimum of 3 inches below bottom of slab with ground cover.

- U. Install Rigid Steel Conduit for service entrance, where exposed to weather, or where embedded in concrete. Provide PVC conduit for below grade (or rigid steel conduit as required by code). EMT elsewhere, except as noted.
- V. All exposed conduit boxes, hangers, low voltage wire, etc shall be installed prior to painting.
- W. Contractor to provide conduit and boxes from sprinkler system monitoring devices to roof deck. Verify exact location.
- X. Provide PVC conduit for below grade (or rigid steel as required by code) for sensormatic detection loops at entry and exit doors.
- Y. Conduit shall be firmly supported from the building structure by means of corrosion resistant straps, clamps, or hangers. Support multiple parallel conduit runs from trapeze hangers. Conduit above T-grid ceilings may be attached to separate support wires by conduit clips.
- Z. Do not mount conduit on mechanical ducts or penetrate mechanical ducts unless noted otherwise. .
- AA. Mount conduit on mechanical equipment only as required to serve the equipment. Bridge all vibration mountings with flexible conduit.
- BB. Conduit shall not be installed so as to block or restrict access to equipment for normal maintenance or repair of the equipment.
- CC. All connections to motors, transformers, and appliances with moving parts shall be made with flexible conduit.
- DD. Provide expansion fittings for all conduits crossing building expansion joints.
- EE. Cap or plug ends of conduits that are to remain empty. Cap or plug ends of conduits during construction.
- FF. Seal conduits to prevent condensation wherever conduits pass through barriers between areas with a possible temperature difference of 30° F or greater.
- GG. All conduits in contact with earth shall be PVC, coated or protected with two coats of bituminous paint or by vinyl tape.
- HH. Route conduits so that they do not interfere with the lifting out of lay-in ceiling panels, or with ceiling access panels.

3.6 WIRE

- A. Install all wire in raceway unless indicated otherwise. Type MC cable, where allowed, may be installed without a raceway.
- B. Wire sizes indicated on the drawings are based on copper wire with 75° ampacity. Do not substitute smaller or lower ampacity wire without the Engineer's approval. Aluminum wire is not permitted.
- C. All conductors shall be a minimum of #12 (except for control wiring) and copper unless indicated otherwise. All wire shall be assumed to be #12 copper unless noted otherwise.
- D. Conductors may be identified by color impregnated insulation or by taping. Tape shall be overlapped, solid color electrical tape. 3 inches or more of marking tape shall be visible at all terminations and boxes.
- E. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling #4 AWG and larger wires. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed. Completely and thoroughly swab raceway system before installing conductors.
- F. Splice only in accessible junction boxes. Spring action twist-on connectors with insulating covers for copper wire splices and taps, #8 AWG and smaller. Use compression connectors for copper wire splices and taps, #6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.

- G. Inspect wire and cable for physical damage and proper connection. Torque test conductor connections and terminations to manufacturer's recommended values. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.
- H. Metal-Clad Type Cable may be used in place of EMT Type Conduit for lighting and receptacle circuits in concealed areas, where approved by all local codes and authorities.

3.7 BOXES

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Do not install boxes back-to-back in walls. Provide minimum 6 inch separation, except provide minimum 24 inch separation in acoustic-rated walls.
- C. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- D. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes before rough-in.
- E. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud walls, and adjustable steel channel fasteners for flush ceiling outlet boxes.
- F. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
- G. Provide cast outlet boxes in exterior locations and wet locations.
- H. Set floor boxes level and flush with finish flooring material.
- I. Use formed steel floor boxes, cast boxes, or PVC floor boxes where allowed by code for installations in slab on grade.
- J. Close up all unused knockouts or openings in boxes.
- K. Coordinate box sizes and depths with the architectural documents for wall, floor, and ceiling depths, clearances, etc.
- L. Make all connections and openings in floor boxes watertight prior to concrete pour.
- M. Coordinate box locations so as not to interfere with ductwork, piping or equipment. Field verify door swings and coordinate switch locations so that switches are not covered by doors. Verify locations of counters, cabinets, shelving and equipment and adjust box locations accordingly.

3.8 WIRING DEVICES

- A. Install wall switches 48 inches above floor, OFF position down.
- B. Install convenience receptacles 18 inches above floor, 6 inches above backsplash, grounding pole on top, unless shown otherwise.

3.9 WIREWAYS

- A. Install wireways plumb and level.
- B. Install wireways so that covers are easily removed or opened.

3.10 CONDUCTOR TERMINATIONS

- A. Provide connectors, lugs, etc. as necessary to make all electrical splices, taps, and terminations required.
- B. Use self-insulating, spring action mechanical connectors for splices and taps in wire #8 AWG or smaller.
- C. Use crimp-on type, hydraulic compression type or box lug type connectors for stranded copper conductors.

- D. Ensure that all strands of conductors are enclosed within lugs or connectors.

3.11 EQUIPMENT CONNECTIONS

- A. Make connections to all electrical equipment indicated in the documents unless noted otherwise.
- B. Obtain rough-in information and installation requirements from equipment supplier. Verify voltages and load information with equipment supplier prior to installation.

END OF SECTION

SECTION 16400 – SERVICE AND DISTRIBUTION**PART 1 - GENERAL****1.1 SECTION INCLUDE**

- A. Service Entrance.
- B. Disconnect Switches.
- C. Secondary Grounding.
- D. Transformers.
- E. Distribution Switchboard.
- F. Branch Circuit Panelboards.
- G. Lighting Contactors.
- H. Miscellaneous Electrical Service Equipment.

1.2 SYSTEM DESCRIPTION

- A. 277/480 volt, 3 phase, 4 wire, service with single GFCI main, surge and lightning protection for service sizes 800 Amp and above.
- B. 277/480 volt, 3 phase, 4 wire, service with single main (without GFCI), surge and lightning protection for service sizes below 800 Amps.

1.3 REGULATORY REQUIREMENTS

- A. Work shall be governed by the National Electric Code, unless superseded by local ordinances or other legal authority.
- B. Products of this Section to be listed by Underwriters Laboratories.

1.4 SUBMITTALS

- A. Submit product data under provisions of Section 16010.

1.5 NATIONAL ACCOUNTS PROGRAM

- A. Refer to drawings.

PART 2 - PRODUCTS**2.1 DISCONNECT SWITCHES**

- A. Fusible Switch Assemblies: General Electric, Square D , Type HD, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses.
- B. Nonfusible Switch Assemblies: General Electric, Square D , Type HD, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- C. Enclosures: NEMA KS 1; Type as indicated on Drawings.
- D. Fuses: Bussman Type FRS-R for 277/480 volt systems, FRN-R for 120/208 volt systems, unless noted otherwise.

2.2 DISTRIBUTION SWITCHBOARDS

- A. Switchboard: Manufactured by Electric Wall Vendor, see paragraph 1.5 of this section.
- B. Switchboard: Fusible switch type; General Electric, Square D Type QMB.
- C. Enclosure: Nema PB 1; Type 1.
- D. Provide cabinet front with screw cover. Finish in manufacturer's standard gray enamel.
- E. Provide Switchboards with aluminum bus, ratings as scheduled on Drawings. Provide ground bus in all switchboards.
- F. Minimum Integrated Short Circuit Rating: 65,000 Amperes RMS symmetrical for 480 volt switchboards.

2.3 FUSES

- A. Fuses shall be the following types (Bussman used as reference):
 1. 600 Amperes and below: Dual-element construction with interrupting rating of 200,000 amperes RMS symmetrical and peak let-thru current established by U.L. Standard for Class RK-5 fuses. Fuses shall be FRN-RK/FRS-RK.
 2. 600 Amps and above: Time-delay type and shall hold 500% of rated current for a minimum of 4 seconds and clear 20 times current in 0.01 seconds or less with interrupting ratings of 200,000 amperes RMS symmetrical and peak let-thru current and energy let-thru values established by U.L. Standard for Class L fuses. Fuses shall be KRP-C.
 3. Motor Circuits: All individual motor circuits with full load ampere rating (FLA) of 480 amperes or less shall be protected by dual-element time-delay fuses. Fuses shall be FRN-RK/FRS-RK or LPJ. Larger horsepower motors shall be protected by time-delay fuses. Fuses shall be KRP-C. For all other motors, fuses shall be U.L. Class RK-5, dual-element time-delay.
 4. Transformer fuses shall be FRS-RK type fuses. Sized as indicated on drawings.
 5. Circuit breaker panels shall be protected by U.L. Class RK-5. Fuses shall be FRN-RK or FRS-RK.
- B. Provide fuses sizes as indicated on the Drawings.
- C. Acceptable manufacturers: Bussman, Ferraz-Shawmut or Littlefuse.

2.4 DRY TYPE TRANSFORMERS

- A. Dry Type Transformers: ANSI/NEMA ST 20; factory-assembled, air cooled dry type transformers with factory installed 75°C lugs; ratings as shown on the drawings, General Electric or Square D.
- B. Insulation system and average winding temperature rise for rated KVA as follows:

Rating	Class	Rise (deg C)
1-15 KVA	185	115
16-500 KVA	220	150
- C. Winding Taps, Transformers 15 KVA and Larger: ANSI/NEMA ST 20.
- D. Sound Levels: ANSI/NEMA ST 20.
- E. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- F. Mounting: Transformers 75 KVA and less shall be suitable for wall, floor or trapeze mounting; transformers larger than 75 KVA shall be suitable for floor or trapeze mounting.
- G. Coil Conductors: Continuous windings with terminations brazed or welded.
- H. Enclosure: ANSI/NEMA ST 20; Type A. Provide lifting eyes or brackets.

- I. Isolate core and all coils from enclosure using vibration-absorbing mounts.
- J. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

2.5 PANELBOARDS

- A. Lighting and Appliance Branch Circuit Panelboards: General Electric, Square D; Type NEHB for 277/480 volt, NQOD for 120/208 volt, unless noted otherwise.
- B. HVAC Branch Circuit and Distribution Panelboards: General Electric, Square D; Type I-line HCW, main lugs only with 99 inches of breaker mounting space, minimum 65,000 AIC.
- C. Enclosure: NEMA PB 1; Type 1.
- D. Cabinet Size: 6 inches deep; 20 inches wide.
- E. Provide cabinet front with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturers standard gray enamel.
- F. Provide Panelboards with aluminum bus, ratings as scheduled on the Drawings. Provide ground bus in all panelboards.
- G. Minimum Integrated Short Circuit Rating: 65,000 amperes RMS symmetrical for distribution panelboards, 65,000 amperes RMS symmetrical for 480 volt panelboards, 10,000 amperes RMS symmetrical for 240 volt panelboards, or as noted on schedule.
- H. Molded Case Circuit Breakers: NEMA AB 1; bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. 14,000 AIC for 277/480 volt, 10,000 AIC for 120/208 volt, center trip, unless noted otherwise on drawings. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where indicated on Drawings.

2.6 MISCELLANEOUS ELECTRICAL SERVICE EQUIPMENT

- A. Provide miscellaneous equipment as shown and specified on Drawings.

PART 3 EXECUTION

3.1 SERVICE ENTRANCE

- A. Refer to Electrical Plans.

3.2 DISCONNECT SWITCHES

- A. Install disconnect switches where indicated on Drawings. Install fuses in fusible disconnect switches.

3.3 SECONDARY GROUNDING

- A. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter.
- B. Supplementary Grounding Electrode: Use effectively grounded metal frame of the building and driven ground rod. Comply with NEC., Section 250.
- C. Use minimum #6 AWG copper conductor for communications service grounding conductor. Leave 10 feet slack

conductor at terminal board. Use minimum #8 AWG copper conductor for Ampinerny grounding conductors on home runs.

- D. Isolated Grounding Systems: Use insulated equipment grounding conductor and bond to associated transformer ground.
- E. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- F. In-Slab Device Grounding: A green insulated ground shall be installed in all PVC conduit. Size conductor based upon overcurrent protection device and/or volt drop.

3.4 DRY TYPE TRANSFORMERS

- A. Set transformer plumb and level.
- B. Use flexible conduit, 2 foot minimum length, for connections to transformer case. Make connections to side panel of enclosure.
- C. Check for damage and tight connections prior to energizing transformers.
- D. Measure primary and secondary voltages and make appropriate tap adjustments.
- E. Electrical Contractor to verify exact existing conditions prior to bidding. Reuse existing transformers as indicated.

3.5 SWITCHBOARDS AND PANELBOARDS

- A. Install panelboards plumb and square with wall finishes, in conformance with NEMA PB1.1.
- B. Height: 6 ft. to top of panelboard unless noted otherwise.
- C. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- D. Provide "Bake-Lite" labels for:
 - 1. Switches in distribution switchboard.
 - 2. All panelboards, transformers and switchboards.
 - 3. All panelboards for lighting automatically controlled. Do not touch circuit breakers.
- E. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads to within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits with neutrals. Provide additional neutrals and wiring as required.
- F. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

3.6 MISCELLANEOUS ELECTRICAL SERVICE EQUIPMENT

- A. Install and connect miscellaneous equipment where shown on Drawings per manufacturer's instructions.

END OF SECTION

SECTION 16500 - LIGHTING**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Interior Luminaires and lamps
- B. Exterior Luminaires and lamps
- C. National Account Vendors

1.2 REFERENCES

- A. ANSI C82.1 - Specification for Fluorescent Lamp Ballasts.
- B. NEMA LE 2 - H.I.D. Lighting System Noise Criterion (LS-NC) Ratings.

1.3 RELATED SECTIONS

- A. Section 16010 – General Provisions
- B. Section 16050 – Basic Materials and Methods, Modular Wiring System.

1.4 NATIONAL ACCOUNTS PROGRAM

- A. As indicated on drawings.

PART 2 - PRODUCTS**2.1 INTERIOR & EXTERIOR LUMINAIRES AND ACCESSORIES**

- A. Refer to drawings for purchasing responsibilities of luminaires, lamps, modular wiring and accessories. Install and connect all luminaires, lamps modular wiring and accessories for a complete and working system.

2.2 LAMPS

- A. Furnish lamps as indicated on Fixture Schedule.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install all luminaires where indicated on Plans.
- B. Install lamps in luminaires and lamp-holders as indicated on lighting fixture schedule.
- C. Support surface-mounted luminaires directly from building structure.
- D. Install recessed luminaires to permit removal from below. Install grid clips. Do not impair the lift-out feature of lay-in ceiling.

3.2 RELAMPING

- A. Relamp luminaires which have failed lamps at completion of Work or building turnover date.

3.3 ADJUSTING AND CLEANING

- A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires.
- B. Touch up luminaire finish at completion of Work.

END OF SECTION



GENERAL CONDITIONS



The following supplements, modifies, deletes and/or adds to the A.I.A. General Conditions, A-201, 14th Edition, 1997. Where any article, paragraph or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph or subparagraph shall remain in effect and the supplementary provisions shall be considered as added thereto. Where any Article, paragraph or subparagraph in the General Conditions is amended, voided or superseded by any of the following paragraphs, the provisions of such Article, paragraph or subparagraph not so amended or voided or superseded shall remain in effect. In the event of any conflict with such General Conditions, the provision of these Supplemental General Conditions will prevail.

1.1.1. Change first sentence to read as follows:

"1.1.1 The Contract Documents consist of the Project Manual including Advertisement or Invitation to Bid, the Instructions to Bidders, (AIA DOCUMENT A-701, 1997), THE SUPPLEMENTARY INSTRUCTIONS TO BIDDERS (IB), the Proposal form, the Subcontractor List Form, the Construction Contract, the Conditions of the Contract (General and Supplementary), the Technical Specifications, the Drawings, all pre-bid Addenda issued and all Change Orders issued after execution of the Contract."

1.2 Add the following:

"1.2.6 Execute work as per Contract Documents. Make no changes therefrom without having first received written permission FROM THE PROFESSIONAL OF RECORD. Where detailed information is lacking, before proceeding with work, refer matter to the Professional of Record for information."

"1.2.7 If the Contractor observes any errors, discrepancies or omissions in the Contract Documents, he shall promptly notify the Professional of Record, requesting clarification. If the Contractor proceeds with work affected by such errors, discrepancies or omissions without receiving such clarification, he does so at his own risk, but not limited to coordination. Any adjustments involving such circumstances made by the Contractor, prior to approval by the Professional of Record, shall be at the Contractor's risk and the settlement of any complications or disputes arising therefrom shall be at the Contractor's sole expense."

"1.2.8 In general, the Drawings indicate dimensions, positions and details of construction; the PROJECT MANUAL describes qualities of material and methods of workmanship. All work described in the PROJECT MANUAL shown on the drawings and all work dependent upon or necessary, shall be executed in a quality workmanlike manner and shall be of the materials best adapted to the purpose where such work or materials are not specifically mentioned."

"1.2.9 Should conflicts occur in or between Drawings and PROJECT MANUAL the Contractor is deemed to have estimated on the more expensive way unless he has asked for and obtained additional written instructions from the Professional of Record before submission of the contractor's proposal as to which method or materials will be required."

"1.2.10 All work and materials shall be the best of the respective kinds specified and indicated. Should any workmanship or materials be required which are not directly or indirectly called for in the PROJECT MANUAL and/or shown on the drawings, but which are necessary for proper fulfillment of the obvious intent thereof, said workmanship or materials shall be the same as similar parts that are detailed, indicated or specified, and the Contractor shall understand the same to be implied and provide for it in his proposal as fully as if it were particularly described or delineated."

1.3 Delete in its entirety and insert the following:

"The use of the Contract Documents shall be restricted to the original site for which they were prepared and publication thereof is expressly limited to such use. Reuse, reproduction or publication by any method, in whole or in part, is prohibited. Title to the Contract Documents remains with the Professional of Record without prejudice. Visual contact with the Contract Documents shall constitute prima facie evidence of the acceptance of these restrictions."

2.2.1 Delete in its entirety.

2.2.2 Delete in its entirety.

2.2.3 Delete in its entirety.

2.2.5 Delete in its entirety.

2.3.1 Delete "persistently" from paragraph.

2.4.1 Delete "after such seven-day period give the Contractor ... If the Contractor... deficiencies the Owner may," Delete fourth sentence in its entirety.

3.2 Add the following:

"The Contractors shall notify the Professional of Record or Owner, in writing, at or before the time of submitting his proposal, of any discrepancies between the Contract Documents and the existing Conditions at the site, and he shall make his proposal conform to the intent of the Contract Documents, without additional cost to the Owner."

"3.2.4 Neither the Owner nor the Professional of Record assume any responsibility for an understanding or representation made by any of their agents or representatives prior to the execution of the Agreement unless (1) such understandings or representation are made by any of their agents or representatives in written form prior to the execution of the agreement unless and such understandings or representations are expressly stated in the Agreement, and (2) the Agreement expressly provides that responsibility therefore is assumed by the Owner."

"3.2.5 Maps, soil investigation reports and similar reference data made available to the Contractor are given for the Contractor's information only, and neither the Owner nor the Professional of Record assume any responsibility for conclusions the Contractor may draw therefrom."

"3.2.6 Failure of the Contractor to acquaint himself with all available information concerning these Conditions will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work."

3.3.3 Add the following:

"Neither the presence or absence of the Owner or the Professional of Record, nor their authorized representatives, shall relieve the Contractor from any requirements herein."

3.4 Add the following:

"3.4.3 When requested by the Professional of Record, the Contractor shall deliver to the Professional of Record, (prior to final acceptance of the work as a whole) signed certificates from suppliers of materials and manufactured items stating that such items conform to the Contract Documents."

"3.4.4 The Contractor, immediately upon award of the Contract (or where Shop drawings, Product data or samples, etc., are required, immediately upon receipt of reviewed submittals thereof) shall place orders for all materials, work, fabrication and/or equipment to be incorporated in the work. The Contractor shall keep the Professional of Record informed as to the availability of all materials, work, fabrications and/or equipment specified and to advise the Professional of Record promptly, in writing, of all orders placed and of such material, work, fabrication and/or equipment which may not available for the purposes of completing the Contract."

"3.4.5 Labor shall be performed in best quality and most workmanlike manner, by mechanics skilled in their respective trades. Standards for work required throughout shall be of such grade as will result in first-class work."

"3.4.6 Mechanics whose work is unsatisfactory to the Owner or the Professional of Record or is considered by the Owner or Professional of Record to be careless, incompetent, unskilled or otherwise objectionable shall be dismissed from work under the Contract upon written notice from Owner or Professional of Record."

3.5.1 Change fourth sentence to read as follows:

"If required by the Professional of Record or by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment."

3.7.4 Delete "Knowing it to be" from paragraph. Add the following:

"3.7.5 The Contractor shall, before commencing work, verify all grades, lines, levels and dimensions shown on the drawings and shall report any errors or inconsistencies to the Professional of Record. The Contractor shall not proceed

until such errors or inconsistencies are corrected."

"3.7.6 The Contractor shall establish and maintain all buildings and construction grades, lines, levels and benchmarks and shall be responsible for accuracy and protection of same. This work shall be performed by a licensed civil engineer or surveyor."

"3.7.7 The Contractor shall protect all temporary benchmarks and maintain them in place for duration of the Contract or until such time as their removal does not affect completion of the Project."

"3.7.8 The Contractor shall not remove any property line markers or monuments or data established by the Owner. If such are damaged or removed, the Contractor shall bear cost of replacement."

3.9.1 Delete first sentence and insert the following:

"The Contractor shall employ a competent project manager, superintendent and necessary assistants who shall be in attendance at the Project Site on a full-time basis during the progress of the work. The superintendent shall not divide his duties or responsibilities among any other projects that are not a specific portion of this agreement."

3.10.1 Change "information" to read "approval".

3.13.1 Add the following:

"The Contractor shall be liable for any and all damage caused by him to the Owner's premises. The Contractor shall hold and save the Owner, his agents and representatives, free and harmless from liability of any nature or any kind arising from any use, trespass or damage occasioned by his operations on premises or third persons."

3.14 Add the following:

"3.14.3 In all cases exercise extreme care in cutting operations, and perform such operations under adequate supervision by competent mechanics skilled in the applicable trade. Openings shall be neatly cut and shall be kept as small as possible to avoid unnecessary damage. Careless and/or avoidable cutting, damage, etc., will not be tolerated, and the Contractor shall be held responsible for such avoidable or willful damage."

"3.14.4 All replacing, patching and repairing of all materials and surfaces cut or damaged in the execution of the work shall be performed by experienced mechanics of the several trades involved. Such replacing, repairing and/or patching shall be done with the applicable materials, in such a manner that all surfaces so replaced, etc., will, upon completion of the work, match the surrounding similar surfaces."

3.16.1 Add the following:

"The Contractor shall provide facilities for such access without charge to the Owner so the Professional of Record may perform his functions under the Contract Documents."

4.1.1 Add the following:

"In the Contract Documents, the term Architect refers to the PROFESSIONAL OF RECORD and it shall be understood to their acting through any of their personnel (Project Manger, Architect, Engineer or Team) or consultants duly authorized to act for them."

4.1.2 Delete in its entirety.

4.1.3 Delete in its entirety.

4.1.4 Delete in its entirety.

4.2.1 Change third sentence to read as follows:

"The Owner's instructions to the Contractor shall be forwarded through the Professional of Record or as the Owner otherwise elects, in which case the Owner accepts full responsibility with the Contractor for the instructions given."

4.2.8 Delete in its entirety and insert the following:

"The Professional of Record will prepare proposal requests. Contractor to prepare Change Orders based on Proposal Requests and Article 7. Professional of Record may authorize minor changes in the work as provided in Paragraph 7.4."

4.2.12 Add the following:

"If work is required in a manner to make it impossible to produce first class work, or should discrepancies appear among Contract Documents, the Contractor shall request interpretation before proceeding with work."

4.2.13 Delete in its entirety.

4.5 Delete in its entirety.

5.2.1 Delete second and third sentence.

5.2.2 Delete "or the Professional of Record" and "reasonable and timely" from first sentence.

5.2.3 Delete "or the Professional of Record" and "reasonable" from paragraph. Add the following:

"The provisions of this subparagraph providing for adjustment of price shall not apply if the Contractor has proposed a subcontractor unqualified under any applicable state law."

6.1.3 Delete in its entirety and insert the following:

"The Contractor shall provide for the coordination of the work of the Owner's forces and of each separate contractor with the work of the Contractor."

6.2.2 Add "and the Owner" after "Professional of Record".

7.1.2 Delete in its entirety.

7.2.1 Substitute "the Contractor" for "the Professional of Record".**

** Add "on the enclosed form" after the word "prepared" in the first sentence.

7.3.1 Change first reference to "Professional of Record" to "Owner" and delete second reference.***

*** Add "and shall be prepared on the enclosed sample" to the end of the first sentence.

7.3.4 Change "Professional of Record" to "Owner".

7.3.3.5 Add the following:

"All change order directives shall be referenced to account numbers as shown on Schedule of Values."

7.3.6 Change "Professional of Record" to "Owner".

7.3.7 Change "Professional of Record" to "Owner".

7.3.9 Delete the words "made by the Professional of Record".

7.4 Delete in its entirety.

8.1.3 Add "and certificate of occupancy or equivalent has been issued by the applicable governmental agency." to end of paragraph.

8.3.1.2 Adverse weather conditions shall be defined as weather extremes (precipitation, temperature and/or winds) which prohibit any type of construction activity scheduled during the time of adverse weather that exceeds the ten year average.

8.3.2.1 Requests for extensions of construction time due to adverse weather conditions shall include U.S. Weather Bureau Climatological Reports, for the time involved, from the nearest reporting station. Extensions of time may be requested for any month of construction for days lost due to adverse weather that exceeds the ten year average.

9.2.1 Add "and the Owner" after "Professional of Record" to paragraph.

9.3 Add the following:

"9.3.1 Application for Payment shall be made on A.I.A. Form G-702 and G-703, 1992 Edition entitled "Application and certificate for Payment", (2 copies) utilizing complete provisions provided by the form. Provide signature space for Owner's approval."

"9.3.2.1 The Contractor agrees to accompany all payment requests, except the first, with unconditional lien waivers from all subcontractors and material men pertaining to all the work performed and all materials provided with respect to previous payments received by Contractor. The Contractor further agrees that each subcontract (which, for the purpose of this paragraph, includes both contracts with subcontractors and material men) shall contain an express provision, satisfactory in form and content to the Owner, whereby such subcontractor or material men expressly agrees that, for the benefits of the Owner, it waives all rights to file mechanics liens with respect to any unpaid services or materials provided by it, as specified by current State statutes. Such subcontractor or material men shall give written notice to the Owner of such non-payment for such materials and services, which notice shall include a specific detail listing of the services and materials with respect to which payment has not been made. The Contractor further agrees that the Owner shall have the right to issue checks made jointly payable to the Contractor and any subcontractor or material men claiming not to have been paid for services or materials provided for which Contractor has been paid. If any liens are filed against the Owner's property, the Owner may, at their option, require the Contractor to immediately provide a bond in accordance with State requirements. Final lien waivers, stating "Unconditional Upon Final Payment", from all subcontractors and material men shall accompany the final payment request prior to approval for release of construction retention funds.

9.5.1 Subparagraph .1 - Change to read:

".1 Defective work not remedied. If the contractor fails to begin remedial action within 5 days following written notification, Owner will perform work at the contractor's expense."

Subparagraph .7 - Delete "persistent" from sentence.

9.7.1 Add "and if such failure has not been corrected within seven (7) calendar days after notice there of is given to the Owner and Professional of Record," after "payment" third line of paragraph.

9.8.2 Add "and the Owner" after "Professional of Record" to the first sentence.

9.8.3 Delete in its entirety.

PARAGRAPH 9.8 - SUBSTANTIAL COMPLETION: Add the following new subparagraph 9.8.4:

"9.8.4 The Contractor shall reimburse the Owner by deductive Change Order, for the Professional of Record's additional services made necessary by the Contractor's failure to finally complete the work within fifteen (15) days from substantial completion".

9.10.1 Add "or Owner" following: ". . . Payment, the Professional of Record" and " when the Professional of Record".

9.10.2 Revise to the following: ". . . to indemnify the Owner against such lien" to read ". . . to indemnify the Owner against such lien as a condition precedent to receiving any further payment on account of the work of such contractor."

"9.10.2.1 Neither the final payment nor the remaining retained percentage shall become due, until after all requirements, listed in Section 01700 Contract Closeout, have been 100% completed."

9.10.3 Add the following: "Except those arising from:

1. Unsettled liens,
2. Faulty or defective Work appearing after Substantial Completion,
3. Failure of the Work to comply with the requirements of the Contract Documents, or
4. Terms of any special warranties required by the Contract Documents."

10.1.3 Add the following: ". . . except as otherwise provided in the Contract Documents."

10.2 Add the following:

"10.2.8 The Contractor shall be responsible for all existing structure and/or improvements, both above and underground, including the finishes thereof (both exterior and interior) within the adjoining working areas, and shall provide adequate protection therefore, either by barricades, covering or by temporary removal. Any existing structures and/or improvements damaged during construction shall be repaired and/or improvements damaged during construction shall be repaired and/or replaced with materials, workmanship, fixtures or equipment of the same kind, quality and size as required by the Contract Documents. Any materials or equipment temporarily removed and damaged shall be re-erected or installed in an approved manner."

ARTICLE II - INSURANCE & BONDS:

Paragraph 11.1 - CONTRACTOR'S LIABILITY INSURANCE: Delete subparagraph 11.1.1 in its entirety and insert the following:

"11.1.1 Do not commence work until required insurance has been obtained and paid for, nor until insurance policies have been approved by Owner as to a company or companies licensed to do business in the state in which the project is located, amount and coverage form (contractor's insurance carrier must be an "A" A.M. Best rated carrier.) Do not permit any subcontractor to commence work on subcontract until such insurance has been so obtained and has been approved by the Owner.

The Contractor shall furnish the Owner certificate evidencing such insurance, list NewQuest Properties and its subsidiaries as an additional insured on all policies required and shall arrange with each insurance company to give Owner thirty days notice of all renewals, cancellations and major changes in the policies.

Furnish one copy of Certificates herein required for each copy of the Agreements' specifically set forth and evidence of all coverage required by Subparagraph 11.1 and 11.2. The form of the Certificates shall be in conformance with the enclosed sample. Furnish to Owner as shown below copies of any endorsements that are subsequently issued amending coverage or limits:

Ley/Lane Investments
4544 Post Oak Place Drive, Suite 375
Houston, TX 77027
Attn: David Ley

"11.1.2.1 The insurance required by Subparagraph 11.1.1 shall be written for not less than the following, or greater if required by law:

1. Worker's Compensation:

State Statutory

Applicable Federal Statutory

Employer's Liability \$ 500,000 / \$500,000 / \$500,000

2. Comprehensive general Liability (including Premises-Operation; (Contingent Liability, Contractual Liability, Independent Contractor's Protection; and Products and Completed Operation)"

Bodily Injury \$1,000,000 Each Occurrence

\$2,000,000 Annual Aggregate

Property Damage \$1,000,000 Each Occurrence

\$2,000,000 Annual Aggregate

Products and completed operations to be maintained insured for two years after final completion.

Property Damage Liability Insurance will provide X, C, or U coverage as applicable.

3. Contractual Liability:
 - Bodily Injury \$1,000,000 Each Occurrence
\$2,000,000 Annual Aggregate
 - Property Damage \$1,000,000 Each Occurrence
\$2,000,000 Annual Aggregate
4. Personal Injury, with Employment exclusion deleted:
\$1,000,000 Annual Aggregate
5. Comprehensive Automobile Liability:
\$1,000,000 Combined Single Limit
6. The Contractor shall provide the limits of liability by a combination of the above described policy forms and an Umbrella Excess Liability policy.

Contractor's excess liability, umbrella form, bodily injury and property damage combined:

\$1,000,000 Each Occurrence
\$1,000,000 Aggregate

11.1.3.1 The Contractor shall, prior to starting work, furnish one copy of Certificates herein required for each copy of the Agreement which shall specifically set forth evidence of all coverage required by Subparagraph 11.1.1, 11.1.2 and 11.1.3. The form of the Certificate shall be in conformance with the enclosed sample. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits.

Delete existing 11.2.1 and substitute the following:

“11.2.1 The Contractor shall be responsible for purchasing and maintaining Owner's Liability insurance with the same limits as Contractor's Comprehensive General Liability. Including; Bodily Injury, Property Damage and Personal Injury. (Broad Form Property Damage Endorsements).”

PARAGRAPH 11.3 - PROPERTY INSURANCE:

Delete subparagraph 11.3.1, 11.3.1.1, 11.3.1.2, 11.3.1.3 in its entirety and insert the following:

“11.3.1 The Contractor shall purchase and maintain Builders Risk Policy issued to contractor and Owner and shall include interest of subcontractors and such insurance shall cover all work in the course of construction including temporary structures and materials used in construction at the job site and while awaiting installation, including storage and transit to the site of materials, paid for by the Owner including the Owner's installed fixtures and equipment. The Policy shall insure all risks of direct physical loss or damage from any external cause subject to policy terms conditions and exclusions and the policy will not cover vehicles, property, while waterborne, trees, shrubs, plants or grass, plans, specifications, blueprints, or contractor's tools or equipment of any kind. (Fixtures and Equipment insured value \$300,000.00.)

The amount of insurance provided shall not be less than the final completed value of the project, including the Owner's installed fixtures and equipment, less cost of site preparation and excavation. A policy deductible clause not exceeding two hundred fifty dollars (\$250.00) shall be permissible and such deductible shall be borne by the Contractor. Policy shall specifically permit beneficial occupancy, by Owner prior to completion or acceptance of the work.”

“11.3.1.1 The form of policy for this coverage shall be "Completed Value".

“11.3.1.2 If by terms of this insurance any mandatory deductibles are required. or if the Contractor should elect, with the concurrence of the Owner, to increase the mandatory deductible amounts or purchase this insurance with voluntary deductible amounts, the Contractor shall be responsible for payment of the amount of the deductible in the event of a paid claim.”

11.3.4 Delete subparagraph in its entirety and substitute the following:

“The contractor shall file two certified copies of all policies with the Owner before exposure to loss can occur. If the Owner is damaged by the failure of the Contractor to maintain such insurance and to so notify the Owner, then the Contractor shall bear all reasonable costs properly attributable thereto. The Contractor shall not commence work until he has received a copy of such policies.”

11.3.6 Delete in its entirety.

11.3.9 Delete in its entirety.

11.4 Performance Bond and Labor and Material Payment Bond: Add the following subparagraphs to this article:

"11.4.3 The Contractor is required, as a condition precedent of the execution of the Contract, to furnish bond in a penal sum of one hundred percent (100%) of the total amount payable by the terms of the Contract and pay all premiums for such bonds."

"11.4.4. Bonds shall be in accordance with State Requirements with amount shown equal to 100% of the total amount payable by terms of the Contract. Surety shall be company licensed to do business in state in which work is located and shall be acceptable to Owner. Bond amount shall be increased to include any Change Order added to the Contract to 100% total value amount of each Change Order. Bond limitations shall be one year except where state laws and statutes require additional time limitations."

12.1.1 Add "or the Owner's" after "Professional of Record's" to paragraph.

12.1.2 Add "or the Owner" after "Professional of Record" to paragraph.

12.3.1 Add the following: "Nonconforming work shall be deemed accepted only if the Owner does so expressly and in writing." to paragraph.

13.1 Add the following:

"13.1.2 Nothing contained in the Contract Documents shall be construed as authority for violation by the Contractor of any applicable codes or ordinances which shall take full and complete precedence of anything herein contained to the contrary."

"13.1.3 In the event that the building inspector or other public official requires that additional work be done or that the work under the Contract Documents be modified in any way, the Contractor shall notify the Professional of Record and the Owner in writing of the requested change. The Professional of Record will review the requested change with the Owner and advise the Contractor in writing. Any such work performed without written permission shall be at the expense of the Contractor performing such work."

13.2.2.1 Repair all defects and/or damage resulting from faults in workmanship or materials that develop during specified guarantee periods. Disruption of store business shall not be permitted. Contractor shall complete repair work entirely at his own expense within five days of receipt of written notice. General Contractor must coordinate work schedules with Owner prior to commencement of any repair and/or warranty work.

13.2.2.2 Emergency / Warranty repairs - Note: **Telephone communication will constitute official notification.** This will be followed up by written notification. Failure to respond within one hour gives the Owner the right to have repair work performed. Charges for that work shall be billed to the General Contractor upon completion of any warranty and/or repair work. The General Contractor shall notify the Owner in writing when the work is completed.

13.5.1 Add "and the Owner" after "Professional of Record" to paragraph.

13.5.2 Add "and the Owner" after "Professional of Record" to paragraph.

14.1.1.5 Add ". . . and such condition is not corrected promptly after written notice there of is given to Owner and Professional of Record", after "contractor" to paragraph.

14.1.2 Delete the words “and damages” at the end of this paragraph.

14.2.1.1 Delete "persistently or repeatedly".

14.2.1.3 Delete "persistently".

14.2.1.4.1 Delete "substantial".

14.2.2 Delete "upon certification by the Professional of Record that sufficient cause exists to justify such action".

END OF SECTION

The General Conditions for this project shall be based on AIA Document A201, 1997 edition.

The following supplementary general conditions have been based on AIA Document A201, 1997 edition.

END OF SECTION