

UNIFIED STATE LABORATORIES SOLAR ARRAYS

TAYLORSVILLE, UTAH

OWNER
**DIVISION OF FACILITIES &
CONSTRUCTION MANAGEMENT**
4110 STATE OFFICE BUILDING
SALT LAKE CITY, UTAH 84114

DFCM PROJECT
#10237390

**CONSTRUCTION
DOCUMENTS**

DIVISIONS 0 THRU 33

09 February 2011



VCBO ARCHITECTURE
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SECTION 00 3100

AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.1 AGREEMENT CONCERNING DRAWING FILES ON ELECTRONIC MEDIA

- A. The electronic files will be distributed from the Architect to the General Contractor only once the following form has been signed. It will be the General Contractor's responsibility to control distribution.
- B. Valentiner Crane Brunjes Onyon Architects, L.L.C. (the Architect) does not assume any responsibility for the accuracy of the information contained in these drawing files. Any and all users are aware that differences may exist between the electronic files delivered and the printed hard-copy construction documents. In the event of a conflict between the signed and sealed hard-copy construction documents prepared by the Architect and the electronic files, the signed or sealed hard-copy construction documents shall govern.
- C. Any and all users who may obtain these drawings **from the General Contractor** under this agreement, including but not limited to; subcontractors, vendors, suppliers etc., agree to indemnify and hold harmless the Architect, its officers, directors, employees and sub-consultants against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising from any changes made by anyone other than the Architect or from any transfer or reuse of the electronic files including data contained in the files without the prior written consent of the Architect.
- D. Building Information Model (BIM) drawing files will be made available to the Contractor and its subcontractors for the purposes of preparing submittals for their portion of the work **only** after the "Agreement Concerning Drawing Files on Electronic Media" has been signed by the General Contractor.

PART 2 PRODUCTS (NOT USED)

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END OF SECTION

AGREEMENT CONCERNING DRAWING FILES ON ELECTRONIC MEDIA

Valentiner Crane Brunjes Onyon Architects, L.L.C. (the Architect) does not assume any responsibility for the accuracy of the information contained in these digital models. Any and all users are aware that differences may exist between the electronic files delivered and the printed hard-copy construction documents. In the event of a conflict between the signed and sealed hard-copy construction documents prepared by the Architect and the electronic files, the signed or sealed hard-copy construction documents shall govern.

Any and all users who may obtain these digital models from the General Contractor under this agreement, including but not limited to; subcontractors, vendors, suppliers etc., agree to indemnify and hold harmless the Architect, its officers, directors, employees and sub-consultants against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising from any changes made by anyone other than the Architect or from any transfer or reuse of the electronic files without the prior written consent of the Architect.

Under no circumstances shall delivery of the electronic digital models be deemed a sale by the Architect, and the Architect makes no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall the Architect be liable for any loss of profit or any consequential damages as a result of the use or reuse of the electronic files.

The digital Building Information Models provided will contain information as provided on construction documents. The user shall remove all notes, text, detail cuts and member designations from the electronic file prior to use. If used as submittal documents, submittals will be rejected if non-compliant. The drawing files provided by VCBO may not be reproduced or distributed to individuals outside the company or collective organization signing this agreement.

LIST OF DRAWINGS:

Project Name: **DFCM – UNIFIED STATE LABORATORIES SOLAR ARRAY**
VCBO Project # **10420**

List of Revit Models: **Architectural, Structural, Mechanical and Electrical.**

ACCEPTANCE OF TERMS, CONDITIONS & LIMITATIONS:

Name of Company/Contractor

Signature of Company/Contractor Representative

Printed Name of Individual Signing

Position/Title

Date

This agreement must be signed and returned to VCBO prior to release of any electronic document.

SECTION 00 3132

GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Geotechnical investigation report prepared by Gordon Spilker Huber Geotechnical Consultants, Inc.
- B. Inclusion of soils investigation is for **Contractor information only, and is not part of the contract documents**. Recommendations and provisions of the Geotechnical Investigation apply to work of this contract. The Contractor is responsible for all requirements and provisions either outlined or detailed in the Geotechnical Investigation.
- C. The geotechnical report presents limited information regarding subsoil conditions along with tests and results of analyses conducted on the Owner's behalf by the geotechnical engineer. No guarantee is made to the Contractor as to the accuracy of the information contained in the geotechnical report.
- D. The geotechnical report is not intended to define subsurface conditions in sufficient detail for Contractor proposals and bidding. Contractors must draw their own conclusions and perform additional geotechnical investigations as necessary to verify the conditions referenced in the geotechnical report and to determine the existence of conditions not addressed in the report.
- E. The Owner is not responsible for interpretations or conclusions drawn by the Contractor concerning this site from the information contained in the geotechnical report.
- F. Contractor shall field verify **all** site conditions.

1.2 REPORT

- A. Report dated February 2, 2011 is included at the end of this section.

END OF SECTION

**REPORT
GEOTECHNICAL STUDY
PROPOSED SOLAR PANELS
UNIFIED STATE LABORATORY FACILITY
4500 SOUTH 2700 WEST
TAYLORSVILLE, UTAH**

Submitted To:

VCBO Architecture
524 South 600 East
Salt Lake City, Utah 84102

Submitted By:

Gordon Spilker Huber Geotechnical Consultants, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123

February 2, 2011

Job No. 0068-014-10

February 2, 2011
Job No. 0068-014-10

VCBO Architecture
524 South 600 East
Salt Lake City, Utah 84102

Attention: Ms. Whitney Ward

Ladies and Gentlemen:

Re: Report
Geotechnical Study
Proposed Solar Panels
Unified State Laboratory Facility
4500 South 2700 West
Taylorsville, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed at the site of the proposed solar panels site, which will be located at the Unified State Laboratory facility at the address of 4500 South 2700 West in Taylorsville, Utah. The general location of the site with respect to major topographic features and existing facilities, as of 1999, is presented on Figure 1, Vicinity Map. A more detailed layout of the site showing the proposed location of the solar panels in relation to existing structures and roadways is presented on Figure 2, Site Plan. The location of the borings drilled in conjunction with this study is also presented on Figure 2.

Gordon Spilker Huber Geotechnical Consultants, Inc. (GSH) completed a preliminary geotechnical study dated October 25, 2007¹ and a final geotechnical study dated February 26, 2008² for the structure located immediately north of the proposed solar panels.

¹ "Report, Preliminary Geotechnical Study, Proposed New UDOT Facility, 4500 South and 2700 West, Taylorsville, Utah," GSH Job No. 0068-013-07.

² "Report, Final Geotechnical Study, Proposed New UDOT Facility, 4500 South and 2700 West, Taylorsville, Utah," GSH Job No. 0068-013A-07.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of our study were planned in discussions between Ms. Whitney Ward of VCBO and Mr. Alan Spilker of GSH.

In general, the objectives of this study were to:

1. Accurately define and evaluate the subsurface soil and groundwater conditions in the area of the proposed solar panels.
2. Provide recommendations and parameters for earthwork, drilled pier foundations, and geoseismic information to be utilized in the design and construction of the proposed solar panels.

In accomplishing these objectives, our scope has included the following:

1. A field program consisting of the drilling, logging, and sampling of 3 borings to a depth of 26 to 31 feet.
2. A laboratory testing program.
3. An office program consisting of the correlation of available data, engineering analyses, and the preparation of this summary report.

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of Master Agreement Between Architect and Consultant dated December 27, 2010 and signed January 24, 2011.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the exploration boring, projected groundwater conditions, and the layout and design data discussed in Section 2., Proposed Construction, of this report. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The project will consist of the construction of four individual solar panels that will be on the order of 20 to 30 feet tall. Each solar panel will be supported on a drilled concrete pier system estimated to be between 2.5 and 3.5 feet in diameter and extend approximately 20.0 to 30.0 feet below the existing ground surface. The solar panel (including live load) is anticipated to have a weight of approximately 37,000 pounds. The piers will have a maximum deflection of up to one inch.

Site development will require a minimal amount of earthwork in the form of site grading.

3. SITE INVESTIGATIONS

3.1 FIELD PROGRAM

In order to define and evaluate the subsurface soil and groundwater conditions at the site, 3 borings were explored to depths of 26 to 31 feet below existing grade. The borings were drilled using a truck-mounted drill rig equipped with hollow-stem augers. The locations of the borings are presented on Figure 2. A fourth boring was planned but could not be completed due to weather conditions during drilling.

The field portion of our study was under the direct control and continual supervision of an experienced member of our geotechnical staff. During the course of the drilling operations, a continuous log of the subsurface conditions encountered was maintained. In addition, samples of the typical soils encountered were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural examination. These classifications have been supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3C, Log of Borings. Soils were classified in accordance with the nomenclature described on Figure 4, Unified Soil Classification System.

A 3.25-inch outside diameter, 2.42-inch inside diameter drive sampler (Dames & Moore) was utilized in the majority of the subsurface sampling at the site. The blow counts recorded on the boring logs were those required to drive the sampler 12 inches with a 140-pound hammer dropping 30 inches.

Following completion of drilling operations, one and one-quarter-inch diameter slotted PVC pipe was installed in Borings B-1 and B-2 in order to provide a means of monitoring future groundwater fluctuations.

3.2 LABORATORY TESTING

3.2.1 General

In order to provide data necessary for our engineering analyses, a laboratory testing program was performed. The program includes moisture, density, consolidation, laboratory vane shear, and chemical tests. The following paragraphs describe the tests and summarize the test data.

3.2.2 Moisture and Density Tests

To aid in classifying the soils and to help correlate other test data, moisture and density tests were performed on selected samples. The results of these tests are presented on the boring logs, Figures 3A through 3C.

3.2.3 Consolidation Tests

To provide data necessary for our settlement analyses, a consolidation test was performed on each of two representative samples of the natural soils encountered in the exploration borings. The test results indicate that the natural clay soils are moderately to highly over-consolidated and will exhibit moderate strength and compressibility characteristics under the anticipated loading range. Detailed results are maintained within our files and can be transmitted to you, you're your request.

3.2.4 Laboratory Vane Shear Tests

To determine the undrained shear strength of the clay soils encountered at the site, laboratory vane shear tests were performed. The results of the tests are tabulated below:

Boring No.	Depth (feet)	Soil Type	In-Situ Moisture Content (percent)	Dry Density (pcf)	Ultimate Shear Strength (psf)
B-1	3	CL	31.7	89.2	3,800
B-1	5	CL	33.9	79.2	3,400
B-2	2	CL	36.5	83.1	2,580
B-2	5	CL	30.3	88.0	3,300
B-3	3.5	CL	30.7	82.6	2,680
B-3	6.5	CL/SC	23.5	94.3	2,080
B-3	20	CL	31.9	85.8	3,200

3.2.5 Chemical Tests

To determine if the site soils will react detrimentally with concrete, chemical tests were performed on a representative sample of the soils encountered in Boring B-2 at a depth of two and one-half feet below existing grade. The results of the chemical tests are tabulated below:

Boring No.	Depth (feet)	Soil Classification	pH	Total Water Soluble Sulfate (ppm)
B-2*	2.5	CL	8.0	800

* October 25, 2007 Study

4. SITE CONDITIONS

4.1 SURFACE

The site consists of a rectangular-shaped area of land located just south of the existing Unified State Laboratory building at 4500 South 2700 West in Taylorsville, Utah. Interstate 215 bounds the site to the east, 2700 West Street to the west, UDOT facilities buildings to the south, and Unified State Laboratories to the north.

The site grade is approximately eight feet lower than 2700 West Street and at the same elevation as the parking lot to the south and north. The site slopes gently from the west downhill to the east. Total overall relief within the proposed construction area is on the order of one to two feet. The surface was covered with approximately one foot of snow overlying a moderate amount of grasses and weeds.

4.2 SUBSURFACE SOIL AND GROUNDWATER

From the surface at the boring location and extending to a depth of one to one and one-half feet are non-engineered fills comprised of silty clay with varying amounts of fine and coarse gravel. The non-engineered fills are very loose to loose, moist, and brown.

Below the non-engineered fills and extending to a depth of seven to nine feet is natural silty clay with trace fine sand and an occasional layer up to one-quarter inch thick of silty fine sand. The clay is medium stiff to very stiff, moist, and grades from brown to gray with depth. These natural clays are anticipated to exhibit moderate to moderately high compressibility.

Below the clay and extending to depths of 15.5 to 18.0 feet are sands and gravels with varying amounts of silt. The sands and gravels are loose to dense, moist, and brown. These natural sands and gravels are anticipated to exhibit moderately low to low compressibility.

Underneath the sands and gravels and extending to a depth of 28 feet in Boring B-1 and to the explored depths of 31 and 26 feet in Borings B-2 and B-3, respectively, are silty clay with varying amounts of fine sand. Within the silty clay soils are occasional layers of silty sand and gravel from 1 to 18 inches thick. The clay is stiff to very stiff, moist to saturated with depth, and light brown to brown. These natural clays are anticipated to exhibit moderate to moderately high compressibility.

Underneath the clay in Boring B-1 and extending to the explored depth of 31 feet is silty fine to coarse gravel with some fine sand. The gravel is medium dense, saturated, and brown. These natural gravels are anticipated to exhibit moderately low to low compressibility.

The lines designating the interface between soil types on the boring log generally represent approximate boundaries. In-situ, the transition between soil types may be gradual.

Groundwater was encountered at a depth of approximately 28.0 feet during drilling operations and at a depth of 28.5 feet approximately 2 weeks following. Seasonal and longer-term groundwater fluctuations of one to two feet should be anticipated. The highest seasonal levels will generally occur during the late spring and summer months.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

The site is suitable for the proposed construction utilizing a drilled pier foundation.

The most significant geotechnical aspect is the surficial layer of non-engineered fill encountered to depths of one to one and one-half feet. The non-engineered fills are not suitable for the lateral support of the pier and must be completely removed around such, as detailed within this report. The non-engineered fills may be re-utilized as structural fill if compacted to the requirements as presented later within this report.

In the following sections, detailed discussions pertaining to on-site soil parameters for earthwork, drilled pier foundations, and the geoseismic setting of the site are provided.

5.2 EARTHWORK

5.2.1 Site Preparation

Initial site preparation will consist of the removal of surface vegetation, topsoil, non-engineered fill, and other deleterious materials from beneath an area extending out at least two feet from the perimeter of the proposed support tower.

Subsequent to the above operations and prior to the placement of structural fill, the exposed natural subgrade must be proofrolled by passing moderate-weight rubber tire-mounted

construction equipment over the surface at least twice. If any loose, soft, or disturbed zones are encountered, they must be completely removed and replaced with granular structural fill.

5.2.2 Structural Fill

Structural fill is defined as all fill which will ultimately be subjected to structural loadings, such as imposed by the pier. Structural fill will be required as backfill near foundations and utilities. All structural fill must be free of sod, rubbish, topsoil, frozen soil, and other deleterious materials.

On-site soils may be re-utilized as structural site grading fill if they meet the requirements of such. Only granular fills containing less than 18 percent fines are recommended as structural fill surrounding the proposed pier.

Non-structural site grading fill is defined as all fill material not designated as structural fill and may consist of any cohesive or granular soils not containing excessive amounts of degradable material.

5.2.3 Fill Placement and Compaction

All structural fill shall be placed in lifts not exceeding eight inches in loose thickness. Structural fills shall be compacted in accordance with the percent of the maximum dry density as determined by the AASHTO³ T-180 (ASTM⁴ D-1557) compaction criteria in accordance with the following table:

Location	Total Fill Thickness (feet)	Minimum Percentage of Maximum Dry Density
Beneath an area extending at least 8 feet beyond the perimeter of the pier	0 to 10	95
Outside area defined above	0 to 5	90
Outside area defined above	5 to 10	95

Structural fills greater than 10 feet thick are not anticipated at the site.

Subsequent to stripping and prior to the placement of structural site grading fill, the subgrade shall be prepared as discussed in Section 5.2.1, Site Preparation, of this report. In confined areas, subgrade preparation should consist of the removal of all loose or disturbed soils.

³ American Association of State Highway and Transportation Officials

⁴ American Society for Testing and Materials

Non-structural fill may be placed in lifts not exceeding 12 inches in loose thickness and compacted by passing construction, spreading, or hauling equipment over the surface at least twice.

5.3 EXCAVATIONS

Temporary construction excavations, such as utility trenches etc., not exceeding four feet in depth within the existing non-engineered fills and natural fine-grained soils may be constructed with near-vertical sideslopes. Temporary excavations up to eight feet deep in the natural fine-grained cohesive soils, above or below the water table, may be constructed with sideslopes no steeper than one-half horizontal to one vertical. Excavations deeper than eight feet (excluding drilled piers) are not anticipated at the site. Excavations encountering saturated and/or loose cohesionless soils will be very difficult and will require very flat sideslopes and/or shoring and bracing.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated.

5.4 UTILITY TRENCHES

All utility trench backfill material below structurally loaded facilities (flatwork, floor slabs, roads, etc.) shall be placed at the same density requirements established for structural fill. If the surface of the backfill becomes disturbed during the course of construction, the backfill shall be proofrolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proofrolling shall be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If excessively loose or soft areas are encountered during proofrolling, they shall be removed to a maximum depth of two feet below design finish grade and replaced with structural fill.

Most utility companies and City-County governments are now requiring that Type A-1a or A-1b (AASHTO Designation – basically granular soils with limited fines) soils be used as backfill over utilities. These organizations are also requiring that in public roadways the backfill over major utilities be compacted over the full depth of fill to at least 96 percent of the maximum dry density as determined by the AASHTO T-180 (ASTM D-1557) method of compaction. We recommend that as the major utilities continue onto the site that these compaction specifications are followed.

5.5 DRILLED PIER FOUNDATIONS

5.5.1 Design Parameters

A drilled concrete pier foundation system will be used to support the proposed support tower monopole. We anticipate that drilled pier design will be governed by lateral loading and acceptable lateral deflections. Soil parameters presented in this report for lateral design were

calculated utilizing the LPILE computer method. The primary parameter for evaluation of lateral pile and drilled pier capacity is the coefficient of lateral subgrade reaction (k). GSH utilized a maximum deflection of one inch for the evaluation of the proposed drilled shaft pier. Additional parameters can be provided, upon request.

In this report, recommended values for k are presented as k_{LPILE} for the different soil strata encountered within the boring. At the pier location, surficial fills must be removed extending out a minimum of 2 feet from the pier edge and replaced with granular soils compacted to a minimum of 95 percent of the maximum dry density as determined by the AASHTO T-180 (ASTM D-1557) compaction criteria. The non-engineered fills encountered at the site may be re-used as structural fill if it meets the requirements of such as presented in this report. Recommended soil parameter values for the soils encountered in the boring log for lateral pier design are provided in the table below:

Depth (feet)	Soil Type*	Est. Effective Unit Weight (pcf)	Cohesion (psf)	Estimated ϕ	Static k_{LPILE} Recommended (pci)	$\epsilon_{.50}$	Soil Modulus k (pci)
0-3.0	Silty Clay*	125	1,000*	---	25*	0.02	---
3.0-8.5	Silty Clay	125	2,000	---	100	0.01	---
8.5-12.0	Silty Gravel	135	---	34	---	---	90
12.0-15.5	Silty Sand	135	---	32	---	---	35
15.5-28.0	Silty Clay	125	2,000	---	100	0.01	---

* The values for the upper 36 inches of soils/fills at the surface have been reduced due to soil weathering (freezing) and seasonal effects.

Drilled piers are anticipated to extend a minimum of 20 to 25 feet below the ground surface. Average values for bearing capacity and side friction of drilled piers may be taken from the table on the following page. These values are based on the natural soil conditions encountered within the borings and should not be used in fill areas unless the fill is placed as structural fill. Additionally, these values are based on a clean pier excavation bearing on undisturbed soils. This may be difficult for pier installation below the groundwater. Although not anticipated, if the tip extends below the groundwater, typically end-bearing capacity is neglected since producing a clean pier excavation base is difficult.

Depth (feet)	Soil Type	Ultimate End-Bearing (psf)	Skin Friction (psf)	Uplift Friction (psf)
0-3.0	Silty Clay	NA	325	200
3.0-8.5	Silty Clay	NA	650	425
8.5-12.0	Silty Gravel	NA	1,000	675
12.0-15.5	Silty Sand	NA	1,000	675
15.5-28.0	Silty Clay	4,000	650	425

The following table presents the results of our analysis for 30-, 36-, and 42-inch concrete piers with maximums of one-half- and one-inch pile-head deflection. Drilled piers must be installed to a minimum depth of 20 feet to achieve the listed lateral capacities.

Pier Diameter (inches)	Maximum Deflection (inches)	Maximum Moment (in-lbs)	Maximum Shear Force (lbs)
30	0.5	-3.178 E+07	232,523
30	1.0	-5.335 E+07	373,066
36	0.5	-3.279 E+07	245,755
36	1.0	-5.402 E+07	382,932
42	0.5	-3.393 E+07	261,336
42	1.0	-5.631 E+07	404,790

5.5.2 Installation

Each pier excavation shall be inspected to ensure it is free of loose soil that may slough into the excavation. Each pier excavation should have a straight smooth side and not be allowed to flare near the ground surface. Each excavation shall be inspected for irregularities that may affect the pier performance to determine if the excavation meets the structural engineer's design tolerances. The pier should be reinforced its entire length. Concrete shall be placed immediately following drilling to reduce drying of the upper soils and to reduce the safety risk of the open excavation.

Groundwater should be anticipated at a depth of approximately 28 feet and is not anticipated to affect the design or construction of the proposed piers. Additionally, concrete shall be pumped or tremmied to the bottom of the excavation and not allowed to free fall more than three feet.

5.5.3 Settlements

Settlements associated with the drilled pier design with a minimum embedment depth of 25 feet are anticipated to have settlements of less than 1 inch.

5.6 GEOSEISMIC SETTING

5.6.1 General

Utah municipalities adopted the International Building Code (IBC) 2009 on January 1, 2007. The IBC 2009 code determines the seismic hazard for a site based upon 2002 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

5.6.2 Faulting

The site is located within a fault investigation zone identified by Salt Lake County. The nearest active fault is the Granger Fault, which is part of the West Valley Fault zone and is located approximately 100 to 200 feet to the west of the project site. A surface fault rupture hazard evaluation dated December 20, 2007⁵ was completed by Great Basin Earth Science for the site.

5.6.3 Soil Class

For dynamic structural analysis, the Site Class D - Stiff Soil Profile as defined in Table 1613.5.2, Site Class Definitions, of the IBC 2009 can be utilized.

5.6.4 Ground Motions

The IBC 2009 code is based on 2002 USGS mapping, which provides values of short and long period accelerations for the Site Class B-C boundary for the Maximum Considered Earthquake (MCE). This Site Class B-C boundary represents a hypothetical bedrock surface and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for a MCE event and incorporates a soil amplification factor for a Site Class D soil profile in the second column. Based on the site latitude and longitude (40.67453 degrees north and 111.95459 degrees west, respectively), the values for this site are tabulated on the following page.

⁵ "Surface Fault Rupture Hazard Evaluation, Department Of Health, Unified State Lab, Taylorsville, Utah." Great Basin Earth Science Job No. 07-012

Spectral Acceleration Value, T Seconds	Site Class B-C Boundary [mapped values] (% g)	Site Class D [adjusted for site class effects] (% g)
Peak Ground Acceleration	61.0	61.0
0.2 Seconds, (Short Period Acceleration)	$S_S = 152.4$	$S_{MS} = 152.4$
1.0 Seconds (Long Period Acceleration)	$S_1 = 59.9$	$S_{M1} = 89.9$

The IBC 2009 code design accelerations (S_{DS} and S_{D1}) are based on multiplying the above accelerations (adjusted for site class effects) for the MCE event by two-thirds ($\frac{2}{3}$).

5.6.5 Liquefaction

The site is located in an area that has been identified by Salt Lake County as having a “moderate” liquefaction potential. Liquefaction is defined as the condition when saturated, loose, finer-grained sand-type soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event.

Groundwater was measured at a depth of approximately 28 feet below grade. Due to the depth of the groundwater, the clay soils, and the density of the granular soils encountered below the groundwater table, liquefaction is not anticipated to occur at the site during the design seismic event.

5.7 CEMENT TYPES

Laboratory tests indicate that the site soils contain negligible amounts of water soluble sulfates. Therefore, all concrete which will be in contact with the site soils may be prepared using Type I or IA cement.

5.8 SITE OBSERVATIONS

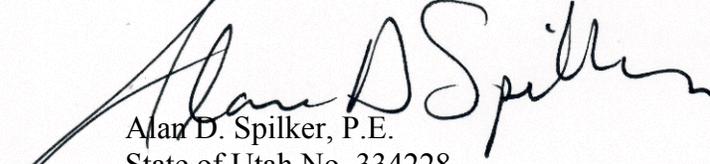
A log of soils excavated should be recorded during drilling of the individual piers and compared to the design soils. It is recommended that a qualified geotechnical engineer observe the drilling to provide verification and further recommendations, as needed.

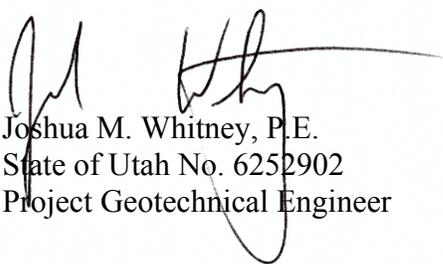
We appreciate the opportunity of providing this service for you. If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

GSH Geotechnical Consultants, Inc.

Reviewed by:

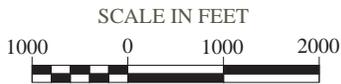
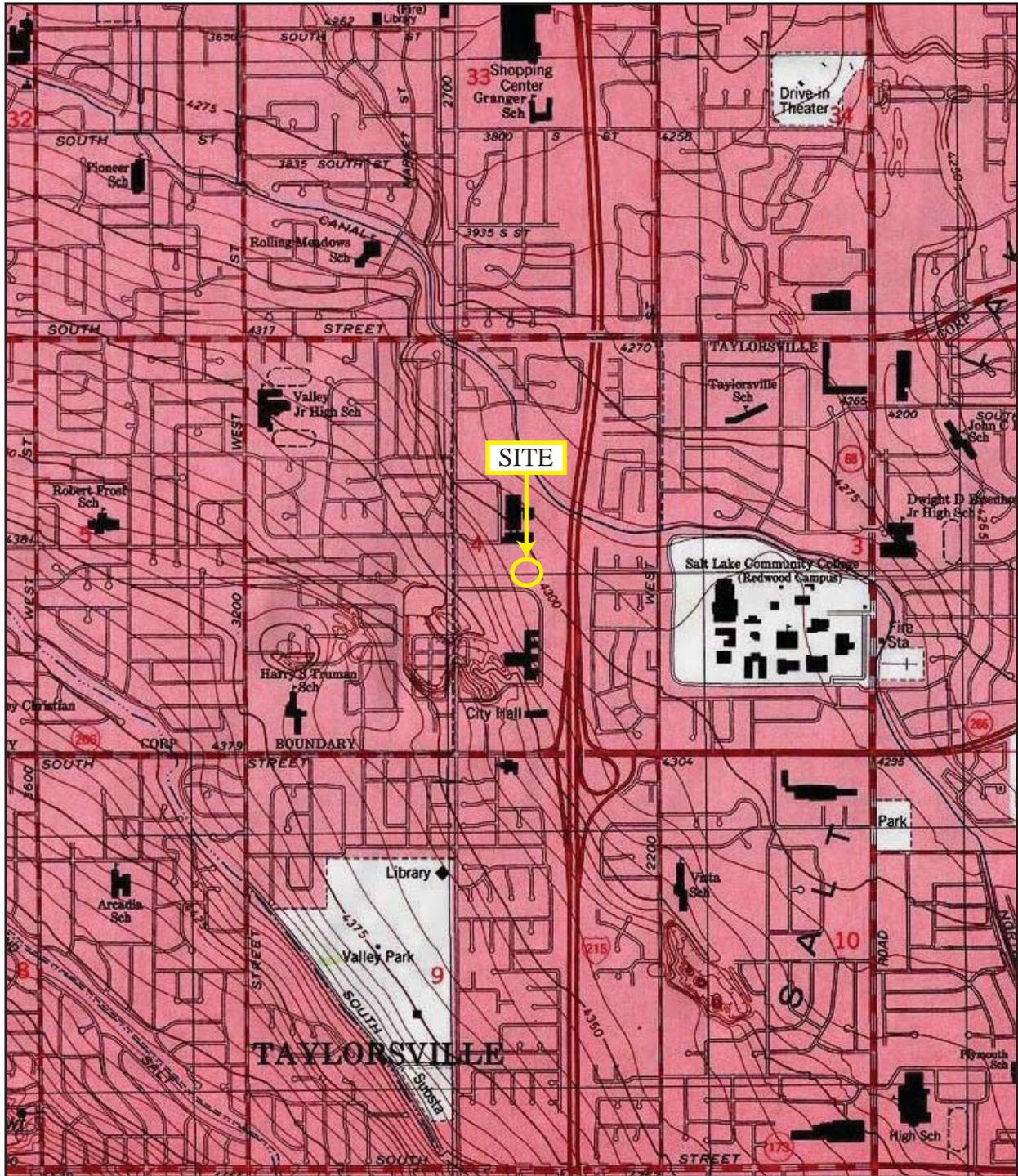

Alan D. Spilker, P.E.
State of Utah No. 334228
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State of Utah No. 6252902
Project Geotechnical Engineer

ADS/JMW:jlh

- Encl. Figure 1, Vicinity Map
- Figure 2, Site Plan
- Figure 3 Log of Boring
- Figure 4, Unified Soil Classification System

Addressee (3 + email)

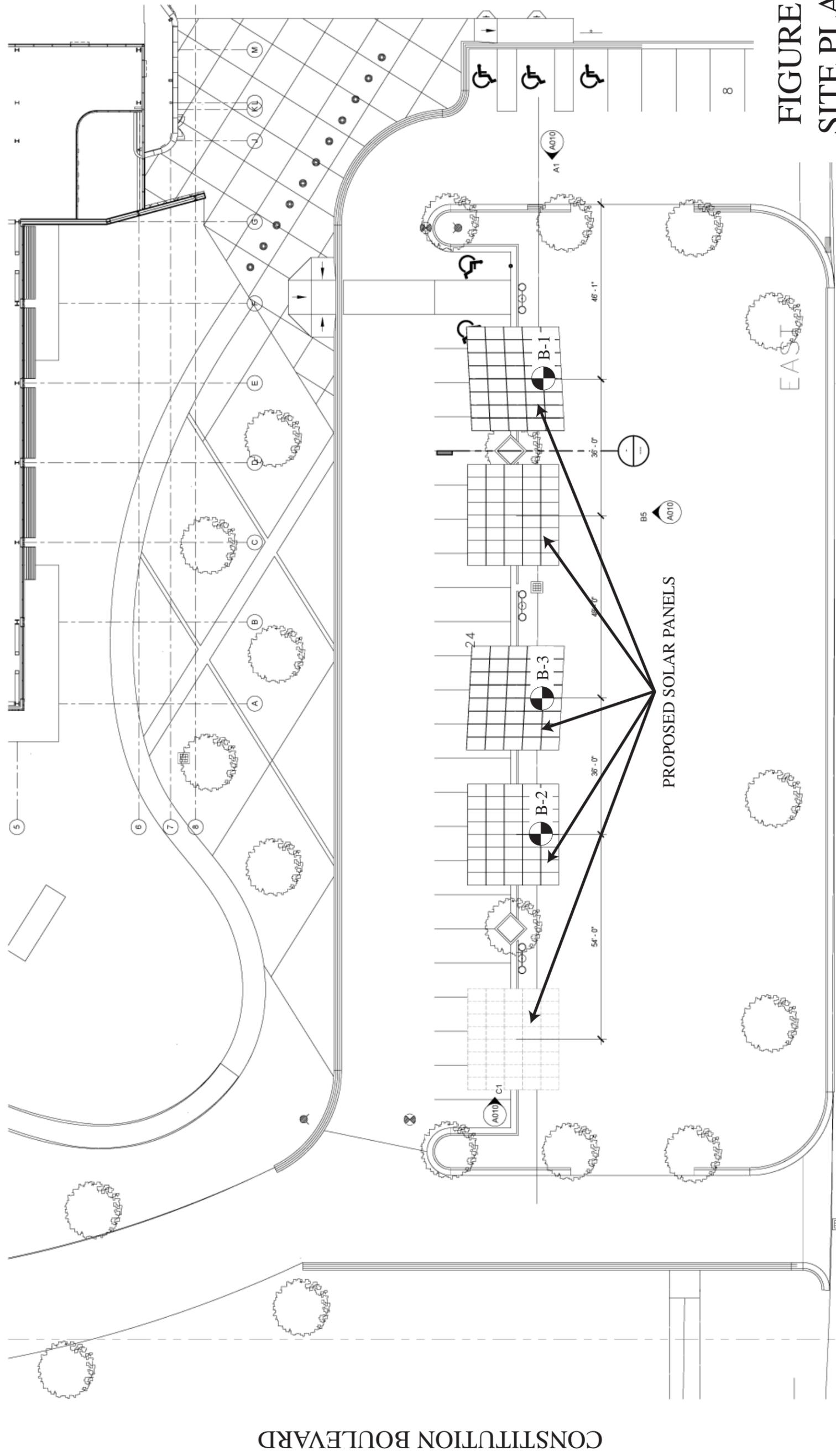


REFERENCE:
USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAP
TITLED "SALT LAKE CITY SOUTH, UTAH" DATED 1999

FIGURE 1
VICINITY MAP



GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.



CONSTITUTION BOULEVARD

FIGURE 2
SITE PLAN

4390 SOUTH STREET



REFERENCE:
ADAPTED FROM DRAWING ENTITLED
"SOLAR PARKING STRUCTURE, UNIFIED STATE LABS"
BY VCBO ARCHITECTURE, DATED JANUARY 3, 2011

APPROXIMATE SCALE: 1" = 25'

Project Name: Proposed Solar Parking Structures
 Location: 4500 South 2700 West, Taylorsville, Utah
 Drilling Method: 3-3/4" ID Hollow-Stem Auger
 Elevation: ---
 Remarks: _____

Project No.: 0068-014-10
 Client: VCBO Architecture
 Date Drilled: 01-07-11 GSH Field Rep.: PRE
 Water Level: 29.0' (01-07-11)

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY CLAY, FILL with some fine and coarse gravel and fine sand; brown (CL-FILL)									moist stiff
		SILTY CLAY with trace fine sand and occasional layers up to 1/10" of silty fine sand; brown (CL)		13		31.7		89			
		grades gray	5	9		33.9		79			medium stiff
		SILTY FINE AND COARSE GRAVEL with some fine to coarse sand; brown (GM)	10	43							moist medium dense
		SILTY FINE TO MEDIUM SAND brown (SM)									moist loose
		SILTY CLAY with some fine sand; brown (CL)	15	20							moist stiff
		grades with layers up to 1' thick of silty gravels	20	22		21.8		102			stiff/very stiff
		grades with layers up to 2' thick of silty gravels	25								stiff

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3A

Project Name: Proposed Solar Parking Structures
 Location: 4500 South 2700 West, Taylorsville, Utah
 Drilling Method: 3-3/4" ID Hollow-Stem Auger
 Elevation: - - -
 Remarks: _____

Project No.: 0068-014-10
 Client: VCBO Architecture
 Date Drilled: 01-07-11 GSH Field Rep.: PRE
 Water Level: 29.0' (01-07-11)

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
	▼	SILTY FINE AND COARSE GRAVEL with some fine sand; brown (GM)	21	21							saturated medium dense
		Stopped drilling at 29.5' Stopped sampling at 31.0'. Installed 1-1/4" diameter slotted PVC pipe to 31.0'	35								
			40								
			45								
			50								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3A
(con't)

Project Name: Proposed Solar Parking Structures
 Location: 4500 South 2700 West, Taylorsville, Utah
 Drilling Method: 3-3/4" ID Hollow-Stem Auger
 Elevation: ---
 Remarks: _____

Project No.: 0068-014-10
 Client: VCBO Architecture
 Date Drilled: 01-07-11 GSH Field Rep.: PRE
 Water Level: 28.5' (01-07-11)

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY CLAY, FILL with some fine to coarse gravel and fine sand; major roots (topsoil) to 2"; brown (CL-FILL)									loose to 8"
		SILTY CLAY with trace fine sand; brown (CL)		12		36.5		83			moist stiff
			5	9		30.3		88			medium stiff
											moist medium dense
		SILTY FINE AND COARSE GRAVEL with some fine gravel and trace silt; brown (SG)	10	33							
			15	51							dense
		SILTY CLAY with some fine sand and occasional layers up to 1" thick of silty fine to coarse sand; brown (CL)	20	26		18.2		109			moist very stiff
			25								saturated

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3B

Project Name: Proposed Solar Parking Structures

Project No.: 0068-014-10

Location: 4500 South 2700 West, Taylorsville, Utah

Client: VCBO Architecture

Drilling Method: 3-3/4" ID Hollow-Stem Auger

Date Drilled: 01-07-11 GSH Field Rep.: PRE

Elevation: - - -

Water Level: 28.5' (01-07-11)

Remarks: _____

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		grades without layers of sand		16	▲						stiff
		grades with some fine to coarse sand and trace fine gravel	30	9	▲						medium stiff
		Stopped drilling at 29.5' Stopped sampling at 31.0'. Installed 1-1/4" diameter slotted PVC pipe to 31.0'.	35								
			40								
			45								
			50								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3B
(con't)

Project Name: Proposed Solar Parking Structures
 Location: 4500 South 2700 West, Taylorsville, Utah
 Drilling Method: 3-3/4" ID Hollow-Stem Auger
 Elevation: ---
 Remarks: _____

Project No.: 0068-014-10
 Client: VCBO Architecture
 Date Drilled: 01-07-11 GSH Field Rep.: PRE
 Water Level: No groundwater encountered (01-07-11)

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY CLAY, FILL with some fine and coarse gravel and fine sand; major roots (topsoil) to 2"; brown (CL-FILL)									loose to 8" moist medium stiff
		SILTY CLAY with trace fine sand; brown (CL)		10	▲▼	30.7		83			
		grades with some fine sand	5								very stiff
				24	▲▼	23.5		94			
		SILTY FINE AND COARSE GRAVEL brown (SM)									moist loose
		grades with medium to coarse sand	10	9	▲▼						
		grades with occasional layers up to 2" thick of silty clay with some fine sand	15	10	▲▼						loose to medium dense
		SILTY CLAY with trace fine sand; brown (CL)									moist stiff
			20	14	▲▼	31.9		86			
		SILTY FINE TO COARSE SAND with some fine gravel; brown (SM)									moist stiff
			25		▲▼						

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3C

UNIFIED SOIL CLASSIFICATION SYSTEM

FIELD IDENTIFICATION PROCEDURES				GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS		
COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size. (The No. 200 sieve size is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.		GW	Well graded gravels, gravel-sand mixtures, little or no fines.		
		GRAVELS WITH FINES (Appreciable amount of fines)	Predominantly one size or a range of sizes with some intermediate sizes missing.		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.		
			Non-plastic fines (for identification procedures see ML below).		GM	Silty gravels, poorly graded gravel-sand-silt mixtures.		
		SANDS More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.		SW	Well graded sands, gravelly sands, little or no fines.	
	Predominantly one size or a range of sizes with some intermediate sizes missing.				SP	Poorly graded sands, gravelly sands, little or no fines.		
	SANDS WITH FINES (Appreciable amount of fines)		Non-plastic fines (for identification procedures see ML below).		SM	Silty sands, poorly graded sand-silt mixtures.		
			Plastic fines (for identification procedures see CL below).		SC	Clayey sands, poorly graded sand-clay mixtures.		
	FINE GRAINED SOILS More than half of material is smaller than No. 200 sieve size. (The No. 200 sieve size is about the smallest particle visible to the naked eye)	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE						
SILTS AND CLAYS Liquid limit less than 50		DRY STRENGTH (CRUSHING CHARACTERISTICS) DILATANCY (REACTION TO SHAKING) TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)	None to slight	Quick to slow	None		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sand with slight plasticity.
			Medium to high	None to very slow	Medium		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			Slight to medium	Slow	Slight		OL	Organic silts and organic silt-clays of low plasticity.
			Slight to medium	Slow to none	Slight to medium		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
SILTS AND CLAYS Liquid limit greater than 50		Hgh to very high	None	High		CH	Inorganic clays of high plasticity, fat clays.	
		Medium to high	None to very slow	Slight to medium		OH	Organic clays of medium to high plasticity.	
		HIGHLY ORGANIC SOILS Readily identified by color, odor, spongy feel and frequently by fibrous texture.				Pt	Peat and other highly organic soils.	

1 Boundary classifications: -Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.
2 All sieve sizes on this chart are U.S. standard.

GENERAL NOTES

- In general, Unified Soil Classification Designations presented on the logs were evaluated by visual methods only. Therefore, actual descriptions (based on laboratory testing) may differ.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
- Logs represent general soil conditions observed at the point of exploration on the date indicated.
- No warranty is provided as to the continuity of soil conditions between individual sample locations.

LOG KEY SYMBOLS

	Bulk / Bag Sample		Thin Wall
	Standard Penetration Split Spoon Sampler		No Recovery
	Rock Core		3-3/4" ID D&M Sampler
	Water Level		3" ID D&M Sampler
			California Sampler

FINE - GRAINED SOIL		TORVANE		POCKET PENETROMETER		FIELD TEST
CONSISTENCY	SPT (blows/ft)	UNDRAINED SHEAR STRENGTH (tsf)	UNDRAINED SHEAR STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	
Very Soft	<2	<0.125	<0.125	<0.25	<0.25	Easily penetrated several inches by Thumb. Squeezes through fingers.
Soft	2 - 4	0.125 - 0.25	0.125 - 0.25	0.25 - 0.5	0.25 - 0.5	Easily penetrated 1" by Thumb. Molded by light finger pressure.
Medium Stiff	4 - 8	0.25 - 0.5	0.25 - 0.5	0.5 - 1.0	0.5 - 1.0	Penetrated over 1/2" by Thumb with moderate effort. Molded by strong finger pressure.
Stiff	8 - 15	0.5 - 1.0	0.5 - 1.0	1.0 - 2.0	1.0 - 2.0	Indented about 1/2" by Thumb but penetrated only with great effort
Very Stiff	15 - 30	1.0 - 2.0	1.0 - 2.0	2.0 - 4.0	2.0 - 4.0	Readily indented by Thumb nail
Hard	>30	>2.0	>2.0	>4.0	>4.0	Indented with difficulty by Thumb nail

COARSE - GRAINDE SOIL

APPERENT DENSITY	SPT (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	<4	0 - 15	Easily penetrated with 1/2" reinforcing rod pushed by hand
Loose	4 - 10	15 - 35	Difficult to penetrated with 1/2" reinforcing rod pushed by hand
Medium Dense	10 - 30	35 - 65	Easily penetrated a foot with 1/2" reinforcing rod driven with 5-lb hammer
Dense	30 - 50	65 - 85	Difficult to penetrated a foot with 1/2" reinforcing rod driven with 5-lb hammer
Very Dense	>50	85 - 100	Penetrated only a few inches with 1/2" reinforcing rod driven with 5-lb hammer

STRATIFICATION

DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2"
LAYER	1/2 - 12"
DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness
Frequent	More than one per foot of thickness

CEMENTATION

DESCRIPTION	DESCRIPTION
Weakly	Crumbles or breaks with handling of slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumbles or breaks with finger pressure

MODIFIERS

DESCRIPTION	%
Trace	<5
Some	5 - 12
With	>12

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible water, usually soil below Water Table

FIGURE 4

DIVISION 1 - GENERAL REQUIREMENTS

Section 01 1000	Summary of Work
ARRA Documents	a. Attachment 2: Federal Flow Down Requirements
	b. Attachment 3: Federal Assurances
	c. Final Davis Bacon Act (DBA) Clauses as Approved by the Department of Labor (DOL) for Use in Financial Assistance Programs other than Weatherization Assistance Programs and Loan Programs - November 6, 2009
	d. Energy Efficiency and Renewable Energy Buy American De Minimis Public Interest Waiver
Section 01 1900	Definitions and Standards
Section 01 2300	Alternates
Section 01 2600	Contract Modification Procedures
Section 01 2900	Payment Procedures
Section 01 3100	Project Management and Coordination
Section 01 3300	Submittals
Section 01 4000	Quality Control Services
Section 01 5000	Temporary Facilities and Controls
Section 01 6000	Product Requirements
Section 01 7300	Execution Requirements
Section 01 7419	Construction Waste Management and Disposal
Section 01 7700	Closeout Procedures
Section 01 7800	Operation and Maintenance Data
Section 01 7810	Project Record Documents
Section 01 7900	Demonstration and Training

SECTION 01 1000
SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Requirements of **DIVISION 0 - BIDDING REQUIREMENTS** and **DIVISION 1 - GENERAL REQUIREMENTS** apply to **every section** contained in the Project Manual, and shall govern the execution of Work required by the Contract Documents.
- B. Provide everything necessary for and incidental to proper and satisfactory completion of all Work specified and indicated or shown in the Contract Documents.
- C. The Project consists of the construction of **four free-standing solar arrays** at Unified State Labs. A fifth array shall be bid as an additive alternate.

1.2 PROJECT LOCATION

- A. New solar arrays will be located at Unified State Laboratories, 4431 South 2700 West, Taylorsville, Utah, in the south parking lot.

1.3 SEPARATE CONTRACTS

- A. **The Owner may enter into separate contracts for construction.** Each contractor shall be responsible to coordinate efforts with other trade contractors to ensure timely completion of the work.
- B. **Coordinate the Work** of this contract with the work of separate contractors to ensure timely completion of the work.

1.4 CODES

- A. **Law of place of building governs.** Conform to applicable requirements of the latest editions of the **International Building Code**, International **Building Code Standards**, International **Mechanical Code**, International **Plumbing Code**, National **Electrical Code**, **National Fire Protection Association** requirements, local ordinances, and **OSHA** requirements applicable to this project, unless a higher standard is called for, without additional cost to the Owner.
- B. **Comply with CABO/ANSI A117.1**, American National Standard, "**Accessible and Usable Buildings and Facilities**" latest edition which is in force for the project location, for handicapped accessibility.

1.5 CONTRACTOR USE OF PREMISES

- A. **General:** During the construction period the Contractor shall have use of the premises for construction operations, including:
 - 1. The Contractor's use of the premises is limited only by the **Owner's right** to perform work or to **retain other contractors** on portions of the Project

- B. **Use of the Site:** Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
1. **Driveways and Entrances:** Keep driveways and entrances serving the premises clear and available to emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
 2. **Do not unreasonably encumber the site** with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary obtain and pay for such storage off-site.
 3. **Lock automotive type vehicles** such as passenger cars and trucks and other types of mechanized and motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

1.6 DUST CONTROL

- A. **The Contractor** shall be responsible to provide continuous (7 days per week, 24 hours per day) fugitive dust control measures within the limits of the construction site, related sites and adjacent streets and roads. Dust control shall be provided for, but not be specifically limited to, the stabilization of unpaved roads, haul roads, access roads, spoil sites, borrow and material sources, excavations, embankments, stockpiles, and all other areas which become potential sources of dust as a result of construction activities.
- B. **Contractor's dust control measures** shall maintain compliance with the **General Utah Air Pollution Regulations**, R446 - Utah Air Conservation Regulations, Section 4.5, Fugitive Emissions, applicable County Air Pollution Control Ordinances, and as directed by the Architect. Dust control measures shall include but not be limited to the following:
1. **Wetting of surfaces** with water as appropriate.
 2. **Minimizing surface disturbances.**
- C. **In order to control fugitive dust emissions**, Contractor shall apply the following procedures and techniques:
1. **Cover loads of materials**, debris and waste materials taken from construction sites as needed to suppress dust during transit.
 2. **Water down** or apply other approved dust control measures to the construction site, haul roads and public access roads as needed to suppress dust.
 3. **All mud and dirt shall be removed** from vehicles prior to entering a paved or graveled area or road. Any mud or dirt that is carried out onto paved or graveled surfaces shall be removed from surfaces immediately and no less than daily.
- D. **Biobased content:**
1. **Dust Suppressants:** Products formulated to reduce or eliminate the spread of dust associated with gravel roads, dirt parking lots, or similar sources of dust, including products used in equivalent indoor applications. Provide minimum 85% biobased content.

1.7 INCIDENTAL WORK

- A. **Any work**, materials or equipment that **may reasonably be inferred** from the **Contract Documents** as being required to produce the intended result shall be supplied by the Contractor at no additional cost to the owner whether or not specifically called for in the Contract Documents.

1.8 MISCELLANEOUS PROVISIONS

- A. As noted on the Drawings and in the Contract for Construction.
- B. **Project is funded by the American Recovery and Reinvestment Act (ARRA)** and is subject to its provisions. See DFCM website: <http://dfcm.utah.gov/StdDocs/index.html>, ARRA Documents, for full text of provisions. For Contractor's convenience, copies of the documents are also attached to this project manual. Failure of a document to be included does not limit the Contractor's responsibility to comply with all relevant provisions of ARRA, federal regulations, and State of Utah requirements.
- C. Contractor shall certify compliance with:
 - 1. 10 CFR 600, "the Common Rule" and OMB Circulars A-128 and A-87.
 - 2. Regulations regarding legal authority to apply for grant.
 - 3. Title VI of the Civil Rights Act of 1964 and 10 CFR Part 1040.
 - 4. Provisions of the Uniform Relocation and Assistance and Real Property Acquisitions Act of 1970.
 - 5. Hatch Act
 - 6. Fair Labor Standards.
 - 7. Safeguards against conflicts of interest.
 - 8. Provisions for access to records by the grantor agency or the Controller General.
 - 9. The EPA List of Violating Facilities.
 - 10. Flood insurance provisions of Section 102(a) of the Flood Disaster Protection Act of 1973.
 - 11. Assistance with compliance with Section 106 of National Historic Preservation Act of 1966 as amended and the Archeological and Historic Preservation Act of 1966.
 - 12. Furnishing of documentation that neither the Contractor nor any principals are subject to disbarment or suspension.
 - 13. Provisions pursuant to the Clean Air Act of 1970 and the Federal Water Pollution Control Act as amended.
 - 14. Furnishing of documentation verifying that no federally appropriated funds have been used to lobby a member of the Federal Government and disclosing if non-Federal funds have been used for lobbying purposes.
 - 15. Provisions of the Privacy Act of 1974.
 - 16. Per Section 1605, "*None of the funds appropriated or otherwise made available.... may be used for a project for the construction, alteration, maintenance, or repair of a public building or public work unless all of the iron, steel, and manufactured goods used in the project are produced in the United States*".
 - a. Form to be submitted by Contractor for Owner's documentation is provided with Division 1 Section "Submittals".
 - b. Refer to ARRA document "Energy Efficiency and Renewable Energy Buy American Ed Minimis Public Interest Waiver" for exceptions to the Buy American provisions.

17. Davis Bacon Act as outlined in "Final Davis Bacon Act (DBA) Clauses as Approved by the Department of Labor (DOL) for Use in Financial Assistance Programs Other Than Weatherization Assistance Programs and Loan Programs, November 6, 2009, a copy of which is included in this section.
 - a. Current wage determinations are located at <http://www.wdol.gov/dba.aspx>.
 - b. Contractors shall be responsible for verifying most current wage rates.
 - c. Contractors and subcontractors are required to pay covered workers weekly and submit weekly certified payroll records to the contracting agency. They are also required to post the applicable Davis-Bacon wage determinations with the Davis-Bacon poster (WH-1321) on the job site in a prominent and accessible place where they can be easily seen by covered workers.

PART 2 - PRODUCTS

2.1 NOT APPLICABLE

PART 3 - EXECUTION

3.1 NOT APPLICABLE

END OF SECTION

Attachment 2: Federal Flow Down Requirements

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Part 1: Subgrant Flow Down Provisions For State Governments

RESOLUTION OF CONFLICTING CONDITIONS – MANDATORY FLOW DOWN REQUIRED

Any apparent inconsistency between Federal statutes and regulations and the terms and conditions contained in this award must be referred to the DOE Award Administrator for guidance.

AWARD AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of the Grant and Cooperative Agreement cover page, plus the following:

- a. Special terms and conditions.
- b. Attachments:

Attachment No.	Title
1	Intellectual Property Provisions
2	Federal Assistance Reporting Checklist
3	Budget Pages
4	State Annual File
5	State Master File
6	Wage Determination
- c. Applicable program regulations [*Specify*][*Date*]
- d. DOE Assistance Regulations, 10 CFR Part 600 at <http://ecfr.gpoaccess.gov> and if the award is for research and to a university or non-profit, the Research Terms & Conditions and the DOE Agency Specific Requirements at <http://www.nsf.gov/bfa/dias/policy/rtc/index.jsp>.
- e. Application/proposal as approved by DOE.
- f. National Policy Assurances to Be Incorporated as Award Terms in effect on date of award at http://management.energy.gov/business_doe/1374.htm.

PAYMENT PROCEDURES - ADVANCES THROUGH THE AUTOMATED STANDARD APPLICATION FOR PAYMENTS (ASAP) SYSTEM

- a. Method of Payment. Payment will be made by advances through the Department of Treasury's ASAP system.
- b. Requesting Advances. Requests for advances must be made through the ASAP system. You may submit requests as frequently as required to meet your needs to disburse funds for the Federal share of project costs. If feasible, you should time each request so that you receive payment on the same day that you disburse funds for direct project costs and the proportionate share of any allowable indirect costs. If same-day transfers are not feasible, advance payments must be as close as is administratively feasible to actual disbursements.
- c. Adjusting payment requests for available cash. You must disburse any funds that are available from repayments to and interest earned on a revolving fund, program income, rebates, refunds, contract settlements, audit recoveries, credits, discounts, and interest earned on any of those funds before requesting additional cash payments from DOE.
- d. Payments. All payments are made by electronic funds transfer to the bank account identified on the ASAP Bank Information Form that you filed with the U.S. Department of Treasury.

REBUDGETING AND RECOVERY OF INDIRECT COSTS - REIMBURSABLE INDIRECT COSTS AND FRINGE BENEFITS

- a. If actual allowable indirect costs are less than those budgeted and funded under the award, you may use the difference to pay additional allowable direct costs during the project period. If at the completion of the award the Government's share of total allowable costs (i.e., direct and indirect), is less than the total costs reimbursed, you must refund the difference.
- b. Recipients are expected to manage their indirect costs. DOE will not amend an award solely to provide additional

funds for changes in indirect cost rates. DOE recognizes that the inability to obtain full reimbursement for indirect costs means the recipient must absorb the underrecovery. Such underrecovery may be allocated as part of the organization's required cost sharing.

USE OF PROGRAM INCOME - ADDITION

If you earn program income during the project period as a result of this award, you may add the program income to the funds committed to the award and use it to further eligible project objectives.

STATEMENT OF FEDERAL STEWARDSHIP – MANDATORY FLOW DOWN REQUIRED

DOE will exercise normal Federal stewardship in overseeing the project activities performed under this award. Stewardship activities include, but are not limited to, conducting site visits; reviewing performance and financial reports; providing technical assistance and/or temporary intervention in unusual circumstances to correct deficiencies which develop during the project; assuring compliance with terms and conditions; and reviewing technical performance after project completion to ensure that the award objectives have been accomplished.

SITE VISITS – MANDATORY FLOW DOWN REQUIRED

DOE's authorized representatives have the right to make site visits at reasonable times to review project accomplishments and management control systems and to provide technical assistance, if required. You must provide, and must require your subawardees to provide, reasonable access to facilities, office space, resources, and assistance for the safety and convenience of the government representatives in the performance of their duties. All site visits and evaluations must be performed in a manner that does not unduly interfere with or delay the work.

REPORTING REQUIREMENTS -- MANDATORY FLOW DOWN REQUIRED

a. Requirements. The reporting requirements for this award are identified on the Federal Assistance Reporting Checklist, DOE F 4600.2, attached to this award. Failure to comply with these reporting requirements is considered a material noncompliance with the terms of the award. Noncompliance may result in withholding of future payments, suspension, or termination of the current award, and withholding of future awards. A willful failure to perform, a history of failure to perform, or unsatisfactory performance of this and/or other financial assistance awards, may also result in a debarment action to preclude future awards by Federal agencies.

b. Dissemination of scientific/technical reports. Scientific/technical reports submitted under this award will be disseminated on the Internet via the DOE Information Bridge (www.osti.gov/bridge), unless the report contains patentable material, protected data, or SBIR/STTR data. Citations for journal articles produced under the award will appear on the DOE Energy Citations Database (www.osti.gov/energycitations).

c. Restrictions. Reports submitted to the DOE Information Bridge must not contain any Protected Personal Identifiable Information (PII), limited rights data (proprietary data), classified information, information subject to export control classification, or other information not subject to release.

PUBLICATIONS – MANDATORY FLOW DOWN REQUIRED

a. You are encouraged to publish or otherwise make publicly available the results of the work conducted under the award.

b. An acknowledgment of Federal support and a disclaimer must appear in the publication of any material, whether copyrighted or not, based on or developed under this project, as follows:

Acknowledgment: "This material is based upon work supported by the Department of Energy under Award Number DE-EE0000095

Disclaimer: "This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any

warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof."

FEDERAL, STATE, AND MUNICIPAL REQUIREMENTS – MANDATORY FLOW DOWN REQUIRED

You must obtain any required permits and comply with applicable federal, state, and municipal laws, codes, and regulations for work performed under this award.

INTELLECTUAL PROPERTY PROVISIONS AND CONTACT INFORMATION – MANDATORY FLOW DOWN REQUIRED

a. The intellectual property provisions applicable to this award are provided as an attachment to this award or are referenced on the Agreement Face Page. A list of all intellectual property provisions may be found at http://www.gc.doe.gov/financial_assistance_awards.htm.

b. Questions regarding intellectual property matters should be referred to the DOE Award Administrator and the Patent Counsel designated as the service provider for the DOE office that issued the award. The IP Service Providers List is found at [http://www.gc.doe.gov/documents/Intellectual_Property_\(IP\)_Service_Providers_for_Acquisition.pdf](http://www.gc.doe.gov/documents/Intellectual_Property_(IP)_Service_Providers_for_Acquisition.pdf)

LOBBYING RESTRICTIONS – MANDATORY FLOW DOWN REQUIRED

By accepting funds under this award, you agree that none of the funds obligated on the award shall be expended, directly or indirectly, to influence congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. 1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

NOTICE REGARDING THE PURCHASE OF AMERICAN-MADE EQUIPMENT AND PRODUCTS -- SENSE OF CONGRESS – MANDATORY FLOW DOWN REQUIRED

It is the sense of the Congress that, to the greatest extent practicable, all equipment and products purchased with funds made available under this award should be American-made.

DECONTAMINATION AND/OR DECOMMISSIONING (D&D) COSTS – MANDATORY FLOW DOWN REQUIRED

Notwithstanding any other provisions of this Agreement, the Government shall not be responsible for or have any obligation to the recipient for (i) Decontamination and/or Decommissioning (D&D) of any of the recipient's facilities, or (ii) any costs which may be incurred by the recipient in connection with the D&D of any of its facilities due to the performance of the work under this Agreement, whether said work was performed prior to or subsequent to the effective date of this Agreement.

HISTORIC PRESERVATION -- MANDATORY FLOW DOWN REQUIRED

Prior to the expenditure of Federal funds to alter any structure or site, the Recipient is required to comply with the requirements of Section 106 of the National Historic Preservation Act (NHPA), consistent with DOE's 2009 letter of delegation of authority regarding the NHPA. Section 106 applies to historic properties that are listed in or eligible for listing in the National Register of Historic Places. In order to fulfill the requirements of Section 106, the recipient must contact the State Historic Preservation Officer (SHPO), and, if applicable, the Tribal Historic Preservation Officer (THPO), to coordinate the Section 106 review outlined in 36 CFR Part 800. SHPO contact information is available at the following link: <http://www.ncshpo.org/find/index.htm>. THPO contact information is available at the following link: <http://www.nathpo.org/map.html>.

Section 110(k) of the NHPA applies to DOE funded activities. Recipients shall avoid taking any action that results in an adverse effect to historic properties pending compliance with Section 106.

Recipients should be aware that the DOE Contracting Officer will consider the recipient in compliance with Section 106 of the NHPA only after the Recipient has submitted adequate background documentation to the SHPO/THPO for its review, and the SHPO/THPO has provided written concurrence to the Recipient that it does not object to its Section 106 finding or determination. Recipient shall provide a copy of this concurrence to the Contracting Officer.

Part 2: Flow Down Terms For ARRA Awards – See Prescriptions for Applicability

Prescription: This clause must be included in all grants, cooperative agreements and TIAs (new or amended) when funds appropriated under the Recovery Act are obligated to the agreement.

SPECIAL PROVISIONS RELATING TO WORK FUNDED UNDER AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009

Preamble

The American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, (Recovery Act) was enacted to preserve and create jobs and promote economic recovery, assist those most impacted by the recession, provide investments needed to increase economic efficiency by spurring technological advances in science and health, invest in transportation, environmental protection, and other infrastructure that will provide long-term economic benefits, stabilize State and local government budgets, in order to minimize and avoid reductions in essential services and counterproductive State and local tax increases. Recipients shall use grant funds in a manner that maximizes job creation and economic benefit.

The Recipient shall comply with all terms and conditions in the Recovery Act relating generally to governance, accountability, transparency, data collection and resources as specified in Act itself and as discussed below.

Recipients should begin planning activities for their first tier subrecipients, including obtaining a DUNS number (or updating the existing DUNS record), and registering with the Central Contractor Registration (CCR).

Be advised that Recovery Act funds can be used in conjunction with other funding as necessary to complete projects, but tracking and reporting must be separate to meet the reporting requirements of the Recovery Act and related guidance. For projects funded by sources other than the Recovery Act, Contractors must keep separate records for Recovery Act funds and to ensure those records comply with the requirements of the Act.

The Government has not fully developed the implementing instructions of the Recovery Act, particularly concerning specific procedural requirements for the new reporting requirements. The Recipient will be provided these details as they become available. The Recipient must comply with all requirements of the Act. If the recipient believes there is any inconsistency between ARRA requirements and current award terms and conditions, the issues will be referred to the Contracting Officer for reconciliation.

Definitions

For purposes of this clause, Covered Funds means funds expended or obligated from appropriations under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5. Covered Funds will have special accounting codes and will be identified as Recovery Act funds in the grant, cooperative agreement or TIA and/or modification using Recovery Act funds. Covered Funds must be reimbursed by September 30, 2015.

Non-Federal employer means any employer with respect to covered funds – the contractor, subcontractor, grantee, or recipient, as the case may be, if the contractor, subcontractor, grantee, or recipient is an employer; and any professional membership organization, certification of other professional body, any agent or licensee of the Federal government, or any person acting directly or indirectly in the interest of an employer receiving covered funds; or

with respect to covered funds received by a State or local government, the State or local government receiving the funds and any contractor or subcontractor receiving the funds and any contractor or subcontractor of the State or local government; and does not mean any department, agency, or other entity of the federal government.

Recipient means any entity that receives Recovery Act funds directly from the Federal government (including Recovery Act funds received through grant, loan, or contract) other than an individual and includes a State that receives Recovery Act Funds.

Special Provisions

A. Flow Down Requirement

Recipients must include these special terms and conditions in any subaward.

B. Segregation of Costs

Recipients must segregate the obligations and expenditures related to funding under the Recovery Act. Financial and accounting systems should be revised as necessary to segregate, track and maintain these funds apart and separate from other revenue streams. No part of the funds from the Recovery Act shall be commingled with any other funds or used for a purpose other than that of making payments for costs allowable for Recovery Act projects.

C. Prohibition on Use of Funds

None of the funds provided under this agreement derived from the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, may be used by any State or local government, or any private entity, for any casino or other gambling establishment, aquarium, zoo, golf course, or swimming pool.

D. Access to Records

With respect to each financial assistance agreement awarded utilizing at least some of the funds appropriated or otherwise made available by the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, any representative of an appropriate inspector general appointed under section 3 or 8G of the Inspector General Act of 1988 (5 U.S.C. App.) or of the Comptroller General is authorized –

- (1) to examine any records of the contractor or grantee, any of its subcontractors or subgrantees, or any State or local agency administering such contract that pertain to, and involve transactions relation to, the subcontract, subcontract, grant, or subgrant; and
- (2) to interview any officer or employee of the contractor, grantee, subgrantee, or agency regarding such transactions.

E. Publication

An application may contain technical data and other data, including trade secrets and/or privileged or confidential information, which the applicant does not want disclosed to the public or used by the Government for any purpose other than the application. To protect such data, the applicant should specifically identify each page including each line or paragraph thereof containing the data to be protected and mark the cover sheet of the application with the following Notice as well as referring to the Notice on each page to which the Notice applies:

Notice of Restriction on Disclosure and Use of Data

The data contained in pages ---- of this application have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, DOE shall have the right to use or disclose the data here to the extent provided in the award. This restriction does not limit the Government's right to use or disclose data obtained without restriction from any source, including the applicant.

Information about this agreement will be published on the Internet and linked to the website www.recovery.gov, maintained by the Accountability and Transparency Board. The Board may exclude posting contractual or other information on the website on a case-by-case basis when necessary to protect national security or to protect information that is not subject to disclosure under sections 552 and 552a of title 5, United States Code.

F. Protecting State and Local Government and Contractor Whistleblowers.

The requirements of Section 1553 of the Act are summarized below. They include, but are not limited to:

Prohibition on Reprisals: An employee of any non-Federal employer receiving covered funds under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing, including a disclosure made in the ordinary course of an employee's duties, to the Accountability and Transparency Board, an inspector general, the Comptroller General, a member of Congress, a State or Federal regulatory or law enforcement agency, a person with supervisory authority over the employee (or other person working for the employer who has the authority to investigate, discover or terminate misconduct, a court or grant jury, the head of a Federal agency, or their representatives information that the employee believes is evidence of:

- gross management of an agency contract or grant relating to covered funds;
- a gross waste of covered funds
- a substantial and specific danger to public health or safety related to the implementation or use of covered funds;
- an abuse of authority related to the implementation or use of covered funds; or
- as violation of law, rule, or regulation related to an agency contract (including the competition for or negotiation of a contract) or grant, awarded or issued relating to covered funds.

Agency Action: Not later than 30 days after receiving an inspector general report of an alleged reprisal, the head of the agency shall determine whether there is sufficient basis to conclude that the non-Federal employer has subjected the employee to a prohibited reprisal. The agency shall either issue an order denying relief in whole or in part or shall take one or more of the following actions:

- Order the employer to take affirmative action to abate the reprisal.
- Order the employer to reinstate the person to the position that the person held before the reprisal, together with compensation including back pay, compensatory damages, employment benefits, and other terms and conditions of employment that would apply to the person in that position if the reprisal had not been taken.
- Order the employer to pay the employee an amount equal to the aggregate amount of all costs and expenses (including attorneys' fees and expert witnesses' fees) that were reasonably incurred by the employee for or in connection with, bringing the complaint regarding the reprisal, as determined by the head of a court of competent jurisdiction.

Nonenforceability of Certain Provisions Waiving Rights and Remedies or Requiring Arbitration: Except as provided in a collective bargaining agreement, the rights and remedies provided to aggrieved employees by this section may not be waived by any agreement, policy, form, or condition of employment, including any predispute arbitration agreement. No predispute arbitration agreement shall be valid or enforceable if it requires arbitration of a dispute arising out of this section.

Requirement to Post Notice of Rights and Remedies: Any employer receiving covered funds under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, shall post notice of the rights and remedies as required therein. (Refer to section 1553 of the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, www.Recovery.gov, for specific requirements of this section and prescribed language for the notices.)

G. Request for Reimbursement (this version is included in WAP/SEP awards with states)

RESERVED

H. False Claims Act

Recipient and sub-recipients shall promptly refer to the DOE or other appropriate Inspector General any credible evidence that a principal, employee, agent, contractor, sub-grantee, subcontractor or other person has submitted a false claim under the False Claims Act or has committed a criminal or civil violation of laws pertaining to fraud, conflict or interest, bribery, gratuity or similar misconduct involving those funds.

I. Information in supporting of Recovery Act Reporting

Recipient may be required to submit backup documentation for expenditures of funds under the Recovery Act including such items as timecards and invoices. Recipient shall provide copies of backup documentation at the request of the Contracting Officer or designee.

J. Availability of Funds

Funds appropriated under the Recovery Act and obligated to this award are available for reimbursement of costs until September 30, 2015.

Prescription: The following award term shall be used to implement the recipient reporting and registration requirements in the Recovery Act section 1512.

REPORTING AND REGISTRATION REQUIREMENTS UNDER SECTION 1512 OF THE RECOVERY ACT

(a) This award requires the recipient to complete projects or activities which are funded under the American Recovery and Reinvestment Act of 2009 (Recovery Act) and to report on use of Recovery Act funds provided through this award. Information from these reports will be made available to the public.

(b) The reports are due no later than ten calendar days after each calendar quarter in which the recipient receives the assistance award funded in whole or in part by the Recovery Act.

(c) Recipients and their first-tier recipients must maintain current registrations in the Central Contractor Registration (<http://www.ccr.gov>) at all times during which they have active federal awards funded with Recovery Act funds. A Dun and Bradstreet Data Universal Numbering System (DUNS) Number (<http://www.dnb.com>) is one of the requirements for registration in the Central Contractor Registration.

(d) The recipient shall report the information described in section 1512(c) of the Recovery Act using the reporting instructions and data elements that will be provided online at <http://www.FederalReporting.gov> and ensure that any information that is pre-filled is corrected or updated as needed.

Prescription: When awarding Recovery Act funds for construction, alteration, maintenance, or repair of a public building or public work and the total project value is estimated less than \$7,443,000, the agency shall use this award term.

REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS -- SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009

(a) Definitions. As used in this award term and condition--

(1) Manufactured good means a good brought to the construction site for incorporation into the building or work that has been--

(i) Processed into a specific form and shape; or

(ii) Combined with other raw material to create a material that has different properties than the properties of the individual raw materials.

(2) Public building and public work means a public building of, and a public work of, a governmental entity (the United States; the District of Columbia; commonwealths, territories, and minor outlying islands of the United States; State and local governments; and multi-State, regional, or interstate entities which have governmental functions). These buildings and works may include, without limitation, bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, and canals, and the construction, alteration, maintenance, or repair of such buildings and works.

(3) Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements.

(b) Domestic preference. (1) This award term and condition implements Section 1605 of the American Recovery and Reinvestment Act of 2009 (Recovery Act) (Pub. L. 111--5), by requiring that all iron, steel, and manufactured goods used in the project are produced in the United States except as provided in paragraph (b)(3) and (b)(4) of this section and condition.

(2) This requirement does not apply to the material listed by the Federal Government as follows:

[Award official to list applicable excepted materials or indicate "none"]

(3) The award official may add other iron, steel, and/or manufactured goods to the list in paragraph (b)(2) of this section and condition if the Federal Government determines that--

(i) The cost of the domestic iron, steel, and/or manufactured goods would be unreasonable. The cost of domestic iron, steel, or manufactured goods used in the project is unreasonable when the cumulative cost of such material will increase the cost of the overall project by more than 25 percent;

(ii) The iron, steel, and/or manufactured good is not produced, or manufactured in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(iii) The application of the restriction of section 1605 of the Recovery Act would be inconsistent with the public interest.

(c) Request for determination of inapplicability of Section 1605 of the Recovery Act . (1)(i) Any recipient request to use foreign iron, steel, and/or manufactured goods in accordance with paragraph (b)(3) of this section shall include adequate information for Federal Government evaluation of the request, including--

(A) A description of the foreign and domestic iron, steel, and/or manufactured goods;

(B) Unit of measure;

(C) Quantity;

(D) Cost;

(E) Time of delivery or availability;

(F) Location of the project;

(G) Name and address of the proposed supplier; and

(H) A detailed justification of the reason for use of foreign iron, steel, and/or manufactured goods cited in accordance with paragraph (b)(3) of this section.

(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed cost comparison table in the format in paragraph (d) of this section.

(iii) The cost of iron, steel, and/or manufactured goods material shall include all delivery costs to the construction site and any applicable duty.

(iv) Any recipient request for a determination submitted after Recovery Act funds have been obligated for a project for construction, alteration, maintenance, or repair shall explain why the recipient could not reasonably foresee the need for such determination and could not have requested the determination before the funds were obligated. If the recipient does not submit a satisfactory explanation, the award official need not make a determination.

(2) If the Federal Government determines after funds have been obligated for a project for construction, alteration, maintenance, or repair that an exception to section 1605 of the Recovery Act applies, the award official will amend the award to allow use of the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is nonavailability or public interest, the amended award shall reflect adjustment of the award amount, redistribution of budgeted funds, and/or other actions taken to cover costs associated with acquiring or using the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is the unreasonable cost of the domestic iron, steel, or manufactured goods, the award official shall adjust the award amount or redistribute budgeted funds by at least the differential established in 2 CFR 176.110(a).

(3) Unless the Federal Government determines that an exception to section 1605 of the Recovery Act applies, use of foreign iron, steel, and/or manufactured goods is noncompliant with section 1605 of the American Recovery and Reinvestment Act.

(d) Data. To permit evaluation of requests under paragraph (b) of this section based on unreasonable cost, the Recipient shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Items Cost Comparison

Description	Unit of measure	Quantity	Cost
(dollars)*			
Item 1:			
Foreign steel, iron, or manufactured good	_____	_____	_____
Domestic steel, iron, or manufactured good	_____	_____	_____
Item 2:			
Foreign steel, iron, or manufactured good	_____	_____	_____
Domestic steel, iron, or manufactured good	_____	_____	_____

[List name, address, telephone number, email address, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.]

[Include other applicable supporting information.]

[*Include all delivery costs to the construction site.]

Prescription: When awarding Recovery Act funds for construction, alteration, maintenance, or repair of a public building or public work with a total project value over \$7,443,000 that involves iron, steel, and/or manufactured goods materials covered under international agreements, the agency shall use this award term.

REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS (COVERED UNDER INTERNATIONAL AGREEMENTS)—SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009

(a) *Definitions.* As used in this award term and condition—

Designated country —(1) A World Trade Organization Government Procurement Agreement country (Aruba, Austria, Belgium, Bulgaria, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea (Republic of), Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and United Kingdom;

(2) A Free Trade Agreement (FTA) country (Australia, Bahrain, Canada, Chile, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Israel, Mexico, Morocco, Nicaragua, Oman, Peru, or Singapore); or

(3) A United States-European Communities Exchange of Letters (May 15, 1995) country: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, and United Kingdom.

Designated country iron, steel, and/or manufactured goods —(1) Is wholly the growth, product, or manufacture of a designated country; or

(2) In the case of a manufactured good that consist in whole or in part of materials from another country, has been substantially transformed in a designated country into a new and different manufactured good distinct from the materials from which it was transformed.

Domestic iron, steel, and/or manufactured good —(1) Is wholly the growth, product, or manufacture of the United States; or

(2) In the case of a manufactured good that consists in whole or in part of materials from another country, has been substantially transformed in the United States into a new and different manufactured good distinct from the materials from which it was transformed. There is no requirement with regard to the origin of components or subcomponents in manufactured goods or products, as long as the manufacture of the goods occurs in the United States.

Foreign iron, steel, and/or manufactured good means iron, steel and/or manufactured good that is not domestic or designated country iron, steel, and/or manufactured good.

Manufactured good means a good brought to the construction site for incorporation into the building or work that has been—

(1) Processed into a specific form and shape; or

(2) Combined with other raw material to create a material that has different properties than the properties of the individual raw materials.

Public building and public work means a public building of, and a public work of, a governmental entity (the United States; the District of Columbia; commonwealths, territories, and minor outlying islands of the United States; State and local governments; and multi-State, regional, or interstate entities which have governmental functions). These buildings and works may include, without limitation, bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, and canals, and the construction, alteration, maintenance, or repair of such buildings and works.

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements.

(b) *Iron, steel, and manufactured goods.* (1) The award term and condition described in this section implements—

(i) Section 1605(a) of the American Recovery and Reinvestment Act of 2009 (Pub. L. 111–5) (Recovery Act), by requiring that all iron, steel, and manufactured goods used in the project are produced in the United States; and

(ii) Section 1605(d), which requires application of the Buy American requirement in a manner consistent with U.S. obligations under international agreements. The restrictions of section 1605 of the Recovery Act do not apply to designated country iron, steel, and/or manufactured goods. The Buy American requirement in section 1605 shall not be applied where the iron, steel or manufactured goods used in the project are from a Party to an international agreement that obligates the recipient to treat the goods and services of that Party the same as domestic goods and services. This obligation shall only apply to projects with an estimated value of \$7,443,000 or more.

(2) The recipient shall use only domestic or designated country iron, steel, and manufactured goods in performing the work funded in whole or part with this award, except as provided in paragraphs (b)(3) and (b)(4) of this section.

(3) The requirement in paragraph (b)(2) of this section does not apply to the iron, steel, and manufactured goods listed by the Federal Government as follows:

(4) The award official may add other iron, steel, and manufactured goods to the list in paragraph (b)(3) of this section if the Federal Government determines that—

(i) The cost of domestic iron, steel, and/or manufactured goods would be unreasonable. The cost of domestic iron, steel, and/or manufactured goods used in the project is unreasonable when the cumulative cost of such material will increase the overall cost of the project by more than 25 percent;

(ii) The iron, steel, and/or manufactured good is not produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality; or

(iii) The application of the restriction of section 1605 of the Recovery Act would be inconsistent with the public interest.

(c) Request for determination of inapplicability of section 1605 of the Recovery Act or the Buy American Act. (1)(i) Any recipient request to use foreign iron, steel, and/or manufactured goods in accordance with paragraph (b)(4) of this section shall include adequate information for Federal Government evaluation of the request, including—

(A) A description of the foreign and domestic iron, steel, and/or manufactured goods;

(B) Unit of measure;

(C) Quantity;

(D) Cost;

(E) Time of delivery or availability;

(F) Location of the project;

(G) Name and address of the proposed supplier; and

(H) A detailed justification of the reason for use of foreign iron, steel, and/or manufactured goods cited in accordance with paragraph (b)(4) of this section.

(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed cost comparison table in the format in paragraph (d) of this section.

(iii) The cost of iron, steel, or manufactured goods shall include all delivery costs to the construction site and any applicable duty.

(iv) Any recipient request for a determination submitted after Recovery Act funds have been obligated for a project for construction, alteration, maintenance, or repair shall explain why the recipient could not reasonably foresee the need for such determination and could not have requested the determination before the funds were obligated. If the recipient does not submit a satisfactory explanation, the award official need not make a determination.

(2) If the Federal Government determines after funds have been obligated for a project for construction, alteration, maintenance, or repair that an exception to section 1605 of the Recovery Act applies, the award official will amend the award to allow use of the foreign iron, steel, and/or relevant manufactured goods. When the basis for the exception is nonavailability or public interest, the amended award shall reflect adjustment of the award amount, redistribution of budgeted funds, and/or other appropriate actions taken to cover costs associated with acquiring or using the foreign iron, steel, and/or relevant manufactured goods.. When the basis for the exception is the unreasonable cost of the domestic iron, steel, or manufactured goods, the award official shall adjust the award amount or redistribute budgeted funds, as appropriate, by at least the differential established in 2 CFR 176.110(a).

(3) Unless the Federal Government determines that an exception to section 1605 of the Recovery Act applies, use of foreign iron, steel, and/or manufactured goods other than designated country iron, steel, and/or manufactured goods is noncompliant with the applicable Act.

(d) *Data.* To permit evaluation of requests under paragraph (b) of this section based on unreasonable cost, the applicant shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Items Cost Comparison

Description	Unit of measure	Quantity	Cost (dollars)*
<i>Item 1:</i>			
Foreign steel, iron, or manufactured good	_____	_____	_____
Domestic steel, iron, or manufactured good	_____	_____	_____
<i>Item 2:</i>			
Foreign steel, iron, or manufactured good	_____	_____	_____
Domestic steel, iron, or manufactured good	_____	_____	_____

Prescription: When issuing announcements or requesting applications for Recovery Act programs or activities that may involve construction, alteration, maintenance, or repair the agency shall use this award term.

WAGE RATE REQUIREMENTS UNDER SECTION 1606 OF THE RECOVERY ACT

(a) Section 1606 of the Recovery Act requires that all laborers and mechanics employed by contractors and subcontractors on projects funded directly by or assisted in whole or in part by and through the Federal Government pursuant to the Recovery Act shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code.

Pursuant to Reorganization Plan No. 14 and the Copeland Act, 40 U.S.C. 3145, the Department of Labor has issued regulations at 29 CFR parts 1, 3, and 5 to implement the Davis-Bacon and related Acts. Regulations in 29 CFR 5.5 instruct agencies concerning application of the standard Davis-Bacon contract clauses set forth in that section. Federal agencies providing grants, cooperative agreements, and loans under the Recovery Act shall ensure that the standard Davis-Bacon contract clauses found in 29 CFR 5.5(a) are incorporated in any resultant covered contracts that are in excess of \$2,000 for construction, alteration or repair (including painting and decorating).

(b) For additional guidance on the wage rate requirements of section 1606, contact your awarding agency. Recipients of grants, cooperative agreements and loans should direct their initial inquiries concerning the application of Davis-Bacon requirements to a particular federally assisted project to the Federal agency funding the project. The Secretary of Labor retains final coverage authority under Reorganization Plan Number 14.

Prescription: The award term described in this section shall be used by agencies to clarify recipient responsibilities regarding tracking and documenting Recovery Act expenditures.

RECOVERY ACT TRANSACTIONS LISTED IN SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS AND RECIPIENT RESPONSIBILITIES FOR INFORMING

(a) To maximize the transparency and accountability of funds authorized under the American Recovery and Reinvestment Act of 2009 (Pub. L. 111--5) (Recovery Act) as required by Congress and in accordance with 2 CFR 215.21 "Uniform Administrative Requirements for Grants and Agreements" and OMB Circular A--102 Common Rules provisions, recipients agree to maintain records that identify adequately the source and application of Recovery Act funds. OMB Circular A--102 is available at <http://www.whitehouse.gov/omb/circulars/a102/a102.html>.

(b) For recipients covered by the Single Audit Act Amendments of 1996 and OMB Circular A--133, "Audits of States, Local Governments, and Non-Profit Organizations," recipients agree to separately identify the expenditures for Federal awards under the Recovery Act on the Schedule of Expenditures of Federal Awards (SEFA) and the Data Collection Form (SF--SAC) required by OMB Circular A--133. OMB Circular A--133 is available at <http://www.whitehouse.gov/omb/circulars/a133/a133.html>. This shall be accomplished by identifying expenditures for Federal awards made under the Recovery Act separately on the SEFA, and as separate rows under Item 9 of Part III on the SF--SAC by CFDA number, and inclusion of the prefix "ARRA-" in identifying the name of the Federal program on the SEFA and as the first characters in Item 9d of Part III on the SF--SAC.

(c) Recipients agree to separately identify to each subrecipient, and document at the time of subaward and at the time of disbursement of funds, the Federal award number, CFDA number, and amount of Recovery Act funds. When a recipient awards Recovery Act funds for an existing program, the information furnished to subrecipients shall distinguish the subawards of incremental Recovery Act funds from regular subawards under the existing program.

(d) Recipients agree to require their subrecipients to include on their SEFA information to specifically identify Recovery Act funding similar to the requirements for the recipient SEFA described above. This information is needed to allow the recipient to properly monitor subrecipient expenditure of ARRA funds as well as oversight by the Federal awarding agencies, Offices of Inspector General and the Government Accountability Office.

Prescription: Include for ARRA awards when WAGE RATE REQUIREMENTS UNDER SECTION 1606 OF THE RECOVERY ACT article is used.

DAVIS BACON ACT REQUIREMENTS

A. Definitions. For purposes of this term, the Contract Work Hours and Safety Standards Act term, and the Recipient Functions term, the following definitions are applicable:

(1) *Award* means the Award by the Department of Energy (DOE) to a Recipient that includes a requirement to comply with the labor standards clauses and wage rate requirements of the Davis-Bacon Act (DBA) for work performed by all laborers and mechanics employed by Subrecipients, Contractors and subcontractors on projects funded by or assisted in whole or in part by and through the Federal Government pursuant to the Recovery Act.

(2) "*Construction, alteration or repair*" means all types of work done by laborers and mechanics employed by the Subrecipient, construction contractor or construction subcontractor on a particular building or work at the site thereof, including without limitation—

(a) Altering, remodeling, installation (if appropriate) on the site of the work of items fabricated off-site;

(b) Painting and decorating; or

(c) Manufacturing or furnishing of materials, articles, supplies, or equipment on the site of the building or work.

(3) *Contract* means a written procurement contract executed by a Subrecipient for the acquisition of property and services for construction, alteration, and repair under a Subaward. For purposes of these terms, a Contract shall include subcontracts and lower-tier subcontracts under the Contract.

(4) *Contracting Officer* means the DOE official authorized to execute awards on behalf of DOE and who is responsible for the business management and non-program aspects of the financial assistance process.

(5) *Contractor* means an entity that enters into a Contract. For purposes of these terms, Contractor shall include subcontractors and lower-tier subcontractors.

(6) *Recipient* means any entity other than an individual that receives Recovery Act funds in the form of a grant directly from the Federal Government. The term includes the State that receives an Award from DOE and is financially accountable for the use of any DOE funds or property, and is legally responsible for carrying out the terms and conditions of the program and Award.

(7) “*Site of the work*”—

(a) Means—

(i) The physical place or places where the construction called for in the Award, Subaward, or Contract will remain when work on it is completed; and

(ii) Any other site where a significant portion of the building or work is constructed, provided that such site is established specifically for the performance of the project;

(b) Except as provided in paragraph (c) of this definition, the site of the work includes any fabrication plants, mobile factories, batch plants, borrow pits, job headquarters, tool yards, etc., provided—

(1) They are dedicated exclusively, or nearly so, to performance of the project; and

(2) They are adjacent or virtually adjacent to the site of the work as defined in paragraphs (7)(a)(i) or (7)(a)(ii) of this definition; and

(c) Does not include permanent home offices, branch plant establishments, fabrication plants, or tool yards of a Contractor or subcontractor whose locations and continuance in operation are determined wholly without regard to a particular contract or Federal Award or project. In addition, fabrication plants, batch plants, borrow pits, job headquarters, yards, etc., of a commercial or material supplier which are established by a supplier of materials for the project before opening of bids and not on the project site as defined in paragraphs (7)(a)(i) or (7)(a)(ii) of this definition, are not included in the “site of the work.” Such permanent, previously established facilities are not a part of the “site of the work” even if the operations for a period of time may be dedicated exclusively or nearly so, to the performance of an Award, Subaward, or Contract.

(8) *Subaward* means an award of financial assistance in the form of money, or property in lieu of money, made under an award by a Recipient to an eligible Subrecipient or by a Subrecipient to a lower-tier subrecipient. The term includes financial assistance when provided by any legal agreement, even if the agreement is called a contract, but does not include the Recipient’s procurement of goods and services to carry out the program nor does it include any form of assistance which is excluded from the definition of “Award” above.

(9) *Subrecipient* means a non-Federal entity that expends Federal awards received from a pass-through entity [Recipient] to carry out a Federal program, but does not include an individual that is a beneficiary of such a program. The term includes a Community Action Agency (CAA), local agency, or other entity to which a Subaward under the Award is made by a Recipient that includes a requirement to comply with the labor

standards clauses and wage rate requirements of the DBA work performed by all laborers and mechanics employed by contractors and subcontractors on projects funded by or assisted in whole or in part by and through the Federal Government pursuant of the Recovery Act.

B. Davis-Bacon Act

(1)(a) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached to the Subaward or Contract and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Recipient, a Subrecipient, or Contractor and such laborers and mechanics.

(i) Applicable to Recipient Only: Prior to the issuance of the Subaward or Contract, the Recipient shall notify the Contracting Officer of the site of the work in order for the appropriate wage determination to be obtained by the Contracting Officer from the Secretary of Labor.

(ii) If the Subaward or Contract is or has been issued without a wage determination, the Recipient shall notify the Contracting Officer immediately of the site of the work under the Subaward or Contract in order for the appropriate wage determination to be obtained by the Contracting Officer from the Secretary of Labor.

(b) Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the DBA on behalf of laborers or mechanics are considered wages paid to such laborers and mechanics, subject to the provisions of paragraph B(4) below; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such period.

(c) Such laborers and mechanics shall be paid not less than the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in the paragraph entitled Apprentices and Trainees. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

(d) The wage determination (including any additional classifications and wage rates conformed under paragraph B(2) of this term) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Subrecipient and Contractor at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(2)(a) The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the Subaward or Contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefore only when all the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination.

(ii) The classification is utilized in the area by the construction industry.

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the Subrecipient (and Contractor, when applicable) and the laborers and mechanics to be employed in the classification (if known), or their representatives agree on the classification and wage rate (including

the amount designated for fringe benefits, where appropriate), the Subrecipient shall notify the Recipient. The Recipient shall notify the Contracting Officer of this agreement. If the Contracting Officer agrees with the classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the:

Wage and Hour Division
Employment Standards Administration
U.S. Department of Labor
Washington, DC 20210

The Administrator or an authorized representative will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(c) In the event the Subrecipient (and Contractor, when applicable), and the laborers or mechanics to be employed in the classification, or their representatives, do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Subrecipient shall notify the Recipient. The Recipient shall notify the Contracting Officer of the disagreement. The Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(d) The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs B(2)(b) or B(2)(c) of this Term shall be paid to all workers performing work in the classification under the Award, Subaward, or Contract from the first day on which work is performed in the classification.

(3) Whenever the minimum wage rate prescribed in the Award, Subaward, or Contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Subrecipient and Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(4) If the Subrecipient or Contractor does not make payments to a trustee or other third person, the Subrecipient or Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Subrecipient or Contractor that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Subrecipient or Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

C. Rates of Wages

(1) The minimum wages to be paid laborers and mechanics under the Subaward or Contract involved in performance of work at the project site, as determined by the Secretary of Labor to be prevailing for the corresponding classes of laborers and mechanics employed on projects of a character similar to the contract work in the pertinent locality, are included as an attachment to the Award, Subaward, or Contract.

(2) If the Subaward or Contract has been issued without a wage determination, the Recipient shall notify the Contracting Officer immediately of the site of the work under the Subaward or Contract in order for the appropriate wage determination to be obtained by the Contracting Officer from the Secretary of Labor.

D. Payrolls and Basic Records

(1) Payrolls and basic records relating thereto shall be maintained by the Recipient, Subrecipient and Contractor during the course of the work and preserved for a period of 3 years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions

or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under paragraph (4) of the provision entitled Davis-Bacon Act, that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Subrecipient or Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. The Subrecipient or Contractor employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(2)(a) The Contractor shall submit weekly for each week in which any Contract work is performed a copy of all payrolls to the Subrecipient. The Subrecipient shall submit weekly for each week in which any Subaward or Contract work is performed a copy of all payrolls to the Recipient. The Recipient shall submit weekly for each week in which any Subaward or Contract work is performed a copy of all payrolls to the Contracting Officer. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph D(1) of this Term, except that the full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site.

(b) The Recipient is responsible for ensuring that all Subrecipients and Contractors submit copies of payrolls and basic records as required by paragraph D, Payrolls and Basic Records, of this Term. The Subrecipient is responsible for ensuring all Contractors, including lower tier subcontractors submit copies of payrolls and basic records as required by paragraph D, Payrolls and Basic Records, of this term. Subrecipients and Contractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request for transmission to the Contracting Officer, the Recipient, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. The Recipient shall also obtain and provide the full social security number and current address of each covered worker upon request by the Contracting Officer or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a Recipient to require a Subrecipient or Contractor to provide addresses and social security numbers to the Recipient for its own records, without weekly submission to the Contracting Officer.

(c) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Recipient, Subrecipient or Contractor or his or her agent who pays or supervises the payment of the persons employed under the Subaward or Contract and shall certify—

(i) That the payroll for the payroll period contains the information required to be maintained under paragraph D(2)(a) of this Term, the appropriate information is being maintained under paragraph D(1) of this Term, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the Subaward or Contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR Part 3; and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the Subaward or Contract.

(d) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the “Statement of Compliance” required by paragraph D(2)(c) of this Term.

(e) The falsification of any of the certifications in Paragraph D, Payrolls and Basic Records, of this Term may subject the Recipient, Subrecipient or Contractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(3) The Recipient, Subrecipient, or Contractor shall make the records required under paragraph D(1) of this Term available for inspection, copying, or transcription by the Contracting Officer, authorized representatives of the Contracting Officer, or the Department of Labor. The Subrecipient or Contractor shall permit the Contracting Officer, authorized representatives of the Contracting Officer or the Department of Labor to interview employees during working hours on the job. If the Recipient, Subrecipient, or Contractor fails to submit the required records or to make them available, the Contracting Officer may, after written notice to the Recipient, Subrecipient, or Contractor take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

E. Withholding of Funds

(1) The DOE Contracting Officer shall, upon his or her or its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Recipient or any other contract or Federal Award with the same Recipient, on this or any other federally assisted Award subject to Davis-Bacon prevailing wage requirements, which is held by the same Recipient so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Subrecipient or a Contractor the full amount of wages required by the Award or Subaward or a Contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the Award or Subaward or a Contract, the Contracting Officer may, after written notice to the Recipient take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(2) The Recipient shall, upon its own action or upon written request of the DOE Contracting Officer or an authorized representative of the Department of Labor, withhold or cause to be withheld from any Subrecipient or Contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Subrecipient or Contractor the full amount of wages required by the Subaward or Contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the Subaward or Contract, the Recipient may, after written notice to the Subrecipient or Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased or the Government may cause the suspension of any further payment under any other contract or Federal award with the same Subrecipient or Contractor, on any other federally assisted Award subject to Davis-Bacon prevailing wage requirements, which is held by the same Subrecipient or Contractor.

F. Apprentices and Trainees

(1) Apprentices.

(a) An apprentice will be permitted to work at less than the predetermined rate for the work they performed when they are employed—

(i) Pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship and Training, Employer, and Labor Services (OATELS) or with a State Apprenticeship Agency recognized by the OATELS; or

(ii) In the first 90 days of probationary employment as an apprentice in such an apprenticeship program, even though not individually registered in the program, if certified by the OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

(b) The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Subrecipient or Contractor as to the entire work force under the registered program.

(c) Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in paragraph F(1) of this Term, shall be paid not less than the applicable wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(d) Where a Subrecipient or Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Subrecipient's or Contractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination.

(e) Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

(f) In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Subrecipient or Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) Trainees.

(a) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by (OATELS). The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by OATELS.

(b) Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship/training program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the OATELS shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed.

(c) In the event OATELS withdraws approval of a training program, the Subrecipient or Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(3) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this Term shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

G. Compliance with Copeland Act Requirements

The Recipient, Subrecipient or Contractor shall comply with the requirements of 29 CFR Part 3 which are hereby incorporated by reference in the Award, Subaward or Contract.

H. Subawards and Contracts

(1) The Recipient, the Subrecipient and Contractor shall insert in the Subaward or any Contracts this Term entitled “Davis Bacon Act Requirements” and such other terms as the Contracting Officer may require. The Recipient shall be responsible for ensuring compliance by any Subrecipient or Contractor with all of the requirements contained in this Term. The Subrecipient shall be responsible for the compliance by Contractor with all of the requirements contained in this Term.

(2) Within 14 days after issuance of a Subaward, the Recipient shall deliver to the Contracting Officer a completed Standard Form (SF) 1413, Statement and Acknowledgment, for each Subaward and Contract for construction within the United States, including the Subrecipient’s and Contractor’s signed and dated acknowledgment that this Term) has been included in the Subaward and any Contracts. The SF 1413 is available from the Contracting Officer or at [http://contacts.gsa.gov/webforms.nsf/0/70B4872D16EE95A785256A26004F7EA8/\\$file/sf1413_e.pdf](http://contacts.gsa.gov/webforms.nsf/0/70B4872D16EE95A785256A26004F7EA8/$file/sf1413_e.pdf). Within 14 days after issuance of a Contract or lower- tier subcontract, the Subrecipient shall deliver to the Recipient a completed Standard Form (SF) 1413, Statement and Acknowledgment, for each Contract and lower-tier subcontract for construction within the United States, including the Contractor and lower- tier subcontractor’s signed and dated acknowledgment that this Term has been included in any Contract and lower-tier subcontracts. SF 1413 is available from the Contracting Officer or at [http://contacts.gsa.gov/webforms.nsf/0/70B4872D16EE95A785256A26004F7EA8/\\$file/sf1413_e.pdf](http://contacts.gsa.gov/webforms.nsf/0/70B4872D16EE95A785256A26004F7EA8/$file/sf1413_e.pdf). The Recipient shall immediately provide to the DOE Contracting Officer the completed Standard Forms (SF) 1413.

I. Contract Termination—Debarment

A breach of these provisions may be grounds for termination of the Award, Subaward, or Contract and for debarment as a Contractor or subcontractor as provided in 29 CFR 5.12.

J. Compliance with Davis-Bacon and Related Act Regulations

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are hereby incorporated by reference in the Award, Subaward or Contract.

K. Disputes Concerning Labor Standards

The United States Department of Labor has set forth in 29 CFR Parts 5, 6, and 7 procedures for resolving disputes concerning labor standards requirements. Such disputes shall be resolved in accordance with those procedures and shall not be subject to any other dispute provision that may be contained in the Award, Subaward, and Contract. Disputes within the meaning of this Term include disputes between the Recipient, Subrecipient (including any Contractor) and the Department of Energy, the U.S. Department of Labor, or the employees or their representatives.

L. Certification of Eligibility.

(1) By entering into this Award, Subaward, or Contract (as applicable), the Recipient, Subrecipient, or Contractor, respectively certifies that neither it (nor he or she) nor any person or firm who has an interest in the Recipient, Subrecipient, or Contractor’s firm, is a person, entity, or firm ineligible to be awarded Government contracts or Government awards by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(2) No part of this Award, Subaward or Contract shall be subcontracted to any person or firm ineligible for award of

a Government contract or Government award by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(3) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

M. Approval of Wage Rates

All straight time wage rates, and overtime rates based thereon, for laborers and mechanics engaged in work under an Award, Subaward or Contract must be submitted for approval in writing by the head of the federal contracting activity or a representative expressly designated for this purpose, if the straight time wages exceed the rates for corresponding classifications contained in the applicable Davis-Bacon Act minimum wage determination included in the Award, Subaward or Contract. Any amount paid by the Subrecipient or Contractor to any laborer or mechanic in excess of the agency approved wage rate shall be at the expense of the Subrecipient or Contractor and shall not be reimbursed by the Recipient or Subrecipient. If the Government refuses to authorize the use of the overtime, the Subrecipient or Contractor is not released from the obligation to pay employees at the required overtime rates for any overtime actually worked.

Contract Work Hours and Safety Standards Act

This Term entitled “Contract Work Hours and Safety Standards Act (CWHSSA)” shall apply to any Subaward or Contract in an amount in excess of \$100,000. As used in this CWHSSA Term, the terms laborers and mechanics include watchmen and guards.

A. Overtime requirements. No Subrecipient or Contractor contracting for any part of the Subaward work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

B. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the term set forth in paragraph B herein, the Subrecipient or Contractor responsible therefor shall be liable for the unpaid wages. In addition, such Subrecipient or Contractor shall be liable to the United States (in the case of work done under a Subaward or Contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the provision set forth in CWHSSA paragraph A, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the term set forth in paragraph (A) of this section.

C. Withholding for unpaid wages and liquidated damages.

(1) The DOE Contracting Officer shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Recipient on this or any other Federal Award or Federal contract with the same Recipient on any other federally-assisted Award or contract subject to the CWHSSA, which is held by the same Recipient such sums as may be determined to be necessary to satisfy any liabilities of such Recipient for unpaid wages and liquidated damages as provided in the term set forth in CWHSSA, paragraph B of this Term.

(2) The Recipient shall, upon its own action or upon written request of the DOE Contracting Officer or an authorized representative of the Department of Labor, withhold or cause from any moneys payable on account of work performed by the Subrecipient or Contractor on this or any other federally assisted subaward or contract subject to the CWHSSA, which is held by the same Subrecipient or Contractor such sums as may be determined to be necessary to satisfy any liabilities of such Subrecipient or Contractor for unpaid wages and liquidated damages as provided in term set forth in CWHSSA, paragraph B of this Term.

D. Subcontracts. The Subrecipient shall insert in a Contract and a Contractor shall insert in any lower tier subcontracts, the terms set forth in these CWHSSA paragraphs (A) through (D) and also a provision requiring the Contractors to include this CWHSSA Term in any lower tier subcontracts. The Recipient shall be responsible for compliance by any Subrecipient or Contractor, with the CWHSSA paragraphs A through D. The Subrecipient shall be responsible for compliance by any Contractor (including lower- tier subcontractors).

E. The Subrecipient or Contractor shall maintain payrolls and basic payrolls in accordance with Davis-Bacon Act Requirements term, for all laborers and mechanics, including guards and watchmen working on the Subaward or Contracts. These records are subject to the requirements set forth in the Davis Bacon Requirements term.

Attachment 3: Federal Assurances

- I. The Contractor hereby assures and certifies that it will comply with the regulations, policies, guidelines and requirements as indicated below for said type of institution.
 1. Hospitals: 10 CFR 600, OMB Circular A-110, and Appendix E of 45 CFR 74.
 2. State Agencies, Public Schools, Local Governments, and Indian Tribal Governments: 10 CFR 600, the "Common Rule," and OMB Circulars A-128 and A-87.
 3. Publicly funded Colleges and Universities: 10 CFR 600, and OMB Circulars A-110, A-133, and A-21.
 4. Private Non-Profit Organizations - Private Schools: 10 CFR 600, and OMB Circulars A-110, A-133, and A-122.
 5. Individuals/Private For-Profit Organizations: Not covered by OMB Circulars.

- II. Also, the Contractor assures and certifies with respect to the project that:
 - (1) LEGAL AUTHORITY. It possesses legal authority to apply for the grant; that a resolution, motion, or similar action has been duly adopted or passed as an official act of the applicant's governing body, if necessary, authorizing the filing of the application, including all understandings and assurances contained therein, and directing and authorizing the person identified as the official representative of the applicant to act in connection with the application and to provide such additional information as may be required.
 - (2) CIVIL RIGHTS. It will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352) and in accordance with Title VI of that Act, no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the applicant received federal financial assistance and will immediately take any measures necessary to effectuate this agreement.
 - (3) CIVIL RIGHTS. It will comply with Title VI of the Civil Rights Act of 1964 (42 USC 2000d) and 10 CFR Part 1040 prohibiting employment discrimination where (1) the primary purpose of a grant is to provide employment, or, (2) discriminatory employment practices will result in unequal treatment of persons who are or should be benefiting from the grant-aided activity.
 - (4) DISPLACED PERSONS. It will comply with requirements of the provisions of the Uniform Relocation Assistance and Real Property

Acquisitions Act of 1970 (P.L. 91-646) which provides for fair and equitable treatment of persons displaced as a result of federal and federally assisted programs.

- (5) HATCH ACT. It will comply with the provision of the Hatch Act which limits the political activity of employees.
- (6) FAIR LABOR STANDARDS. It will comply with minimum wage and maximum hours provisions of the Federal Fair Labor Standards Act, as they apply to hospital and educational institution employees of state and local governments.
- (7) CONFLICT OF INTEREST. It will establish safeguards to prohibit employees from using their positions for a purchase that is, or gives the appearance of, being motivated by a desire for private gain for themselves or others, particularly those with whom they have family, business or other ties.
- (8) RECORDS ACCESS. It will give the grantor agency or the Comptroller General, through any authorized representative, the access to and the right to examine all records, books, papers or documents related to the grant.
- (9) ENVIRONMENTAL PROTECTION AGENCY'S LIST OF VIOLATING FACILITIES. It will insure that the facilities under its ownership, lease, or supervision, which shall be utilized in the accomplishment of the project are not listed on the Environmental Protection Agency's (EPA) list of Violating Facilities and that it will notify the federal grantor agency of the receipt of any communication from the Director of the EPA Office of Federal Activities indicating that a facility to be used in the project is under consideration for listing by the EPA.
- (10) FLOOD INSURANCE. It will comply with the flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973, P.L. 93-234, 87 Stat. 975, approved December 31, 1976. Section 102(a) requires, on and after March 2, 1975, the purchase of flood insurance in communities where such insurance is available as a condition for the receipt of and federal financial assistance for construction or acquisition purposes for use in any area having special flood hazards. The phrase "federal financial assistance" includes any form of loan, grant, guarantee, insurance payment, rebate, subsidy, disaster assistance loan or grant, or any other form of direct or indirect federal assistance.
- (11) NATIONAL HISTORIC PRESERVATION. It will assist the federal grantor agency in its compliance with Section 106 of the National Historic Preservation Act of 1966 as amended (16 USC 470), Executive Order 11593, and the Archaeological and Historic Preservation Act of 1966 (16 USC 469a-1 et seq.) by (a) consulting with the State Historic Preservation Officer on the conduct of investigations, as necessary, to identify properties listed in or eligible for inclusion in the National Register of

Historic Places that are subject to adverse effects (see 36 CFR Part 800.8) by the activity, and notifying the federal grantor agency of the existence of any such properties, and by (b) complying with all requirements established by the federal grantor agency to avoid or mitigate adverse effects upon such properties.

- (12) DEBARMENT AND SUSPENSION. It, nor its principals, is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency. Where the contractor is unable to certify to any of the statements in this certification, such contractor shall attach an explanation to this contract.
- (13) ENVIRONMENTAL STANDARDS. If the amount of this contract exceeds \$100,000, it agrees to comply with applicable standards, regulations, or orders issued pursuant to the Clean Air Act of 1970 (42 USC 1857 et seq.) and the Federal Water Pollution Control Act (33 USC 1251 et seq.) as amended. Violations shall be reported to DOE and the Regional Office of the Environmental Protection Agency.
- (14) LOBBYING CERTIFICATION. If the amount of this contract exceeds \$100,000, it will comply with the following:
1. No federal appropriated funds have been paid, or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.
 2. If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing, or attempting to influence, an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
 3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the

required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

- (15) PRIVACY ACT. The Contractor and its subcontractors will maintain no information about any individual in a manner which would violate the provisions of the Privacy Act of 1974, Public Law 93-579 as amended.
- (16) LIABILITIES AND LOSSES. The U.S. Department of Energy assumes no liability with respect to any damage or loss arising out of any activities undertaken with the financial support of this grant.

**FINAL DAVIS BACON ACT (DBA) CLAUSES AS APPROVED BY
THE DEPARTMENT OF LABOR (DOL) FOR USE IN FINANCIAL
ASSISTANCE PROGRAMS OTHER THAN WEATHERIZATION
ASSISTANCE PROGRAMS AND LOAN PROGRAMS
November 6, 2009**

Clause XXX. Davis Bacon Act and Contract Work Hours and Safety Standards Act.

Definitions: For purposes of this clause, Clause XXX, Davis Bacon Act and Contract Work Hours and Safety Standards Act, the following definitions are applicable:

(1) "Award" means any grant, cooperative agreement or technology investment agreement made with Recovery Act funds by the Department of Energy (DOE) to a Recipient. Such Award must require compliance with the labor standards clauses and wage rate requirements of the Davis-Bacon Act (DBA) for work performed by all laborers and mechanics employed by Recipients (other than a unit of State or local government whose own employees perform the construction) Subrecipients, Contractors, and subcontractors.

(2) "Contractor" means an entity that enters into a Contract. For purposes of these clauses, Contractor shall include (as applicable) prime contractors, Recipients, Subrecipients, and Recipients' or Subrecipients' contractors, subcontractors, and lower-tier subcontractors. "Contractor" does not mean a unit of State or local government where construction is performed by its own employees."

(3) "Contract" means a contract executed by a Recipient, Subrecipient, prime contractor, or any tier subcontractor for construction, alteration, or repair. It may also mean (as applicable) (i) financial assistance instruments such as grants, cooperative agreements, technology investment agreements, and loans; and, (ii) Sub awards, contracts and subcontracts issued under financial assistance agreements. "Contract" does not mean a financial assistance instrument with a unit of State or local government where construction is performed by its own employees.

(4) "Contracting Officer" means the DOE official authorized to execute an Award on behalf of DOE and who is responsible for the business management and non-program aspects of the financial assistance process.

(5) "Recipient" means any entity other than an individual that receives an Award of Federal funds in the form of a grant, cooperative agreement, or technology investment agreement directly from the Federal Government and is financially accountable for the use of any DOE funds or property, and is legally responsible for carrying out the terms and conditions of the program and Award.

(6) "Subaward" means an award of financial assistance in the form of money, or property in lieu of money, made under an award by a Recipient to an eligible Subrecipient or by a Subrecipient to a lower-tier subrecipient. The term includes financial assistance when provided by any legal agreement, even if the agreement is called a contract, but does not include the Recipient's procurement

of goods and services to carry out the program nor does it include any form of assistance which is excluded from the definition of "Award" above.

(7) "Subrecipient" means a non-Federal entity that expends Federal funds received from a Recipient to carry out a Federal program, but does not include an individual that is a beneficiary of such a program.

(a) Davis Bacon Act

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and, without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, *provided* that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The Contracting Officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the Contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination;

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(C) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this Contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the Contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *provided* that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The Department of Energy or the Recipient or Subrecipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under

this Contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the Contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the Contract, the Department of Energy, Recipient, or Subrecipient, may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The Contractor shall submit weekly for each week in which any Contract work is performed a copy of all payrolls to the Department of Energy if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit the payrolls to the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner, as the case may be, for transmission to the Department of Energy. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and

Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime Contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Department of Energy if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit them to the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner, as the case may be, for transmission to the Department of Energy, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the Contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the Contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the Contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 3729 of title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Department of Energy or

the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees—

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work

performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this Contract.

(6) Contracts and Subcontracts. The Recipient, Subrecipient, the Recipient's, and Subrecipient's contractors and subcontractor shall insert in any Contracts the clauses contained herein in(a)(1) through (10) and such other clauses as the Department of Energy may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Recipient shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of the paragraphs in this clause.

(7) Contract termination: debarment. A breach of the Contract clauses in 29 CFR 5.5 may be grounds for termination of the Contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this Contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the

procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Recipient, Subrecipient, the Contractor (or any of its subcontractors), and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this Contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(b) Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No Contractor or subcontractor contracting for any part of the Contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The Department of Energy or the Recipient or Subrecipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same prime Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Contracts and Subcontracts. The Recipient, Subrecipient, and Recipient's and Subrecipient's contractor or subcontractor shall insert in any Contracts, the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Recipient shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(5) The Contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the Contract for all laborers and mechanics, including guards and watchmen, working on the Contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. The records to be maintained under this paragraph shall be made available by the Contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Department of Energy and the Department of Labor, and the Contractor or subcontractor will permit such representatives to interview employees during working hours on the job.



Department of Energy
Washington, DC 20585

ASSISTANT SECRETARY OF ENERGY
FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY

MEMORANDUM OF DECISION

SUBJECT: Determination of inapplicability (nationwide limited waiver in the public interest) of section 1605 of the Recovery Act of 2009 (the Buy American provision) to EERE-funded projects for incidental items that comprise in total a *de minimis* amount of the total cost of the iron, steel, and manufactured goods used in a project; that is, any such incidental items up to a limit of no more than 5 percent of the total cost of the iron, steel, and manufactured goods used in and incorporated into a project.

Under the authority of the Recovery Act, section 1605(b)(1), the head of a Federal department or agency may issue a “determination of inapplicability” (a waiver of the Buy American provisions) if the application of the restrictions of section 1605 would be inconsistent with the public interest. On November 10, 2009, the Secretary of Energy delegated the authority to make all inapplicability determinations to the Assistant Secretary for Energy Efficiency and Renewable Energy, for EERE Recovery Act projects.

Pursuant to this delegation, the Assistant Secretary, EERE, has determined that application of section 1605 restrictions would be inconsistent with the public interest for incidental items that comprise in total a *de minimis* amount of the total cost of the iron, steel and manufactured goods used in the project; that is, any such incidental items up to a limit of no more than 5 percent of the total cost of the iron, steel, and manufactured goods used in and incorporated into a project.

Recovery Act projects funded by EERE typically involve the use of literally thousands of miscellaneous, generally low-cost items that are essential for, but incidental to, the construction, alteration, maintenance or repair of a public building or public work and are incorporated into the physical structure of the project, such as nuts, bolts, wires, cables, and switches. For many of these incidental items, the country of manufacture and the availability of alternatives are not always readily or reasonably identifiable in the normal course of business. More importantly, the miscellaneous character of these items, together with their low cost (both individually and when procured in bulk), characterize them as incidental to the project.

Requiring individual waivers for incidental items would be time prohibitive and overly burdensome for both applicants and for EERE. Therefore, a nationwide limited *de minimis* waiver of incidental items up to a limit of no more than 5 percent of the total

cost of the iron, steel, and manufactured goods used in and incorporated into a project is justified in the public interest.

Issuance of this nationwide limited waiver recognizes EERE's commitment to expeditious costing of Recovery Act dollars, by balancing the need for expeditious and efficient implementation of the Recovery Act while still applying the Buy American provisions for materials that are greater than a *de minimis* part of the projects.

In light of the foregoing, and under the authority of section 1605(b)(1) of the Public Law 111-5 and Redesignation Order 00-002-01C, dated November 10, 2009, with respect to Recovery Act projects funded by EERE, I hereby issue a "determination of inapplicability" (a waiver under the Recovery Act Buy American provisions) for incidental items that comprise in total a *de minimis* amount of the project; that is, any such incidental items up to a limit of no more than 5 percent of the total cost of the iron, steel, and manufactured goods used in and incorporated into a project.



Cathy Zoi
Assistant Secretary for Energy Efficiency and Renewable Energy
U.S. Department of Energy

May 24, 2010



Department of Energy
Washington, DC 20585

ASSISTANT SECRETARY OF ENERGY
FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY

MEMORANDUM OF DECISION

SUBJECT: Amended determination of inapplicability (nationwide limited waiver in the public interest) of section 1605 of the Recovery Act of 2009 (the Buy American provision) to EERE-funded projects for incidental and/or ancillary solar Photovoltaic (PV) equipment, when this equipment is utilized in solar installations containing domestically manufactured PV cells or modules (panels).

Under the authority of the Recovery Act, section 1605(b)(1), the head of a Federal department or agency may issue a “determination of inapplicability” (a waiver of the Buy American provisions) if the application of section 1605 would be inconsistent with the public interest. On November 10, 2009, the Secretary of Energy delegated the authority to make all inapplicability determinations to the Assistant Secretary for Energy Efficiency and Renewable Energy, for EERE Recovery Act projects.

Pursuant to this delegation, the Assistant Secretary has determined that application of section 1605 restrictions would be inconsistent with the public interest for incidental and/or ancillary solar Photovoltaic (PV) equipment, when this equipment is utilized in solar installations containing domestically manufactured PV cells or modules (panels).

This amended determination clarifies and supersedes the solar public interest waiver issued on August 6, 2010. Specifically, this amended public interest determination clarifies that thin-film and flexible PV installations are also subject to the terms of this waiver.

This amended public interest determination waives the Buy American requirements in EERE-funded Recovery Act projects for the purchase of the following solar PV equipment: 1) Domestically-manufactured modules containing foreign-manufactured cells, 2) Foreign-manufactured modules, when completely comprised of domestically-manufactured cells, and 3) Any ancillary items and equipment (including, but not limited to, charge controllers, combiners and disconnect boxes, breakers and fuses, racks, trackers, lugs, wires, cables and all otherwise incidental equipment with the exception of inverters and batteries) when utilized in a solar installation involving a U.S. manufactured

PV module, or a module manufactured abroad but comprised exclusively of domestically-manufactured cells. This waiver expires February 6, 2011 (six months from the date of the original waiver issuance). Recipients of EERE Recovery Act funds who have taken substantial steps to commit funds for the purchase of the items covered in this waiver by February 6, 2011 will not be impacted by the expiration of this waiver.

Definitions - Solar *cells* are the basic building block of PV technologies. The cells are functional semiconductors, made by processing and treating crystalline silicon or other photo-sensitive materials to create a layered product that generates electricity by absorbing light photons. The individual cells are cut and/or assembled into larger groups known as *panels* or *modules*. These two terms are synonymous and used interchangeably in this memorandum. The panel is the end product, and consists of a series of solar cells, a backing surface, and a covering to protect the cells from weather and other types of damage. A solar *array* is created by installing multiple modules in the same location to increase the electrical generating capacity. Operational solar PV modules and arrays use cells to capture and transfer solar-generated electricity. The solar modules and cells represent the highest intellectual content and dollar-value items associated with solar PV energy generation.

The Buy American provisions contain no requirement with regard to the origin of components or subcomponents in manufactured goods used in a project, as long as the manufacturing occurs in the United States [(2 CFR 176.70(a)(2)(ii)]. However, determining where final manufacturing occurs in the context of the solar production chain is complicated. Under a plain reading of the Recovery Act Buy American provisions, only the PV modules would need to be manufactured in the United States, but the source of the component parts – including the high-value cells – would not be relevant to complying with the Buy American requirements.

EERE and the National Renewable Energy Laboratory have conducted extensive research into the nature of the domestic solar manufacturing industry to determine the best way to apply the Buy American requirements to solar PV projects. EERE considered three basic options: (1) follow the current interpretation of the Buy American provisions and require that only the modules be produced in the United States, irrespective of the origin of the cells contained in the modules; (2) apply the interpretation that the modules and cells are distinct manufactured goods and thus both must be produced in the United States; and (3) choose a more inclusive approach that allows a solar installation to comply if either the cells *or* the modules are manufactured in the United States.

Of the options considered, only option (3) recognizes EERE's determination that the manufacturing process for cells and the final PV module production represent distinct and significant stages in the solar PV manufacturing chain. Conducting either of these discrete activities in the United States creates roughly equal numbers of American jobs. Furthermore, the design and manufacture of the cells captures the largest portion of the intellectual property present in a solar installation.

For all the reasons outlined above, EERE believes the public interest is best served by supporting the domestic cell manufacturing industry. It is therefore in the public interest to issue a waiver of the Recovery Act Buy American provisions that allows grantees to purchase foreign modules made with domestically-manufactured cells, in addition to domestic modules with foreign-produced cells.

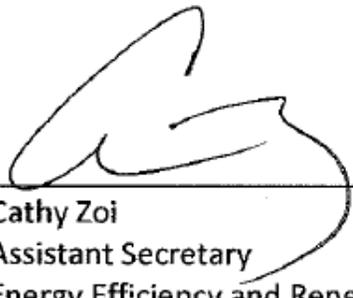
Because EERE believes strongly in strengthening the domestic PV manufacturing supply chain in the United States, EERE is limiting the duration of this waiver to six months from the date it was originally issued, with the expectation that there will be an increase in the number of companies that produce solar PV modules in the United States containing domestically-manufactured cells.

This amended public interest waiver determination also resolves questions regarding the applicability of the Buy American provisions to numerous individual manufactured goods that are incidental in cost and technological significance but are ultimately incorporated into the final solar installation. These items, including, but not limited to, charge controllers, combiners and disconnect boxes, breakers and fuses, racks, trackers, lugs, wires, and cables—but excluding inverters and batteries—are generally low-cost incidental items that are incorporated into the installation of PV modules and arrays on public buildings and public works. This public interest waiver for all incidental and ancillary items eliminates potential questions and ambiguities concerning whether the incidental items are final manufactured goods or merely components of a larger solar module, installation or array.

Issuance of this nationwide public interest waiver recognizes EERE's commitment to expeditious costing of Recovery Act dollars by enabling recipients to easily ascertain whether a given solar installation complies with the Buy American provision. Simultaneously, this waiver advances the purpose and the principles of the Buy American provision by focusing on the highest-value and most labor-intensive pieces of solar PV equipment.

In light of the foregoing, and under the authority of section 1605(b)(1) of Public Law 111-5 and Redesignation Order 00-002-01C, dated November 10, 2009, with respect to Recovery Act projects funded by EERE, the Assistant Secretary hereby issues an amended "determination of inapplicability" (a waiver under the Recovery Act Buy American provisions) for the following items: 1) Domestically-manufactured modules containing foreign-manufactured cells, 2) Foreign-manufactured modules, when completely comprised of domestically-manufactured cells, and 3) Any ancillary items and equipment (including, but not limited to, charge controllers, combiners and disconnect boxes, breakers and fuses, racks, trackers, lugs, wires, cables and all otherwise incidental equipment with the exception of inverters and batteries) when utilized in a solar installation involving a U.S. manufactured PV module, or a module manufactured abroad but comprised exclusively of domestically-manufactured cells. This waiver expires February 6, 2011 (six months from the date of the original waiver issuance). Recipients of EERE Recovery Act funds who have taken substantial steps to commit

funds for the purchase of the items covered in this waiver by February 6, 2011 will not be impacted by the expiration of this waiver. Furthermore, the Assistant Secretary reserves the right to revisit and amend this determination based on new information or new developments.



Cathy Zoi
Assistant Secretary
Energy Efficiency and Renewable Energy
U.S. Department of Energy

Date: _____

7/30/10

DIVISION 1 - GENERAL REQUIREMENTS

Section 01 1000	Summary of Work
ARRA Documents	a. Attachment 2: Federal Flow Down Requirements
	b. Attachment 3: Federal Assurances
	c. Final Davis Bacon Act (DBA) Clauses as Approved by the Department of Labor (DOL) for Use in Financial Assistance Programs other than Weatherization Assistance Programs and Loan Programs - November 6, 2009
	d. Energy Efficiency and Renewable Energy Buy American De Minimis Public Interest Waiver
Section 01 1900	Definitions and Standards
Section 01 2300	Alternates
Section 01 2600	Contract Modification Procedures
Section 01 2900	Payment Procedures
Section 01 3100	Project Management and Coordination
Section 01 3300	Submittals
Section 01 4000	Quality Control Services
Section 01 5000	Temporary Facilities and Controls
Section 01 6000	Product Requirements
Section 01 7300	Execution Requirements
Section 01 7419	Construction Waste Management and Disposal
Section 01 7700	Closeout Procedures
Section 01 7800	Operation and Maintenance Data
Section 01 7810	Project Record Documents
Section 01 7900	Demonstration and Training

SECTION 01 1000
SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Requirements of **DIVISION 0 - BIDDING REQUIREMENTS** and **DIVISION 1 - GENERAL REQUIREMENTS** apply to **every section** contained in the Project Manual, and shall govern the execution of Work required by the Contract Documents.
- B. Provide everything necessary for and incidental to proper and satisfactory completion of all Work specified and indicated or shown in the Contract Documents.
- C. The Project consists of the construction of **four free-standing solar arrays** at Unified State Labs. A fifth array shall be bid as an additive alternate.

1.2 PROJECT LOCATION

- A. New solar arrays will be located at Unified State Laboratories, 4431 South 2700 West, Taylorsville, Utah, in the south parking lot.

1.3 SEPARATE CONTRACTS

- A. **The Owner may enter into separate contracts for construction.** Each contractor shall be responsible to coordinate efforts with other trade contractors to ensure timely completion of the work.
- B. **Coordinate the Work** of this contract with the work of separate contractors to ensure timely completion of the work.

1.4 CODES

- A. **Law of place of building governs.** Conform to applicable requirements of the latest editions of the **International Building Code**, International **Building Code Standards**, International **Mechanical Code**, International **Plumbing Code**, National **Electrical Code**, **National Fire Protection Association** requirements, local ordinances, and **OSHA** requirements applicable to this project, unless a higher standard is called for, without additional cost to the Owner.
- B. **Comply with CABO/ANSI A117.1**, American National Standard, "**Accessible and Usable Buildings and Facilities**" latest edition which is in force for the project location, for handicapped accessibility.

1.5 CONTRACTOR USE OF PREMISES

- A. **General:** During the construction period the Contractor shall have use of the premises for construction operations, including:
 - 1. The Contractor's use of the premises is limited only by the **Owner's right** to perform work or to **retain other contractors** on portions of the Project

- B. **Use of the Site:** Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
1. **Driveways and Entrances:** Keep driveways and entrances serving the premises clear and available to emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
 2. **Do not unreasonably encumber the site** with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary obtain and pay for such storage off-site.
 3. **Lock automotive type vehicles** such as passenger cars and trucks and other types of mechanized and motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

1.6 DUST CONTROL

- A. **The Contractor** shall be responsible to provide continuous (7 days per week, 24 hours per day) fugitive dust control measures within the limits of the construction site, related sites and adjacent streets and roads. Dust control shall be provided for, but not be specifically limited to, the stabilization of unpaved roads, haul roads, access roads, spoil sites, borrow and material sources, excavations, embankments, stockpiles, and all other areas which become potential sources of dust as a result of construction activities.
- B. **Contractor's dust control measures** shall maintain compliance with the **General Utah Air Pollution Regulations**, R446 - Utah Air Conservation Regulations, Section 4.5, Fugitive Emissions, applicable County Air Pollution Control Ordinances, and as directed by the Architect. Dust control measures shall include but not be limited to the following:
1. **Wetting of surfaces** with water as appropriate.
 2. **Minimizing surface disturbances.**
- C. **In order to control fugitive dust emissions**, Contractor shall apply the following procedures and techniques:
1. **Cover loads of materials**, debris and waste materials taken from construction sites as needed to suppress dust during transit.
 2. **Water down** or apply other approved dust control measures to the construction site, haul roads and public access roads as needed to suppress dust.
 3. **All mud and dirt shall be removed** from vehicles prior to entering a paved or graveled area or road. Any mud or dirt that is carried out onto paved or graveled surfaces shall be removed from surfaces immediately and no less than daily.
- D. **Biobased content:**
1. **Dust Suppressants:** Products formulated to reduce or eliminate the spread of dust associated with gravel roads, dirt parking lots, or similar sources of dust, including products used in equivalent indoor applications. Provide minimum 85% biobased content.

1.7 INCIDENTAL WORK

- A. **Any work**, materials or equipment that **may reasonably be inferred** from the **Contract Documents** as being required to produce the intended result shall be supplied by the Contractor at no additional cost to the owner whether or not specifically called for in the Contract Documents.

1.8 MISCELLANEOUS PROVISIONS

- A. As noted on the Drawings and in the Contract for Construction.
- B. **Project is funded by the American Recovery and Reinvestment Act (ARRA)** and is subject to its provisions. See DFCM website: <http://dfcm.utah.gov/StdDocs/index.html>, ARRA Documents, for full text of provisions. For Contractor's convenience, copies of the documents are also attached to this project manual. Failure of a document to be included does not limit the Contractor's responsibility to comply with all relevant provisions of ARRA, federal regulations, and State of Utah requirements.
- C. Contractor shall certify compliance with:
 - 1. 10 CFR 600, "the Common Rule" and OMB Circulars A-128 and A-87.
 - 2. Regulations regarding legal authority to apply for grant.
 - 3. Title VI of the Civil Rights Act of 1964 and 10 CFR Part 1040.
 - 4. Provisions of the Uniform Relocation and Assistance and Real Property Acquisitions Act of 1970.
 - 5. Hatch Act
 - 6. Fair Labor Standards.
 - 7. Safeguards against conflicts of interest.
 - 8. Provisions for access to records by the grantor agency or the Controller General.
 - 9. The EPA List of Violating Facilities.
 - 10. Flood insurance provisions of Section 102(a) of the Flood Disaster Protection Act of 1973.
 - 11. Assistance with compliance with Section 106 of National Historic Preservation Act of 1966 as amended and the Archeological and Historic Preservation Act of 1966.
 - 12. Furnishing of documentation that neither the Contractor nor any principals are subject to disbarment or suspension.
 - 13. Provisions pursuant to the Clean Air Act of 1970 and the Federal Water Pollution Control Act as amended.
 - 14. Furnishing of documentation verifying that no federally appropriated funds have been used to lobby a member of the Federal Government and disclosing if non-Federal funds have been used for lobbying purposes.
 - 15. Provisions of the Privacy Act of 1974.
 - 16. Per Section 1605, "*None of the funds appropriated or otherwise made available.... may be used for a project for the construction, alteration, maintenance, or repair of a public building or public work unless all of the iron, steel, and manufactured goods used in the project are produced in the United States*".
 - a. Form to be submitted by Contractor for Owner's documentation is provided with Division 1 Section "Submittals".
 - b. Refer to ARRA document "Energy Efficiency and Renewable Energy Buy American Ed Minimis Public Interest Waiver" for exceptions to the Buy American provisions.

17. Davis Bacon Act as outlined in "Final Davis Bacon Act (DBA) Clauses as Approved by the Department of Labor (DOL) for Use in Financial Assistance Programs Other Than Weatherization Assistance Programs and Loan Programs, November 6, 2009, a copy of which is included in this section.
 - a. Current wage determinations are located at <http://www.wdol.gov/dba.aspx>.
 - b. Contractors shall be responsible for verifying most current wage rates.
 - c. Contractors and subcontractors are required to pay covered workers weekly and submit weekly certified payroll records to the contracting agency. They are also required to post the applicable Davis-Bacon wage determinations with the Davis-Bacon poster (WH-1321) on the job site in a prominent and accessible place where they can be easily seen by covered workers.

PART 2 - PRODUCTS

2.1 NOT APPLICABLE

PART 3 - EXECUTION

3.1 NOT APPLICABLE

END OF SECTION

SECTION 01 1900

DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. **Definitions:** Basic Contract definitions are included in the General Conditions.
1. **Directed:** Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by the Architect", "requested by the Architect", and similar phrases. However, no implied meaning shall be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.
 2. **Approve:** The term "approved," where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the duties and responsibilities of the Architect as stated in General and Supplementary Conditions. Such approval shall not release the Contractor from responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.
 3. **Furnish:** The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."
 4. **Install:** The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."
 5. **Provide:** The term "provide" means "to furnish and install, complete and ready for the intended use."
 6. **Protect:** Except as otherwise defined in greater detail, the term "protect" is used to describe the process of shielding from harm existing fixtures, elements or materials.
- B. **Specification Format and Conventions:**
1. **Specification Format:** The Specifications are organized into Divisions and Sections using the 33 division format and CSI/CSC's "MasterFormat" numbering system.
 - a. **Section Identification:** The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
 2. **Specification Content:** The Specifications use certain conventions for style of language and the intended meaning of terms, words, and phrases when used in particular situations. These conventions are as follows.
 - a. **Abbreviated Language:** Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

- b. **Imperative mood** and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - 1) The words "shall", "shall be", or "shall comply with", depending on the context, are implied where a colon (:) is used within a sentence or phrase.

C. **Drawing Symbols:**

- 1. **Graphic symbols:** Where not otherwise noted, symbols are defined by "**Architectural Graphic Standards**", published by John Wiley & Sons, Inc., latest edition.
 - a. **Mechanical/Electrical Drawings:** Graphic symbols used on mechanical and electrical Drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, they are supplemented by more specific symbols recommended by technical associations including ASME, ASPE, IEEE, and similar organizations. Refer instances of uncertainty to the Architect for clarification before proceeding.

D. **Industry Standards:**

- 1. **Applicability of Standards:** Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference. Individual Sections indicate which codes and standards the Contractor must keep available at the Project Site for reference.
- 2. **Publication Dates:** Where the date of issue of a referenced standard is not specified, comply with the standard in effect as of date of Contract Documents.
- 3. **Conflicting Requirements:** Where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Architect for a decision before proceeding.
- 4. **Copies of Standards:** Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - a. **Where copies of standards are needed** for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.
 - b. **Although copies of standards needed** for enforcement of requirements also may, be included as part of required submittals, the Architect reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.

- E. **Abbreviations and Names:** Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision.
1. **A copy** of the **CSI** directory of **Construction Industry Associations, Societies, and Institutes**, and Abbreviations is on file in the office of the Architect.

END OF SECTION

SECTION 01 2300

ALTERNATES

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. **Alternate:** An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
- B. **The cost or credit** for each alternate is the **net addition to or deduction from the Contract Sum** to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. **Coordination:** Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
- B. **Include as part of each alternate,** miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- C. **Notification:** Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- D. **Execution of Work:** Execute accepted alternates under the same conditions as other work of the Contract.
- E. **Schedule:** A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS

2.1 (NOT USED)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

ADDITIVE ALTERNATE NO. 1

Provide lightweight, self-ballasting tubular solar array system on roof. Refer to Division 26 Section "Solar Photovoltaic Systems".

ADDITIVE ALTERNATE NO. 2

Provide one additional photovoltaic array as shown on Drawings. Refer to Division 26 Section "Solar Photovoltaic Systems".

END OF SECTION

SECTION 01 2600

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. **Related Sections include the following:**
 - 1. **Division 1 Section "Product Requirements"** for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. **Architect will issue supplemental instructions** authorizing **Minor Changes** in the Work, **not involving** adjustment to the **Contract Sum** or the **Contract Time**, on forms issued by the **Architect** or the **Owner**.

1.4 PROPOSAL REQUESTS

- A. **Owner-Initiated Proposal Requests:** Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. **Proposal Requests** issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. **Within time specified** in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. **Include a list of quantities** of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. **Indicate applicable taxes**, delivery charges, equipment rental, and amounts of trade discounts.
 - c. **Include an updated Contractor's Construction Schedule** that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- B. **Contractor-Initiated Proposals:** If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to the Architect.
1. **Include a statement outlining reasons** for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. **Include a list of quantities of products** required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. **Indicate applicable taxes**, delivery charges, equipment rental, and amounts of trade discounts.
 4. **Include an updated Contractor's Construction Schedule** that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 5. **Comply** with requirements in **Division 1** Section "**Product Requirements**" if the proposed change requires substitution of one product or system for product or system specified.
- C. **Proposal Request Form:** Use forms issued by the **Architect** or the **Owner**.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

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

PART 2 - PRODUCTS

2.1 (NOT USED)

PART 3 - EXECUTION

3.1 (NOT USED)

END OF SECTION

SECTION 01 2900

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This **Section specifies** administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. **Related Sections** include the following:
 - 1. **Division 1 Section "Contract Modification Procedures"** for administrative procedures for handling changes to the Contract.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. **Coordination:** Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. **Correlate line items** in the Schedule of Values with other required administrative forms and schedules, including the following:
 - 2. **Application for Payment** forms with Continuation Sheets.
 - a. Submit applications for payment on DFCM forms (<http://dfcm.utah.gov/StdDocs/index.html>, items 8 and 9).
 - 3. **Submittals Schedule.**
 - 4. **Submit the Schedule of Values to Architect** at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 - 5. **Sub-schedules:** Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- B. **Format and Content:** Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. **Identification:** Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
2. **Arrange the Schedule of Values** in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. **Provide a breakdown** of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. **Round amounts** to nearest whole dollar; total shall equal the Contract Sum.
5. **Provide a separate line item** in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. **Differentiate** between items **stored on-site** and items **stored off-site**. Include evidence of insurance or bonded warehousing if required.
6. **Provide separate line items** in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. **Each item** in the Schedule of Values and Applications for Payment **shall be complete**. Include total cost and proportionate share of general overhead and profit for each item.
 - a. **Temporary facilities** and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
8. **Schedule Updating:** Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. **General:** Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. **Payment Application Times:** The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
 1. **Original certified Davis Bacon payroll records shall be submitted weekly.**

- C. **Payment Application Forms:** Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. **Application Preparation:** Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
1. **Entries shall match data on the Schedule of Values** and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. **Include amounts of Change Orders** and Construction Change Directives issued before last day of construction period covered by application.
- E. **Transmittal:** Submit **3 signed and notarized original copies** of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. **Buy American Certificates:** With each Application for Payment, submit "Buy American" certificates in accordance with requirements of American Recovery and Reinvestment Act of 2009 , the Trade Agreements Act (19 U.S.C. § 2501–2581), and the Buy American Act and Buy American Law.
- G. **Waivers of Mechanic's Lien:** With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. **Submit partial waivers** on each item for amount requested, before deduction for retainage, on each item.
 2. **When an application shows** completion of an item, submit final or full waivers.
 3. **Owner reserves the right** to designate which entities involved in the Work must submit waivers.
 4. **Waiver Delays:** Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
 - a. **Submit final Application for Payment** with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. **Waiver Forms:** Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. **Initial Application for Payment:** Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products list.
 5. Schedule of unit prices.
 6. Submittals Schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.

10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.
 16. Initial settlement survey and damage report if required.
- I. **Application for Payment at Substantial Completion:** After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. **Include documentation** supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. **This application shall reflect Certificates of Partial Substantial Completion** issued previously for Owner occupancy of designated portions of the Work.
- J. **Final Payment Application:** Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. **Evidence of completion** of Project closeout requirements.
 2. **Insurance certificates** for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. **Updated final statement**, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "**Contractor's Affidavit of Payment of Debts and Claims.**"
 5. AIA Document G706A, "**Contractor's Affidavit of Release of Liens.**"
 6. AIA Document G707, "**Consent of Surety to Final Payment.**"
 7. **Evidence** that claims have been settled.
 8. **Final meter readings for utilities**, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. **Final, liquidated damages** settlement statement.

PART 2 - PRODUCTS

2.1 (NOT USED)

PART 3 - EXECUTION

3.1 (NOT USED)

END OF SECTION

SECTION 01 3100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. **This Section includes** administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
1. General project coordination procedures.
 2. Conservation.
 3. Coordination Drawings.
 4. Administrative and supervisory personnel.
 5. Project meetings.
- B. **Each contractor shall participate in coordination requirements.** Certain areas of responsibility will be assigned to a specific contractor.
- C. **Related Sections:** The following Sections contain requirements that relate to this Section:
1. **Division 1 Section "Execution Requirements"** for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 2. **Division 1 Section "Submittals"** for procedures for coordinating electronic submittals.
 3. **Division 1 Section "Closeout Procedures"** for coordinating Contract closeout.

1.3 COORDINATION

- A. **Coordination:** Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
1. **Schedule construction** operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. **Coordinate installation** of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 3. **Make adequate provisions** to accommodate items scheduled for later installation.
- B. **Memoranda:** If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

- C. **Administrative Procedures:** Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
 2. Preparation of the Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
- D. **Administrative Software requirements:** The General Contractor shall create a project specific, web-based project processing software site for receiving and distributing all project related information (i.e. Submittals, RFI's, ASI's, Addenda, Construction documents, Project logs, Field reports, and Meeting minutes) using ATTOLIST (www.attolist.com or 877-442-3713) or an equal product that provides the following functionality:
1. FTP functions for secure, encrypted data storage for all project related information for control, transparency and information access for the Contractor, Design Team and Owner.
 2. The FTP site shall be used for processing and delivering Construction Administration, Document Management and Project Management functions.
 3. It shall include log functions for dating and tracking all project related documents.
 4. It shall include Automated notifications for document postings, due dates, document availability dates, and progress warnings for reviewers.
 5. The Contractor must still review all documents and add their stamp and comments directly to the PDF's.
 6. The General Contractor shall employ a PDF review software system such as Blue Beam (www.bluebeam.com) or another similar system for producing, formatting, and marking-up project related documents. The General Contractor shall review all the documents and adds their stamp and comments directly to the PDF prior to posting for the Design team to review.
 7. Include Administrative Software and ftp site cost in overhead and fees within the contract bid at no additional cost to the Owner.
 8. General Contractor shall provide to the Architect and Owner, an electronic archive of all data at the end of the project via DVD(s) for final project records.
- E. Contractor is to keep a **printed record** of all Construction Documents including all clarifications, RFI's and approved changes to the Contract **on site**.
- F. **Conservation:** Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.4 SUBMITTALS

- A. **Coordination Drawings:** Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. **Indicate relationship of components** shown on separate Shop Drawings.
 2. Indicate required installation sequences.
 3. **Refer to Division 26** Sections for specific Coordination Drawing requirements for mechanical and electrical installations.
- B. **Staff Names:** Within **5 business days** of starting construction operations, submit a list of **principal staff assignments**, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of **individuals assigned as standbys** in the absence of individuals assigned to Project.
1. **Post copies** of list in Project meeting room, in temporary field office, and by each temporary telephone.
- C. **Submittal Log:** See section 'Submittals' for electronic delivery and record keeping.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. **General:** In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
1. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

- A. **General:** Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. **Attendees:** Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. **Agenda:** Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. **Minutes:** Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within [3] days of the meeting.
- B. **Preconstruction Conference:** Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than [15] days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. **Attendees:** Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. **Agenda:** Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing.
 - d. Designation of responsible personnel.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for processing Applications for Payment.
 - g. Distribution of the Contract Documents.
 - h. Submittal procedures.
 - i. Preparation of Record Documents.
 - j. Use of the premises.
 - k. Responsibility for temporary facilities and controls.
 - l. Parking availability.
 - m. Office, work, and storage areas.
 - n. Equipment deliveries and priorities.
 - o. First aid.
 - p. Security.
 - q. Progress cleaning.
 - r. Working hours.

C. **Progress Meetings:** Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.

1. **Attendees:** In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. **Agenda:** Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. **Contractor's Construction Schedule:** Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. **Review present and future needs** of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 - 14) Documentation of information for payment requests.

3. **Reporting:** Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 - a. **Schedule Updating:** Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.7 REQUESTS FOR INFORMATION (RFI)

- A. **Procedure:** Immediately on discovery of the need for interpretation of Contract Document, and if not possible to request interpretation at Project meeting, prepare and submit an **RFI** in the form specified.
 1. Requests for information shall originate with **Contractor**. RFI's submitted by entities **other than Contractor** will be **returned with no response**.
 2. **Coordinate** and submit RFI's in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

- B. **Content of the RFI:** Include a detailed, legible description of item needing interpretation and the following:
 1. Project **name**.
 2. **Date**.
 3. Name of **Contractor**.
 4. Name of **Architect** and **Owner**.
 5. **RFI number**, numbered sequentially.
 6. **Specification Section** number and title and related paragraphs, as appropriate.
 7. **Drawing number** and detail references, as appropriate.
 8. **Field dimensions** and conditions, as appropriate.
 9. **Contractor's suggested solution(s)**. If Contractor's solution(s) impact the Contractor Time or the Contract Sum, Contractor shall state impact in the RFI.
 10. **Contractor's** signature.
 11. **Attachments:** Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. **Supplementary drawings** prepared by Contractor shall include dimensions, thickness, structural grid references, and details of affected materials, assemblies, and attachments.

- C. **Hard-Copy RFI's:** Use the **form supplied** by the **Architect** or the **Owner**.
 1. **Identify** each page of attachments with the RFI number and sequential page number.
 2. **Attachments** shall be electronic files in **Adobe Acrobat PDF** format.

- D. **Electronic RFI's:**
 1. RFI's shall be **processed and delivered electronically** through web-based RFI processing software with sequential numbers.

- E. **Architect's Action:** Architect will review each RFI, determine action required, and return it. Allow **seven working days** for Architect's response for each RFI. RFI's received after **1:00 p.m.** will be considered as received the following working day.
1. **The following RFI's** will be returned **without action**:
 - a. Requests for **approval of submittals**.
 - b. Request for **approval of substitutions**.
 - c. Requests for **coordination information** already indicated in the Contract Documents.
 - d. Request for **adjustments in the Contract Time or Contract Sum**.
 - e. Requests for **interpretation of Architect's actions** on submittals.
 - f. **Incomplete RFI's** or RFI with numerous errors.
 2. **Architect's action** may include a **request for additional information**, in which case Architect's Time for response will start again.
 3. **Architect's action** on RFI that may result a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. **If Contractor believes** the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Owner in writing within **10 calendar days** of receipt of the RFI response.
- F. **On receipt of Architect's Owner's action**, update the RFI log and immediately distribute the RFI response to the affected parties. Review response and notify Architect and Owner within **seven calendar days** if Contractor disagrees with response.
- G. **RFI Log:** Prepare, maintain, and submit a tabular log of RFI's organized by RFI number. submit log monthly.
1. **Project** name.
 2. Name and address of **Contractor**.
 3. Name and address of **Architect** and **Owner**.
 4. **RFI number** including RFI's that were dropped and not submitted.
 5. **RFI description**.
 6. **Date** the RFI was submitted.
 7. **Date** Architect's and Owner's **response** was received.
 8. **Identification of related Minor Change** in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 9. **Identification of related Field Order**, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS

2.1 (NOT USED)

PART 3 - EXECUTION

3.1 (NOT USED)

END OF SECTION

SECTION 01 3300

SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

- A. **This Section specifies** administrative and procedural requirements for submittals required for performance of the Work, including:
1. Contractor's construction schedule.
 2. Daily construction reports.
 3. Shop Drawings.
 4. Product Data.
 5. Samples.
 6. Deferred Submittals for review by the Building Code Official.
 7. Certifications of American manufacture of iron, steel and manufactured goods (except as specifically excluded).
- B. **Administrative Submittals:** Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
1. Applications for payment.
 2. Performance and payment bonds.
 3. Insurance certificates.
 4. List of Subcontractors.
- C. **Inspection and test reports** are included in Section "Quality Control Services."
- D. **Related Documents:** Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.
1. **Division 1 - Project Management:** Electronic web-based construction administration software.

1.2 ELECTRONIC SUBMITTAL DELIVERY

- A. To minimize printing reimbursables, shipping reimbursables and the impact on the environment, submittals shall be processed and delivered electronically through a web-based submittal processing system.
- B. The Construction Manager, Contractor or Subcontractor shall originate submittals via the designated web-based submittal system. The Construction Manager or Contractor must first review and approve all submittals sent by Subcontractors prior to sending to design team. Include Contractor's certification that information complies with Contract Document requirements, record deviations from Contract Document requirements, including minor variations and limitations. Submittals uploaded by subcontractors shall not be visible to the Design team until the submittal becomes official and forwarded from the Construction Manager or Contractor to the Design team via the system with a transmittal.
- C. Submittals must follow the requirements outlined in this specification and as required in individual specification sections.

- D. The following types of submittals shall be delivered to the design team electronically in pdf format:
1. Product Data
 2. Shop Drawings
 3. Certifications
 4. ARRA Required Product Data
 5. Test Data
 6. Schedules
 7. Calculations
 8. Mix Designs
 9. Warranty Information
- E. **Samples And Color Selection**
1. All samples/color selections shall be delivered by mail or courier to the design team for review.
 2. Samples and color selection shall not be reviewed electronically.
 3. See separate specification sections for quantities and sample selection process. The design team shall return review comments via the web-based submittal processing system.
- F. **Submittal Stamps**
1. The Contractor or Construction Manager shall affix an electronic stamp to PDF submittals.
- G. **Submittal Logs**
1. The design and construction team shall collectively maintain the submittal log through web-based submittal processing software.
 2. It is not required that the Contractor maintain a separate submittal log between the Subcontractors and Contractor.
 3. Construction team shall make a reasonable effort to deliver all submittals electronically via web-based submittal processing software. Submittals shall not be delivered by email.
 4. Samples shall be logged in via web-based processing software, but delivered hardcopy by mail

1.3 SUBMITTAL PROCEDURES

- A. **No submittal will be accepted** by the Architect without the **General Contractor's action stamp**, clearly visible, indicating that the submittal has been fully reviewed by the General Contractor for compliance to the Construction Documents.
- B. Submittals with the General Contractors stamp but **not in compliance with the Construction Documents will be deemed incomplete** and returned without review. These will not be shown as received.
- C. **Coordination:** Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
1. **Coordinate transmittal** of different types of submittals for **related elements** of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. **The Architect reserves the right to withhold action** on a submittal requiring **coordination with other submittals** until related submittals are received.

- D. **Processing Time:** Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.
1. **Initial Review:** Allow **15 business days** for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. **Concurrent Review:** Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow **20 business days** for initial review of each submittal.
 3. **Differed Submittal Review:** Where differed submittals are required by the Building Code Official allow review time as dictated by the Official.
 4. **If intermediate submittal** is necessary, process it in same manner as initial submittal.
 5. **Allow 15 business days** for processing each resubmittal.
 6. **No extension of the Contract Time** will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- E. **Submittal Preparation:** Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. **Include the following information** on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of **Architect**.
 - d. Name and address of **Contractor**.
 - e. Name and address of **Subcontractor**.
 - f. Name and address of **Supplier**.
 - g. Name of **Manufacturer**.
- F. **Submittal Transmittal:** Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.
1. **On the form**, or separate sheet, record **deviations** from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
- G. **Submittal requirements for electronic PDF submittals:**
1. All submittals shall be created with native PDF files whenever possible. Do not print a PDF file, and scan in as an image file, as this will delete all file search functions typically embedded within a native PDF file.
 2. All PDF submittals shall be broken down by individual specification section. Do not collate multiple specification sections together into one non-separated submittal package (i.e. carpet, VCT, rubber base, and entry mats; though frequently provided by one installer, shall not be submitted as one non-separated package unless formatted as described below.)
 3. All PDF submittals that cover multiple items within one specification section, or PDF submittals that include multiple related specification sections shall have an index and be formatted with electronic book marks to distinguish various components from one another, and make each item easily retrievable without navigating through each page of an entire submittal.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. **Bar-Chart Schedule:** Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule.
1. **Provide a separate time bar** for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".
 2. **Within each time bar** indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
 3. **Prepare the schedule** on a sheet of sufficient width to show data for the entire construction period.
 4. **Secure time commitments** for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
 5. **Coordinate the Contractor's construction schedule** with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.
 6. **Indicate completion** in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.
- B. **Distribution:** Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
1. **When revisions are made**, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. **Schedule Updating:** Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.5 DAILY CONSTRUCTION REPORTS

- A. **Daily Construction Report:** Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Architect at weekly intervals:
1. List of subcontractors at the site.
 2. Approximate count of personnel at the site.
 3. High and low temperatures, general weather conditions.
 4. Accidents and unusual events.
 5. Meetings and significant decisions.
 6. Stoppages, delays, shortages, losses.
 7. Meter readings and similar recordings.
 8. Orders and requests of governing authorities.
 9. Change Orders received, implemented.
 10. Services connected, disconnected.

- B. **Material Location Reports:** At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. **Field Condition Reports:** Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

1.6 SPECIAL REPORTS

- A. **General:** Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. **Reporting Unusual Events:** When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1.7 SHOP DRAWINGS

- A. **Submit in timely manner to complete project, but no later than 90 days** after Notice of Award.
 - 1. A fee of \$100.00 will be charged by the Owner, per submittal for all submittals past this date.
- B. **Submit newly prepared information**, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings.
- C. **Shop Drawings** include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
 - 1. Dimensions.
 - 2. Identification of products and materials included.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
- D. **Sheet Size:** Submit Shop Drawings, layout drawings and other **Revit or CADD** style sheets formatted for 24" x 36" or 30" x 42" sheets. Details and drawings are to match or exceed construction bid document scales. **All drawings are to be submitted to scale.** All other product brochures and cut sheets can be provided in an 8-1/2x11 format.
- E. **Final Electronic Submittal:** Submit 2 prints, one for the Architect and one for the Owner at the end of the project or as requested by the parties during construction.
 - 1. If submittal was reviewed by members of the design team other than the Architect, provide an additional copy of the submittal for each design firm.
 - 2. The prints shall be marked-up and maintained as a **"Record Document"**.

- F. **Final Submittal:** Submit 5 prints. 2 prints will be retained; the remainder will be returned.
1. One of the prints returned shall be marked-up and maintained as a "**Record Document**".
 2. **Do not use Shop Drawings** without an appropriate final stamp indicating action taken in connection with construction.

1.8 DEFERRED SUBMITTALS

- A. Some building elements are specified to be designed under the direction of the supplier or subcontractors. See the General Information sheet on the drawings for a list of required deferred submittals.
- B. All deferred submittals are to be submitted on same size sheet as original drawings (30 x 42 or 8 1/2 x 11). Drawings and calculations shall be on the Design professionals titleblock stating the project name and all other items specified under 'Submittal Preparation' above.
- C. Deferred submittals shall be submitted to the Architect who will disperse three copies to the Building Code Official for review as required by the IBC.
- D. Contractor shall include these submittal sheets in the Record Documents.

1.9 BUY AMERICAN CERTIFICATION

- A. In accordance with Section 1605 for the American Recovery and Reinvestment Act of 2009, **all iron, steel, and manufactured goods** (except where specifically exempted) shall be **of American manufacture**.
- B. **Submit form indicating product origin, place of manufacture, and cost** for each applicable project component.

1.10 PRODUCT DATA

- A. **Submit in timely manner to complete project**, but no later than **90 days** after Notice of Award.
- B. **Collect Product Data into a single submittal** for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

1. **Mark each copy to show applicable choices and options.** Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with recognized trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 2. **Include all pertinent ARRA product data.**
- C. **Do not submit Product Data** until compliance with requirements of the Contract Documents has been confirmed.
- D. **Submittals:** Submit 4 copies of each required submittal; submit 6 copies where required for maintenance manuals. The Architect will retain one, and will return the other marked with action taken and corrections or modifications required.
- E. **Electronic Submittals:** Submit a pdf copy of each required submittal; include copies where required for maintenance manuals. See electronic submittal delivery and submittal procedures for further requirements

1.11 SAMPLES

- A. **Submit in timely manner** to complete project, but no later than **90 days** after Notice of Award.
- B. **Samples:** Submit full-size, fully fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.
- C. **Submittals:** Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.
 1. **Maintain sets of Samples**, as returned, at the Project site, for quality comparisons throughout the course of construction.

1.12 CONTRACTOR'S REVIEW

- A. **Contractor's Review:** Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. **Approval Stamp:** Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- C. **Submittals not marked** with an approval stamp and those not in compliance with the Construction Documents shall be returned without further review. It is the Contractor's responsibility to review submittals for compliance prior to forwarding the submittal to the Design Team for review.

1.13 ARCHITECT'S ACTION

- A. **Architect's Action:** Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.
 - 1. Compliance with specified characteristics is the Contractor's responsibility.

- B. **Action Stamp:** The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked to indicate the action taken.
 - 1. **Corrections or comments made on the shop drawings** during this review **do not relieve the Contractor from compliance with requirements of the drawings and specifications.** This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for; confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

PART 2 - PRODUCTS

2.1 (NOT USED)

PART 3 - EXECUTION

3.1 (NOT USED)

END OF SECTION

SECTION 01 4000

QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. **This Section specifies administrative and procedural** requirements for quality control services.
- B. **Quality control services include inspections and tests** and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Architect.
- C. **Inspection and testing services are required** to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
 - 1. **Specific quality control requirements** for individual construction activities are specified in the Sections that specify those activities.
 - 2. **Inspections, test and related actions** specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
- D. **Requirements for the Contractor** to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- E. **Related Documents:** Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 RESPONSIBILITIES

- A. **Contractor Responsibilities:**
 - 1. **Unless otherwise indicated** as the responsibility of another identified entity, **Contractor shall provide inspections, tests, and other quality-control services** specified elsewhere in the Contract Documents and required by authorities having jurisdiction. **Costs** for these services shall be **included in the Contract Sum**.
 - a. **Where individual Sections** specifically indicate that certain inspections, tests, and other quality-control services are the **Contractor's responsibility**, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.
 - b. **Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility**, the Owner will employ and pay a qualified independent testing agency to perform those services.
 - 2. **Retesting:** The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

3. **Cost of Retesting:** Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.
 4. **Associated Services:** The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
 - a. **Providing access to the Work** and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
 - b. **Taking adequate quantities** of representative samples of materials that require testing or assisting the agency in taking samples.
 - c. **Providing facilities for storage** and curing of test samples, and delivery of samples to testing laboratories.
 - d. **Security and protection** of samples and test equipment at the Project site.
- B. **Owner Responsibilities:** The Owner will provide inspections, tests and similar quality control services **specified to be performed by independent agencies and not by the Contractor, except** where they are **specifically indicated as the Contractor's responsibility** or are provided by another **identified entity**. **Costs** for these services are **not included** in the Contract Sum.
1. **The Owner will employ and pay** for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility.
- C. **Duties of the Testing Agency:** The independent testing agency engaged to perform inspections, sampling and testing of materials and construction **specified in individual Specification Sections** shall cooperate with the Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.
1. **The agency shall notify the Architect and Contractor** promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. **The agency is not authorized** to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
 3. The agency shall not perform any duties of the Contractor.
- D. **Coordination:** The **Contractor** and **each agency** engaged to perform inspections, tests and similar services **shall coordinate** the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. **The Contractor is responsible for scheduling times** for inspections, tests, taking samples and similar activities.

1.3 SUBMITTALS

- A. **The independent testing agency** shall submit a certified written report of each inspection, test or similar service, to the Architect, in duplicate
1. **Submit additional copies** of each written report directly to the governing authority, when the authority so directs.
 2. **Report Data:** Written reports of each inspection, test or similar service shall include, but not be limited to:
 - a. Date of issue.
 - b. Project title and number.

- c. Name, address and telephone number of testing agency.
- d. Dates and locations of samples and tests or inspections.
- e. Names of individuals making the inspection or test.
- f. Designation of the Work and test method.
- g. Identification of product and Specification Section.
- h. Complete inspection or test data.
- i. Test results and an interpretation of test results.
- j. Ambient conditions at the time of sample-taking and testing.
- k. Name and signature of laboratory inspector.
- l. Recommendations on retesting.

1.4 QUALITY ASSURANCE

- A. **Qualification for Service Agencies:** Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.
 - 1. **Each independent inspection and testing agency** engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

PART 2 - PRODUCTS

2.1 (NOT USED)

PART 3 - EXECUTION

3.1 TESTS REQUIRED

- A. **Tests required may include** but not be limited to the following (all items listed here may not occur, see drawings and associated section of the specifications):
 - 1. **Soil Report** per **IBC 2009, 1803.6** and testing per **1806.5.8.** of compacted fill during construction.
 - 2. **Special Inspections** per **IBC 2009, Section 1704** including fabricators.
 - a. **Welding** per **1704.3** and **Table 1704.3.**
 - b. **High strength bolts** per **1704.3.3** and **Table 1704.3.**
 - c. **Concrete** per **1704.4** and **Table 1704.4.**
 - d. **Soils** per **1704.7** and **Table 1704.7.**
- B. **It is recommended** that the contractor arrange for soils compaction and any other soils-related testing to be performed by or through the same firm that provided the initial soils investigation data. **A copy** of the **soils investigation data** is included with the project manual or **if not included** may be obtained from the **Architect's Office** upon request. The soils investigation is included for reference only.

3.2 REPAIR AND PROTECTION

- A. **General:** Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.

1. **Protect construction** exposed by or for quality control service activities, and protect repaired construction.
2. **Repair and protection is the Contractor's responsibility**, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION

SECTION 01 5050

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section specifies administrative and procedural requirements for temporary services and facilities, including such items as temporary utility services, temporary construction and support facilities, and project security and protection.
- B. Temporary construction and support facilities required for the project include but are not limited to the following:
 - 1. Sanitary facilities, including drinking water.
 - 2. Hoists.
 - 3. First aid station.
 - 4. Waste disposal services.
 - 5. Construction aids and miscellaneous general services and facilities.
- C. Security and protection facilities and services required for the project include but are not limited to the following:
 - 1. Temporary fire protection.
 - 2. Barricades, warning signs, lights.
 - 3. Enclosure fence for stored material.
 - 4. Environmental protection.

1.2 QUALITY ASSURANCE

- A. **Regulations:** Comply with requirements of local laws and regulations governing construction and local industry standards, in the installation and maintenance of temporary services and facilities, including but not limited to the following:
 - 1. Building codes, including requirements for permits, testing and inspection.
 - 2. Health and safety regulations.
 - 3. Utility company regulations and recommendations governing temporary utility services.
 - 4. Environmental protection regulations governing use of water and energy, and the control of dust, noise and other nuisances.
- B. **Standards:** Comply with the requirements of NFPA Code 241, "Building Construction and Demolition Operations", and ANSI A-10 Series standards for "Safety Requirements for Construction and Demolition", and the NECA National Joint Guideline NJG-6 "Temporary Job Utilities and Services."
- C. Refer to to the most current "**Guidelines for Bid Conditions for Temporary Job Utilities and Services**", as prepared jointly by AGC and ASC industry recommendations.

1.3 JOB CONDITIONS

- A. **General:** Provide each temporary service and facility ready for use at each location when the service or facility is first needed to avoid delay in the performance of the work. Maintain, expand as required and modify temporary services and facilities as needed throughout the progress of the Work. Do not remove until services or facilities are no longer needed, or are replaced by the authorized use of completed permanent facilities.
- B. **Conditions of Use:** Operate temporary services and facilities in a safe and efficient manner. Do not overload temporary services or facilities, and do not permit them to interfere with the progress of the work. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.
 - 1. **Temporary Construction and Support Facilities:** Maintain temporary facilities in such a manner as to prevent discomfort to users. Take necessary fire prevention measures. Maintain temporary support facilities in a sanitary manner so as to avoid health problems and other deleterious effects.
 - 2. **Security and Protection:** Maintain site security and protection facilities in a safe, lawful and publicly acceptable manner. Take necessary measures to prevent erosion of the site.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. **General:** Provide new materials and equipment for temporary services and facilities, used materials and equipment that are undamaged and in serviceable condition may be used, if acceptable to the Architect.
- B. **Temporary Construction and Support Facilities:** Provide facilities that can be maintained properly throughout their use at the project site.
- C. **Temporary Offices and Similar Construction:** For temporary offices, fabrication shops, storage sheds and similar construction, provide either standard prefabricated or mobile units or the equivalent job-built construction.
 - 1. **Self-contained Toilet Units:** Provide single-occupant self-contained toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar non-absorbent material.
 - 2. **Tarpaulins:** Provide waterproof, fire-resistant, UL labeled tarpaulins with a flame-spread rating of 15 or less.
 - 3. **First Aid Supplies:** Comply with governing regulations and recognized recommendations within the construction industry.
 - 4. **Drinking Water:** Provide potable water approved by local health authorities.
 - 5. **Sign Materials:** For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thicknesses indicated. Provide exterior grade acrylic-latex-base enamel for painting panels and applying graphics.

- D. **Fire Extinguishers:** Provide type "A" fire extinguishers for temporary offices and similar spaces where there is a minimal danger of electrical or grease-oil-flammable liquid fires. In other locations provide type "ABC" dry chemical extinguishers, or a combination of several extinguishers of NFPA recommended types for the exposures in each case.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. **General:** Use qualified tradesmen for installation of temporary services and facilities. Locate temporary services and facilities where they will serve the entire project adequately and result in minimum interference with the performance of the Work.
1. Relocate, modify and extend services and facilities as required during the course of work so as to accommodate the entire work of the project.

3.2 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. **General:** Provide a reasonably neat and uniform appearance in temporary construction and support facilities acceptable to the Architect/Engineer and the Owner.
1. Locate field offices, storage and fabrication sheds and other support facilities for easy access to the Work. Position offices so that windows give the best possible view of construction activities.
 2. Maintain field offices, storage and fabrication sheds, temporary sanitary facilities, waste collection and disposal systems, and project identification and temporary signs until near substantial completion. Immediately prior to substantial completion remove these facilities.
- B. **Sanitary Facilities:** Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with governing regulations including safety and health codes for the type, number, location, operation and maintenance of fixtures and facilities; provide not less than specified requirements. Install in locations that will best serve the project's needs.
1. Sanitary facilities located within the existing facility will not be permitted to be used by the Contractor.
- C. **Hoists:** Provide adequate facilities for hoisting materials and employees. Do not permit employees to ride hoists which comply only with requirements for hoisting materials. The Contractor is responsible for selection of type, size, and number of facilities. Truck cranes and similar devices used for hoisting are considered as being "tools and equipment" and not temporary facilities.
- D. **Collection and Disposal of Wastes:**
1. Establish a system for daily collection and disposal of waste or extraneous materials from all construction areas on site that may present a hazard to the project, its craftsmen and the expeditious construction of the work. The Contractor shall provide to the Owner a satisfactory method to assure clean-up is performed in a timely and expeditious fashion. Enforce requirements strictly. Do not hold collected materials at the site longer than 1 day. Handle waste materials that are hazardous, dangerous, or unsanitary separately from other inert waste by containerizing appropriately. Dispose of waste material in a lawful manner.

- a. Burying or burning of waste materials on the site will not be permitted.
 - b. Washing waste materials down sewers or into waterways will not be permitted.
 - c. Provide rodent proof containers located on each floor level of construction work, to encourage depositing of lunch garbage and similar wastes by construction personnel.
 - 2. The Owner reserves the right to withhold payments and perform the clean-up, if necessary, at the expense of the Contractor, if unsatisfactory clean-up efforts are not performed in a timely fashion.
- E. **Construction Aids and Miscellaneous Services and Facilities:**
- 1. Design, construct, and maintain construction aids and miscellaneous general services and facilities as needed to accommodate performance of the work. Construction aids and miscellaneous general services and facilities include, but or not limited to the following:
 - a. Temporary stairs and ladders.
 - b. Guardrails and barriers.
 - 2. Stairs: Provide temporary stairs where ladders are not adequate for performance of work.
 - 3. Guardrails and Barriers: Provide guardrails at all unprotected edges of floor and roof openings, and at perimeter of roof and unenclosed floors.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. **General:** Provide a reasonably neat and uniform appearance to security and protection facilities acceptable to the Architect/Engineer and the Owner.
- B. **Temporary Fire Protection:**
 - 1. Install and maintain temporary fire protection facilities of the types needed to adequately protect against reasonably predictable and controllable fire losses. Comply with applicable recommendations of the NFPA Standard 10 "Standard for Portable Fire Extinguishers". Locate fire extinguishers where they are most convenient and effective for their intended purpose. Store combustible materials in containers in recognized fire-safe locations.
 - 2. Develop and supervise an overall fire prevention and first-aid fire protection program for personnel at the project site. Review needs with the local fire department officials and establish procedures to be followed. Instruct personnel in methods and procedures to be followed. Post warnings and information and enforce strict discipline. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking of any kind on school property. Provide supervision of welding operations, and similar sources of ignition for possible fires.
- C. **Security Enclosure and Lockups:**
 - 1. Install general temporary enclosure of partially completed areas of construction. Provide locking entrances adequate to deter unauthorized entrance, vandalism, theft and similar deleterious effects of violations of project security.
 - 2. Storage: Where materials and equipment must be temporarily stored, prior to and during construction, and are of substantial value or are attractive for possible theft, provide a secure lockup and enforce strict discipline in connection with the timing of installation and release of materials, so that the opportunity for theft and vandalism is minimized.

- D. **General Environmental Protection:** Provide general protection facilities, operate temporary facilities, conduct construction activities, and enforce strict discipline for personnel on the site in ways and by methods that comply with environmental regulations, and that minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result from the performance of work at the site. Avoid the use of tools and equipment which produce harmful noise. Restrict the use of noise making tools and equipment to hours of use that will minimize noise complaints from persons and firms near the project site.

3.4 OPERATION, TERMINATION AND REMOVAL

- A. **Supervision:** Enforce strict discipline in use of temporary services and facilities at the site. Limit availability of temporary services and facilities to essential and intended uses to minimize waste and abuse. Do not permit temporary installations to be abused or endangered. Do not allow hazardous, dangerous or unsanitary conditions to develop or persist on the project site.
- B. **Maintenance:** Operate and maintain temporary services and facilities in good operating condition throughout the time of use and until removal is authorized. Protect from damage by freezing temperatures and similar elements.
- C. **Termination and Removal:** Unless the Architect requests that it be maintained for a longer period of time, remove each temporary service and facility promptly when the need for it or a substantial portion of it has ended, or when it has been replaced by the authorized use of a permanent facility, or no later than substantial completion. Complete, or, if necessary, restore permanent work which may have been delayed because of interference with the temporary service or facility. Repair damaged work, clean exposed surfaces and replace work which cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary services and facilities and remain the property of the Contractor.

END OF SECTION

SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. **This Section includes** the following administrative and procedural requirements: selection of products for use in Project; **product delivery, storage, and handling**; manufacturers' **standard warranties** on products; **special warranties**; **product substitutions**; and **comparable products**.
- B. **Related Sections** include the following:
1. **Division 1 Section "Summary"** for documents related to the American Recovery and Reinvestment Act of 2009 (ARRA).
 2. **Division 1 Section "Definitions and Standards"** for applicable industry standards for products specified.
 3. **Division 1 Section "Payment Procedures"** for documentation to be submitted with payment applications related to the ARRA.
 4. **Division 1 Section "Closeout Procedures"** for submitting warranties for contract closeout.
 5. Divisions 2 through 33 **Sections** for specific requirements for **warranties** on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. **Products:** Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
1. **Named Products:** Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 2. **New Products:** Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products. Only new products are allowed to be used unless directed by the Architect in writing.
 3. **Comparable Product:** Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. **Substitutions:** Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

- C. **Basis-of-Design Product Specification:** Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.
1. Ensure that **all products meet ARRA product requirements, including the "Buy American"** provision.
- D. **Manufacturer's Warranty:** Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. **Special Warranty:** Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

- A. **Product List:** Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
1. **Coordination:** Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 2. **Form:** Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 3. **Initial Submittal:** Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - a. **At Contractor's option,** initial submittal may be limited to product selections and designations that must be established early in Contract period.
 4. **Completed List:** Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 5. **Architect's Action:** Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.

- B. **Substitution Requests:** Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. **Substitution Request Form:** Use **CSI Form 13.1A** or equivalent.
 2. **Documentation:** Show compliance with requirements for substitutions and the following, as applicable:
 - a. **Statement** indicating why specified material or product cannot be provided.
 - b. **Coordination information**, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. **Detailed comparison** of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. **Product Data**, including drawings and descriptions of products and fabrication and installation procedures.
 - e. **Samples**, where applicable or requested.
 - f. **List of similar installations** for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. **Material test reports** from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. **Research/evaluation reports** evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. **Detailed comparison** of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. **Cost information**, including a proposal of change, if any, in the Contract Sum.
 - k. **Contractor's certification** that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. **Contractor's waiver of rights** to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 3. **Architect's Action:** If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution **within 15 business days** of receipt of request, or **7 business days** of receipt of additional information or documentation, whichever is later.
 - a. **Form of Acceptance:** Change Order.
 - b. **Use product specified** if Architect cannot make a decision on use of a proposed substitution within time allocated.
- C. **Basis-of-Design Product Specification Submittal:** Comply with requirements in **Division 1 Section "Submittal Procedures."** Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. **Compatibility of Options:** If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
1. **Each contractor is responsible** for providing products and construction methods compatible with products and construction methods of other contractors.
 2. **If a dispute arises** between contractors over concurrently selectable but incompatible products, **Architect will determine** which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. **Deliver, store, and handle products** using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
1. **Schedule delivery** to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. **Coordinate delivery** with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. **Deliver products to Project site** in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. **Inspect products** on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 5. **Store products** to allow for inspection and measurement of quantity or counting of units.
 6. **Store materials** in a manner that will not endanger Project structure.
 7. **Store products** that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 8. **Comply with product manufacturer's written instructions** for temperature, humidity, ventilation, and weather-protection requirements for storage.
 9. **Protect stored products** from damage.

1.7 PRODUCT WARRANTIES

- A. **General:** Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. **Special Warranties:** Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. **Manufacturer's Standard Form:** Modified to include Project-specific information and properly executed.
 2. Refer to **Divisions 2 through 16 Sections** for specific content requirements and particular requirements for submitting special warranties.
- C. **Submittal Time:** Comply with requirements in **Division 1 Section "Closeout Procedures."**

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

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

7. **Product Options:** Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
 8. **Basis-of-Design Products:** Where Specification paragraphs or subparagraphs titled "**Basis-of-Design Products**" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "**Comparable Products**" Article to obtain approval for use of an unnamed product.
 - a. **Substitutions** may be considered, unless otherwise indicated.
 9. **Visual Matching Specification:** Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
 - a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.
 10. **Visual Selection Specification:** Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
 - a. **Standard Range:** Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - b. **Full Range:** Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
- C. **Buy American:** Use of American Iron, Steel, and Manufactured Goods ("Buy American"): No more than 5 percent (by cost) of iron, steel, and manufactured goods shall be produced or manufactured outside the United States.
1. See documents following Section 01 1000 "Summary" and as posted on DFCM website for additional information.
 2. For projects funded by Energy Efficiency and Renewable Energy (EERE) Recovery Act, solar photovoltaic equipment is not subject to Buy American provisions when fabricated of domestically-manufactured PV cells assembled in foreign-produced modules or when modules are fabricated in the United States using foreign-produced cells. Refer to item 25.5 at DFCM Standard Documents website and documents following Section 01 1000 "Summary".

2.2 PRODUCT SUBSTITUTIONS

- A. **Timing:** Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

- B. **Conditions:** Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
1. Requested substitution offers Owner a **substantial advantage** in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 2. Requested substitution **does not require extensive revisions** to the Contract Documents.
 3. Requested substitution is **consistent** with the **Contract Documents** and will produce indicated results.
 4. Substitution request is **fully documented** and properly submitted.
 5. Requested substitution will **not adversely affect** Contractor's **Construction Schedule**.
 6. Requested substitution has received **necessary approvals** of **authorities having jurisdiction**.
 7. Requested substitution is **compatible** with other portions of the Work.
 8. Requested substitution has been **coordinated** with other portions of the Work.
 9. Requested substitution provides **specified warranty**.
 10. If requested substitution involves **more than one contractor**, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

- A. **Where products** or manufacturers are **specified by name**, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
1. **Evidence** that the proposed product **does not require extensive revisions** to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. **Detailed comparison** of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. **Evidence** that proposed product provides **specified warranty**.
 4. **List of similar installations** for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. **Samples**, if requested.

PART 3 - EXECUTION

3.1 (NOT USED)

END OF SECTION

SECTION 01 7300

EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. **This Section includes** general procedural requirements governing **execution of the Work** including, but not limited to, the following:
1. Construction layout.
 2. Field engineering and surveying.
 3. General installation of products.
 4. Progress cleaning.
 5. Starting and adjusting.
 6. Protection of installed construction.
 7. Correction of the Work.
- B. **Related Sections** include the following:
1. **Division 1 Section "Project Management and Coordination"** for procedures for coordinating field engineering with other construction activities.
 2. **Division 1 Section "Submittals"** for administrative submittals and also product and procedural submittals.
 3. **Division 1 Section "Cutting and Patching"** for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
 4. **Division 1 Section "Closeout Procedures"** for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

- A. **Qualification Data:** For land surveyor/professional engineer to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. **Certificates:** Submit certificate signed by land surveyor/professional engineer certifying that location and elevation of improvements comply with requirements.
- C. **Landfill Receipts:** Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. **Certified Surveys:** Submit two copies signed by land surveyor/professional engineer.
- E. **Final Property Survey:** Submit three copies and an electronic copy in pdf format showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

- A. **Land Surveyor Qualifications:** A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS

2.1 (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. **Existing Utility Interruptions:** Do not interrupt utilities serving facilities occupied unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. **Notify Architect and Owner** not less than **two business days** in advance of proposed utility interruptions.
 - 2. **Do not proceed** with **utility interruptions** without Architect's and Owner's written permission.

- B. **Field Measurements:** Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. **Space Requirements:** Verify space requirements and dimensions of items shown diagrammatically on Drawings.

- D. **Review of Contract Documents and Field Conditions:** Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. **Verification:** Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

- B. **General:** Engage a land surveyor/professional engineer to lay out the Work using accepted surveying practices.
 - 1. **Establish benchmarks** and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. **Establish dimensions** within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. **Inform installers** of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. **Notify Architect** when deviations from required lines and levels exceed allowable tolerances.
 - 6. **Close site surveys** with an error of closure equal to or less than the standard established by authorities having jurisdiction.

- C. **Site Improvements:** Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

- D. **Building Lines and Levels:** Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

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

3.4 FIELD ENGINEERING

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

3.5 INSTALLATION

- A. **General:** Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. **Make vertical work plumb** and make horizontal work level.

2. **Where space is limited**, install components to maximize space available for maintenance and ease of removal for replacement.
 3. **Conceal pipes**, ducts, and wiring in finished areas, unless otherwise indicated.
 4. **Maintain minimum headroom clearance** as indicated in spaces without a suspended ceiling.
- B. **Comply with manufacturer's written instructions** and recommendations for installing products in applications indicated.
- C. **Install products** at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. **Conduct construction operations** so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. **Tools and Equipment:** Do not use tools or equipment that produce harmful noise levels.
- F. **Anchors and Fasteners:** Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
1. **Mounting Heights:** Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. **Allow for building movement**, including thermal expansion and contraction.
- G. **Joints:** Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- H. **Hazardous Materials:** Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

- A. **General:** Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
1. **Comply** with requirements in **NFPA 241** for removal of combustible waste materials and debris.
 2. **Do not hold materials** more than **7 days** during normal weather or **3 days** if the temperature is expected to rise above 80 deg F (27 deg C).
 3. **Containerize hazardous and unsanitary waste materials** separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. **Site:** Maintain Project site free of waste materials and debris.
- C. **Work Areas:** Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

- D. **Installed Work:** Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. **Concealed Spaces:** Remove debris from concealed spaces before enclosing the space.
- F. **Exposed Surfaces:** Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. **Cutting and Patching:** Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
 - 1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- H. **Waste Disposal:** Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. **Protection:** During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- J. **Maintenance:** Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure smooth operation without damaging effects.
- K. **Limiting Exposures:** Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 DUST CONTROL

- A. **The Contractor** shall be responsible to provide continuous (7 days per week, 24 hours per day) fugitive dust control measures within the limits of the construction site, related sites and adjacent streets and roads. Dust control shall be provided for, but not be specifically limited to, the stabilization of unpaved roads, haul roads, access roads, spoil sites, borrow and material sources, excavations, embankments, stockpiles, and all other areas which become potential sources of dust as a result of construction activities.
- B. **Contractor's dust control measures** shall maintain compliance with the **General Utah Air Pollution Regulations**, R446 - Utah Air Conservation Regulations, Section 4.5, Fugitive Emissions, applicable County Air Pollution Control Ordinances, and as directed by the Architect. Dust control measures shall include but not be limited to the following:
 - 1. **Wetting of surfaces** with water as appropriate.
 - 2. **Minimizing surface disturbances.**

- C. **In order to control fugitive dust emissions**, Contractor shall apply the following procedures and techniques:
 - 1. **Cover loads of materials**, debris and waste materials taken from construction sites as needed to suppress dust during transit.
 - 2. **Water down** or apply other approved dust control measures to the construction site, haul roads and public access roads as needed to suppress dust.
 - 3. **All mud and dirt shall be removed** from vehicles prior to entering a paved or graveled area or road. Any mud or dirt that is carried out onto paved or graveled surfaces shall be removed from surfaces immediately and no less than daily.

3.8 STARTING AND ADJUSTING

- A. **Start equipment** and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. **Adjust operating components** for proper operation without binding. Adjust equipment for proper operation.
- C. **Test each piece** of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. **Manufacturer's Field Service:** If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

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

3.10 CORRECTION OF THE WORK

- A. **Repair or remove** and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
 - 1. **Repairing includes** replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. **Restore permanent facilities** used during construction to their specified condition.
- C. **Remove and replace damaged surfaces** that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. **Repair components** that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. **Remove and replace** chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. 75% of waste shall be diverted from the landfill by weight, of potential landfill trash/waste by recycling and/or salvage.
- E. Contractor shall submit a Waste Disposal Report at the completion of the project; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- F. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- G. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2 DEFINITIONS

- A. **Clean:** Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. **Construction and Demolition Waste:** Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. **Hazardous:** Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. **Nonhazardous:** Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

- E. **Nontoxic:** Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. **Recyclable:** The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. **Recycle:** To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. **Recycling:** The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. **Return:** To give back reusable items or unused products to vendors for credit.
- J. **Reuse:** To reuse a construction waste material in some manner on the project site.
- K. **Salvage:** To remove a waste material from the project site to another site for resale or reuse by others.
- L. **Sediment:** Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. **Source Separation:** The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. **Toxic:** Poisonous to humans either immediately or after a long period of exposure.
- O. **Trash:** Any product or material unable to be reused, returned, recycled, or salvaged.
- P. **Waste:** Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.3 SUBMITTALS

- A. See **Section 01 3300** - Submittals, for submittal procedures.
- B. **Submit Waste Management** prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.
- C. **Waste Management Plan:** Include the following information:
 1. **Analysis of the trash** and waste projected to be generated during the entire project construction cycle, including types and quantities.
 2. **Landfill Options:** The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).

3. **Landfill Alternatives:** List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the local market for each material.
 - c. State the estimated net cost, versus landfill disposal.
 4. **Meetings:** Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 5. **Materials Handling Procedures:** Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 6. **Transportation:** Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
- D. **Waste Disposal Reports:** Submit at the completion of the project, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
1. **Submit Report** on a form acceptable to Owner.
 2. **Landfill Disposal:** Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 3. **Incinerator Disposal:** Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project delivered to incinerators.
 - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 4. **Recycled and Salvaged Materials:** Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
 5. **Material Reused on Project:** Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards (cubic meters).
 - c. Include weight tickets as evidence of quantity.
 6. **Other Disposal Methods:** Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. **Manager:** Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. **Communication:** Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. **Instruction:** Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. **Meetings:** Discuss trash/waste management goals and issues at project meetings.
 - 1. Regular job-site meetings.
 - 2. Job safety meetings.
- E. **Facilities:** Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. **As a minimum, provide:**
 - a. **Separate area for storage** of materials to be reused on-site, such as wood cut-offs for blocking.
 - b. **Separate dumpsters** for each category of recyclable.
 - c. **Recycling bins** at worker lunch area.
 - 2. Provide containers as required.
 - 3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
 - 4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
 - 5. Locate enclosures out of the way of construction traffic.
 - 6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 7. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. **Hazardous Wastes:** Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. **Recycling:** Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

- H. **Reuse of Materials On-Site:** Set aside, sort, and protect separated products in preparation for reuse.
- I. **Salvage:** Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 7700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. **This Section includes** administrative and procedural requirements for contract closeout, including, but not limited to, the following:
1. Inspection procedures.
 2. Project Record Documents.
 3. Operation and maintenance manuals.
 4. Warranties.
 5. Instruction of Owner's personnel.
 6. Final cleaning.
- B. **Related Sections** include the following:
1. **Division 1 Section "Payment Procedures"** for requirements for Applications for Payment for Substantial and Final Completion.
 2. **Division 1 Section "Execution Requirements"** for progress cleaning of Project site.
 3. **Division 1 Section "Operation and Maintenance Data"** for operation and maintenance manual requirements.
 4. **Divisions 2 through 33 Sections** for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. **Preliminary Procedures:** Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
1. **Prepare a list of items** to be completed and corrected (**punch list**), the value of items on the list, and reasons why the Work is not complete.
 2. **Advise Owner** of pending insurance changeover requirements.
 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. **Obtain and submit releases** permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 5. **Prepare and submit Project Record Documents**, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 6. **Deliver tools, spare parts, extra materials**, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. **Make final changeover** of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 8. **Complete startup testing** of systems.
 9. **Submit test/adjust/balance** records.
 10. **Terminate and remove temporary facilities** from Project site, along with mockups, construction tools, and similar elements.
 11. **Advise Owner of changeover** in heat and other utilities.
 12. **Submit changeover information** related to Owner's occupancy, use, operation, and maintenance.
 13. **Complete final cleaning requirements**, including touchup painting.
 14. **Touch up and otherwise repair and restore** marred exposed finishes to eliminate visual defects.
- B. **Inspection:** Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. **Reinspection:** Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. **Results of completed inspection** will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

- A. **Preliminary Procedures:** Before requesting final inspection for determining date of Final Completion, complete the following:
1. **Submit a final Application for Payment** according to **Division 1** Section "**Payment Procedures.**"
 2. **Submit certified copy** of Architect's **Substantial Completion** inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. **Submit evidence** of final, **continuing insurance** coverage complying with insurance requirements.
 4. **Submit pest-control** final inspection report and warranty.
 5. **Instruct Owner's personnel** in operation, adjustment, and maintenance of products, equipment, and systems.
- B. **Inspection:** Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. **Reinspection:** Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
- C. **Additional Review Fees:** Should Architect perform more than one additional review, or extend it's construction period services more than 15 business days beyond the scheduled completion date, due to the failure of the Contractor's work to comply with the claims of status or completion made by the Contractor, Owner will compensate Architect for such additional/ extended services at the rate of \$500.00 per day. The Owner shall then deduct the amount of such compensation from the final payment to the Contractor.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. **Preparation:** Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. **Organize list of spaces in sequential order**, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. **Organize items applying to each space by major element**, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. **Include** the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

1.6 PROJECT RECORD DOCUMENTS

- A. **General:** Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
- B. **Record Drawings:** Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
1. **Mark Record Prints** to show the **actual** installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. **Give particular attention** to information on **concealed elements** that cannot be readily identified and recorded later.
 - b. **Accurately record** information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
 2. **Mark record sets with erasable**, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 3. **Mark important additional information** that was either shown schematically or omitted from original Drawings.
 4. **Note Construction Change Directive numbers**, Change Order numbers, alternate numbers, and similar identification where applicable.
 5. **Identify and date each Record Drawing**; include the designation "**PROJECT RECORD DRAWING**" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

- C. **Record Specifications:** Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. **Give particular attention to information on concealed products** and installations that cannot be readily identified and recorded later.
 2. **Mark copy with the proprietary name** and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. **Note related Change Orders**, Record Drawings, and Product Data, where applicable.
- D. **Record Product Data:** Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
1. **Give particular attention to information on concealed products** and installations that cannot be readily identified and recorded later.
 2. **Include significant changes** in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. **Note related Change Orders**, Record Drawings, and Record Specifications, where applicable.
- E. **Miscellaneous Record Submittals:** Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.7 OPERATION AND MAINTENANCE MANUALS

- A. **Assemble a complete set of operation and maintenance data** indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. **Operation Data:**
 - a. Emergency instructions and procedures.
 - b. System, subsystem, and equipment descriptions, including operating standards.
 - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - d. Description of controls and sequence of operations.
 - e. Piping diagrams.
 2. **Maintenance Data:**
 - a. Manufacturer's information, including list of spare parts.
 - b. Name, address, and telephone number of Installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.
 - h. Copies of warranties and bonds.

- B. **Organize operation and maintenance manuals** into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "**OPERATION AND MAINTENANCE MANUAL**," Project name, and subject matter of contents.

1.8 WARRANTIES

- A. **Submittal Time:** Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. **Organize warranty documents** into an orderly sequence based on the table of contents of the Project Manual.
 - 1. **Bind warranties** and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
 - 2. **Provide heavy paper dividers** with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. **Identify each binder** on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. **Provide additional copies** of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. **Cleaning Agents:** Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

- A. **Instruction:** Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Provide instructors experienced in operation and maintenance procedures.
 - 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 - 3. Schedule training with Owner, through Architect, with at least seven days' advance notice.
 - 4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

- B. **Program Structure:** Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
1. System design and operational philosophy.
 2. Review of documentation.
 3. Operations.
 4. Adjustments.
 5. Troubleshooting.
 6. Maintenance.
 7. Repair.

3.2 FINAL CLEANING

- A. **General:** Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. **Cleaning:** Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. **Complete the following** cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. **Clean Project site**, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. **Sweep paved areas** broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. **Rake grounds** that are neither planted nor paved to a smooth, even-textured surface.
 - d. **Remove tools**, construction equipment, machinery, and surplus material from Project site.
 - e. **Remove snow and ice** to provide safe access to building.
 - f. **Clean exposed exterior and interior hard-surfaced finishes** to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. **Remove debris** and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. **Clean transparent materials**, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - i. **Remove labels** that are not permanent.
 - j. **Touch up and otherwise repair and restore marred**, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) **Do not paint** over "UL" and similar labels, including mechanical and electrical nameplates.

- k. **Wipe surfaces** of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - l. **Replace parts** subject to unusual operating conditions.
 - m. **Leave Project clean** and ready for occupancy.
- C. **Pest Control:** Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. **Cleaning Standards:** Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 01 7800

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. **This Section includes** administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 1. **Operation and maintenance** documentation directory.
 2. **Emergency** manuals.
 3. **Operation manuals** for systems, subsystems, and equipment.
 4. **Maintenance manuals** for the care and maintenance of products, materials, and finishes systems and equipment.
 5. **Requirements and procedures** for operating the facility **after commissioning**.
- B. **Related Sections** include the following:
 1. **Division 1** Section "**Submittal Procedures**" for submitting copies of submittals for operation and maintenance manuals.
 2. **Division 1** Section "**Closeout Procedures**" for submitting operation and maintenance manuals.
 3. **Division 1** Section "**Project Record Documents**" for preparing Record Drawings for operation and maintenance manuals.
 4. Divisions 2 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. **System:** An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. **Subsystem:** A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. **Initial Submittal:** Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.
- B. **Final Submittal:** Submit 2 of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

1.6 QUALITY ASSURANCE

- A. Coordinate with Commissioning Sections. The Commissioning Agent shall review the Operation and Maintenance Manuals for systems that were commissioned.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. **Organization:** Include a section in the directory for each of the following:
 - 1. List of **documents**.
 - 2. List of **systems**.
 - 3. List of **equipment**.
 - 4. Table of **contents**.
- B. **List of Systems and Subsystems:** List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. **List of Equipment:** List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. **Tables of Contents:** Include a table of contents for each emergency, operation, and maintenance manual.
- E. **Identification:** In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. **Organization:** Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.

- B. **Title Page:** Enclose title page in transparent plastic sleeve. Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name, address, and telephone number of Contractor.
 6. Name and address of Architect.
 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. **Table of Contents:** List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. **Manual Contents:** Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. **Binders:** Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. **Dividers:** Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. **Protective Plastic Sleeves:** Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. **Supplementary Text:** Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
 5. **Drawings:** Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

- E. **Maintenance Inspection Requirements:** Describe inspection schedule and procedures necessary to promote durability of materials, components, and systems. Include the following:
 - 1. **Exterior:** Inspection of exterior for assessment of possible water ingress. Indicate points of potential concern.
 - 2. **Equipment:** Seasonal inspection of equipment.

- F. **Environmental Requirements:**
 - 1. Identify environmentally preferable materials and systems incorporated into the Project. Include: product model; manufacturer's name, address, phone, and website; and local technical representative, if any.
 - a. Describe maintenance procedures associated with environmentally preferable materials and systems. Provide cleaning recommendations in accordance with ASTM E1971.
 - 1) Include potential environmental impacts of recommended maintenance procedures and materials.
 - 2) Include potential indoor air quality impacts of the recommended maintenance procedures and materials.

2.3 OPERATION MANUALS

- A. **Content:** In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions.
 - 2. Performance and design criteria if Contractor is delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.
 - 9. Precautions against improper use.
 - 10. License requirements including inspection and renewal dates.

- B. **Descriptions:** Include the following:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.

- C. **Operating Procedures:** Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.

4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. **Systems and Equipment Controls:** Describe the sequence of operation, and diagram controls as installed.
- E. **Piped Systems:** Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

- A. **Content:** Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. **Source Information:** List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. **Product Information:** Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. **Maintenance Procedures:** Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. **Repair Materials and Sources:** Include lists of materials and local sources of materials and related services.
- F. **Warranties and Bonds:** Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. **Content:** For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

- B. **Source Information:** List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. **Manufacturers' Maintenance Documentation:** Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard printed maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. **Maintenance Procedures:** Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training videotape, if available.
- E. **Maintenance and Service Schedules:** Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. **Spare Parts List and Source Information:** Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. **Maintenance Service Contracts:** Include copies of maintenance agreements with name and telephone number of service agent.
- H. **Warranties and Bonds:** Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. **Operation and Maintenance Documentation Directory:** Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

- B. **Emergency Manual:** Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. **Product Maintenance Manual:** Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. **Operation and Maintenance Manuals:** Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. **Manufacturers' Data:** Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. **Drawings:** Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."
- G. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 7810

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. **This Section includes** administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record **Drawings**.
 - 2. Record **Specifications**.
 - 3. Record **Product Data**.
 - 4. Record **Submittals** as requested by the Owner.
 - 5. Record copies of **Davis Bacon payroll records** and "**Buy American certificates**".
- B. **Related Sections** include the following:
 - 1. **Division 1** Section "**Closeout Procedures**" for general closeout procedures.
 - 2. **Division 1** Section "**Operation and Maintenance Data**" for operation and maintenance manual requirements.
 - 3. Divisions 2 through 33 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. **Record Drawings:** Comply with the following:
 - 1. **Number of Copies:** Submit **one set** of marked-up Record Prints.
- B. **Record Specifications:** Submit one copy of Project's Specifications, including addenda and contract modifications.
- C. **Record Product Data:** Submit one copy of each Product Data submittal.
 - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.
- D. **Record Shop Drawings:** Provide copies of shop drawings or other submittals as requested by the Owner.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. **Record Prints:** Maintain one set of white prints of the Contract Drawings and Shop Drawings.
1. **Preparation:** Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on **concealed elements** that would be difficult to identify or measure and record later.
 - b. **Accurately record information** in an understandable drawing technique.
 - c. **Record data as soon as possible** after obtaining it. Record and check the markup before enclosing concealed installations.
 2. **Content:** Types of items requiring marking include, but are not limited to, the following:
 - a. **Dimensional changes** to Drawings.
 - b. Revisions to **details** shown on Drawings.
 - c. **Depths of foundations** below first floor.
 - d. **Locations and depths of underground utilities.**
 - e. Revisions to **routing of piping** and conduits.
 - f. Revisions to **electrical circuitry.**
 - g. **Actual equipment locations.**
 - h. **Duct size** and routing.
 - i. Locations of **concealed internal utilities.**
 - j. Changes made by **Change Order** or **Construction Change Directive.**
 - k. Changes made following **Architect's written orders.**
 - l. **Details not on the original** Contract Drawings.
 - m. **Field records** for variable and concealed conditions.
 - n. Record information on the **Work that is shown only schematically.**
 3. **Mark the Contract Drawings or Shop Drawings**, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. **Mark record sets** with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. **Mark important additional information** that was either shown schematically or omitted from original Drawings.
 6. **Note Construction Change Directive numbers**, alternate numbers, Change Order numbers, and similar identification, where applicable. Paragraph and subparagraphs below describe a procedure for assembling nearly correct reproducible Drawings. Add requirements for special printing methods on specific material, such as moisture-sensitive prints on mylar film. Delete if not required.

2.2 RECORD SPECIFICATIONS

- A. **Preparation:** Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Note related Change Orders, Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

- A. **Preparation:** Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Include Davis Bacon payroll records and Buy American certificates under separate tab in bound volume.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. **Recording:** Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. **Maintenance of Record Documents and Samples:** Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and Owner's reference during normal working hours.
1. **Maintain Davis Bacon payroll records and "Buy American" certificates** for a minimum of **3 years** following receipt of final payment.

END OF SECTION

SECTION 01 7900

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
1. **Demonstration** of operation of systems, subsystems, and equipment.
 2. **Training** in operation and maintenance of systems, subsystems, and equipment.
 3. **Administrative and procedural requirements** for instructing Owner's personnel on environmental issues associated with operation and maintenance of the facility.
 4. **Demonstration** and training **CD's**.
- B. **Related Sections** include the following:
1. **Division 1** Section "**Project Management and Coordination**" for requirements for preinstruction conferences.
 2. **Divisions 2 through 33** Sections for specific requirements for demonstration and training for products in those Sections.
- C. **Unit Price for Instruction Time:** Length of instruction time will be measured by actual time spent performing demonstration and training in required location. No payment will be made for time spent assembling educational materials, setting up, or cleaning up.
- D. **DVD:** A high-density optical disk for storing large amounts of data, especially high-resolution audio-visual material

1.3 SUBMITTALS

- A. **Instruction Program:** Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
1. At completion of training, submit two complete training manual(s) for Owner's use.
- B. **Qualification Data:** For firms and persons specified in Quality Assurance Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners and other information specified.
- C. **Attendance Record:** For each training module, submit list of participants and length of instruction time.

- D. **Evaluations:** For each participant and for each training module, submit results and documentation of performance-based test.
- E. **Demonstration and Training DVD's:** Submit two copies of digitally recorded session, converted to a DVD within seven days of end of each training module.
 - 1. **Identification:** On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Architect and Construction Manager.
 - d. Name of Contractor.
 - e. Date videotape was recorded.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - 2. **Transcript:** Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

1.4 QUALITY ASSURANCE

- A. **Instructor Qualifications:** A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
- B. **Preinstruction Conference:** Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Coordinate with commissioning requirements. Refer to Commissioning Sections.
 - 4. Review required content of instruction.
 - 5. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. **Program Structure:** Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
1. **Photovoltaic systems**, including orientation for optimal performance.
 2. **Electrical service and distribution**, including transformers, switchboards, panelboards, uninterruptible power supplies and motor controls.
 3. **Lighting equipment** and controls.
- B. **Training Modules:** Develop a learning objective and teaching outline for each module as applicable. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
1. **Basis of System Design**, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Operating standards.
 - c. Regulatory requirements.
 - d. Equipment function.
 - e. Operating characteristics.
 - f. Limiting conditions.
 - g. Performance curves.
 2. **Documentation:** Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 3. **Emergencies:** Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 4. **Operations:** Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Required sequences for electric or electronic systems.
 - l. Special operating instructions and procedures.

5. **Adjustments:** Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Economy and efficiency adjustments.
6. **Troubleshooting:** Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. **Maintenance:** Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. **Repairs:** Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. **Assemble educational materials** necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. **Engage qualified instructors** to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 1. Owner will furnish Contractor with names and positions of participants.
- B. **Scheduling:** Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 1. Schedule training with Owner, through Construction Manager, with at least 14 days' advance notice.
- C. **Evaluation:** At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- D. **Cleanup:** Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING DVD'S

- A. **General:** Engage a qualified commercial photographer to record demonstration and training DVDs. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. **DVD Format:** Provide demonstration and training in DVD format.
- C. **Recording:** Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
- D. **Narration:** Describe digitally recorded scenes by audio narration by microphone while videotape is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- E. **DVD:** Convert each videotaped session to a DVD format. If multiple topics are on the same **disc it is to be indexed** to allow searching of topics.

END OF SECTION

DIVISION 2 – EXISTING CONDITIONS

Section 02 4101
Section 02 4102

Cutting and Patching
Selective Demolition

SECTION 02 4101

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. The General Contractor is responsible to patch and repair any and all material disturbed during construction, this is to include but not limited to walls, floors, ceilings, asphalt, concrete, lawns and landscaping, roofs, etc.

1.3 DEFINITION

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

1.4 SUBMITTALS

- A. **Cutting and Patching Proposal:** Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed.
 - 1. **Architect's Approval:** Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

- A. **Structural Elements:** Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. **Operational Elements:** Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety, including but not limited to the following:
 - 1. Primary operational systems and equipment.
 - 2. Fire-protection systems.
 - 3. Communication systems.
 - 4. Electrical wiring systems.

- C. **Miscellaneous Elements:** Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 - 1. Piping, ductwork, vessels, and equipment.

- D. **Visual Requirements:** Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
 - 1. If possible, retain original Installer or fabricator to cut and patch exposed Work. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.

- E. **Cutting and Patching Conference:** Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

- A. **Existing Warranties:** Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. **General:** Comply with requirements specified in other Sections of these Specifications.

- B. **Existing Materials:** Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Examine surfaces** to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. **Compatibility:** Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. **Proceed with installation** only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. **Temporary Support:** Provide temporary support of Work to be cut.
- B. **Protection:** Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. **Adjoining Areas:** Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. **Existing Services:** Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

3.3 PERFORMANCE

- A. **General:** Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. **Cutting:** Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. **General:** use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. **Existing Finished Surfaces:** Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. **Concrete/Masonry:** Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. **Mechanical and Electrical Services:** Cut off pipe or conduit to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 5. **Patching:** Proceed with patching after construction operations requiring cutting are complete.
- C. **Patching:** Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Patch masonry with masonry units and grout that match as closely as possible the original. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - 1. **Inspection:** Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - 2. **Exposed Finishes:** Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

END OF SECTION

SECTION 02 4102

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. **This Section includes** the following:
1. **Demolition and removal** of selected **site elements**.
 2. **Repair procedures** for selective demolition operations.
- B. **Related Sections** include the following:
1. **Division 1** Section "**Cutting and Patching**" for cutting and patching procedures for selective demolition operations.
 2. **Division 31** Section "**Site Clearing**" for site clearing and removal of above- and below-grade improvements.
 3. **Electrical Sections** for demolishing, cutting, patching, or relocating electrical items.

1.3 DEFINITIONS

- A. **Deconstruction:** Disassembly of buildings for the purpose of recovering materials
- B. **Demolish:** Completely remove and legally dispose of off-site.
- C. **Existing to Remain or Retain:** Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled
- D. **Protect:** Except as otherwise defined in greater detail, the term "protect" is used to describe the process of shielding from harm existing fixtures, elements or materials.
- E. **Protect and Maintain:** To remove deteriorating corrosion, reapply protective coatings, and install protective measures such as temporary guards; to provide the least degree of intervention.
- F. **Recycle:** Recovery of demolition waste for subsequent processing in preparation for reuse.
- G. **Remove:** To detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- H. **Remove and Salvage:** To detach items from existing construction and deliver them to Owner ready for reuse.

- I. **Remove and Reinstall:** To detach items from existing construction, repair and clean them for reuse, and reinstall them where indicated.
- J. **Salvage:** Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.
- K. **Stabilize:** To apply measures designed to reestablish a weather-resistant enclosure and the structural reinforcement of an item or portion of the building while maintaining the essential form as it exists at present.

1.4 MATERIALS OWNERSHIP

- A. **Historic items, relics, and similar objects** including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.5 SUBMITTALS

- A. **Qualification Data:** For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. **Proposed Dust-Control and Noise-Control Measures:** Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- C. **Schedule of items and materials to be salvaged:** Identify procedures for disassembly.
 - 1. Coordinate with Solid Waste Management Plan. Identify materials to be recycled. Identify materials to be salvaged for reuse on site and off site.
- D. **Schedule of Selective Demolition Activities:** Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Locations of temporary partitions and means of egress.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- E. **Inventory:** After selective demolition is complete, submit a list of items that have been removed and salvaged.
- F. **Pre-demolition Photographs or Videotape:** Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

- G. **Landfill Records:** Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

- A. **Demolition Firm Qualifications:** An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. **Regulatory Requirements:** Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. **Standards:** Comply with ANSI A10.6 and NFPA 241.
- D. **Pre-demolition Conference:** Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.7 PROJECT CONDITIONS

- A. **Owner will occupy portions of building** immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. **Maintain access to existing walkways**, corridors, and other adjacent occupied or used facilities.
 - 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
- C. **Owner assumes no responsibility for condition of areas** to be selectively demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. **Hazardous Materials:** It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. **Storage or sale of removed items** or materials on-site will not be permitted.

- F. **Utility Service:** Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. **Use repair materials** identical to existing materials.
 - 1. **If identical materials are unavailable** or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. **Use materials whose installed performance equals** or surpasses that of existing materials.
- B. **Comply with material and installation requirements** specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Verify** that utilities have been disconnected and capped.
- B. **Survey existing conditions** and correlate with requirements indicated to determine extent of selective demolition required.
- C. **Inventory and record** the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. **When unanticipated mechanical, electrical, or structural elements** that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. **Engage a professional engineer** to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. **Perform surveys** as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- A. **Existing Utilities:** Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. **Utility Interruption:** Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.

- C. **Provide at least 72 hours'** notice to Owner if shutdown of service is required during changeover.
- D. **Utility Requirements:** Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
- E. **Owner will arrange to shut off indicated utilities** when requested by Contractor.
- F. **If utility services are required to be removed**, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
- G. **Cut off pipe or conduit in walls** or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- H. **Utility Requirements:** Refer to Mechanical and Electrical Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

- A. **Dangerous Materials:** Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- B. **Pest Control:** Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during selective demolition operations.
- C. **Site Access and Temporary Controls:** Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. **Do not close or obstruct streets**, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
 - 2. **Erect temporary protection**, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 - 3. **Protect existing site improvements**, appurtenances, and landscaping to remain.
 - 4. **Erect a plainly visible fence** around drip line of individual trees or around perimeter drip line of groups of trees to remain.
- D. **Temporary Facilities:** Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. **Provide protection** to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. **Provide temporary weather protection**, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. **Protect walls**, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. **Cover and protect furniture**, furnishings, and equipment that have not been removed.
- E. **Temporary Enclosures:** Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. **Where heating or cooling is needed** and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
- F. **Temporary Partitions:** Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
- G. **Temporary Shoring:** Provide and maintain shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

- A. **Dust Control:** Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. **Disposal:** Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- D. **Cleaning:** Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.5 SELECTIVE DEMOLITION

- A. **General:** Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 4. Maintain adequate ventilation when using cutting torches.
 5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads.
 7. Dispose of demolished items and materials promptly.
 8. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.
- B. **Existing Facilities:** Comply with Owner's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
- C. **Existing Items to Remain:** Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- D. **Concrete:** Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- E. **Concrete Slabs-on-Grade:** Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. **General:** Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. **Burning:** Do not burn demolished materials.
- C. **Disposal:** Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION

DIVISION 3 - CONCRETE

Section 03 3000

Cast-in-Place Concrete

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. **Section includes** cast-in-place concrete, formwork, reinforcement, and accessories.
 - 1. **Cast-in-place** concrete used structurally including but not limited to:
 - a. Piers.
 - 2. **Formwork.**
 - 3. **Reinforcement.**
 - a. **Reinforcing Bars.**
 - b. **Steel Wire.**
 - c. **Welded Wire Fabric.**
- C. **Related Sections** include the following:
 - 1. **Division 0 Section "Geotechnical Data"** for soils information.

1.2 SUBMITTALS

- A. **Product Data:** Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.
- B. **Shop Drawings; Reinforcement:** Submit original shop drawings prepared by a registered Professional Engineer for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement.
- C. **Architect's review** is for general architectural applications and features only. Design of formwork for structural stability and efficiency is Contractor's responsibility.

1.3 QUALITY ASSURANCE

- A. **Codes and Standards:** Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. ACI 301 "Specifications for Structural Concrete for Buildings".
 - 2. ACI 318 "Building Code Requirements for Reinforced Concrete".
 - 3. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".
- B. **Testing Agency:** Owner will employ and pay a qualified independent testing agency to perform field quality-control testing services specified in Part 3 of this section. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

1.4 PROJECT CONDITIONS

- A. **Protection of Footings Against Freezing:** Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.
- B. **Surface Protection:** Protect adjacent finish materials against spatter during concrete placement.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Available Products:** Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
- B. **Air Entraining Admixture:**
 - 1. "Air-Mix"; Euclid Chemical Co.
 - 2. "MB-VR or MB-AE"; Master Builders.
 - 3. "Darex AEA" or "Daravair"; W.R. Grace.
- C. **Water Reducing Admixture:**
 - 1. "WRDA Hycol"; W.R. Grace.
 - 2. "Eucon WR-75"; Euclid Chemical Co.
 - 3. "Pozzolith Normal"; Master Builders.
 - 4. "Plastocrete 160"; Sika Chemical Corp.
- D. **Super Plasticizer:**
 - 1. "WRDA 19" or "Daracem"; W.R. Grace.
 - 2. "Sikament"; Sika Chemical Corp.
 - 3. "Eucon 37"; Euclid Chemical Co.
 - 4. "Rheobuild"; Master Builders.
- E. **Water Reducing Non Chloride Accelerator:**
 - 1. "Accelguard 80"; Euclid Chemical Co.
 - 2. "Pozzolith High Early"; Master Builders.
- F. **Water Reducing Non Chloride Retarder:**
 - 1. "Edoco 20006"; Edoco Technical Products.
 - 2. "Pozzolith Retarder"; Master Builders.
 - 3. "Eucon Retarder 75"; Euclid Chemical Co.
 - 4. "Daratard"; W.R. Grace.
- G. **Non-Metallic Grout:**
 - 1. "Set Grout"; Master Builders.
 - 2. "Duragrout"; L & M Const. Chemical Co.
 - 3. "Five Star Grout"; U.S. Grout Corp.
 - 4. "Non Shrink GP Grout" US Spec.

- H. **Epoxy Adhesive:**
1. **"Thiopoxy"**; W.R. Grace.
 2. **"Epoxite"**; A.C. Horn, Inc.
 3. **"Sikadur Hi-Mod"**; Sika Chemical Corp.
 4. **"Euco Epoxy 452 or 620"**; Euclid Chemical Co.
 5. **"Patch and Bond Epoxy"**; The Burke Co.
 6. **"Maxibond 2500"**, US Spec.
 7. Hilti **Hit RE 500**.
 8. Simpson **Set-XP**.

2.2 MATERIALS

- A. **Forms:**
1. **Forms for Exposed Finish Concrete:** Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
 - a. **Overlaid plywood** complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form", Class I.
 - b. **Plywood** complying with U.S. Product Standard **PS-1 "B-B** (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
 - c. **Concrete Pier Forms:** Equal to **Sonotube Finish Free Concrete Forms** with Duraglas Coating.
 - 1) **Description:** Multiple layers of 100 percent recycled paperboard, spirally wound, and laminated with adhesive.
 - 2) **Interior Surface:** Smooth with no spiral seams or form markings.
 - 3) **Exterior Surface:** Moisture barrier outer label.
 - 4) Forms shall not impart visible seams or form marks on concrete columns.
 - 5) Integral stripping filament for removal of form without cutting.
 - 6) 1-piece, 1-time-use forms.
 2. **Form Coatings:** Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
 3. **Form Ties:** Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units which will leave no metal closer than 1-1/2" to surface.
 - a. **Provide ties** which, when removed, will leave holes **not larger than 1" diameter** in concrete surface.
- B. **Reinforcing Materials:**
1. **Reinforcing Bars:** ASTM A 615, **Grade 60**, deformed; or **Grade 40** where specified.
 2. **Steel Wire:** ASTM A 82, plain, cold-drawn steel.
 3. **Welded Wire Fabric:** ASTM A 185, welded steel wire fabric.
 - a. **Flat.**

4. **Supports for Reinforcement:** Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.
 - a. **For slabs-on-grade**, use supports with sand plates or horizontal runners where base material will not support chair legs.
 - b. **For exposed-to-view** concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
5. **Weldable Reinforcing Bars:** ASTM A 706

C. **Concrete:**

1. **Portland Cement:** ASTM C 150, **Type II (verify with General Structural Notes and Geotechnical Investigation)**, typical unless noted otherwise.
 - a. **Use one brand of cement** throughout project, unless otherwise acceptable to Architect.
 - b. **Fly Ash:** ASTM C 618, Class F.
 - c. **Normal Weight Aggregates:** ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.
 - 1) **For exterior exposed** surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
 - 2) **Fine Aggregates** shall comply with the following gradations:

Sieve	Percent passing
3/8"	100
No. 4	95 to 100
No. 16	50 to 85
No. 50	10 to 30
No. 100	2 to 10
 - 3) **Course Aggregates** shall comply with the following gradations:

Sieve	Percent passing
1-1/2"	100
3/4"	90 to 100
3/8"	25 to 55
No. 4	0 to 10
No. 8	0 to 5

No. 200 Not to exceed 1.75 percent by weight in the combined course and fine aggregate.
 - 4) **Gradation limits:** Maximum aggregate size shall not exceed the following requirements.
 - (a) 1/5 narrowest dimension between forms.
 - (b) 1/3 of depth of slabs.
 - (c) 3/4 of minimum clear spacing between reinforcing bars.
 - d. **Water:** Drinkable.

D. **Admixtures:**

1. **Air-Entraining Admixture:** ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
2. **Water-Reducing Admixture:** ASTM C 494, Type A, and containing not more than 0.1 percent chloride ions.
3. **Super Plasticizer:** ASTM C 494, Type F or Type G and containing not more than 0.1 percent chloride ions.
4. **Water-Reducing, Non-Chloride Accelerator Admixture:** ASTM C 494, Type E, and containing not more than 0.1 percent chloride ions.

5. **Water-Reducing, Retarding Admixture:** ASTM C 494, Type D, and containing not more than 0.1 percent chloride ions.
6. **Prohibited Admixtures:** Calcium chloride thycyanates or admixtures containing more than 0.1 percent chloride ions are not permitted.

E. **Accessories:**

1. **Non-Shrink Grout:** Grout shall be prepackaged, non-metallic, non-gaseous. It shall conform to ASTM C 1107 Grade B or C at a fluid, flow cone, consistency. Fluid grout shall attain 6500 psi compressive strength in 28 days.
2. **Absorptive Cover:** Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
3. **Moisture-Retaining Cover:** One of the following, complying with ASTM C 171.
 - a. **Waterproof** paper.
 - b. **Polyethylene** film.
 - c. **Polyethylene-coated** burlap.
4. **Liquid Membrane-Forming Curing Compound:** Liquid type membrane-forming curing compound complying with ASTM C 309, Type 1 or 1D Class B for interior and ASTM C 309 Type 2 Class A for exterior.
5. **Epoxy Adhesive:** ASTM C 881, two component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.

2.3 MIXES

A. **Proportioning and Design of Mixes:**

1. **Prepare design mixes for each type** and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.
2. **Submit written reports to Architect and Structural Engineer** of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.

B. **Design mixes** to provide normal weight concrete with a W/C ratio as indicated on the structural drawings.

C. **Adjustment to Concrete Mixes:** Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

D. **Admixtures:**

1. **Use water-reducing admixture** or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.
2. **Use non-chloride accelerating admixture** in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).
3. **Use high-range water-reducing admixture** in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water/cement ratios below 0.50.

4. **Use air-entraining admixture** in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at **manufacturer's prescribed rate** to result in concrete at point of placement having total air content **as indicated on the structural drawings**.
 - a. **Concrete structures** and slabs exposed to freezing and thawing, deicer chemicals, or subjected to hydraulic pressure:
 - 1) **4.5 percent** (moderate exposure); **5.5 percent** (severe exposure) **1 1/2" max. aggregate. 4.5 percent** (moderate exposure); **6.0 percent** (severe exposure) **1" max. aggregate.**
 - 2) **5.0 percent** (moderate exposure); **6.0 percent** (severe exposure) **3/4" max. aggregate.**
 - 3) **5.5 percent** (moderate exposure); **7.0 percent** (severe exposure) **1/2" max. aggregate.**
 - b. **Other Concrete** (not exposed to freezing, thawing, or hydraulic pressure): **2 percent to 4 percent** air.
5. **Use admixtures for water-reducing and set-control** in strict compliance with manufacturer's directions.
6. **Water-Cement Ratio:** Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
 - a. Subjected to **freezing and thawing**; W/C **0.50**.
 - b. Subjected to **deicers/watertight**; W/C **0.45**.
 - c. Subjected to **brackish water, salt spray, or deicers**; W/C **0.40**.
7. **Slump Limits:** Proportion and design mixes to result in concrete slump at point of placement as indicated.
 - a. **Reinforced foundation systems:** Not less than **1 inch** and not more than **3 inches**.
 - b. Concrete containing super-plasticizer: Not more than 8" after addition of super plasticizer to site-verified 4" slump concrete.
 - c. **Other concrete:** Not less than **1"** nor more than **4"**.

E. **Concrete Mixing:**

1. **Job-Site Mixing:** Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd., or fraction thereof.
 - a. **Provide batch ticket for each batch** discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.
2. **Ready-Mix Concrete:** Comply with requirements of ASTM C 94, and as herein specified.
3. **During hot weather,** or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

PART 3 - EXECUTION

3.1 GENERAL

- A. **Preparation:** Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. **Installation Tolerances:**

1. **Walls:** Comply with ACI requirements for horizontal, vertical, and story to story tolerances.

3.2 ERECTION

A. **Forms:** Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with **ACI 347**.

1. **Design formwork** to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
2. **Construct forms** to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
3. **Fabricate forms for easy removal** without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
4. **Provide temporary openings** where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
5. **Chamfer exposed corners** and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
6. **Provisions for Other Trades:** Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
7. **Cleaning and Tightening:** Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retightening forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.
8. **Preparation of Form Surfaces:**
 - a. **Clean re-used forms** of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
 - b. **Coat contact surfaces** of forms with a form-coating compound before reinforcement is placed.
 - c. **Thin form-coating compounds** only with thinning agent of type, amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

- d. **Coat steel forms** with a non-staining, rust-preventative form oil or otherwise protect against rusting. **Rust-stained steel formwork is not acceptable.**

B. **Pier Forms**

1. **Place and brace pier forms** in accordance with manufacturer's instructions. At a minimum, forms must be secured at the base and at the top of the form. Additional mid-point bracing may be required for pier heights in excess of 12 feet.
2. Erect forms at locations and to elevations as indicated on the Drawings.
3. Erect pier forms plumb. Bracing must be adequate to maintain plumb of column form throughout pouring and curing of concrete.
4. Avoid damaging interior surface and coating of forms.
5. Waterproof and reinforce openings cut into forms.
6. Do not use forms that are out-of-round, deformed, damaged, or contain defects that could impair concrete surface.
7. Protect forms from rain and snow if work is delayed and forms have been positioned for placing concrete.
8. Place waterproof sheeting over top of forms to prevent damage to interior surface by rain or snow.
9. Do not allow forms to stand in water or snow before placing concrete.

3.3 INSTALLATION

- A. **Reinforcement:** Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

1. **Clean reinforcement** of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
2. **Accurately position**, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
3. **Place reinforcement** to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
4. **Install welded 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.

- B. **Concrete Placement:**

1. **Apply temporary protective covering** to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.
2. **General:** Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.
3. **Deposit concrete continuously** or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
4. **Placing Concrete in Forms:** Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

5. **Consolidate placed concrete** by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
 - a. **Do not use vibrators** to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
 - b. **Do not vibrate** forms or reinforcing steel.

C. **Concrete Placement in Pier Forms**

1. Place concrete as specified below:
 - a. Do not place concrete if column forms are wet.
 - b. Apply form release coating to interior surface.
 - c. Place concrete at pour rate in accordance with manufacturer's instructions. Sonotube Finish Free is sold in standard lengths of 12 feet and can be poured to this full height without pour rate restrictions, as indicated on the product label. For lengths in excess of this, do not exceed 1800 pounds per square foot form pressure.
 - d. Do not touch interior surface of forms with vibrator.
 - e. Do not vibrate concrete from exterior of forms.
2. **Cold Weather Placing:** Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306.1 and as herein specified.
 - a. **When air temperature has fallen** to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C), and not more than 80 deg F (27 deg C) at point of placement.
 - b. **Do not use frozen materials** or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - c. **Do not use calcium chloride**, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
3. **Hot Weather Placing:** When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
 - a. **Cool ingredients** before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg 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 water. Use of liquid nitrogen to cool concrete is Contractor's option.
 - b. **Cover reinforcing steel** with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
 - c. **Fog spray forms**, reinforcing steel, and subgrade just before concrete is placed.
 - d. **Use water-reducing retarding admixture** (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

D. **Finish:**

1. **Rough Form Finish:** Formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
2. **Smooth Form Finish:** For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
 - a. **Smooth Rubbed Finish:** Provide smooth rubbed finish to concrete surfaces, which have received smooth form finish treatment, not later than one day after form removal.
 - 1) **Moisten concrete surfaces** and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
3. **Sand Blasted Finish:** Perform sand blasting within 24 to 72 hours after casting. Coordinate with formwork construction, concrete placement schedule, and formwork removal to ensure that surfaces to be blast finished are blasted at same age for uniform results.
 - a. **Depth of Cut:** Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surfaces to match Architect's samples, as follows:
 - 1) **Brush:** Remove cement matrix to expose face of fine aggregate; no reveal.
 - b. **Abrasive Blasting:** Abrasive blast corners and edge of patterns carefully, using back-up boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure, and blasting techniques required to match Architect's samples.
4. **Related Unformed Surfaces:** At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

E. **Joints:**

1. **Construction Joints:** Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Architect.
2. **Provide keyways** at least 1-1/2" deep in construction joints in walls, slabs, and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.
3. **Place construction joints perpendicular to main reinforcement.** Continue reinforcement across construction joints, except as otherwise indicated.
4. **Isolation Joints in Slabs-on-Ground:** Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.

5. **Contraction (Control) Joints in Slabs-on-Ground:** Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8" x 1/4 slab depth or inserts 1/4" wide x 1/4 of slab depth, unless otherwise indicated. **Cut construction joints** in concrete **as soon as possible** after concrete can take the weight of cutting machine, in order to allow cracks to occur at the contraction joint.
 - a. **Form contraction joints** by inserting premolded plastic, hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
 - b. **Contraction joints in unexposed floor slabs** may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
6. **If joint pattern not shown**, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third-bays).
7. **Embedded Items:**
 - a. **Set and build into work anchorage devices** and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.
 - b. **Install reglets** to receive top edge of foundation sheet waterproofing, and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
 - c. **Edge Forms and Screed Strips for Slabs:** Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

F. **Miscellaneous Concrete:**

1. **Filling-In:** Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
2. **Curbs:** Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
3. **Equipment Bases and Foundations:** Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

3.4 CURING AND PROTECTION

- A. **General:** Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. **Start initial curing** as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less than 7 days.

2. **Begin final curing** procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- B. **Curing Methods:** Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.
1. **Provide moisture curing** by following methods.
 - a. **Keep concrete surface continuously wet** by covering with water.
 - b. **Continuous water-fog** spray.
 - c. **Covering concrete surface with specified absorptive cover**, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.
 2. **Provide moisture-cover curing** as follows:
 - a. **Cover concrete surfaces** with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. **Provide curing and sealing compound** to exposed interior slabs and to exterior slabs, walks, and curbs, as follows:
 - a. **Apply specified curing and sealing compound** to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - b. **Do not use membrane curing compounds** on surfaces which are to be **covered with coating material** applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Architect.

3.5 REMOVAL OF FORMS

- A. **Formwork not supporting weight of concrete**, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
- B. **Form facing material** may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.
- C. **Removal of Pier Forms**
1. Remove column forms in accordance with manufacturer's instructions.
 2. Adhesion of Concrete to Form increases over time. If removal of the form is required, remove as soon as operations will not damage concrete, a minimum of 24 hours and a maximum of 5 days after placing concrete is recommended.
 3. Prevent damage to concrete from form removal.

- D. **Re-Use of Forms:**
1. **Clean and repair surfaces of forms** to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
 2. **When forms are extended for successive concrete placement**, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.6 CONCRETE SURFACE REPAIRS

- A. **Patching Defective Areas:** Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.
1. **Cut out honeycomb**, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
 2. **For exposed-to-view surfaces**, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
 3. **Repair of Formed Surfaces:** Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
 4. **Repair concealed formed surfaces**, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
 5. **Repair of Unformed Surfaces:** Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.
 6. **Repair finished unformed surfaces that contain defects** which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
 7. **Correct high areas in unformed surfaces by grinding**, after concrete has cured at least 14 days.
 8. **Correct low areas in unformed surfaces** during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

- B. **Repair defective areas**, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
1. **Repair isolated random cracks** and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
- C. **Perform structural repairs** with prior approval of Architect or Structural Engineer for method and procedure, using specified epoxy adhesive and mortar.

3.7 FIELD QUALITY CONTROL

- A. **Sampling and testing** for quality control during placement of concrete may include the following, as directed by Architect.
1. **Sampling Fresh Concrete:** ASTM C 172, except modified for slump to comply with ASTM C 94.
 - a. **Slump:** As indicated on the Structural Drawings.
 - b. **Air Content:** As indicated on the Structural Drawings.
 - c. **Concrete Temperature:** Test hourly when air temperature is 40 deg F (4 deg C) and below, and when 80 deg F (27 deg C) and above; and each time a set of compression test specimens made.
 2. **Compression Test Specimen:** ASTM C 31; one set of 5 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
 3. **Compressive Strength Tests:** ASTM C 39; one set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and two specimens retained in reserve for later testing if required.
 - a. **When frequency of testing** will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
 - b. **When total quantity** of a given class of concrete is less than 50 cu. yds., strength test may be waived by Architect if, in his judgement, adequate evidence of satisfactory strength is provided.
 - c. **When strength of field-cured cylinders** is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

- d. **Strength level of concrete** will be considered satisfactory if averages of sets of three 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.

- B. **Test results will be reported in writing to Architect**, Structural Engineer and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, 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.

- C. **Nondestructive Testing:** Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

- D. **Additional Tests:** The testing service will 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. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

END OF SECTION

DIVISION 4 - MASONRY

Not Used

DIVISION 5 - METALS

Section 05 1200
Section 05 5000

Structural Steel
Metal Fabrications

SECTION 05 1200
STRUCTURAL STEEL

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. **Extent of structural steel** work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
- B. **Related Sections:**
1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
 2. **Miscellaneous Metal Fabrications** are specified elsewhere in **Division 5**.
- C. **Definitions:** Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.

1.3 SUBMITTALS

- A. **Product Data:** Submit producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
1. **High-strength bolts** (each type), including nuts and washers.
 2. Structural steel **primer paint**.
 3. **Shrinkage-resistant** grout.
- B. **Shop Drawings:** Submit shop drawings, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams.
1. **Include details** of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS A2.1 and A2.4 symbols, and show size, length, and type of each weld.
 - a. **Provide setting drawings**, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of others sections.
- C. **Test Reports:** Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results.
- D. **Surveys:** Submit certified copies of each survey conducted by a registered professional engineer, showing elevations and locations of base plates and anchor bolts to receive structural steel, and final elevations and locations for major members. Indicate discrepancies between actual installation and contract documents.

1.4 QUALITY ASSURANCE

- A. **Source Quality Control:** Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
1. Promptly remove and replace materials or fabricated components which do not comply.
- B. **Fabricator Qualifications:** Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
1. **Fabricator** must participate in the **AISC Quality Certification Program** and be designated an AISC-Certified Plant as follows:
 - a. **Category:** Category Cbd, complex steel building structures.
 2. **Fabricators without AISC Certification** shall provide **special inspectors** and conduct special inspections as required by **authorities having jurisdiction**.
 3. **Other Certifications**, other than AISC, may be acceptable but must be submitted and approved by authorities having jurisdiction prior to fabrication of any steel.
- C. **Design of Members and Connections:** Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.
- D. **Promptly notify Architect** whenever design of members and connections for any portion of structure are not clearly indicated.
- E. **Codes and Standards:**
1. **Comply** with provisions of following, except as otherwise indicated:
 - a. AISC "**Code of Standard Practice for Steel Buildings and Bridges**", excluding the following: Section 1.5.1, Section 3.3 (first sentence and last sentence), Section 3.4, Section 4.2, Section 4.2.1, Section 4.2.2, Section 6.3.2, Section 7.5.4, and Section 7.11.5.
 2. AISC "**Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings**", including "Commentary" and Supplements thereto as issued.
 3. AISC "**Specifications for Architecturally Exposed Structural Steel**".
 4. AISC "**Specifications for Structural Joints using ASTM A 325 or A 490 Bolts**" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
 5. **American Welding Society (AWS) D1.1 "Structural Welding Code - Steel"**.
 6. ASTM A 6 "**General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use**".
- F. **Qualifications for Welding Work:** Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
1. **Provide certification** that welders to be employed in work have satisfactorily passed AWS qualification tests within the last 12 months.
 2. **If recertification of welders is required**, retesting will be Contractor's responsibility.

1.5 DELIVERY, STORAGE AND HANDLING

- A. **Deliver materials** to site at such intervals to ensure uninterrupted progress of work.
 - 1. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.
- B. **Store materials** to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. **Approved Manufacturers:** Subject to compliance with requirements, provide one of the following:
 - 1. **Non-shrink Non-metallic Grout.**
 - a. **Euco N.S.;** Euclid Chemical Co.
 - b. **Masterflow 713;** Master Builders
 - c. **Five Star Grout;** U.S. Grout Corp.

2.2 MATERIALS

- A. **Metal Surfaces, General:** For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
- B. **Wide Flange Structural Steel Shapes:** ASTM A 992, Grade 50 enhanced.
 - 1. **Other Structural Steel Shapes, Plates and Bars:** ASTM A 36.
- C. **Hollow Structural Sections (HSS):** ASTM A 500, Grade B.
- D. **Steel Castings:** ASTM A 27, Grade 65-35, medium-strength carbon steel.
- E. **Anchor Bolts:** ASTM A 307, headed type unless otherwise indicated.
- F. **Unfinished Threaded Fasteners:** ASTM A 307, Grade A, regular low-carbon steel bolts and nuts.
 - 1. Provide hexagonal heads and nuts for all connections.
 - 2. Provide either hexagonal or square, heads and nuts, except use only hexagonal units for exposed connections.

- G. **High-Strength Threaded Fasteners:** Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
 - 1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.
 - 2. Direct tension indicator washers may be used at Contractor's option.
- H. **Electrodes for Welding:** Comply with AWS Code.
- I. **Structural Steel Primer Paint:** SSPC - Paint 13.
- J. **Cement Grout:** Portland cement (ASTM C 150, Type I or Type III) and clean, uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.
- K. **Non-metallic Shrinkage-Resistant Grout:** Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CE-CRD-C621.

2.3 FABRICATION

- A. **Shop Fabrication and Assembly:** Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
 - 1. **Properly mark** and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
 - 2. **Where finishing is required**, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. **Connections:** Weld or bolt shop connections, as indicated.
 - 1. **Bolt field connections**, except where welded connections or other connections are indicated.
 - 2. **Provide high-strength threaded fasteners** for principal bolted connections, except where unfinished bolts are indicated.
 - 3. **Provide unfinished threaded fasteners** for only bolted connections of secondary framing members to primary members (including purlins, girts, and other framing members taking only nominal stresses) and for temporary bracing to facilitate erection.
- C. **High-Strength Bolted Construction:** Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" (RCRBSJ).
- D. **Welded Construction:** Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

- E. **Shear Connectors:** Prepare steel surfaces as recommended by manufacturer of shear connectors. Where possible shop weld shear connectors, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.

2.4 SHOP PAINTING

- A. **General:** Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.
- B. **Non-painted Areas:** Do not paint surfaces which are to be welded or high-strength bolted with friction-type connections.
- C. **Inaccessible Surfaces:** Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. **Surface Preparation:** After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
 - 1. **SP-1** "Solvent Cleaning".
 - 2. **At all exposed exterior** steel and **exposed interior** steel prepare surface in accordance with commercial blast cleaning **SSPC-SP6** with median surface profile of 1.5 to 2.0 mils.
- E. **Painting:** Provide a one-coat shop applied paint system complying with Steel Structures Painting Council (SSPC)-Paint System Guide No. 7.00. Refer to Section 09900, Painting, for specific primer required on identified steel items.

PART 3 - EXECUTION

3.1 PREPARATION

- A. **Surveys:** Employ a registered professional engineer or land surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.

3.2 ERECTION

- A. **Temporary Shoring and Bracing:** Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds. Do not shore cambered steel beams unless otherwise indicated on drawings.
 - 1. **Temporary Planking:** Provide temporary planking and working platforms as necessary to effectively complete work.

- B. **Setting Bases and Bearing Plates:** Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
- C. **Adjustments:** Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout. Install high strength washers under nuts at all anchor bolts.
- D. **Grouting:** Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
1. Comply with manufacturer's instructions.
- E. **Field Assembly:** Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. **Level and plumb individual members** of structure within specified AISC tolerances.
 2. **Establish required leveling** and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
 3. **Splice members** only where indicated and accepted on shop drawings.
- F. **Erection Bolts:** On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.
- G. **Field Adjustments:** Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
1. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- H. **Gas Cutting:** Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.
- I. **Touch-Up Painting:** Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
1. **Apply by brush or spray** to provide minimum dry film thickness of 1.5 mils.

3.3 QUALITY CONTROL

- A. **Testing Agency:** Owner will employ and pay a qualified independent testing agency to perform field quality-control testing services specified in this section.
- B. **Testing agency** shall **conduct and interpret tests** and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
- C. **Provide access for testing agency** to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- D. **Testing agency** may **inspect structural steel** at plant before shipment; however, Architect reserves right, at any time before final acceptance, to reject material not complying with specified requirements.
- E. **Correct deficiencies** in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.
- F. **Shop Bolted Connections:** Inspect or test in accordance with AISC specifications.
- G. **Shop Welding:** Inspect and test during fabrication of structural steel assemblies, 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** of all welds.
 - 3. **Perform tests of welds** as follows. Inspection procedures listed are to be used at Contractor's option.
 - a. **Radiographic Inspection:** ASTM E 94 and ASTM E 142; minimum quality level "2-2T".
 - b. **Ultrasonic Inspection:** ASTM E 164.
 - 4. **Inspection of shop welding** is not required if the fabricator complies with Section 1704.2.2 of the **2009 IBC**.
- H. **Field Bolted Connections:** Inspect in accordance with **2009 IBC** Section **1704.3.3**.
- I. **Field Welding:** Inspect and test during erection of structural steel as follows:
 - 1. Comply with **2009 IBC** Section **1704.1** and Table **1704.3**.
 - 2. **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.
 - 3. **Perform visual inspection** of all welds.

3.4 CLEANUP

- A. Refer to **Division 1**, Section "**Execution Requirements**".

END OF SECTION

SECTION 05 5000

METAL FABRICATIONS

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** the following:
1. Steel **framing** and **supports** for **mechanical** and **electrical** equipment.
 2. Steel **framing** and **supports** for applications where framing and supports are **not specified in other Sections**.
 3. Miscellaneous **metal trim**.
 4. Pipe **bollards**.
- B. **Related Sections** include the following:
1. **Division 5** Section "**Structural Steel**" for structural-steel framing system components.

1.3 SUBMITTALS

- A. **Product Data:** For the following:
1. Paint products.
 2. Grout.
- B. **Shop Drawings General:** Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
1. Provide templates for anchors and bolts specified for installation under other Sections.
- C. **Welding Certificates:** Copies of certificates for welding procedures and personnel.
- D. **Qualification Data:** For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

- A. **Fabricator Qualifications:** A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- B. **Welding:** Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code--Steel."
 2. AWS D1.2, "Structural Welding Code--Aluminum."
 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- C. **Architectural Exposed Steel:** All exposed steel members shall be detailed, fabricated and erected as **Architecturally Exposed Structural Steel (AESS) as defined in the AISC Code of Standard Practice.**

1.5 PROJECT CONDITIONS

- A. **Field Measurements General:** Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. **Established Dimensions:** Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

- A. **Coordinate installation of anchorages for metal fabrications.** Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.7 CASH ALLOWANCE

- A. Contractor shall include an allowance of **\$6,400.00** for **miscellaneous steel**, beyond that which is required by the contract documents..

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. **Metal Surfaces, General:** For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

2.2 FERROUS METALS

- A. **Steel Plates, Shapes, and Bars:** ASTM A 36/A 36M.
- B. **Steel Tubing:** Cold-formed steel tubing complying with ASTM A 500.

- C. **Steel Pipe:** ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- D. **Uncoated Hot-Rolled Steel Sheet:** Commercial quality, complying with ASTM A 569/A569M or structural quality, complying with ASTM A 570/A 570M, Grade 30, unless another grade is required by design loads.
- E. **Brackets, Flanges, and Anchors:** Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.
- F. **Cast-in-Place Anchors in Concrete:** Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. **Threaded or wedge type;** galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- G. **Welding Rods and Bare Electrodes:** Select according to AWS specifications for metal alloy welded.

2.3 PAINT

- A. **Shop Primer for Ferrous Metal:** Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
 - 1. Refer to **Section 09900 - Painting** for specific primer required on identified steel items.
- B. **Galvanizing Repair Paint:** High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. **Bituminous Paint:** Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FASTENERS

- A. **General:** Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
- B. **Bolts and Nuts:** Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. **Anchor Bolts:** ASTM F 1554, Grade 36.

- D. **Machine Screws:** ASME B18.6.3 (ASME B18.6.7M).
- E. **Lag Bolts:** ASME B18.2.1 (ASME B18.2.3.8M).
- F. **Wood Screws:** Flat head, carbon steel, ASME B18.6.1.
- G. **Plain Washers:** Round, carbon steel, ASME B18.22.1 (ASME B18.22M).
- H. **Lock Washers:** Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).
- I. **Expansion Anchors:** Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. **Material:** Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
- J. **Toggle Bolts:** FS FF-B-588, tumble-wing type, class and style as needed.

2.5 GROUT

- A. **Nonshrink, Nonmetallic Grout:** Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION, GENERAL

- A. **Shop Assembly:** Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. **Shear and punch** metals cleanly and accurately. Remove burrs.
- C. **Ease exposed edges** to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. **Weld corners** and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

- E. **Provide for anchorage** of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- F. **Cut, reinforce, drill, and tap metal fabrications** as indicated to receive finish hardware, screws, and similar items.
- G. **Fabricate joints** that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- H. **Allow for thermal movement** resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. **Temperature Change** (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- I. **Form exposed work true to line** and level with accurate angles and surfaces and straight sharp edges.
- J. **Remove sharp or rough areas** on exposed traffic surfaces.
- K. **Form exposed connections with hairline joints**, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. **General:** Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.
- B. **Fabricate units** from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. **Fabricate units from slotted channel framing** where required for deflection.
 - 2. **Where units are indicated to be cast into concrete** or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long at 24 inches (600 mm) o.c., unless otherwise indicated.
 - 3. **Furnish inserts** if units must be installed after concrete is placed.
- C. **Galvanize** miscellaneous framing and supports in the following locations:
 - 1. Exterior locations and where miscellaneous items will be concealed from view.

2.8 MISCELLANEOUS STEEL TRIM

- A. **Unless otherwise indicated**, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. **Provide cutouts, fittings, and anchorages as needed** to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.
- C. **Galvanize miscellaneous steel trim** in the following locations:
 - 1. **Exterior.**

2.9 PIPE BOLLARDS

- A. **Fabricate pipe bollards** from Schedule 40 steel pipe.
 - 1. Cap bollards with 1/4-inch- (6-mm-) minimum steel plate.
- B. **Fabricate sleeves** for bollard anchorage from steel pipe with 1/4-inch (6-mm) thick steel plate welded to bottom of sleeve.
- C. **Fabricate internal sleeves** for removable bollards from Schedule 40 steel pipe or 1/4-inch (6-mm) wall-thickness steel tubing with an OD 1/16 inch (1.5 mm) less than ID of bollards. Match drill sleeve and bollard for 1/2-inch (12-mm) steel machine bolt.

2.10 FINISHES, GENERAL

- A. **Comply with NAAMM's** "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.11 STEEL AND IRON FINISHES

- A. **Galvanizing:** Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 123, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. **Preparation for Shop Priming:** Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. **Exteriors** (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "**Commercial Blast Cleaning.**"
 - 2. **Interiors** (SSPC Zone 1A): SSPC-SP 3, "**Power Tool Cleaning.**"

- C. **Application:** Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. **Fastening to In-Place Construction:** Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.
- B. **Cutting, Fitting, and Placement:** Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. **Provide temporary bracing** or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. **Fit exposed connections accurately together to form hairline joints.** Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. **Field Welding:** Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. **Corrosion Protection:** Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. **General:** Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

- B. **Support steel girders on solid grouted masonry**, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated at girders supported on concrete or masonry, install as specified above for setting and grouting bearing and leveling plates.

3.3 INSTALLING PIPE BOLLARDS

- A. **Anchor bollards in place with concrete footings.** Support and brace bollards in position in footing excavations until concrete has been placed and cured.
- B. **Anchor internal sleeves for removable bollards** in place with concrete footings. Support and brace sleeves in position in footing excavations until concrete has been placed and cured.
 - 1. **Place removable bollards** over internal sleeves and secure with 1/2-inch (12-mm) machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner will furnish padlocks.
 - 2. **Do not fill** removable bollards with concrete
- C. **Fill bollards solidly** with concrete, mounding top surface.

3.4 ADJUSTING AND CLEANING

- A. **Touchup Painting:** Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. **Galvanized Surfaces:** Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

Not Used

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

Section 07 9200

Joint Sealants

SECTION 07 9200

JOINT SEALANTS

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** sealants for the following applications, including those specified by reference to this Section:
 - 1. **Exterior joints** in the following vertical surfaces and non-traffic horizontal surfaces:
 - a. Control and expansion joints in **cast-in-place concrete**.
 - b. Joints between **different materials** listed above.
 - c. **Other joints** as indicated.
 - 2. **Exterior joints** in the following horizontal **traffic surfaces**:
 - a. **Control, expansion**, and isolation joints in cast-in-place concrete slabs.
 - b. **Other joints** as indicated.
 - 3. **All joints** between dissimilar materials.

1.3 PERFORMANCE REQUIREMENTS

- A. **Provide elastomeric joint sealants** that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. **Product Data:** For each joint-sealant product indicated.

1.5 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. **Source Limitations:** Obtain each type of joint sealant through one source from a single manufacturer.
- C. **Preconstruction Compatibility and Adhesion Testing:** Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. **Use manufacturers standard test methods** to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - a. **Perform tests** under environmental conditions replicating those that will exist during installation.
2. **Submit not fewer than nine pieces** of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. **Schedule sufficient time** for testing and analyzing results to prevent delaying the Work.
4. **For materials failing tests**, obtain joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. **Testing will not be required if** joint sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. **Deliver materials** to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. **Store and handle materials** in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not proceed with installation of joint sealants under the following conditions:
 1. **When ambient and substrate temperature** conditions are outside limits permitted by joint sealant manufacturer.
 2. **When joint substrates are wet.**
- B. **Joint-Width Conditions:** Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. **Joint-Substrate Conditions:** Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY

- A. **Special Installer's Warranty:** Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. **Warranty Period:** **Three years** from date of Substantial Completion.

- B. **Special Manufacturer's Warranty:** Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. **Warranty Period:** Ten years from date of Substantial Completion.

- C. **Special warranties** specified in this Article **exclude** deterioration or failure of elastomeric joint sealants from the following:
 - 1. **Movement of the structure** resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. **Disintegration of joint substrates** from natural causes exceeding design specifications.
 - 3. **Mechanical damage** caused by individuals, tools, or other outside agents.
 - 4. **Changes in sealant appearance** caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. **Compatibility:** Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

- B. **Colors of Exposed Joint Sealants:** As selected by Architect from manufacturer's full range for this characteristic.

2.2 ELASTOMERIC JOINT SEALANTS

- A. **Elastomeric Sealant Standard:** Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

- B. **Additional Movement Capability:** Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

- C. **Suitability for Contact with Food:** Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.3 SOLVENT-RELEASE JOINT SEALANTS

- A. **Acrylic-Based Solvent-Release Joint-Sealant Standard:** Comply with ASTM C 1311 for each product of this description indicated in the Solvent-Release Joint-Sealant Schedule at the end of Part 3.
- B. **Butyl-Rubber-Based Solvent-Release Joint-Sealant Standard:** Comply with ASTM C 1085 for each product of this description indicated in the Solvent-Release Joint-Sealant Schedule at the end of Part 3.

2.4 LATEX JOINT SEALANTS

- A. **Latex Sealant Standard:** Comply with ASTM C 834 for each product of this description indicated in the Latex Joint-Sealant Schedule at the end of Part 3.

2.5 JOINT-SEALANT BACKING

- A. **General:** Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. **Cylindrical Sealant Backings:** ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. **Type C:** Closed-cell material with a surface skin.
- D. **Elastomeric Tubing Sealant Backings:** Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- E. **Bond-Breaker Tape:** Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. **Primer:** Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. **Cleaners for Nonporous Surfaces:** Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

- C. **Masking Tape:** Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. All joints of **dissimilar materials** to receive joint sealant.
- B. **Examine joints** to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- C. **Proceed with installation** only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. **Surface Cleaning of Joints:** Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
 - 1. **Remove all foreign material** from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. **Clean porous joint substrate surfaces** by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include concrete, masonry or unglazed surfaces of ceramic tile.
 - 3. **Remove laitance** and form-release agents from concrete.
 - 4. **Clean nonporous surfaces** with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants to metal, glass, porcelain enamel or glazed surfaces of ceramic tile.
- B. **Joint Priming:** Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. **Masking Tape:** Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. **General:** Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. **Sealant Installation Standard:** Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. **Acoustical Sealant Application Standard:** Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. **Install sealant backings** of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. **Do not leave gaps** between ends of sealant backings.
 - 2. **Do not stretch**, twist, puncture, or tear sealant backings.
 - 3. **Remove absorbent sealant backings** that have become wet before sealant application and replace them with dry materials.
- E. **Install bond-breaker tape** behind sealants where sealant backings are not used between sealants and back of joints.
- F. **Install sealants** by proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
 - 4. Seal abutting joint at all dissimilar materials.
- G. **Tooling of Nonsag Sealants:** Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. **Remove excess sealants** from surfaces adjacent to joint.
 - 2. **Use tooling agents** that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. **Provide concave joint configuration** per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - 4. **Provide flush joint configuration**, per Figure 5B in ASTM C 1193, where indicated.
 - 5. **Provide recessed joint configuration**, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.
 - a. **Use masking tape** to protect adjacent surfaces of recessed tooled joints.

3.4 CLEANING

- A. **Clean off excess sealants** or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. **Protect joint sealants** during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.6 ELASTOMERIC JOINT-SEALANT SCHEDULE

- A. **Medium-Modulus Neutral-Curing Silicone Sealant:** Where joint sealants of this type are indicated, provide products complying with the following:
1. **Products:**
 - a. **791**; Dow Corning.
 - b. **PSI-631**; Polymeric Systems, Inc.
 - c. **Sonolastic 150**, Sonneborn
 - d. **Spectrem 2**; Tremco.
 2. **Type and Grade:** S (single component) and NS (nonsag).
 3. **Class:** 25.
 4. **Use Related to Exposure:** NT (nontraffic).
 5. **Uses Related to Joint Substrates:** M (masonry), G (glass), A (aluminum), and, as applicable to joint substrates indicated, O (other).
 - a. **Use O Joint Substrates:** Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick and masonry, ceramic tile, and wood.
 6. **Stain-Test-Response Characteristics:** Nonstaining to porous substrates per ASTM C 1248.
 7. **Applications:** Exterior and interior joints in vertical surfaces of concrete; between metal and concrete and mortar; perimeter of metal frames in exterior walls; overhead or ceiling joints.

- B. **Single-Component Nonsag Urethane Sealant:** Where joint sealants of this type are indicated, provide products complying with the following:
1. **Products:**
 - a. **Vulkem 921;** Mameco International.
 - b. **Dynatrol I;** Pecora Corporation.
 - c. **DyMonic;** Tremco.
 - d. **NP1,** Sonneborn.
 2. **Type and Grade:** S (single component) and NS (nonsag).
 3. **Class:** 25
 4. **Use Related to Exposure:** NT (nontraffic).
 5. **Uses Related to Joint Substrates:** M, A, and, as applicable to joint substrates indicated, O.
 - a. **Use O Joint Substrates:** Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick and masonry, ceramic tile, and wood.
 6. **Applications: Joints in concrete.**

END OF SECTION

DIVISION 8 – OPENINGS

Not Used

DIVISION 9 - FINISHES

Section 09 9100 Painting

SECTION 09 9100

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. **Section includes** painting work, **interior** and **exterior**. Work Includes, but is not limited to painting the following:
1. **Exterior** steel.
 2. **Work includes** field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, plug mold, electric panels, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated.
- B. **"Paint"** as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- C. **Surfaces to be Painted:** Except where natural finish of material is specifically noted as a surface not to be painted, paint all exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. **If color or finish is not designated**, Architect will select these from manufacturer's **full range** of colors and finishes.
1. **Multiple colors will be selected** by the Architect for any type of paint system.
 2. **Surface preparation**, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
 3. **If it can be seen**, paint it.
- D. **Following categories of work are not included** as part of field-applied finish work:
1. **Finished Metal Surfaces:** Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
 2. **Operating Parts:** Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting.
 3. **Labels:** Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
- E. **Related Sections:**
1. **Shop Primers:** Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
 - a. **Unless otherwise specified**, shop priming of fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of these specifications.

- F. **Related Documents:** Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUBMITTALS

- A. **Product Data:** Submit manufacturer's technical information including Paint label analysis and application instructions for each material proposed for use.
- B. **Samples:** Prior to beginning work, review Finish Schedule for colors to be painted. Use representative colors when preparing samples for review. Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.
 - 1. **On surfaces** and other exterior building components, duplicate painted finishes of prepared samples. Provide full-coat finish samples on at least 10 sq. ft. of surface, or as directed, until required sheen, color and texture is obtained; simulate finished lighting conditions for review of in-place work.
 - a. **Final acceptance of colors** will be from samples applied on the job.

1.3 QUALITY ASSURANCE

- A. **Single Source Responsibility:** Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.
- B. **Coordination of Work:** Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

1.4 DELIVERY AND STORAGE

- A. **Deliver materials** to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
 - 1. Name or title of material.
 - 2. Fed. Spec. number, if applicable.
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Manufacturer's name.
 - 5. Contents by volume, for major pigment and vehicle constituents.
 - 6. Thinning instructions.
 - 7. Application instructions.
 - 8. Color name and number.
- B. **Store materials** not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.
 - 1. **Protect from freezing where necessary.** Keep storage area neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

1.5 JOB CONDITIONS

- A. **Apply water-base paints** only when temperature of surfaces to be painted and surrounding air temperatures are between 50 deg. F and 90 deg. F, unless otherwise permitted by paint manufacturer's printed instructions.
- B. **Apply solvent-thinned paints** only when temperature of surfaces to be painted and surrounding air temperatures are between 45 deg. F and 95 deg. F, unless otherwise permitted by paint manufacturer's printed instructions.
- C. **Do not paint in snow, rain, fog or mist**, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.
 - 1. **Painting may be continued during inclement weather** if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.
- D. **Determine moisture content of surfaces** to be painted by performing appropriate tests using a commercially available moisture meter. Apply paint only when surfaces are within limits specified by the paint manufacturer's printed instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. **Approved Manufacturers:**
 - 1. **Devoe** Paints.
 - 2. **ICI** Paint Stores.
 - 3. **PPG** Industries, Pittsburgh Paints (Pittsburgh).
 - 4. **Pratt and Lambert** (P & L).
 - 5. The **Sherwin-Williams** Company (S-W).
 - 6. **Benjamin Moore** & Co.
 - 7. **Kwal** Paint.

2.2 MATERIALS

- A. **Material Quality:** Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
- B. **Proprietary names** used to designate color or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.
- C. **Federal Specifications** establish minimum acceptable quality for paint materials. Provide written certification from paint manufacturer that materials provided meet or exceed these minimums.

- D. **Manufacturer's products** which comply with coating qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to Architect. Furnish material data and manufacturer's certificate of performance to Architect for any proposed substitutions.
- E. **Color Pigments:** Pure, non-fading, applicable types to suit substrates and service indicated.
- F. **Lead content in pigment**, if any, is limited to contain not more than 0.06% lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.
 - 1. This limitation is extended to interior surfaces and those exterior surfaces, such as stairs, decks, porches, railings, windows, and doors which are readily accessible to children under seven years of age.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Applicator must examine areas** and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.
- B. **Starting of painting work** will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
- C. **Do not paint over dirt**, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.2 PREPARATION

- A. **General:** Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
- B. **Barrier Coats:** Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
- C. **Accessories Removal:** Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
- D. **Surface Preparation:** Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

- E. **Ferrous Metals:** Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
- F. **Touch-up:** Touch-up shop-applied prime coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.
- G. **Galvanized Surfaces:** Clean free of oil and surface contaminants with non-petroleum based solvent.
- H. **Materials Preparation:**
 - 1. **Mix and prepare** painting materials in accordance with manufacturer's directions.
 - 2. **Maintain containers** used in mixing and application of paint in a clean condition, free of foreign materials and residue.
 - 3. **Stir materials before application** to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.3 APPLICATION

- A. **General:** Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. **Paint colors**, surface treatments, and finishes, are indicated in "schedules" of the contract documents.
 - 2. **Provide finish coats** which are compatible with prime paints used.
 - 3. **Apply additional coats** when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 - 4. **Sand lightly** between each succeeding enamel or varnish coat.
 - 5. **Omit first coat** (exterior faces) of surfaces which have been **shop-primed** and touch-up painted, unless otherwise indicated.
- B. **Scheduling Painting:** Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. **Re-coat Time:** Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
 - 2. **Minimum Coating Thickness:** Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.
- C. **Mechanical and Electrical Work:** Painting of mechanical and electrical work is limited to those items exposed to mechanical equipment rooms and in occupied spaces.
 - 1. **Electrical items** to be painted include, but are not limited to, the following:
 - a. Conduit and fittings.

- D. **Prime Coats:** Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.
 - 1. **Recoat primed and sealed surfaces** where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- E. **Pigmented (Opaque) Finishes:** Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
- F. **Completed Work:** Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.4 FIELD QUALITY CONTROL

- A. **The right is reserved by Owner to invoke the following material testing procedure** at any time, and any number of times during period of field painting:
 - 1. **Owner will engage services of an independent testing laboratory** to sample paint being used. Samples of materials delivered to project site will be taken, identified and sealed, and certified in presence of Contractor.
 - a. **Testing laboratory** will perform appropriate tests for any or all of following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.
 - b. **If test results show** that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, and remove non-complying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are non-compatible.

3.5 CLEAN-UP AND PROTECTION

- A. **Clean-Up:** During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.
 - 1. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- B. **Protection:** Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
 - 1. **Provide "Wet Paint" signs** as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
 - 2. **At completion of work of other trades**, touch-up and restore all damaged or defaced painted surfaces.

- C. **Extra Stock:** Deliver stock or maintenance materials to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.
1. **Paint:** Furnish not less than one (1) full gallon for each color and type of paint installed.

3.6 EXTERIOR PAINT SCHEDULE

- A. **General:** Provide the following **paint systems** for the various substrates as indicated below **or equivalent system** from **approved manufacturers** listed above.

B. **METAL** (Galvanized)

Sherwin-Williams - Latex (100% Acrylic) Systems

1st Coat: S-W **DTM Acrylic Primer, B66W1** Series

Finish: Flat

Sheen: (Percent at 60 deg) less than **10%**

Thickness: (Mils per coat) **5 - 10** wet - **2.5 - 5** dry.

2nd Coat: S-W **DTM Acrylic Gloss** Coating, **B66** Series

3rd Coat: S-W **DTM Acrylic Gloss** Coating, **B66** Series

Finish: Gloss

Sheen: (Percent at 60 deg) **75-85%**

Thickness: (Mils per coat) **6.5 - 10** wet - **2.5 - 4** dry.

Kwal Paints - Latex (100% Acrylic) Systems

1st Coat: Kwal **DTM Accu-Guard Acrylic** Primer, 5821

Finish: Flat

Sheen: (Percent at 60 deg) less than **10%**

Thickness: (Mils per coat) **6 - 8** wet - **3 - 4** dry.

2nd Coat: Kwal **DTM Accu-Guard Acrylic** Gloss, 8300 Series

3rd Coat: Kwal **DTM Accu-Guard Acrylic** Gloss, 8300 Series

Finish: Gloss

Sheen: (Percent at 60 deg) **75-85%**

Thickness: (Mils per coat) **6.5 - 10** wet - **2.5 - 4** dry.

PPG - Latex (100% Acrylic) Systems

1st Coat: **PPG Pitt-Tech Primer/Finish** DTM 90-712 Series.

Finish: Flat

Sheen: (Percent at 60 deg) 0-10

Thickness: (Mils per coat) 5.1 - 7.7 wet; 2.0 -3.0 dry.

2nd Coat: **PPG Pitt-Tech High Gloss** DTM 90-374 Series

3rd Coat: **PPG Pitt-Tech High Gloss** DTM 90-374 Series

Finish: Gloss

Sheen: (Percent at 60 deg) 70-100

Thickness: (Mils per coat) 5.5 - 8.3 wet; 2.0 - 3.0 dry

- C. **METAL** (Misc. Iron, Ornamental Iron, Cat Walks, Fire Escapes, Hydrants, Handrails, Ladders, Fences etc.)

Sherwin-Williams - Alkyd Systems

1st Coat: S-W **Kem Kromik Universal Metal Primer, B50Z**
Finish: Flat
Sheen: (Percent at 60 deg) less than **10%**
Thickness: (Mils per coat) **6 - 8** wet - **3 - 4** dry.
2nd Coat: S-W **Industrial Enamel, B54Z** Series
3rd Coat: S-W **Industrial Enamel, B54Z** Series
Finish: Gloss
Sheen: (Percent at 60 deg) **75-85%**
Thickness: (Mils per coat) **6.5 - 10** wet - **2.5 - 4** dry.

Kwal Paints - Alkyd Systems

1st Coat: Kwal **DTM Accu-Guard Acrylic Primer, 5821.**
Finish: Flat
Sheen: (Percent at 60 deg) less than **10%**
Thickness: (Mils per coat) **6 - 8** wet - **3 - 4** dry.
2nd Coat: Kwal **DTM Accu-Guard Acrylic Gloss, 8300** Series
3rd Coat: Kwal **DTM Accu-Guard Acrylic Gloss, 8300** Series
Finish: Gloss
Sheen: (Percent at 60 deg) **75-85%**
Thickness: (Mils per coat) **6.5 - 10** wet - **2.5 - 4** dry.

PPG - Alkyd Systems

1st Coat: **PPG Multiprime** Low VOC Universal Primer 97-680.
Finish: Satin
Sheen: (Percent at 60 deg) less than 25.
Thickness: (Mils per coat) 5.6 - 7.4 wet; 3.0 - 4.0 dry.
2nd Coat: **PPG Speedhide Gloss Oil Enamels** 6-282 Series.
3rd Coat: **PPG Speedhide Gloss Oil Enamels** 6-282 Series
Finish: Gloss
Sheen: (Percent at 60 deg) 85-100
Thickness: 3.2 - 4.0 wet; 1.8 - 2.3 dry.

- D. **METAL** Exposed Exterior Structural Steel Elements (Columns, Trusses, Decking etc.)

Surface Preparation: **Remove all oil and grease** from surface with aromatic solvent wipe, such as **Xylene** or **Med.** Protect adjacent surfaces from damage. Prepare surface in accordance with commercial blast cleaning **SSPC-SP6** with median surface profile of 1.5 to 2.0 mils.

Sherwin-Williams - Polyamide Epoxy (primer) / Aliphatic Polyurethane (finish)

1st Coat: SW **Recoatable Epoxy** Primer, **B67**
Finish: Flat
Sheen: Low sheen
Thickness: (Mils per coat) **6 - 9** wet - **4 - 6** dry.
2nd Coat: SW **Hi-Solids** Polyurethane **B65W300.**
3rd Coat: SW **Hi-Solids** Polyurethane **B65W300.**
Finish: High Gloss
Thickness: (Mils per coat) **4.5 - 6** wet - **3 - 4** dry.

Kwal Paints - Polyamide Epoxy (primer) / Aliphatic Polyurethane (finish)

1st Coat: Kwal/Comex **Paint E-10** High Solids Epoxy

Finish: Flat

Sheen: Low sheen

Thickness: (Mils per coat) **4.5 - 6** wet - **3 - 4** dry.

2nd Coat: Kwal/Comex **Paint E-10** High Solids Epoxy

3rd Coat: Kwal/Comex **Paint U-50** High Gloss Urethane

Finish: High Gloss

Thickness: (Mils per coat) **4.5 - 6** wet - **3 - 4** dry.

END OF SECTION

DIVISION 26 - ELECTRICAL

Section 26 0519	Low-Voltage Electrical Power Conductors and Cables
Section 26 0526	Grounding and Bonding for Electrical Systems
Section 26 0533	Raceways and Boxes for Electrical Systems
Section 26 2416	Panelboards
Section 26 3150	Solar Photovoltaic Systems

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2, Type XHHW-2 and Type SO.
- C. Multi-conductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for Type SO with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.
- B. Exposed Branch Circuits: Type THHN-2-THWN-2, single conductors in raceway.
- C. Exposed Photovoltaic Branch Circuits: Use manufacturers recommended cable between micro-inverters.
- D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.
- E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
 - a. Test main insulation and conductivity on main feeder to solar shades prior to energizing the system.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

END OF SECTION 260519

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Grounding systems and equipment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 5/8 by 96 inches (16 by 2400 mm) in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger unless otherwise indicated.
- B. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
- B. Metal Poles Supporting Photovoltaic Modules: Install grounding electrode (a concrete encased electrode or UFER at each pole support) and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit or feeder conductors.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

- B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
- C. Concrete Encased Electrode (UFER): Provide one of the following
 1. 20 feet of bare 4 AWG copper encased in concrete.
 2. Bond to steel reinforcing bars with bare 4 AWG copper if they are a minimum of 1/2" in diameter and are NOT epoxy coated.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF SECTION 260526

SECTION 260533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Boxes, enclosures, and cabinets.
4. Handholes and boxes for exterior underground cabling.

1.2 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. GRC: Comply with ANSI C80.1 and UL 6.
- C. ARC: Comply with ANSI C80.5 and UL 6A.
- D. IMC: Comply with ANSI C80.6 and UL 1242.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 1. Comply with NEMA RN 1.
 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- F. EMT: Comply with ANSI C80.3 and UL 797.
- G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 2. Fittings for EMT:

- a. Material: Steel.
 - b. Type: compression.
 - 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- H. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ENT: Comply with NEMA TC 13 and UL 1653.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- C. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- E. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- H. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Fiberglass.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- I. Cabinets:

1. NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Standard: Comply with SCTE 77.
2. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Underground Conduit: RNC, Type EPC-40-PVC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.

- d. Gymnasiums.
- 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
- C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - 3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
 - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Install surface raceways only where indicated on Drawings.
- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- D. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- G. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- H. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.

2. Arrange raceways to keep a minimum of **1 inch (25 mm)** of concrete cover in all directions.
 3. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 4. Change from ENT to GRC or IMC before rising above floor.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to **1-1/4-inch (35-mm)** trade size and insulated throat metal bushings on **1-1/2-inch (41-mm)** trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than **200-lb (90-kg)** tensile strength. Leave at least **12 inches (300 mm)** of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- N. Surface Raceways:
1. Install surface raceway with a minimum **2-inch (50-mm)** radius control at bend points.
 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding **48 inches (1200 mm)** and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- O. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- P. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where an underground service raceway enters a building or structure.
 3. Where otherwise required by NFPA 70.
 4. Use LFMC in damp or wet locations subject to severe physical damage.
 5. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- Q. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.

- R. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.
- S. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- T. Locate boxes so that cover or plate will not span different building finishes.
- U. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than **6 inches (150 mm)** in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within **12 inches (300 mm)** of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with **3 inches (75 mm)** of concrete for a minimum of **12 inches (300 mm)** on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of **60 inches (1500 mm)** from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from **1/2-inch (12.5-mm)** sieve to **No. 4 (4.75-mm)** sieve and compacted to same density as adjacent undisturbed earth.

- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install handholes with bottom below frost line, <Insert depth of frost line below grade at Project site > below grade.
- E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 262416

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include wiring diagrams for power, signal, and control wiring.
 - 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- B. Enclosures: Surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 3R.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- C. Incoming Mains Location: Bottom.
- D. Phase, Neutral, and Ground Buses: Tin-plated aluminum.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Tin-plated aluminum.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus Configured Terminators: Mechanical type.
 - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.
- G. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, and listed and labeled for series-connected short-circuit rating by an NRTL.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker.

- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating to meet available fault currents.
 - 1. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store and install panelboards and accessories according to NECA 407.
- B. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- C. Mount top of trim **90 inches (2286 mm)** above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box.
- E. Install overcurrent protective devices and controllers not already factory installed.
- F. Install filler plates in unused spaces.
- G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- H. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- B. Panelboard Nameplates: Label each panelboard with a nameplate.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.

END OF SECTION 262416

SECTION 263150

SOLAR PHOTOVOLTAIC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Grid-connected solar photovoltaic (PV) system rated to produce 32kW nominal AC output under peak sun conditions (1000 W/m²) including the following:
 - 1. Photovoltaic modules, including structural support systems.
 - 2. Micro-Inverters.
 - 3. Disconnect switches (both AC and DC).
 - 4. Remote monitoring provisions.
- B. Related Sections:
 - 1. Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" for conductors and cables required for PV systems and components.

1.3 DEFINITIONS

- A. CEC: California Energy Commission.
- B. DC: Direct Current
- C. PTC: Photovoltaic Test Conditions
- D. PV: Photovoltaic.
- E. STC: Standard Test Conditions.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Photovoltaic components and support structures shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 SUBMITTALS

- A. Product Data: Include electrical ratings and data with any optional features and accessories for the following:

1. Solar photovoltaic modules (including energy generation ratings and efficiencies). The manufacturer's product literature shall clearly indicate:
 - a. module physical dimensions;
 - b. module weight;
 - c. current-voltage curves;
 - d. short circuit current;
 - e. open circuit voltage;
 - f. maximum power current;
 - g. maximum power voltage;
 - h. temperature coefficients of module power;
 - i. power output tolerance;
 - j. maximum series fuse rating.
 2. Utility interactive inverters (including inverter operation sequences, voltage regulation and efficiencies).
 3. DC disconnect switches.
 4. DC combiner boxes
 5. Alternating current disconnect switches and distribution components.
 6. Structural support hardware.
 7. Monitoring system.
- B. Shop Drawings: Detailed electrical and structural shop drawings sufficient for a complete installation of a solar photovoltaic system, including plans, wiring diagrams and installation instructions. Shop drawings shall include performance charts, details of equipment assemblies with dimensions indicated, weights, components, location and identification of each field connection, and access, workspace, and clearance requirements.
1. Wiring and Connection Diagrams: Internal and field wiring, including power, signal, and control wiring. Include wire sizes, types and termination points.
 2. Raceway Drawings: Plans and details indicating complete raceway requirements for all wiring.
 3. Details: Elevations and details for control and indication displays.
- C. Manufacturer Seismic Qualification Certification: Submit certification that the structural support hardware and photovoltaic equipment will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the system will remain in place without separation of any parts from devices when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
 2. Dimensioned Outline Drawings of Equipment System: Describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Operation and Maintenance Manuals: For all components of the solar photovoltaic system, including the solar photovoltaic modules, disconnect switches, and inverter, with respect to all operation and maintenance manuals.
1. The Operation and Maintenance manuals shall include the following:
 - a. Title page with clear plastic cover.
 - b. Front title page to include the project title.
 - c. Front title page to include the names of:
 - 1) The Owner
 - 2) The Consultant
 - 3) The Designer
 - 4) The General Contractor
 - 5) The Electrical Contractor

- 6) Any Sub-Contractors, such as a roofing contractor and/or PV array installer.
 - 7) Service representatives in case the PV system does not function.
 - 8) Provide the addresses, phone and fax numbers for the above contacts adjacent to their name.
- d. List of As-built Schematics:
- 1) Single- and triple-line electrical diagram.
 - 2) Site plan.
- e. System Description:
- 1) Describe the system design and configuration.
 - 2) Describe the operation of the PV system (how does it work), and explain the function of each sub-system (if any).
 - 3) Provide an overview of major system components (modules, array, inverters, disconnects, over-current protection) and their connections.
- f. Operator's Manual:
- 1) Procedures for operating the PV system, verifying correct system operation, normal system start up, normal shutdown, producing performance data, and changing inverter protection settings (if permitted).
 - 2) Emergency shutdown and isolation procedures.
 - 3) Start-up procedures for all major equipment, sub-systems and controls, including any alarm functions and power failure mode.
- g. Maintenance Manual:
- 1) Procedures for servicing and maintaining complete system and individual components including:
 - a) All necessary ordinary maintenance, preventive maintenance, minor repair work, and projections for equipment replacement.
 - b) Cleaning the modules and array.
 - c) A schedule of tasks (inspection, cleaning, etc.), time between tasks, and task descriptions.
 - d) How to repair or replace hardware.
 - e) Preventing module and array shading due to the growth in foliage.
 - 2) Describe how to troubleshoot module, array, and inverter problems, including:
 - a) Trouble-shooting sequences.
 - b) The voltage and current expected at various access points to allow simple operational and troubleshooting checks.
 - c) A list of checkpoints if system fails.
 - 3) Provide warning against hazards that could arise in the operation or maintenance of the system and fully describe the precautions that are to be taken to avoid these hazards.
 - 4) Include a parts list giving a sufficient description of each part for ordering a replacement.
 - 5) Provide two-page maintenance log for tracking planned and unplanned maintenance with columns for sequential entry #, date of entry, and entry description.
 - 6) List of equipment suppliers and warranties:
 - a) Provide complete list of equipment suppliers, including address and telephone number.
 - b) Provide complete original-issue manufacturer's documentation, brochures and literature, parts list (if available), installation, and maintenance information for all PV system equipment.
 - c) Provide a warranty list for all items that extend beyond the standard one-year contractor's warranty period.
 - d) Provide guarantees and warranty documents for all equipment.
- h. Test Reports, Certifications:
- 1) Pre-operational cleaning reports.

- 2) Identification of disconnecting means: schedule including location, service and normal position.
 - 3) Electrical inspection approval report.
 - 4) Utility approval/acceptance report.
 - 5) Start-up reports of equipment.
 - 6) Table of inverter protection settings (if user adjustable).
 - 7) Test and commissioning documentation.
 - 8) Guarantee and warranty certificates for all equipment and systems.
- E. Qualification Data for the following:
 - 1. Manufacturer.
 - 2. Installer.
 - 3. Testing agency.
 - F. Source quality-control test reports.
 - G. Field quality-control test reports.
 - H. Utility Coordination Letter: A letter from the utility operating the electrical grid to which the system will be connected certifying that the utility has reviewed and approved the design and implementation of a solar photovoltaic system to be connected to its utility grid.
 - I. Utility Acceptance Letter: Where required by the local utility, written verification indicating that the utility has inspected and approved of the installation of the system and of the isolation-protection method provided to ensure disconnection of the solar photovoltaic system from the utility grid upon interruption of power supplied from the utility grid.
 - J. Letter of Inspection: Written verification from the authority having jurisdiction that the system has been inspected and accepted by the authority having jurisdiction.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. System Operation: IEEE 929.
- C. System Interconnection: IEEE 1547.
- D. Inverter: UL 1741 listed; IEEE 929 compliant.
- E. PV Modules: UL 1703 listed; IEEE 1262 compliant.
- F. IEEE 1374 – Terrestrial Photovoltaic Power System Safety
- G. Comply with NFPA 70 and NFPA 101.
- H. Installer Qualifications:
 - 1. Licensed in the State of Utah as a Solar Energy Systems Contractor (contractor license classification S202).
 - 2. Have no less than five (5) years of relevant experience on at least five (5) projects in the installation of solar photovoltaic systems similar to that required for this project.

- I. Source Limitations: PV panels shall be in compliance with AARA requirements including the Buy American Solar Public Interest Waiver (see DFCM website <http://dfcm.utah.gov/StdDocs/index.html> for more details).
- J. Source Quality Control: Manufacturers of equipment to be installed in the solar photovoltaic system shall have not less than five (5) years of continuous experience in the design and manufacture of the component the respective manufacturer is to provide.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment in fully enclosed vehicles.
- B. Store equipment in spaces having environments controlled within manufacturers' written instructions for ambient temperature and humidity conditions for non-operating equipment.

1.8 SERVICE CONDITIONS

- A. Environmental Conditions: The solar photovoltaic system shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
 - 1. Ambient Temperature for Electronic Components: -20 to 45 deg C (-4 to 113 deg F).
 - 2. Relative Humidity: 0 to 95 percent, condensing.
 - 3. Altitude: Sea level to 6000 feet.

1.9 WARRANTY

- A. Special Warranty for PV System and Components: Manufacturer's standard form in which manufacturer of PV system and components agrees to repair or replace components of PV systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Include the following warranty periods, from date of Substantial Completion, including parts and labor:
 - a. Photovoltaic Modules (workmanship): 2 years
 - b. Photovoltaic Modules (peak power output): 25 years.
 - c. Inverters: 5 years.
 - d. Structural Support System: 5 years.
 - e. Disconnect Switches: 5 years.
 - f. Comprehensive System Operation: 5 years.

1.10 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.
 - 1. Fuses: One for every 10 of each type and rating, but no fewer than 4 of each.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Solar Photovoltaic Modules:
 - a. SolarWorld AG
 - b. Schott Solar
 - c. Sharp Electronics Corporation
 2. Micro-Inverters:
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Enphase Energy
 3. Roof top Photovoltaic Modules (Additive Alternate, see drawings):
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Solyndra
 - a) Copper indium gallium diselenide (CIGS) thin film cells in cylindrical, hermetically sealed glass tubes, mounted in rack, factory assembled, with junction box, cables for connection in series complying with IEC 61646 and 61730.

2.2 SOLAR PHOTOVOLTAIC MODULE REQUIREMENTS

- A. General Requirements:
1. Indicate on nameplate certifying that the module meets all applicable standards:
 - a. IEC 61215
 - b. IEEE 1262
 - c. UL 1703
 2. Framed, flat-plate, non-concentrating, and employ Silicon Nitrate Coated Poly-crystalline, mono-crystalline or HIT photovoltaic technology.
 3. One or more bypass diodes installed in the module junction box.
 4. Must be compatible with the provided micro-inverter.
- B. Electrical Characteristics at 1000W/m² and Cell Temperature of 25°C:
1. Minimum Peak Power, STC: 230 watts
 2. Minimum Rated Power, PTC: 200 watts
 3. Power Output Tolerance: -0 /+5.
 4. Module Efficiency: 13% or greater
- C. Photovoltaic Structural Support Equipment:
1. Support each module to be individually removed for maintenance, repair, or replacement.
 2. Allow a module to be removed without breaking the bonding of all modules.
 3. Allow for adjustment of the positioning of modules to provide even spacing between all modules.
 4. Be appropriate for the snow and wind loads applicable for the area of installation;
 5. Withstand wind loads of up to 200 km/h (124.27 mph);

6. Be constructed of one of the following:
 - a. corrosion resistant aluminum (6061 or 6063);
 - b. hot dipped galvanized steel (as established per ASTM A123);
 - c. coated or painted steel (although only in low corrosion environments); or
 - d. stainless steel.

2.3 INVERTER REQUIREMENTS

A. General Requirements:

1. Direct Current Side:
 - a. Compatible with the PV system array output;
 - b. Capable of completely automatic, continuous, unattended and stable operation over the range of voltages, currents, and power levels for the size and type of the array to which it is connected, including at start-up, synchronization and disconnect.
 - c. Employ maximum power point tracking technology (MPPT).
 - d. Ground fault protection.
2. Alternating Current Side:
 - a. Power factor of 1.0 without using external reactive power compensation;
 - b. Alternating current output voltage that is directly compatible with the building distribution voltage without the use of an external voltage transformer.
 - c. Does not require a external isolation transformer;
 - d. Capable of operating in parallel with other inverters and the local electrical distribution system.
 - e. Employ built-in mechanisms that cause it to cease to energize the building due to conditions of over-voltage, under-voltage, over-frequency, under-frequency, and in order to prevent islanding.
 - f. Senses loss of utility voltage and automatically disconnects itself from the system until utility voltage is restored.
 - g. Fused disconnect.
3. Inverter Unit:
 - a. Micro-inverter unit suitable for connection to a single PV panel.
 - b. Compatible with the selected panel DC output.
 - c. Capable of being connected in parallel with other micro-inverter units and auto-selecting the phase of its AC output.
 - d. Single-phase unit connected in parallel with a 3-phase circuit.
 - e. Fail-safe;
 - f. Utility-interactive;
 - g. Capable of computer-interactive performance monitoring;
 - h. Peak efficiency of 93% or higher;
 - i. Total harmonic distortion of 5% or less;
 - j. Automatically disconnects from the grid system when power quality exceeds the following range parameters (per IEEE 929):
 - 1) Voltage: +10% / -10%.
 - 2) Frequency: 59.3 – 60.5 Hz.
 - k. Permits reconnection to the utility grid after disconnection due to under or over voltage, under or over frequency, or loss of power in the utility grid, according to the time delay and power quality provisions specified in IEEE 929;
 - l. Communication port capable of remote monitoring of individual inverter operation from a computer or from specialized monitoring equipment and be compatible with the existing Enphase Energy envoy monitoring system.
 - m. Meet the requirements for interconnection to the local power utility;
 - n. Meet the following standards and certifications:
 - 1) IEEE 519;
 - 2) IEEE 929;

- 3) IEEE 1547; and
- 4) UL 1741.

2.4 ENCLOSURES

- A. Outdoor: NEMA 3R or better steel cabinets with access to components through hinged doors with flush tumbler lock and latch. All outdoor equipment shall be constructed of weather and sunlight resistant materials
- B. Finish: Manufacturer's standard baked-enamel finish over corrosion-resistant prime treatment.

2.5 NAMEPLATES

- A. Manufacturer's original nameplates indicating service ratings and standard compliance shall be required on all photovoltaic modules, inverters, and disconnect switches.

2.6 SYSTEM MONITORING AND ALARMS

- A. Provisions for Remote Computer Monitoring(this system shall tie into existing Enphase Energy Envoy monitoring system): Communication module in inverter unit provides capability for remote monitoring Include the following features:
 1. Connectors and network interface units or modems for data transmission via RS-232 or similar link.
 2. Additional monitoring functions and features shall include the following:
 - a. Measuring and recording the incoming and outgoing voltage at the inverter; providing alarm for excursions outside proper voltage range.
 - b. Measuring and recording the incoming and outgoing frequency at the inverter; providing alarm for excursions outside proper frequency range.
 - c. Measuring and recording instantaneous power output of the photovoltaic system and cumulative power output of the photovoltaic system.
 - d. Memory device to store recorded data in nonvolatile electronic memory.
 - e. Web box to provide connection between any computer and the inverter using 4-conductor twisted pair cables from an RS-485 output at the inverter to the web box. The web box then connects to a local area network (LAN) with an Ethernet cable or to a phone line with the modem.
 - 1) Inverter Communication: system communicates with monitoring device via the system neutral conductor.
 - 2) Ethernet: 10/100 MBit, connection to LAN network.
 - f. Web-Based Portal: At no additional charge to the Owner, provide a web-based portal that allows storage and graphic display of system's performance data. Portal is accessible anytime from any PC computer via a web browser. Daily system data is uploaded to the portal from the system web box at intervals selected by the user. Include a minimum of 5 years of this service in base bid.

2.7 SOURCE QUALITY CONTROL

- A. Testing: Factory test photovoltaic modules and inverters prior to shipment:
 1. Power generation test (for photovoltaic modules).
 2. Automatic disconnect and reconnect tests (for inverters in over or under voltage, over or under frequency, or utility grid power loss conditions).

3. Functional test and demonstration of all functions, controls, indicators, sensors, and protective devices.
 4. Full-load test.
 5. Overload test.
 6. Power failure test.
- B. Observation of Test: Give 14 days' advance notice of tests and provide access for Owner's representative to observe tests at Owner's option.
- C. Report test results. Include the following data:
1. Description of input source and output loads used. Describe actions required to simulate source load variation and various operating conditions and malfunctions.
 2. List of indications, parameter values, and system responses considered satisfactory for each test action. Include tabulation of actual observations during test.
 3. List of instruments and equipment used in factory tests.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance.
1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment will be installed, before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Installation shall comply with the National Electrical Code (NFPA 70).
- B. Wiring: Install wiring in raceway according to Section 260533, "Raceways and Boxes for Electrical Systems."
1. Install all direct current wiring connected to, and terminations at, modules in accordance with the module manufacture's recommendations.
 2. Install all direct current and alternating current wiring connected to, and terminations at, inverter in accordance with the inverter manufacture's recommendations.
 3. Label all source circuits within the source circuit combiner for polarity and string number (both positive and negative). Label all other wiring for polarity and/or phase.
 4. All terminations must use listed box terminal or compression type connections.
- C. Provide all overcurrent protection required for the system and install such overcurrent protection in an accessible location for servicing and maintenance.
- D. Building Envelope Penetrations:
1. Install all roofing and building envelope penetration per the Contract Documents, and in locations approved by the Architect.

2. Install all connections to the roof and building envelope structure per the Contract Documents.
 3. Use only as many attachment points and roof penetrations as necessary for structural loading concerns. The number of attachment points and structural requirements of the roof must be specifically identified in the drawings.
 4. Before roof work is started, co-ordinate with the Architect/Owner regarding any roof warranty.
 5. Seal roof penetrations to suit building code requirements.
 6. Properly size all wiring penetrations of the building envelope in a neat, workmanlike manner.
 7. Properly seal any roof or wall penetrations to prevent leakage with industry approved sealing methods according to standard building practices.
- E. Array Mounting:
1. If the array is to be ground mounted, construct piles as per the Contract Documents, standard practice for piles, and mounting rack manufacturer specifications.
 2. For roof-mounted arrays, provide structural system that supports array off roof. Coordinate with roofing details and installer.
- F. Field Testing – Modules:
1. Upon receipt, check each individual PV module visually for signs of damage.
 2. Field-test each individual PV module prior to assembly into array to verify electrical integrity and specified performance.
 - a. Measure and record open circuit voltage (Voc) and short circuit current (Isc) and compare the results with nameplate values.
 - b. Estimate and record ambient air temperature and solar radiation conditions.
 - c. Complete the testing under good, clear weather conditions.
 3. In the event the measurements are out of the expected ranges, deem the module defective and notify the Supply Contractor.
 4. Do not install defective modules.
 5. Submit a copy of all testing records to the Owner.
- G. Array:
1. Coordinate the array installation with building envelope penetration or groundwork.
 2. Ensure roof area or other installation site is capable of handling the designed array size with no overhanging edges except as indicated.
 3. If roof mounted, verify that the roof is capable of handling additional weight of PV system. Augment roof structure as necessary.
 4. Install PV support structure and modules per Contract Documents and support structure manufacturer assembly instructions.
 5. Modules must fit snug against the support structure. Do not twist the module to force a fit since the glazing may shatter.
 6. This PV system is likely to be placed in a high profile and publicly visible location. As a result, the aesthetics of the overall installation are likely extremely important to the Owners. To create a uniform appearance with the array, adjust the PV module position to permit uniform spacing between individual modules.
 7. The use of ferrous metals, contact of dissimilar metals and the use of any wood or plastic components are not permitted.
 8. Avoid the effects of dissimilar metal contact and choose materials to minimize or eliminate these effects accordingly.
 9. Connect all electrical connections between modules. PV modules are instantly electrically "alive" as soon as they are removed from their shipping box and exposed to light. Use live wiring methods when assembling array.
 10. Provide lock-washers to prevent "backing out" of nuts at all bolted connections. Use stainless steel fasteners only.

- H. System
 1. Install all equipment in readily accessible locations as defined by the National Electrical Code.
 2. Install system in compliance with the system component manufacturer's instructions as required to provide a neat, workmanlike, and fully integrated and operational system. Ensure that all required and recommended clearances are maintained.
 3. Connect PV system to the building's electrical distribution system.
 4. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
 5. Properly ground the system parts to reduce the threat of shock hazards and induced surges.
 6. Notify the Owner in writing when the entire PV system is installed, and the preliminary field-testing is successfully completed.
 7. The electrical utility may require that a representative be on-site at the time of the initial system turn on. Provide sufficient notice and co-ordinate work accordingly.
- I. Instrumentation
 1. Install equipment and wiring according to manufacturers installation instructions.
 2. Make final connections to Owner's LAN network.
- J. The quality of workmanship provided by each trade in the execution of its work shall be the finest and highest obtainable in that trade working with the materials specified. Workmanship shall be satisfactory to the Owner and the Owner's decision as to acceptable quality is final.

3.3 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 IDENTIFICATION

- A. Identify equipment and components according to Division 26 Section "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Cleaning:
 1. Clean up all debris resulting from activities daily. Remove all cartons, containers, crates, etc., under Contractor's control as soon as their contents have been removed. Collect waste and place in a designated location.
 2. At the completion of work in any area, clean all work, equipment, etc., keeping it free from dust, dirt, filings, grease, tape residue, and debris, etc.
 3. At the completion of work, check all equipment furnished under this Section for paint damage, and repair any factory-finished paint that has been damaged to match the adjacent areas. Replace any cabinet or enclosure that has been deformed with new material and repainted to match the adjacent areas.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

- C. Tests and Inspections:
1. Field test the array (or each sub-array when installed) in the presence of the Owner to verify electrical integrity and specified performance.
 2. Inspect for integrity of mechanical and electrical connections, component type and labeling verification, and ratings of installed components.
 3. Test manual and automatic operational features and system protective and alarm functions.
 4. Test communication of status and alarms to remote monitoring equipment.
 5. Perform each visual and mechanical inspection and electrical test stated in accordance with the requirements of the authorities having jurisdiction. Certify compliance with test parameters.
 6. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 7. Measure the array (or each sub-array) Voc and Isc under good, clear weather conditions. Estimate ambient air temperature and solar radiation conditions. Record and check for consistency with the module field-test measurements.
 8. Measure the voltage and current of the system when operating the building load.
- D. Remove and replace malfunctioning units and retest as specified above.

3.6 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 26 Sections.
- C. Complete installation and startup checks according to manufacturer's written instructions.

3.7 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.8 DEMONSTRATION AND TRAINING

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain central battery inverters. Refer to Division 01 Section "Demonstration and Training."
- B. Training:
 1. Provide a 3-hour on-site training session for personnel designated by the Owner.
 2. Train the designated personnel to enable them to do the following:
 - a. Proficiently operate the PV system, understand location of control components, turn on and off the system.
 - b. Understand system components, layout, configuration.
 - c. Understand system operation, including factors affecting its optimal operation.
 - d. Adjust and change inverter settings.
 - e. Access graphics, data reports, and logs.
 - f. Recognize malfunctions of the system by observation of visual signals.
 - g. Perform checkout and maintenance procedures for maintaining, troubleshooting, diagnosing, and repairing hardware.
 - h. Understand system drawings and Operation and Maintenance manual.

3. The instructor shall be experienced in presenting this material.
4. Perform demonstration and instruction on a sunny day, in the presence of the Owner using the completed O&M Manual.
5. Instruct the building operators in the operation and preventative maintenance of each piece of equipment and system supplied and installed.
6. Run through all control functions, operating modes and emergency procedures.

3.9 ACCEPTANCE

- A. At the end of the final start-up, testing, and commissioning, if equipment and systems are operating satisfactorily to the Owner, the Owner will sign certificates certifying that the PV system's operation has been tested and accepted in accordance with the terms of this Specification.

END OF SECTION 263150

DIVISION 31 - EARTHWORK

Section 31 1000	Site Clearing
Section 31 2000	Earthwork

SECTION 31 1000

SITE CLEARING

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** the following:
1. Removing and transplanting trees and other vegetation.
 2. Removing above-grade site improvements.
 3. Disconnecting, capping or sealing, and removing site utilities.
 4. Tree protection.
- B. **Related Sections** include the following:
1. **Division 1** Section "**Temporary Facilities and Controls**" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures during site operations.
 2. **Division 2** Section "**Earthwork**" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

- A. **Topsoil:** Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, and other deleterious materials.

1.4 MATERIALS OWNERSHIP

- A. **Materials** indicated to be **stockpiled** or **to remain** are the **Owner's** property. **Cleared materials** shall become **Contractor's** property and shall be removed from the site.

1.5 SUBMITTALS

- A. **Photographs, DVD or videotape**, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. **Record drawings** according to **Division 1** Section "**Closeout Procedures.**"
1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

- A. **Pre-installation Conference:** Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 PROJECT CONDITIONS

- A. **Traffic:** Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. **Do not close or obstruct streets,** walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. **Provide alternate routes** around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. **Improvements on Adjoining Property:** Authority for performing indicated removal and/or access on property adjoining Owner's property will be obtained by Owner before award of Contract.
- C. **Salvable Improvements:** Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- D. **Notification:** Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PREPARATION

- A. **Protect and maintain benchmarks** and survey control points from disturbance during construction.
- B. **Provide erosion-control** measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. **Locate and clearly flag trees** and vegetation to remain or to be relocated.
- D. **Protect existing site improvements** to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

- A. **Erect and maintain a temporary fence** around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

1. **Do not store construction materials**, debris, or excavated material within drip line of remaining trees.
 2. **Do not permit vehicles**, equipment, or foot traffic within drip line of remaining trees.
- B. **Do not excavate within drip line of trees**, unless otherwise indicated.
- C. **Where excavation for new construction is required** within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
1. **Cover exposed roots** with burlap and water regularly.
 2. **Temporarily support** and protect roots from damage until they are permanently relocated and covered with soil.
 3. **Coat cut faces of roots** more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 4. **Cover exposed roots** with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.
- D. **Repair or replace trees** and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.
1. **Employ a qualified arborist**, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
 2. **Replace trees** that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.3 UTILITIES

- A. **Locate, identify, disconnect, and seal or cap off utilities** indicated to be removed.
1. Arrange to shut off indicated utilities with utility companies.
- B. **Existing Utilities:** Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. **Notify Architect** not less than two days in advance of proposed utility interruptions.
 2. **Do not proceed** with utility interruptions without Architect's written permission.
- C. **Excavate for and remove** underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

- A. **Remove obstructions**, asphalt & concrete paving, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
1. **Do not remove trees**, shrubs, and other vegetation indicated to remain or to be relocated.
 2. **Cut minor roots** and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 3. **Completely remove stumps**, roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
 4. **Use only hand methods** for grubbing within drip line of remaining trees.

- B. **Fill depressions caused by clearing and grubbing** operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - 1. **Place fill material** in horizontal layers not exceeding 8-inch (200-mm) loose depth, and compact each layer to a density equal to adjacent original ground.

3.5 TRANSPLANTING OF TREES

- A. **Description:** Prepare, transplant and maintain trees. Plant material to be transplanted shall be as indicated on Drawings or as tagged in field by Architect.
- B. **General:** Prior to performing work, Contractor shall submit a detailed plan for transplanting trees including, but not limited to:
 - 1. Method of preparing trees for transplant, including root pruning;
 - 2. Method of excavating at time of transplant;
 - 3. Method of containing root balls;
 - 4. Proposed root ball width and depth for each size category of tree;
 - 5. Equipment proposed for moving trees and routing on the site for all aspects of operation;
 - 6. Schedule for all transplant work;
 - 7. Any other details or suggestions which vary from methods described herein.
- C. **Method of Transplant:** Machine dug and moved with a hydraulic "tree spade".
- D. **Ground Preparation:**
 - 1. Dig and prepare pits to accommodate transplanted trees prior to final digging of transplant trees.
 - 2. Thoroughly water pits on day of transplanting.
 - 3. Use same size spade to excavate transplant hole as to excavate and remove tree.
- E. **Tree Preparation:**
 - 1. Mark orientation of tree as a guide for positioning in new location.
 - 2. Tie up any low branches that will interfere with equipment or that might be damaged in transplanting operation.
 - 3. Dead, injured or diseased wood shall be removed in accordance with good horticultural practice.
- F. **Transplanting Operation**
 - 1. **Root ball:** Diameter of root ball shall be at least 10 times the diameter of the trunk at breast height (dbh).
 - 2. Depth of root ball shall be sufficient to preserve the majority of large roots; depth shall be approximately 60 percent of the ball width.
 - 3. Excavate, move and replant tree, taking care to avoid damage to tree branches and trunk.
 - 4. In a ring approximately 18 inches wide extending from the edge of the transplanted root ball, loosen the top 8 inches of soil and evenly spread Mycorrhizal fungi mixture at a rate of 2.5 oz/8 square feet to promote root establishment and tree health.

- G. **Finishing:**
1. Cultivate and rake over finished planting areas and leave in orderly condition.
 2. Stake trees immediately after transplanting. Protect tree from staking wire with hose. Set steel stakes at quarter points around tree, outside root ball. Stakes shall be plumb.
 3. Spray uniformly plant material with anti-desiccant within 48 hours of transplanting.
 4. Apply 4 inches of shredded hardwood mulch over each tree's entire transplant area, including outer soil ring.
- H. **Maintenance:** Water and maintain all transplanted material for at least 6 months or until next normal leaf drop in Fall.

3.6 SITE IMPROVEMENTS

- A. **Remove existing above- and below-grade improvements** as indicated and as necessary to facilitate new construction.
- B. **Remove slabs**, paving, curbs, gutters, and aggregate base as indicated.
1. **Unless existing full-depth joints coincide with line of demolition**, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.7 DISPOSAL

- A. **Disposal:** Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 31 2300

EARTHWORK

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** the following:
1. **Excavating support** structures
 2. **Excavating and backfilling trenches for buried mechanical** and electrical utilities and pits for buried utility structures.
 3. **Excavating using Hydrovac equipment** in close proximity to existing underground structures or utilities.
- B. **Related Sections** include the following:
1. **Division 1** Section "**Construction Facilities and Temporary Controls.**"
 2. **Division 2** Section "**Site Clearing**" for site stripping, grubbing, removing topsoil, and protecting trees to remain.

1.3 DEFINITIONS

- A. **Backfill:** Soil materials used to fill an excavation.
1. **Initial Backfill:** Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 2. **Final Backfill:** Backfill placed over initial backfill to fill a trench.
- B. **Base Course:** Layer placed between the subbase course and asphalt paving.
- C. **Bedding Course:** Layer placed over the excavated subgrade in a trench before laying pipe.
- D. **Borrow:** Satisfactory soil imported from off-site for use as fill or backfill.
- E. **Drainage Course:** Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- F. **Excavation:** Removal of material encountered above subgrade elevations.
1. **Bulk Excavation:** Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.
 2. **Unauthorized Excavation:** Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. **Fill:** Soil materials used to raise existing grades.

- H. **Structures:** Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. **Subbase Course:** Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.
- J. **Subgrade:** Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- K. **Utilities:** Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- L. **Hydrovac Excavation:** Method of exposing underground electrical facilities using high pressure water and vacuum. This service is available from a number of companies using the same basic operation concept with differences in the capabilities of each machine.

1.4 SUBMITTALS

- A. **Material Test Reports:** From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. **Classification** according to **ASTM D 2487** of each on-site or borrow soil material proposed for fill and backfill.
 - 2. **Laboratory compaction** curve according to **ASTM D 1557** for each on-site or borrow soil material proposed for fill and backfill.

1.5 PROJECT CONDITIONS

- A. **Site Information:** A Geotechnical Investigation of this site has been prepared. Data on indicated subsurface conditions are **not** intended as **representations or warranties** of accuracy or continuity between soil borings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data are made available for **convenience of Contractor**.
 - 1. **Additional test borings** and other exploratory operations may be made by Contractor at no cost to Owner.
- B. **No additional monies** for exporting or importing of soil.
 - 1. **As part of the Construction Documents**, Owner may have provided Contractor with a Topographic Survey performed by manual or aerial means. Such Survey was prepared for project design purposes and is provided to the Contractor as a courtesy. It is expressly understood that such survey may not accurately reflect existing topographical conditions and typically will vary from actual conditions by a significant degree. It is the Contractor's responsibility to verify actual existing conditions by whatever means the Contractor deems appropriate. The Contractor shall be responsible for determining their own earthwork quantities and not rely on any estimate prepared by the Owner, its Agents or outside parties. The Contractor is responsible as part of its lump sum bid price for the project, for importing and/or exporting soils to achieve final sub-grades with suitable soils per the plans and specifications. No additional monies will be allowed beyond the Contractor's Lump Sum Bid Price for the project, for the exporting and/or importing of soils.

- C. **Existing Utilities:** Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
1. **Should uncharted, or incorrectly charted, piping** or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
 2. **Do not interrupt utilities serving facilities** occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:
 3. **Notify Architect** not less than two days in advance of proposed utility interruptions.
 4. **Do not proceed** with utility interruptions without Architect's written permission.
 5. **Contact utility-locator service** for area where Project is located before excavating.
- D. **Utilities to be removed:** Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.
- E. **Protection of Persons and Property:** Barricade open excavations occurring as part of this work and post with warning lights.
1. **Operate warning lights** as recommended by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. **General:** Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. **Satisfactory Soils:** ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 4 inches (100 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. **Unsatisfactory Soils:** ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. **Backfill and Fill:** Satisfactory soil materials.
- E. **Subbase:** Naturally or artificially well graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 70 percent passing a 3/4- inch (18-mm) sieve and not more than 25 percent passing a No. 200 (0.075-mm) sieve.
- F. **Base Course:** Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; conforming to the 1 inch gradation requirements of Section 301 of the UDOT Standard Specification for Road and Bridge Construction.

- G. **Engineered Fill:** Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 70 percent passing a 3/4-inch (18-mm) sieve and not more than 25 percent passing a No. 200 (0.075-mm) sieve.
- H. **Bedding:** Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- I. **Drainage Fill:** Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch (38-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
- J. **Filter Material:** Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.
- K. **Impervious Fill:** Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

- A. **Warning Tape:** Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:
- B. **Detectable Warning Tape:** Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
 1. **Red:** Electric.
 2. **Yellow:** Gas, oil, steam, and dangerous materials.
 3. **Orange:** Telephone and other communications.
 4. **Blue:** Water systems.
 5. **Green:** Sewer systems.
- C. **Trace Wire:** Insulated 10 gage copper, suitable for direct bury.

PART 3 - EXECUTION

3.1 PREPARATION

- A. **Protect structures,** utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. **Protect subgrades** and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

- C. **Provide erosion-control measures** to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

- A. **Prevent surface water** and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. **Protect subgrades** from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. **Reroute surface water runoff** away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. **Install a dewatering system** to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

- A. **Explosives:** Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. **Unclassified Excavation:** Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 HYDROVAC EXCAVATION

- A. Successful demonstration of technical and safety qualifications of the hydrovac company need to be submitted and approved by the Architect prior to any work being undertaken . Demonstration of technical and safety qualifications will include at minimum:
 - 1. - Written work procedures
 - 2. - Verification of qualifications of employees
 - 3. - Written hazard assessment forms
- B. All documents, procedures, and worker training will need to meet requirements of federal, state and local regulations.
- C. General: HydroVac Excavation
 - 1. All of the hydrovac systems presently available have a combination of water temperature and pressure that have the potential to damage underground cables if applied incorrectly.
 - 2. Cable damaged by excessive water pressure / temperature may appear as a slice into the cable of unknown depth and / or as a tear through the outer jacket of the cable.
 - 3. If there is any concern that cable damage has occurred, call for an inspection of all exposed cables prior to backfilling.

4. In order to expose energized cables using hydrovac methods, the hydrovac company is responsible to create an equal potential zone. The equal potential zone is created to ensure worker protection. Under electrical fault conditions the water, wand and vacuum pipe from the hydrovac truck will make an electrical connection with the cables.
 5. All hydrovac companies must have written work methods for carrying out hydrovac work. The written work methods will include how equal potential zones will be set up for their operations and how the public and other workers in the vicinity of hydrovac operations will be protected.
 6. Prior to hydrovac around high voltage energized cables (13.8kV cables), reclosure blockage is recommended.
- D. The hydrovac operator prior to any excavation within 1 meter of energized high voltage cables must complete a Hazard Assessment.
- E. HydroVac Specifications
1. Pressure - Shall not exceed 1500 psi
 2. Temperature - Shall not exceed 93 degrees C (200 degrees F)
 3. The pressurized water wand will be kept in constant motion while in operation
 4. Vacuum pipe end - Shall have a neoprene or equivalent lip to protect the cable from physical damage.
- F. The hydrovac company is responsible for all aspects of the operation to ensure that damage does not occur to cables or other underground utilities.

3.6 EXCAVATION FOR STRUCTURES

- A. **Excavate to indicated elevations** and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
1. **Excavations for Footings and Foundations:** Do not disturb bottom of excavation. If required to **not disturb** bottom of excavation, **excavate by hand to final grade** just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. **Excavation for Underground Mechanical or Electrical Utility Structures:** Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended for bearing surface.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

- A. **Excavate surfaces under walks** and pavements to indicated cross sections, elevations, and grades.

3.8 EXCAVATION FOR UTILITY TRENCHES

- A. **Trench Excavation:** Excavate trenches to indicated gradients, lines, depths, and elevations.
1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

- B. **Trench Clearance:** Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: 12 inches (300 mm) on each side of pipe or conduit.

- C. **Trench Bottoms:** Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. **For pipes and conduit less than 6 inches** (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. **For pipes and conduit 6 inches** (150 mm) **or larger** in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 - 3. **Excavate trenches 6 inches** (150 mm) **deeper** than elevation required in rock or other unyielding bearing material to allow for bedding course.

- D. **Trench Bottoms:** Excavate trenches 4 inches (100 mm) deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
 - 1. **Excavate trenches 6 inches** (150 mm) **deeper** than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.9 TRENCH SUPPORT SYSTEMS

- A. **Trench support system shall be suitable for the soil structure**, depth of cut, water content of soil, weather conditions, superimposed loads and vibration. Contractor may select one of the following methods of ensuring the safety of workers in the trench, as approved by the Utah State Industrial Commission or its safety inspectors:
 - 1. **Sloping the sides of the trench** to the angle of repose at which the soil will remain safely at rest.
 - 2. **Shoring trench sides by placing sheeting**, timber shores, trench jacks, bracing, piles, or other materials to resist pressures surrounding the excavation.
 - 3. **Using a movable trench box built-up** of steel plates and heavy steel frame of sufficient strength to resist the pressures surrounding the excavation

3.10 APPROVAL OF SUBGRADE

- A. **Notify Architect** when excavations have reached required subgrade.

- B. **If Architect determines** that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

- C. **Proof roll subgrade** with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

- D. **Reconstruct subgrades** damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

3.11 UNAUTHORIZED EXCAVATION

- A. **Fill unauthorized excavation** under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.
 - 1. **Fill unauthorized excavations** under other construction or utility pipe as directed by Architect.

3.12 STORAGE OF SOIL MATERIALS

- A. **Stockpile borrow materials** and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. **Stockpile soil materials** away from edge of excavations. Do not store within drip line of remaining trees.

3.13 BACKFILL

- A. **Place and compact backfill** in excavations promptly, but not before completing the following:
 - 1. **Construction below finish grade** including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 - 2. **Surveying locations** of underground utilities for record documents.
 - 3. **Inspecting and testing** underground utilities.
 - 4. **Removing concrete** formwork.
 - 5. **Removing trash** and debris.
 - 6. **Removing temporary shoring** and bracing, and sheeting.
 - 7. **Installing permanent or temporary** horizontal bracing on horizontally supported walls.

3.14 UTILITY TRENCH BACKFILL

- A. **Place and compact bedding course on trench bottoms** and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. **Backfill trenches excavated under footings** and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.
- C. **Provide 4-inch-** (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase.
- D. **Place and compact initial backfill of subbase material**, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.
 - 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

- E. **Coordinate backfilling** with utilities testing.
- F. **Place and compact final backfill** of satisfactory soil material to final subgrade.
- G. **Install warning tape** directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.15 FILL

- A. **Preparation:** Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. **Plow, scarify, bench, or break up sloped surfaces** steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. **Place and compact fill material** in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.
 - 5. Under footings and foundations, use engineered fill.

3.16 MOISTURE CONTROL

- A. **Uniformly moisten** or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
 - 1. **Do not place backfill** or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. **Remove and replace**, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.17 COMPACTION OF BACKFILLS AND FILLS

- A. **Place backfill** and fill materials in layers not more than **8 inches** (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. **Place backfill and fill materials evenly** on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. **Compact soil to not less than** the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. **Under structures**, building slabs, steps, and pavements, scarify and recompact top 6 inches (150 mm) of existing subgrade and each layer of backfill or fill material at **95 percent**. Compact to **98 percent** for fills **thicker than 6 feet** deep.
 - 2. **Under walkways**, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 95 percent.
 - 3. **Under lawn or unpaved areas**, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 90 percent.

3.18 GRADING

- A. **General:** Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

- B. **Site Grading:** Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
 - 2. Walks: Plus or minus 1 inch (25 mm).
 - 3. Pavements: Plus or minus 1/2 inch (13 mm).

- C. **Grading inside Building Lines:** Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.19 SUBBASE AND BASE COURSES

- A. **Under pavements and walks,** place subbase course on prepared subgrade and as follows:
 - 1. Place base course material over subbase.
 - 2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
 - 3. Shape subbase and base to required crown elevations and cross-slope grades.
 - 4. When thickness of compacted subbase or base course is 6 inches (150 mm) or less, place materials in a single layer.
 - 5. When thickness of compacted subbase or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

- B. **Pavement Shoulders:** Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.20 DRAINAGE COURSE

- A. **Under slabs-on-grade,** place drainage course on prepared subgrade and as follows:
 - 1. **Compact drainage course** to required cross sections and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
 - 2. **When compacted thickness of drainage course is 6 inches (150 mm) or less,** place materials in a single layer.
 - 3. **When compacted thickness of drainage course exceeds 6 inches (150 mm),** place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

3.21 FIELD QUALITY CONTROL

- A. **Testing Agency:** Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. **Allow testing agency to inspect and test subgrades** and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. **Footing Subgrade:** At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- D. **Testing agency will test compaction of soils** in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. **Paved and Building Slab Areas:** At subgrade and at each compacted fill and backfill layer, at least one test for every 1000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
 - 2. **Foundation Wall/Continuous Footing Backfill:** At each compacted backfill layer, at least one test for each 15 linear feet or less of wall length, but no fewer than two tests.
 - 3. **Trench Backfill:** At each compacted initial and final backfill layer, at least one test for each 40 feet or less of trench length, but no fewer than two tests.
 - 4. **Spot Footings:** Minimum of 1 compaction test for each lift for each spot footing.
 - 5. **Sidewalks, Curbs, Gutters, Pads:** Minimum of 1 test for each lift for each 40 lineal feet or 1 test for every 1000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
- E. **When testing agency reports that subgrades, fills, or backfills** have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.22 PROTECTION

- A. **Protecting Graded Areas:** Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. **Repair and reestablish grades** to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. **Where settling occurs** before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. **Restore appearance, quality, and condition** of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. **Disposal:** Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

DIVISION 32 - EXTERIOR IMPROVEMENTS

Section 32 1200	Asphalt Patching
Section 32 1300	Concrete Pavement
Section 32 9113	Landscaping

SECTION 32 1216

ASPHALT PAVING

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** the following:
 - 1. Hot-mix asphalt **patching**.
- B. **Related Sections** include the following:
 - 1. **Division 2** Section "**Earthwork**" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.3 DEFINITIONS

- A. **Hot-Mix Asphalt Paving Terminology:** Refer to ASTM D 8 for definitions of terms.
- B. **UDOT:** Utah Department of Transportation.

1.4 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of UDOT.

1.5 SUBMITTALS

- A. **Product Data:** For each type of product indicated. Include technical data and tested physical and performance properties.
- B. **Material Certificates:** For each paving material, signed by manufacturers, certifying that each material item complies with, or exceeds, specified requirements.

1.6 QUALITY ASSURANCE

- A. Codes and Standards: Comply with UDOT's Standard Specifications, latest edition.

1.7 PROJECT CONDITIONS

- A. **Weather Limitations:** Apply prime and tack coats when ambient temperature is above 50 deg.F (10 deg.C), and when temperature has not been below 35 deg.F (1 deg.C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

1. Construct asphalt concrete surface course when atmospheric temperature is above 40 deg.F (4 deg.C), and when base is dry. Base course may be placed when air temperature is above 30 deg. F (-1 deg.C) and rising.
- B. **Grade Control:** Establish and maintain required lines and elevations.
- C. **Pavement-Marking Paint:** Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4 deg C) for oil-based materials, 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 MATERIALS

- A. **Use locally available materials** and gradations which exhibit a satisfactory record of previous installations.
- B. **Base Course Aggregate:** Sound, non-expansive angular crushed stone, crushed gravel, or crushed slag, sand, stone or slag screenings, conforming to the 1 inch gradation requirements of Section 301 of the Utah Department of Transportation, Standard Specifications for Road and Bridge Construction.
1. **Uncrushed gravel** may be used in base course mixture if required to suit local material availability.
- C. **Base Course Gradation Table** (1 inch gradation)
- | <u>Sieve Size</u> | <u>Ideal Gradation
(Percent Passing)</u> |
|-------------------|--|
| 1" | 100 |
| 1/2" | 79-91 |
| No. 4 | 49-61 |
| No. 16 | 27-35 |
| No. 200 | 7-11 |
- D. **Base Course Thickness:** Minimum of **8 inches** of **aggregate base course** over properly prepared sub-grade in **light asphalt areas**. Minimum of **9 inches** of aggregate **base course** over minimum of **18 inches** of granular sub-base in heavy asphalt pavement areas, as required by the **geotechnical data**.
- E. **Surface Course Aggregate:** Crushed stone, crushed gravel, crushed slag, and sharp-edged natural sand.
- F. **Sand:** Sand prepared from stone, blast-furnace slag, or gravel, or combinations thereof may be used if required to suit local material availability.
- G. **Mineral Filler:** Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M 17 (ASTM D 242).
- H. **Asphalt Cement:** AASHTO M 226 (ASTM D 3381) for viscosity-graded material and AASHTO M 20 (ASTM D 946) for penetration-graded material.

- I. **Tack Coat:** Emulsified asphalt, AASHTO M 140 (ASTM D 997) or M 208 (D 2397); SS-1 SS-1h, CSS-1 or CSS-1h, diluted with one part water to one part emulsified asphalt.

2.2 ASPHALT-AGGREGATE MIXTURE:

- A. Provide plant-mix, hot-laid asphalt-aggregate mixture complying with ASTM D 3515 and as recommended by local paving authorities to suit project conditions.
- B. The percentage of bituminous material by weight added to aggregate will be between 4% and 7% of the weight of the bituminous mixture. Aggregate gradation shall conform to the 1/2 inch gradation requirements of Section 402 of the Utah Department of Transportation, Standard Specifications for Road and Bridge Construction.:

Ideal Gradation per Grading Table C (1/2" Maximum)

<u>Sieve Size</u>	<u>(Percent Passing)</u>
1/2"	100
No. 4	60-80
No. 16	28-42
No. 50	11-23
No. 200	5-9

PART 3 - EXECUTION

3.1 SURFACE PREPARATION:

- A. **General:** Remove loose material from compacted base coarse surface immediately before applying herbicide treatment or prime coat.
 - 1. **Proof roll** prepared base coarse surface to check for unstable areas and areas requiring additional compaction.
 - 2. **Notify Architect** of unsatisfactory conditions. Do not begin paving work until deficient base coarse areas have been corrected and are ready to receive paving.
- B. **Herbicide Treatment:** Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted dry base coarse prior to application of prime coat.
- C. **Tack Coat:** Apply to contact surfaces of previously constructed asphalt or Portland Cement Concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gal. per sq. yd. of surface.
 - 1. Allow to dry until at proper condition to receive paving.
 - 2. Exercise care in applying bituminous materials to avoid smearing on adjoining concrete surfaces. Remove and clean damaged surfaces.

3.2 PATCHING

- A. **Hot-Mix Asphalt Pavement:** Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

- B. **Tack Coat:** Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. **Patching:** Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.3 COMPACTION:

- A. **Percentage of Maximum Density Requirements:** Compact asphalt to 96% of reference laboratory density according to ASTM D-1559, but not less than 94 percent nor greater than 100 percent.

3.4 ROLLING:

- A. **General:** Begin rolling when mixture will bear roller weight without excessive displacement.
 - 1. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
 - 2. Complete compaction before mix temperature cools to 185 deg. F. (85 deg. C.).
- B. **Breakdown Rolling:** Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.
- C. **Second Rolling:** Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.
- D. **Finish Rolling:** Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.
- E. **Patching:** Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.
- F. **Protection:** After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- G. **Barricades:** Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.5 FIELD QUALITY CONTROL

- A. **Testing Agency:** Owner will employ and pay a qualified independent testing agency to perform field quality-control testing services specified in this section. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

- B. **Test in-place asphalt concrete courses** for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Engineer.
- C. **Thickness:** In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:
 - 1. **Base Course:** 1/2-inch, plus or minus.
 - 2. **Surface Course:** 1/4-inch, plus or minus.
- D. **Base Course Testing:** Contractor shall perform at least one density test on aggregate base course for each 200 c.y. (1200 s.y. at 6-inch) of material placed.
- E. **Asphalt Testing:** Contractor shall have at least one (1) coring sample of asphalt taken for every 100 C.Y. (1200 S.Y. at 3-inches) of asphalt installed to verify asphalt density, temperature and thicknesses are in conformance with specifications. Locate coring sites as directed by Architect. Contractor is responsible for costs of tests and repair of core holes. Contractor shall also provide laboratory testing for materials check on bituminous materials, including but not limited to: gradation, extraction, compaction, marshall density, stability, flow and % AC.
- F. **Surface Smoothness:** Test finished surface of each asphalt concrete courses for smoothness, using 10-foot straightedge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.
 - 1. **Base Course Surface:** 1/4-inch.
 - 2. **Wearing Course Surface:** 3/16-inch.
 - 3. **Check surface areas** at intervals as directed by Engineer.

3.6 DISPOSAL

- A. **Remove excavated materials** from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow excavated materials to accumulate on-site.

END OF SECTION

SECTION 32 1313

CONCRETE PAVEMENT

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** exterior cement concrete pavement for the following:
 - 1. Pavements.
 - 2. Curbs and gutters.
 - 3. Walkways.
- B. **Related Sections** include the following:
 - 1. **Division 2** Section "**Earthwork**" for subgrade preparation, grading, and subbase course.
 - 2. **Division 3** Section "**Cast-in-Place**" Concrete.

1.3 DEFINITIONS

- A. **Cementitious Materials:** Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. **Manufacturer Qualifications:** Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. **Concrete Testing Service:** The Owner will engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.
- D. Comply with local governing regulations and the following:
 - 1. **UOSH** Construction Standards Chapter G: Signs, Signals, and Barricades.
 - 2. **UDOT** Instructions to Flaggers.
 - 3. **ANSI D6.1:** Manual on Uniform Traffic Control Devices for Streets and Highways.
 - 4. **ATSSA:** American Traffic Safety Services Association.
 - 5. **State of Utah** Standard Specifications for Road and Bridge Construction, latest edition.

1.5 PROJECT CONDITIONS

- A. **Traffic Control:** Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

- A. **Form Materials:** Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves of a radius 100 feet (30.5 m) or less.
- B. **Form-Release Agent:** Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. **Plain-Steel Welded Wire Fabric:** ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. **Reinforcement Bars:** ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. **Steel Bar Mats:** ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars; assembled with clips.
- D. **Plain Steel Wire:** ASTM A 82, as drawn.
- E. **Joint Dowel Bars:** Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.
- F. **Tie Bars:** ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- G. **Hook Bolts:** ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- H. **Bar Supports:** Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

- A. **General:** Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. **Portland Cement:** ASTM C 150, Type I or II.
 - 1. Fly Ash: ASTM C 618, Class F or C.
- C. **Aggregate:** ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:
 - 1. Class: 4S.
 - 2. Maximum Aggregate Size: 1 inch (25 mm) nominal.
 - 3. Do not use fine or coarse aggregates containing substances that cause spalling.
- D. **Water:** ASTM C 94.

2.4 ADMIXTURES

- A. **General:** Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. **Air-Entraining Admixture:** ASTM C 260.

2.5 CURING MATERIALS

- A. **Evaporation Retarder:** Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. **Clear, Waterborne, Membrane-Forming Curing and Sealing Compound:** ASTM C 1315, Type 1, Class A.

2.6 RELATED MATERIALS

- A. **Expansion- and Isolation-Joint-Filler Strips:** ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. **Bonding Agent:** ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.7 CONCRETE MIXES

- A. **Prepare design mixes,** proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

- B. **Use a qualified independent testing agency** for preparing and reporting proposed mix designs for the trial batch method.
 - 1. **Do not use** Owner's field quality-control testing agency as the independent testing agency.

- C. **Proportion mixes to provide concrete with the following properties:**
 - 1. **Compressive Strength (28 Days): 4000 psi (27.6 MPa).**
 - 2. **Maximum Water-Cementitious Materials Ratio: 0.45.**
 - 3. **Slump Limit: 3 inches (75 mm).**

- D. **Cementitious Materials:** Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. **Fly Ash: 25 percent.**

- E. **Add air-entraining admixture** at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:
 - 1. **Air Content: 6.0 percent** for 1-inch (25-mm) maximum aggregate.

2.8 CONCRETE MIXING

- A. **Ready-Mixed Concrete:** Comply with requirements and with ASTM C 94.

PART 3 - EXECUTION

3.1 PREPARATION

- A. **Proof-roll prepared subbase surface** to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

- B. **Remove loose material** from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. **Set, brace, and secure edge forms**, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

- B. **Clean forms** after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

- A. **General:** Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

- B. **Clean reinforcement** of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. **Arrange, space, and securely tie bars** and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. **Install welded wire fabric** in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. **Install fabricated bar mats** in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap to adjacent mats.

3.4 JOINTS

- A. **General:** Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. **Construction Joints:** Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
 1. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 2. Provide tie bars at sides of pavement strips where indicated.
 3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. **Isolation Joints:** Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 1. **Locate expansion joints** at intervals of **50 feet** (15.25 m), unless otherwise indicated.
 2. **Extend joint fillers full width** and depth of joint.
 3. **Terminate joint** filler less than 1/2 inch (12 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
 4. **Place top of joint filler flush** with finished concrete surface if joint sealant is not indicated.
 5. **Furnish joint fillers in one-piece lengths.** Where more than one length is required, lace or clip joint-filler sections together.
 6. **Protect top edge** of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. **Install dowel bars** and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

- E. **Contraction Joints:** Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. **Grooved Joints:** Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - a. **Radius:** 1/4 inch (6 mm).
 2. **Sawed Joints:** Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
- F. **Edging:** Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
1. **Radius:** 1/4 inch (6 mm).

3.5 CONCRETE PLACEMENT

- A. **Inspection:** Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. **Remove snow, ice, or frost** from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. **Moisten subbase** to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. **Comply** with requirements and with recommendations in **ACI 304R** for measuring, mixing, transporting, and placing concrete.
- E. **Do not add water** to concrete during delivery, at Project site, or during placement.
- F. **Deposit and spread concrete** in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. **Consolidate concrete** by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
1. **Consolidate concrete** along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

- H. **Screed pavement surfaces** with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.
- I. **Curbs and Gutters:** When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- J. **When adjoining pavement lanes are placed in separate pours**, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- K. **Cold-Weather Placement:** Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. **When air temperature has fallen** to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 2. **Do not use frozen materials** or materials containing ice or snow.
 - 3. **Do not use calcium chloride**, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- L. **Hot-Weather Placement:** Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
 - 1. **Cool ingredients** before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. **Cover reinforcement steel** with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. **Fog-spray forms**, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

- A. **General:** Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. **Float Finish:** Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Rfloat surface immediately to uniform granular texture.

1. **Medium-to-Fine-Textured Broom Finish:** Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.7 CONCRETE PROTECTION AND CURING

- A. **General:** Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. **Evaporation Retarder:** Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. **Begin curing** after finishing concrete, but not before free water has disappeared from concrete surface.
- D. **Curing Methods:** Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 1. **Curing and Sealing Compound:** Apply uniformly to exposed concrete in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.8 PAVEMENT TOLERANCES

- A. **Comply with tolerances of ACI 117 and as follows:**
 1. **Elevation:** 1/4 inch (6 mm).
 2. **Thickness:** Plus 3/8 inch (9 mm), minus 1/4 inch (6 mm).
 3. **Surface:** Gap below 10-foot- (3-m-) long, unlevelled straightedge not to exceed 1/4 inch (6 mm).
 4. **Lateral Alignment and Spacing of Tie Bars and Dowels:** 1 inch (25 mm).
 5. **Vertical Alignment of Tie Bars and Dowels:** 1/4 inch (6 mm).
 6. **Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge:** 1/2 inch (13 mm).
 7. **Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge:** Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
 8. **Joint Spacing:** 3 inches (75 mm).
 9. **Contraction Joint Depth:** Plus 1/4 inch (6 mm), no minus.
 10. **Joint Width:** Plus 1/8 inch (3 mm), no minus.

3.9 FIELD QUALITY CONTROL

- A. **Testing Agency:** Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. **Testing Services:** Testing shall be performed according to the requirements of Section 03310 - Concrete Work.

3.10 REPAIRS AND PROTECTION

- A. **Remove and replace concrete pavement** that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. **Drill test cores** where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. **Protect concrete from damage.** Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. **Maintain concrete pavement free of stains,** discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 9113

LANDSCAPING

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. Scope of Work: Landscaping as referred to herein shall include, but not be limited to the following work: soil preparation, installation of headers, weed control, finish grading, furnishing and installing plant materials, tree staking and tying, cleanup, maintenance, and guarantee.

1.2 QUALITY ASSURANCE

- A. General: All plants furnished by the Contractor shall be true to type or name as shown in the Contract Documents and shall be tagged in accordance with the standard practice recommended by the Agricultural Code of the State of Utah; however, determination of plant species or variety will be made by the Landscape Architect.

1.3 CLEANUP

- A. Upon completion of all planting operations, the portion of the project site used for a work or storage area by the Contractor shall be cleaned of all debris, superfluous materials, and equipment. All such materials and equipment shall be entirely removed from the project.
- B. All walks or pavement shall be swept or washed clean upon completion of the Work of this Section.
- C. During the entire Contract period, plant containers that have been cut or removed from plant materials shall be removed from the project site daily, in accordance with the provisions for maintenance and guarantee.

1.4 MAINTENANCE OF LANDSCAPE PLANTING PRIOR TO ACCEPTANCE OF PROJECT

- A. General: The Contractor shall be responsible for protecting, watering, and maintaining all planting and irrigation systems until final acceptance of all work under the contract.

1.5 FINAL INSPECTION AND GUARANTEE

- A. Inspection of work of lawns and planting will be made at conclusion of maintenance.
- B. The Contractor shall replace, as soon as weather conditions permit, all dead plants and all plants not in a vigorous, thriving condition which are noted at the end of the one year guarantee period.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. All landscaping materials for soil conditioning, weed abatement, or planting shall be first-grade, commercial quality and shall have certificates indicating the source of material, analysis, quantity, or weight attached to each sack or container or provided with each delivery. Delivery certificates shall be given to the L.A. as each shipment of material is delivered. A list of the materials used, together with typical certificates of each material, shall be submitted to the L.A. prior to the final acceptance of the job.

2.2 TOPSOIL

- A. Existing on-site topsoil may be stripped and stockpiled on site for landscape use.
- B. Imported topsoil shall be obtained from naturally drained areas and shall be fertile, friable loam suitable for plant growth. Topsoil shall be subject to inspection and approval at the source of supply and upon delivery.

2.3 FERTILIZER AND ADDITIVES

- A. Chemical fertilizers shall be a mixed commercial fertilizer conforming to FS O-F-241 D, Type I, with percentages of nitrogen, phosphoric acid, and potash at 5-10-5 and 16-16-8. The combined N-P-K content shall be following percentages of total weight: 5 percent nitrogen 10 percent phosphoric acid and 5 percent potash. Fertilizers shall be uniform in composition, dry, and free flowing. Fertilizers shall be compatible with seed mixtures and shall be applied in proportions to assure vigorous plant growth without burning or damaging plants.

2.4 MULCH

- A. Shredded bark mulch in planting beds shall be clean, pine bark free of sticks and pieces over 2 inches in size produced by "chipping and shredding" tree branches or similar means.

2.5 PLANT MATERIALS

- A. Plants shall meet requirements of the Contract Documents and shall be in accordance with the botanical names and applicable standards of quality, size, condition, and type. They shall be true to name, genera, species, and variety in accordance with reference publications.

2.6 WILDFLOWER HYDROSEED MIX

A. In areas designated on Drawings, provide drought tolerant perennial wildflower mix tailored to Rocky Mountain/Salt Lake Valley region.

1. Approximate blend mixture:

Cornflower	11 percent
Black Eyed Susan	11 percent
Baby's Breath	11 percent
African Daisy	10 percent
Blue Flax	5 percent
Sweet Alyssum	5 percent
California Poppy	5 percent
Wall Flower	5 percent
Prairie Cornflower	5 percent
Plains Coreopsis	5 percent
Garland Chrysanthemum	4 percent
Perennial Gaillardia	4 percent
Annual Gaillardia	3 percent
Sweet William	3 percent
Shasta Daisy	3 percent
Corn Poppy	2 percent
Catchfly	2 percent
Rocky Mtn. Pestemon	2 percent
Spurred Snapdragon	2 percent
Purple Cornflower	2 percent

B. Apply seed at rate recommended for full coverage, but at no less than ¼ lb. per 1000 s.f.

C. Sow seed by hydroseed method, with wet mix of fiber-hydro mulch material and seed.

D. Application of hydroseed mixture shall be by trained appliers, with demonstrable experience in placement of wildflower mixtures.

2.7 STAKING MATERIALS

A. Stakes for supporting trees to be metal T fence posts or round wood tree staking poles.

2.8 WEED BARRIER FABRIC AND ROOT BARRIER

A. Weed mat shall be "Dewitt" Weed Barrier Pro 5, "Typar" #3301 or approved equal.

B. Root barrier to be "Deep root" or approved equal.

2.9 COBBLE ROCK AND LANDSCAPE BOULDERS

A. Provide clean gravel mulch, cobble rock and landscape boulders as noted on plans and details. Provide samples for review and approval.

PART 3 -- EXECUTION

3.1 GENERAL

- A. The landscape work shall not be performed at any time when it may be subject to damage by climatic conditions.
- B. Planting areas include all areas to be landscaped unless, specified or shown, otherwise.

3.2 SOIL PREPARATION

- A. Areas requiring grading by the landscaper including adjacent transition areas shall be uniformly level or sloping between finish elevations to within 0.10-ft above or below required finish elevations.
- B. The landscape work shall not proceed until after walks, curbs, paving, edging, and irrigation systems are in place. The contract operations shall be completed to a point where the landscape areas will not be disturbed. The sub grade shall be cleaned free of waste materials of all kinds.
- C. After removal of waste materials the planting areas sub grade shall be scarified and pulverized to a depth of not less than 6 inches and all surface irregularities below the cover of topsoil removed.
- D. Any unusual subsoil condition that will require special treatment shall be reported to the L.A.
- E. Topsoil shall be uniformly distributed over all areas where required. Sub grade and topsoil shall be damp and free from frost.
- F. Surface drainage shall be provided by molding the surfaces to facilitate the natural run-off of water. Low spots and pockets shall be filled with topsoil and graded to drain properly.
- G. Finish grade of all planting areas shall be 2 inches below finish grades of adjacent pavement of any kind for sod areas.

3.3 DELIVERY, STORAGE, AND HANDLING OF PLANT MATERIALS

- A. No plants other than the required samples shall be dug or delivered to the site until the required inspections have been made and the plant samples are approved

3.4 TREE AND PLANT LOCATIONS

- A. The CONTRACTOR shall locate and stake all tree and shrub locations and have the locations approved by the L.A. before starting excavation for same. The plant locations shall be observed, and their locations shall be adjusted as directed by L.A. before final approval.

3.5 PLANT PITS

- A. Plant pits, centered on location stakes, shall be excavated circular pits with vertical sides and flat or saucer shape bottom.

3.6 PREPARED BACKFILL

- A. Tree and shrub pit backfilling soil shall consist of ½ existing soil from plant pit and ½ topsoil mixed.

3.7 ROCKS OR UNDERGROUND OBSTRUCTIONS

- A. In the event that rock or underground obstructions are encountered in the excavation of plant pits, alternative locations shall be selected by the Landscape Architect. Moving of trees to alternative locations shall not entail additional costs to the Owner.

3.8 SETTING PLANT MATERIALS

- A. Plants shall be set in center of pits as shown in the Contract Documents. They shall be set plumb and straight, and at such a level that after settlement that the crown of the plant will be 2 inches above the finished grade.
- B. All ground cover plants shall be evenly spaced, staggered in rows, and set at intervals specified, so as to produce a uniform effect. Plants shall be watered immediately after Planting operations have been completed.
- C. All shrubs and vines shall be pruned to remove damaged branches. All bare root shrubs shall be pruned and shaped to compensate for transplant root loss.
- D. Planting soil around roots or balls shall be thoroughly compacted and watered. After planting, the soil in the shrub beds shall be cultivated between shrubs, raked smooth, and neatly outlined. Muddy soil shall not be used for backfilling. All broken or frayed roots shall be properly cut off.

3.9 STAKING AND TREE WRAPPING

- A. Staking of trees shall be done immediately after they are planted. Plants shall stand plumb after staking. Staking shall be as specified unless shown or indicated otherwise.

3.10 PRUNING AND MULCHING

- A. Each tree and shrub shall be pruned in accordance with standard horticultural practice to preserve the natural character of the plant in the manner fitting its use in the landscape design, as approved by the Landscape Architect.

3.11 HYDROSEEDING OF WILDFLOWER MIX

- A. Do not hydroseed area in excess of that which can be mulched on same day. Do not spray hydroseed mixture on existing plants, paved surfaces or structures. Clean up any overspray immediately.

- B. Apply mulch/seed mixture to a thickness of 1/8 inches or as recommended. Maintain clear of shrubs and trees.
- C. Keep mulched area properly watered until germination and establishment of planted areas.
- D. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

3.12 MISCELLANEOUS ITEMS

- A. Bark mulch shall be placed in the planting areas as shown, spread carefully and evenly to a minimum depth of 3 inches.
- B. Concrete curbing shall be placed so that the top finish of curbing matches adjoining concrete curbs and walks. Curbing shall be straight and uniform both horizontal and vertically. Where curbing is next to building, curbing shall be placed against the structure without gaps between structure and curbing.
- C. Identify seeded areas with stakes and string around periphery. Set string at 24 inches above grade, space stakes no more than 48 inches on center.

END OF SECTION