CONTRACT CONDITIONS

FOR

ARENA RENOVATIONS

AT

MIDLOTHIAN HIGH SCHOOL
MIDLOTHIAN, TEXAS

MIDLOTHIAN INDEPENDENT SCHOOL DISTRICT

Project Manual

ENGINEER
REED, WELLS, BENSON AND COMPANY
12001 NORTH CENTRAL EXPRESSWAY, SUITE 1100
DALLAS, TEXAS 75243

RWB Project No. 21008.00
March 25, 2021

INDEX

SECTION 00 03 00

ADVERTISEMENT FOR PROPOSALS
MIDLOTHIAN INDEPENDENT SCHOOL DISTRICT
100 WALTER STEPHENSON ROAD
MIDLOTHIAN, TEXAS 76065

REQUEST FOR COMPETITIVE SEALED PROPOSAL
FOR
ARENA RENOVATIONS
AT MIDLOTHIAN HIGH SCHOOL

The Midlothian Independent School District (MISD) is currently soliciting Requests for Proposals for **ARENA RENOVATIONS AT MIDLOTHIAN HIGH SCHOOL**, CSP's shall be submitted in an envelope marked on the outside with the proposer's name, address, and CSP number and sent to:

Midlothian Independent School District
Shana Volentine, Purchasing Agent
100 Walter Stephenson Road
Midlothian, Texas 76065

CSP 2021-015

CSP's will be received at the above address until **2:00 PM, Thursday April 15, 2021.** CSP's will be opened at this time. Each proposer shall submit one original, and one digital copy saved on a USB Flash Drive of all the associated materials.

CSP's must be submitted in sufficient time to be received and time stamped at the above location on or before the published CSP date and time shown on the CSP. Midlothian Independent School District will not be responsible for delivering mail from the post office. CSP's received after published time and date cannot be considered. FAX CSP'S will not be accepted.

All materials and equipment should be proposed new with installation, freight, and shipping (if required) included in the CSP price.

Proposers must submit sealed CSP's in the form of the executed CSP Form together with any material required by any Addendum to this CSP by the time and date specified. This CSP will allow for the legal acquisition of the CSP prices must be firm for one year from date of award for CSP to be considered.
Documents may be obtained electronically from the Midlothian ISD purchasing web site: https://www.misd.gs/departments/finance/purchasing/bids-rfps-csps-rfqs or by contacting Rola Fadel or Reed Bass with Midlothian ISD.

A pre-proposal meeting will occur on April 6, 2021, at 10:00 AM, at the L. A. Mills Administration Building, 100 Walter Stephenson Road, Midlothian, Texas 76065.

The Owner reserves the right to reject any or all proposals and to waive formality in connection therewith. No proposal shall be withdrawn within 30 days after the proposal opening without the specific consent of the Owner. Refer to Section 00 05 00 for additional information and requirements.

Midlothian ISD's contact for this CSP is Ms. Rola Fadel, Director of Architecture and Facilities, 469-856-5825, rola_fadel@misd.gs . All correspondence to be copied to Reed Bass with Midlothian ISD as well, reed.bass@misd.gs . RWB Consulting Engineer's contact for this CSP is Nathan Hart and Robert Frick , 972-788-4222, nhart@rwb.net or rfrick@rwb.net. **All questions on the project to be sent through Midlothian Independent School District, Shana Volentine shana_volentine@misd.gs and copied to RWB Consulting Engineers.**

PRE-RESPONSE QUESTIONS: All questions regarding clarification or interpretation of the CSP will be submitted in writing by the Proposer, and must be received by **12:00 PM, Friday, April 9, 2021**. No questions will be addressed unless provided in writing. The District will provide a response to questions to all Proposers who have received the CSP. The District is not liable or responsible for any other explanation or interpretations, which anyone presumes to make, by any other source other than the District Purchasing Office.

PAYMENT BOND AND PERFORMANCE BOND: A Payment Bond and Performance Bond, each in an amount equal to 100 percent (100%) of the Contract Sum conditioned upon the faithful performance of the Contract will be required. Please note that all bonding companies presented must be acceptable to the Owner. Payment and Performance Bonds are not required for submission, but the ability of the proposer to provide such bonds is required. **A Proposal Bond is NOT required.**

The prevailing rates of wages are the minimums that must be paid in conformance with all applicable laws of the State of Texas.

In determining the Selected Offeror, the Owner will evaluate the information derived from the Offeror's (Contractor's) Qualification Statement required herein, the information submitted on the Proposal Form, and other selection criteria including the following Selection Criteria:

- **25 Points – Cost** - The purchase price will be scored mathematically as a ratio of the proposal price ranking to the total number of proposers.
- **10 Points – Reputation** - The reputation of the Proposer's goods and services. Items considered: Proposer's past relationships with and input from provided project references regarding recommendation of the Proposer, the Proposer's performance as a team player and their ability to work with the Owner on Change Orders and Contingency Allowances.

- **10 Points – Quality** - The quality of the Proposer's goods and services. Items considered:
  - Proposer's past performance with input from provided project references regarding the Proposer's quality of craftsmanship
  - All required items submitted
  - Information provided in the proposal is clear
- **15 Points – Experience -** The Proposer's overall experience as well as past record of completing similar size and scope of projects on time. Items considered:
  - Number of years in business
  - Number of similar size projects within the past five years
  - Number of similar scope projects within the past five years – project scope must include working on an existing, operational campus maintaining full functionality.
  - Proposer's past performance with input from provided project references regarding the completion of projects related to schedule
- **10 Points – Warranty Work** - The Proposer's response to warranty work requests. Items considered: Proposer's past performance with input from provided project references regarding the ability to perform warranty work in a timely manner.
- **10 Points – Project Closeout** - The Proposer's record of closing out projects expeditiously. Items considered: Proposer's past performance with input from provided project references regarding the closeout process duration.
- **15 Points – Project Team** - Qualifications of the proposed project manager(s) and project superintendent(s). Items considered:
  - Time in construction industry for each individual
  - Number of K-12 school projects completed by each individual
  - Time with company for each individual
- **5 Points – Schedule** - The Proposer's anticipated construction schedule. Items considered: start date, substantial completion date, final completion date, and total construction duration in calendar days.

The Selection Committee consisting of Midlothian ISD administrators, consultants and other staff will make an initial evaluation of the proposals. The committee's recommendation will be considered by the Midlothian ISD Board of Trustees ("Board"). The District reserves the right to review the recommendation with others deemed appropriate by the District prior to review by the entire Board. The final decision-making authority on the proposal rests with the full Board. Decision-making authority has not been delegated to any person or entity other than the Board.

The District will make such investigations as it deems necessary to determine the ability of the offeror to perform the Work, and the offeror shall furnish all such information and data for this purpose as may be requested. The District reserves the right to reject any proposal if the evidence submitted by, or investigation of, such offeror fails to satisfy the District that such offeror is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

The District reserves the right to reject any or all proposals and to waive any formalities or irregularities and to make the award of the contract in the best interest of the District.

A decision regarding determination of the successful Offeror will be made by the District as soon as practical.

NOTICE TO PROCEED: A Notice to Proceed will be sent by the District by noon on May 5, 2021 to inform the successful CSP Proposer of the award.

SECTION 00 05 00

MIDLOTHIAN ISD PROPOSAL INFORMATION FORMS

The following forms were provided by the Midlothian Independent School District and are required to be completed and submitted with the proposal.

END OF SECTION

MIDLOTHIAN ISD
INSPIRING EXCELLENCE

CSP 2021-015
MHS Arena Renovations

_____
Company Name

_____
Address

_____
City/State/Zip

_____
Area Code & Phone Number

_____
Fax Number

_____
E-mail Address

_____
Federal Tax Identification Number

I, the undersigned, as the owner or legally authorized representative of the above named company, by signing the following statement, agree that I have READ and UNDERSTAND all of the Instructions and Specifications contained herein, and that if accepted by the Midlothian Independent School District, a11 of the provisions are part of a binding contract between MISD and our company. I also certify that this bid is made without previous understanding, agreement, or connection with any person, firm or cooperation making a proposal for the same contract, and is in all ways fair and without collusion or fraud.

_____
Owner or Legally Authorized Representative

_____
Signature

_____
Title

_____
Date

CSP 2021-015
MHS Arena Renovations

Remittance Address

_____
Address

_____
City/State/Zip

_____
Local Representative

_____
E-mail Address

_____
Phone and Fax Numbers

ALL PURCHASES MUST OCCUR WITH AN APPROVED DISTRICT PURCHASE ORDER

1) Our firm will accept orders using district purchase orders. YES ☐ NO ☐

MIDLOTHIAN ISD
INSPIRING EXCELLENCE

CSP 2021-015
MHS Arena Renovations

REFERENCES

Please list your references

1. Business Name: _____

   Contact: _____

   Address: _____

   Phone Number: _____

   Email: _____

   Scope of Work/Project:_____

   _____

   _____

2. Business Name: _____

   Contact: _____

   Address: _____

   Phone Number: _____

   Email: _____

   Scope of Work/Project:_____

   _____

   _____

3. Business Name: _____

   Contact: _____

   Address: _____

   Phone Number: _____

   Email: _____

   Scope of Work/Project:_____

   _____

   _____

MIDLOTHIAN ISD
INSPIRING EXCELLENCE

CSP 2021-015
MHS Arena Renovations

CERTIFICATIONS REQUIRED AS OF SEPTEMBER 1, 2017

CERTIFICATION REGARDING TERRORIST ORGANIZATIONS & BOYCOTTING OF ISRAEL
[Govt Code 808 (HB89) and Govt Code 2252 (SB252)

Vendor hereby certifies that it is not a company identified on the Texas Comptroller's list of companies known to have contracts with, or provide supplies or services to, a foreign organization designated as a Foreign Terrorist Organization by the U.S. Secretary of State.

Vendor further certifies and verifies that neither Vendor, nor any affiliate, subsidiary, or parent company of Vendor, if any (the "Vendor Companies"), boycotts Israel, and Vendor agrees that Vendor and Vendor Companies will not boycott Israel during the term of this Agreement. For purposes of this Agreement, the term "boycott" shall mean and include terminating business activities or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory.

_____ Initials of Authorized Representative of Vendor

Vendor's Name/Company Name: _____

Address, City, State, and Zip Code: _____

Phone Number:_____Fax Number:_____

Printed Name and Title of Authorized Representative: _____

Email Address:_____

Signature of Authorized Representative: _____

Date:_____ Federal Tax ID #_____

MISD PURCHASING OFFICE (INTERNAL REVIEW): SB 2252 Certification

Comptroller List was reviewed and The Vendor (IS) (IS NOT) on the lists (Circle one).

Verified by:_____

CSP 2021-015
MHS Arena Renovations

CRIMINAL BACKGROUND CHECK CERTIFICATION FOR CONTRACTORS

To Be Completed by MISD:

Campus/Department: _____

Contact Person: _____

Contact Number: _____

Name of Contractor/Company: _____

Term of Contract: _____ to _____

Introduction: Texas Education Code Chapter 22 requires service contractors to obtain criminal history record information on covered employees. Contractors must certify to the school district that they have done so. Covered employees with disqualifying convictions are prohibited from serving at a school district. For more information on how to obtain criminal histories for covered employees, contact the Texas Department of Public Safety's Crime Records Service at (512) 424-2474.

Definitions:

Covered employee: Employee of a contractor who has or will have *continuing duties related to the contracted services* and has or will have *direct contact with students*. The school district will be the final arbiter of what constitutes direct contact with students.

Continuing duties related to contracted services: Work duties that are performed pursuant to a contract to provide services to a school entity on a regular, repeated basis rather than infrequently or one-time only.

Direct contact with students: The contact that results from activities that provide substantial opportunity for verbal or physical interaction with students that is not supervised by a certified educator or other professional district employee. Contact with students that results from services that do not provide substantial opportunity for unsupervised interaction with a student or students, such as addressing an assembly, officiating a sports contest, or judging an extracurricular event, is not, by itself, direct contact with students. However, direct contact with students does result from any activity that provides substantial opportunity for unsupervised contact with students, which might include, without limitation, the provision of coaching, tutoring, or other services to students. If it is unclear whether you or your employees will have direct contact with students, contact the Midlothian Independent School District.

CSP 2021-015
MHS Arena Renovations

Disqualifying conviction: One of the following offenses, if at the time of the offense, the victim was under 18 or enrolled in a public school: (a) a felony offense under Title 5, Texas Penal Code; (b) an offense for which a defendant is required to register as a sex offender under Chapter 62, Texas Code of Criminal Procedure; or (c) an equivalent offense under federal law or the laws of another state.

Service Contractor: An entity, including a government entity and an individual independent contractor, that contracts or agrees with a school entity by written agreement or verbal understanding to provide services through individuals who receive compensation.

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MHS Arena Renovations

To Be Completed by Contractor/Company:

Name of Contractor/Company:_____

Contact Person: _____

Contact Number: _____

Certification

On behalf of_____("Contractor"), I, the undersigned authorized signatory for Contractor, certify to the Midlothian Independent School District ("District") that *[initial one]*:

_____I have obtained all required criminal history record information regarding myself through the Texas Department of Public Safety's Finger-based Applicant Clearinghouse of Texas ("FACT"). I further certify to the District that I do not have a disqualifying criminal history. I agree to notify MISD in writing within 3 business days if I am arrested or adjudicated for a disqualifying reason during the contract term. I agree to provide MISD with the name and any other requested information of covered employees so that MISD may obtain my criminal history record information. I understand that MISD may terminate my services if at any time it determines, in its sole discretion, that my criminal history is not acceptable.

OR

Some or all of Contractor's employees are *covered employees.* If this box is checked, I further certify that:

_____(1) Contractor has obtained all required criminal history information regarding its covered employees. None of the covered employees has a disqualifying criminal history.

_____(2) If contractor receives information that a covered employee subsequently has a reported criminal history, Contractor will immediately remove the covered employee from contract duties and notify the District within three (3) business days.

_____(3) Upon request, Contractor will provide the District with the name and any other requested information of covered employees so that the District may obtain criminal history record information on the covered employees.

OR

_____None of the Contractor's employees are *covered employees*, as defined above, because: *[either one or both must be checked – refer to definitions on front page]*

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MHS Arena Renovations

[ ] Employees will not have “continuing duties related to the contracted services”

[ ] Employees will not have “direct contact with students”. If this box is checked, I further certify that Contractor has taken precautions or imposed conditions to ensure that its employees will not become *covered employees*. Contractor will maintain these precautions or conditions throughout the time contracted services are provided.

MIDLOTHIAN ISD
INSPIRING EXCELLENCE

CSP 2021-015
MHS Arena Renovations

Signature_____

Printed Name: _____

Title:_____Date: _____

THIS CERTIFICATION MUST BE COMPLETED AND RETURNED TO THE HUMAN RESOURCES* AND CONSTRUCTION *OFFICE BEFORE A CONTRACTOR OR CONTRACTOR'S EMPLOYEES MAY PROVIDE SERVICES FOR MISD.

NONCOMPLIANCE OR MISREPRESENTATION REGARDING THIS CERTIFICATION IS GROUNDS FOR CONTRACT TERMINATION WITHOUT PENALTY TO MISD.

MIDLOTHIAN ISD
INSPIRING EXCELLENCE

CSP 2021-015
MHS Arena Renovations

Felony Conviction Notice
Statutory citation covering notification of criminal history of contractor is found in the Texas Education Code
#44.034. Following is an example of a felony conviction notice:

FELONY CONVICTION NOTICE

Senate Bill 1, passed by the State of Texas Legislators, Section 44.034, Notification of Criminal History, Subsection (a) states, "a person or business entity that enters into a contract with a school district must give advance notice to the district if the person or owner or operator of the business entity has been convicted of a felony." The notice must include a general description of the conduct resulting in the conviction of a felony.

Subsection (b) states, "A school district may terminate a contract with a person or business entity if the district determines that the person or business entity failed to give notice as required by Subsection (a) or misrepresented the conduct resulting in the conviction. The district must compensate the person or business entity for services performed before the termination of the contract.

This notice is not required of a publicly held corporation.

I, the undersigned agent for the firm named below certify that the information concerning notification of felony conviction has been reviewed by me and the following furnished information is true to the best of my knowledge.

Vendor's Name: _____

Authorized Company Official's Name: (please print)

_____

A. My firm is a publicly held corporation; therefore, this reporting requirement is not applicable.

Signature of Company Official: _____

B. My firm is not owned nor operated by anyone who has been convicted of a felony.

Signature of Company Official: _____

C. My firm is owned or operated by the following individual(s) who has/have been convicted of a felony: Name of Felon(s): _____

Details of Conviction: _____

_____

Signature of Company Official: _____

THIS COMPLETED FORM MUST BE RETURNED WITH PROPOSAL

CSP 2021-015
MHS Arena Renovations

STATEMENT OF NON-COLLUSION AND NON-DISCRIMINATION

My signature certifies that the accompanying Proposal:

1. Is not the result of, or affected by, an unlawful act of collusion with another person or company engaged in the same line of business or commerce, or any act of fraud punishable under current local, state, and/or federal ordinances, statutes, regulations and/or policies. Furthermore, I understand that fraud and unlawful collusion are crimes under Federal Law, and can result in fines, prison sentences, and civil damage awards.
2. During the performance of any contract awarded, the Seller will not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin, or handicaps, except where religion, sex or national origin is a bona fide occupation qualification reasonably necessary to the normal operations of the Seller, The Seller agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this non-discrimination clause.
3. The Seller, in all solicitations or advertisements for employees placed by or on behalf of the Seller, will state that such Seller is an equal opportunity employer.
4. Notices, advertisements and solicitations placed in accordance with Federal Law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.
5. The Seller shall include the provisions of the foregoing paragraphs 2, 3 and 4 in every subcontract or purchase order over $10,000.00 so that the provisions will be binding upon each subcontractor or vendor.

I hereby certify that I am authorized to sign as a Representative for the Seller:

NAME OF SELLER:

_____

ADDRESS:

_____

CITY & STATE:

_____

NAME: (Print)

_____

Signature:

_____

TITLE:_____ DATE: _____

TELEPHONE:_____FAX: _____

EMAIL ADDRESS: _____

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

Complete Nos. 1 - 4 and 6 if there are interested parties. Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.

4 Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
		Controlling	Intermediary

5 Check only if there is NO Interested Party. ☐

6 UNSWORN DECLARATION

My name is_____, and my date of birth is_____.

My address is_____,_____,_____,_____,_____.
(street) (city) (state) (zip code) (country)

I declare under penalty of perjury that the foregoing is true and correct.

Executed in_____County, State of_____, on the_____day of_____, 20_____.
(month) (year)

_____
Signature of authorized agent of contracting business entity
(Declarant)

ADD ADDITIONAL PAGES AS NECESSARY

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.** (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information is being disclosed.**

_____

Name of Officer

4 **Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.**

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☐ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

5 **Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.**

6 ☐ Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

_____ _____

Signature of vendor doing business with the governmental entity Date

CONFLICT OF INTEREST QUESTIONNAIRE
For vendor doing business with local governmental entity

A complete copy of Chapter 176 of the Local Government Code may be found at http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm. For easy reference, below are some of the sections cited on this form.

Local Government Code § 176.001(1-a): "Business relationship" means a connection between two or more parties based on commercial activity of one of the parties. The term does not include a connection based on:

(A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or an agency of a federal, state, or local governmental entity;

(B) a transaction conducted at a price and subject to terms available to the public; or

(C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency and that is subject to regular examination by, and reporting to, that agency.

Local Government Code § 176.003(a)(2)(A) and (B):

(a) A local government officer shall file a conflicts disclosure statement with respect to a vendor if:

***

(2) the vendor:

(A) has an employment or other business relationship with the local government officer or a family member of the officer that results in the officer or family member receiving taxable income, other than investment income, that exceeds $2,500 during the 12-month period preceding the date that the officer becomes aware that

(i) a contract between the local governmental entity and vendor has been executed; or

(ii) the local governmental entity is considering entering into a contract with the vendor;

(B) has given to the local government officer or a family member of the officer one or more gifts that have an aggregate value of more than $100 in the 12-month period preceding the date the officer becomes aware that:

(i) a contract between the local governmental entity and vendor has been executed; or

(ii) the local governmental entity is considering entering into a contract with the vendor.

Local Government Code § 176.006(a) and (a-1)

(a) A vendor shall file a completed conflict of interest questionnaire if the vendor has a business relationship with a local governmental entity and:

(1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);

(2) has given a local government officer of that local governmental entity, or a family member of the officer, one or more gifts with the aggregate value specified by Section 176.003(a)(2)(B), excluding any gift described by Section 176.003(a-1); or

(3) has a family relationship with a local government officer of that local governmental entity.

(a-1) The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

(1) the date that the vendor:

(A) begins discussions or negotiations to enter into a contract with the local governmental entity; or

(B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

(2) the date the vendor becomes aware:

(A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);

(B) that the vendor has given one or more gifts described by Subsection (a); or

(C) of a family relationship with a local government officer.

CHECKLIST FOR CSP 2021-015
MHS Arena Renovations

_____ Response Form Pg 1

_____ Response Form Pg 2

_____ Certification – HB 89 and SB 252

_____ Felony Conviction Notice

_____ Non-Collusion and Non-Discrimination form

_____ Conflict of Interest

_____ Form 1295 – Certificate of Interested Parties (this form must be completed online, printed and signed)

_____ Criminal Background Information

_____ Reference Sheet

_____ W-9 (contractor to submit)

_____ Proposal Form

SECTION 00 06 00

MIDLOTHIAN ISD ACADEMIC CALENDAR

The following calendar was provided by the Midlothian Independent School District for the 2020-2021 academic year.

END OF SECTION

MIDLOTHIAN ISD
INSPIRING EXCELLENCE

2020 - 2021 SCHOOL CALENDAR

JULY 2020

SU	MO	TU	WE	TH	FR	SA
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

AUGUST 2020

SU	MO	TU	WE	TH	FR	SA
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2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	([	20	21	22
23	24	25	26	27	28	29
30	31					

SEPTEMBER 2020

SU	MO	TU	WE	TH	FR	SA
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6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25)	26
27	28	(29	30			

OCTOBER 2020

SU	MO	TU	WE	TH	FR	SA
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4	5	6	7	8	9	10
11	12	13	14	15	16]	17
18	[19	20	21	22	23	24
25	26	27	28	29	30	31

NOVEMBER 2020

SU	MO	TU	WE	TH	FR	SA
1	2	3	4	5	6)	7
8	(9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

DECEMBER 2020

SU	MO	TU	WE	TH	FR	SA
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	) 19
20	21	22	23	24	25	26
27	28	29	30	31		

JANUARY 2021

SU	MO	TU	WE	TH	FR	SA
					1	2
3	4	(5	6	7	8]	9
10	[11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

FEBRUARY 2021

SU	MO	TU	WE	TH	FR	SA
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7	8	9	10	11	12)	13
14	(15	16	17	18	19	20
21	22	23	24	25	26	27
28						

MARCH 2021

SU	MO	TU	WE	TH	FR	SA
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26]	27
28	[29	30	31			

APRIL 2021

SU	MO	TU	WE	TH	FR	SA
				1	2	3
4	5	6	7	8	9)	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

MAY 2021

SU	MO	TU	WE	TH	FR	SA
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	])	28	29
30	31					

JUNE 2021

SU	MO	TU	WE	TH	FR	SA
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

DATES TO REMEMBER

All Students Virtual Learning, ***August 20-September 4, February 19, March 22 & April 13***

Face-to-Face Students Transition Week, ***September 8-11***

Elementary Parent/Teacher Conferences, ***September 28***

Early Release Days, ***December 17 & 18, May 26 & 27***

State Testing , ***December 8-11, April 6-9, May 4-7, & May 11-14***

First Semester: Elementary, ***82 days*** Secondary, ***78 days***

Second Semester: Elementary, ***89 days*** Secondary, ***93 days***

Total Yearly Attendance, ***76,800 minutes***

CLOSURE INFO

In the event of delays, cancellations or closures, MISD will notify you by:

- Social Media -
- News - WFAA8, NBC5, CBS11, FOX4
- MISD and campus websites
- Text
- Email
- Recorded phone message

LEGEND

- New Teacher PD Day
- Professional Development/Student Holiday
- First Day for Students
- All Students in Virtual Class
- F2F Students Transitioning to Classroom
- All F2F Students in Classroom
- Holiday School Closed
- Bad Weather Make-Up
- Teacher PD Exchange/Employee Workday/ Student Holiday
- Elem Conferences/Sec Staff Development
- Student Early Release
- COVID-19 Make-Up
- ( ) Secondary Grading Periods
- [ ] Elementary Grading Periods

SAFETY PROCEDURES & TERMS

Shelter-in-Place (Bad Weather)
No one leaves the school. Students and staff remain in their designated weather-safe areas until the shelter-in-place is lifted.

Fire Drill
The building is evacuated. Students and staff remain on the property.

Lockout
Exterior doors are locked. No one leaves or enters the school until the lockout is lifted.

Lockdown
Exterior doors are locked. Students and staff remain hidden in their designated safety areas until the lockdown is lifted.

Off-site Evacuation
The building is evacuated. Buses transport students and staff to the designated off-site location.

MIDLOTHIAN ISD
100 Walter Stephenson Rd. | Midlothian, TX 76065
www.misd.gs | 469 856-5000

SECTION 00 23 00

EXISTING CONDITIONS

1.1 SITE VISITATION

A. Proposers shall visit site of Work, existing buildings, review any available existing drawings and all conditions affecting the work of this Project.

B. Proposers desiring access to existing building after the formal walkthrough that will occur subsequent to the pre-proposal conference, shall contact the Midlothian Independent School District Representative for appointments to visit facility. The existing building is currently occupied. Formal examination of existing conditions will be scheduled at the convenience of the proposer and the available Midlothian Independent School District Staff.

1.2 VERIFICATION

A. Prior to commencement of work, verify all existing conditions, control points, principal lines and elevations, presence of utilities, at or related to the site and existing building, and also examine all adjacent facilities upon which the work is in any way dependent. In the event of any inconsistency or conflict between existing conditions and the proposal documents, immediately notify Engineer of such inconsistency or conflict.

B. Elevations of existing floors, tops of walls, parapets, beams and locations of existing columns, walls and other building elements are based on existing building drawings furnished by the Owner. Contract Documents are based on best available information regarding existing conditions. The intent of the Contract Documents is to integrate new construction with existing conditions. Contractor shall be responsible for verifying existing conditions with Contract Documents.

C. Provide protections necessary to prevent damage to existing buildings, improvements, landscaping and trees, parking, streets, and walks to remain in place. Restore damaged buildings, improvements and other existing conditions to their original condition in manner acceptable to Owner.

1.3 EXISTING CONDITIONS

A. The existing building must be kept functioning during the construction period, except as otherwise indicated. Existing functioning utilities cannot be interrupted without written approval from the Owner. Give two (2) weeks written notice to the Owner prior to planned interruption of any existing functioning utilities. Owner will then schedule

with Contractor for date and time of shutdown. Due to the need for continuous operation of the facility, Owner does not guarantee schedule shutdowns.

B. Notify the Owner's representative when working in areas where utility lines might be encountered.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 00 30 00

PROPOSAL FORM

SUBMITTED BY: _____
(Name of Proposer)

_____
(Address)

Dear Sir:

The undersigned, having examined the drawings, specifications, related documents, and the site of the proposed work, and being familiar with all of the conditions surrounding the work, including the availability of materials and labor, hereby proposes to furnish all labor, materials, and equipment required for the Arena Renovations at Midlothian High School located in Midlothian, Texas, in accordance with the drawings and project manual prepared by RWB Consulting Engineers for the lump sum of:

BASE PROPOSAL amount of:

_____ Dollars ($_____).

ALTERNATE BID No. 1

Provide the added cost to provide DMX controlled RGB lighting around the perimeter of the Arena to include all associated wiring, controls, conduit, etc. Refer to drawings and specifications.

The added cost is as follows:
_____ Dollars ($_____).

List approximate lead time of Video Display Board and associated scoreboard, shot and game clocks _____ weeks.

Notes:

1. Amount shall be shown in both words and figures. In case of discrepancy, the amount shown in words shall govern.
2. Prices listed on Bid Form acknowledge that work for Midlothian High School cannot begin until Summer Break.
3. The above amount does not include State of Texas Sales Tax.
4. The above amounts do include allowances as stated in Section 01 02 00.
5. The Base Proposal Work is intended to be performed during normal working hours, except for activities that create excessive noise or causes a disruption in

building services. In these instances, work shall be performed only when scheduled by the Owner, after hours, or on weekends.

6. Buildings will not be available to contractors until summer. Summer Break starts Friday May 28, 2021. Phased work will need to be coordinated with the district.
7. All Base and Alternate Proposal work shall be substantially completed by 11:00 p.m., August 06, 2021.
8. Contractor shall coordinate with the concurrent gym floor re-finish project occurring in the same space and shall propose a schedule that reflects the understanding that this project will require a minimum of two (2) weeks for the gymnasium floor to be re-finished and the floor re-finish scope has the same substantial completion date. Floor re-finish work will be done by another contractor and is outside the scope of work for this project.
9. Contractor shall include cost to work double shifts and/or weekends as required to complete project by required substantial completion date.
10. Contractor shall include any required equipment expediting cost and charges to complete the work within the timeline established based on the associated notice to proceed listed, site availability, and substantial completion date.
11. A Notice to Proceed will be sent by the District by noon on May 5, 2021 to inform the successful CSP Proposer of the award.

The undersigned affirms that the above stipulated base Proposal sum represents the entire cost per drawings, specifications, and addenda and that no claim will be made on account of any increase in wage scales, material prices, taxes, insurance, cost indexes, or any other rates affecting the construction industry and/or this project.

The undersigned Proposer agrees that this Proposal shall be good and may not be withdrawn for a period of 45 calendar days after the scheduled closing time for receiving Proposals.

The undersigned Proposer understands that the Owner reserves the right to reject any or all Proposals and to waive any informalities in the Proposal.

The Owner reserves the right to require Bonds of the successful Proposer. If written notice of acceptance of this Proposal is received within 45 days after date designated for opening of Proposals, the undersigned, within 10 days of receipt of the Contract, will sign and deliver to the Owner the contract and any required Performance Bond, Labor and Material Payment Bond and properly executed Insurance Verification Form required by the Owner.

Should the undersigned fail to deliver the signed Contract or the required Bonds or Insurance Form within the 10 day period, the Owner reserves the right to terminate the relationship.

TIME OF COMPLETION AND LIQUIDATED DAMAGES

1. The contract date will be established as the number of consecutive calendar days as set out on the proposal form from the “Notice-to-proceed” date issued by the Owner.

2. Failure of the Contractor to complete the Work by the contract date will result in damages being sustained by the Owner. Such damages are, and will continue to be,

impracticable and extremely difficult to determine. Due consideration will be given to delays falling within agreed terms of the contract.

3. The Contractor will pay the Owner Five Hundred Dollars ($500.00) for each calendar day of delay in finishing the Work in excess of time specified for completion, plus authorized time extensions. Execution of the Contract under these specifications shall constitute agreement by the Owner and Contractor that the amount indicated is the minimum value of the costs and actual damage caused by failure of the Contractor to Substantially Complete the Work within the allotted time, that such sum is Liquidated Damages and shall not be construed as a penalty, and that such sum may be deducted from payments due the Contractor if such delay occurs.

Addenda: The undersigned hereby acknowledges receipt of the following addenda to the Drawings and Specifications, all of the provisions and requirements of which addenda have been taken into consideration in the preparation of this Proposal.

Addendum No._____dated_____ Addendum No._____dated

Addendum No._____dated_____ Addendum No._____dated

Addendum No._____dated_____ Addendum No._____dated

Date:_____ Signed _____

Title _____

Name of Firm_____

Organized as a: (Mark one)

Proprietorship_____
Partnership_____
Corporation_____

Under the law of the State Of:

_____

_____
(Date)

Legal Address:

_____

_____

_____

Telephone No._____

Fax No._____

E-mail_____

If Proposal is by a corporation, affix seal above address.

END OF PROPOSAL FORM

SECTION 00 42 00

CONTRACTOR QUALIFICATION REQUIREMENTS

CONTRACTOR QUALIFICATION REQUIREMENTS FOR ARENA RENOVATIONS AT MIDLOTHIAN HIGH SCHOOL

The following requirements will be considered in determining the qualifications of prime contractors for proposing the construction referenced above. Failure to provide full information regarding all requirements may result in disqualification.

1. Contractor must have a Certificate of Authority to do business in the State of Texas.
2. Contractor must have an established office in the State of Texas.
3. Contractor must have been in similar construction business for at least five (5) years.
4. Negative responses from owners and architectural/engineering firms which are familiar with contractor's performance, depending on problems encountered, may be grounds for disqualification.
5. Contractor's own work staff must have performed at least 15% of the work on previous projects and must provide at least 15% of the Work of this Contract.
6. Contractor should have successfully completed in Texas at least two (2) projects of similar scope and complexity over the last four years.
7. As an attachment to the proposal, provide the following specific criteria citing special qualifications to execute this Contract as a prerequisite Contract award. Organize the information in the following format:

    a. Organization:

        1) Stability and capability.
        2) Staff structure for this Project.
        3) Personnel assigned to this Project.

    b. Experience:

        1) Projects of similar scope.
        2) Projects of similar contract amount.

    c. Work Load:

        1) Current work under other contract.
        2) Bonding limitations.

    d. Record of Cost Control:

        1) Examples of similar projects.
        2) Techniques.

e. Record of Quality Control:

1) Examples of similar projects.
2) Techniques.

f. References:

1) Owners.
2) Architects.

g. Financial Strength:

1) History.
2) Resources.
3) References.

8. Proposal will be compared on the basis of the proposed contract and qualifications of the firm to accomplish the projects outlined in Section 01 01 00.

END OF SECTION

SECTION 00 61 00

PERFORMANCE BOND

THE STATE OF TEXAS) KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF _____)

THAT we, _____

as Principal, and _____
as Surety, are hereby held and firmly bound unto MIDLOTHIAN INDEPENDENT SCHOOL DISTRICT, hereafter called Obligee, in the penal sum of $_____ which is the full amount of Principal's contract with the named Obligee, for the payment of which sum the said Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally firmly by these presents.

WHEREAS, the principal has entered into a written contract dated _____ with Obligee named, to do and perform certain construction work as provided in said contract and the related plans, specifications, general conditions and other contract documents, all of which are by reference made a part hereof.

NOW, THEREFORE, the conditions of this Obligation is such that if the Principal shall faithfully perform all of the work in accordance with the plans, specifications general conditions and contract documents, and shall faithfully perform each, every and all other obligations incumbent upon him under the terms of said written contract referred to, and shall fully indemnify and save harmless the Obligee from all costs, expense and damage which it may suffer or incur because of Principal's default, or failure so to do, then this obligation shall be void, otherwise it shall remain in full force and effect.

In the event Principal shall default in the faithful performance of the work called for by said written contract, plans, specifications and contract documents, the Surety shall within 15 days of the determination of default (determined as provided in said contract, general conditions and contract documents) take over and assume completion of said contract, or within such 15 day period make other arrangements satisfactory with the Obligee for completion of the contract, and said Surety shall become entitled thereupon to the payment or benefit of the balance of the contract price as the same matures according to its terms.

The Surety, for the protection of the Obligee herein, waives notice of, and hereby consents to any subsequent modification or alteration both in the work to be performed by the Principal, and the consequent price or sums to be paid by the Obligee, as well as any other change, or amendment, addition or deletion in the contract documents during the progress of the work, including but not limited to all extensions of time or other indulgences permitted the Principal.

Notwithstanding any other provision, the liability of the Surety on this bond shall never exceed the penal sum stated in first paragraph.

This Performance Bond is given in compliance with the terms and provisions of the Revised Civil Statutes of the State of Texas, and this bond and all of the provisions herein contained shall be solely for the protection of the named Obligee which has awarded the contract referred to.

The undersigned, corporate Surety, does by the execution of this Bond solemnly warrant and represent that it is duly authorized to do business in
Texas.

Executed this_____ day of _____, 20___.

Attest: Principal_____

By_____

Title_____

Approved as to Form by Obligee:

_____ _____ Surety

By _____ By _____

Title _____

NOTES:

1. This bond must be payable to the awarding authority, Midlothian Independent School District, as the named Obligee, and it must be approved as to form by such awarding authority.
2. This bond must be furnished before any work is commenced.
3. Surety must be a corporate surety duly authorized to do business in Texas.
4. This PERFORMANCE BOND must be in the full amount of the contract which it secures.
5. Power of Attorney from Corporate Surety should be attached to this Performance Bond.

END OF BOND

SECTION 00 62 00

PAYMENT BOND

THE STATE OF TEXAS KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF _____)

THAT we, _____

as Principal, and _____

as Surety, are hereby held and firmly bound unto MIDLOTHIAN INDEPENDENT SCHOOL DISTRICT, hereafter called Obligee, for the sole use, benefit and protection of all claimants supplying labor and material (as hereinafter defined) in the prosecution of the work provided for in the written contract hereafter referred to in the penal sum of $_____, which is the full amount of Principal's contract with the named Obligee, for the payment of which sum the said Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally firmly by these presents.

WHEREAS, the principal has entered into a written contract dated _____ with Obligee named, to do and perform certain construction work as provided in said contract and the related plans, specifications, general conditions and other contract documents, all of which are by reference made a part hereof.

NOW, THEREFORE, the conditions of this Obligation is such that if the Principal shall promptly make payments to all claimants supplying labor and material (as hereafter defined) in the prosecution of the work provided in said contract, the related plans, specifications, general conditions and other contract documents, then this obligation shall be void, otherwise it shall remain in full force and effect.

The Payment Bond is given in compliance with the terms and provisions of the Revised Civil Statutes of the State of Texas, and the claimants referred to in this bond are those defined by such Civil Statutes, and this bond shall be solely for the protection of all such claimants supplying labor and material as defined in such amendment, in the prosecution of the work provided for in said contract, and shall be for the use of each such claimant and one others.

The undersigned, corporate Surety, does by the execution of this Bond solemnly warrant and represent that it is duly authorized to do business in Texas.

Executed this_____ day of _____, 20____.

Attest: _____ Principal

By_____
Title _____

Approved as to Form by Oblige:

_____ _____ Surety

By _____ By _____

Title _____

NOTES:

1. This bond must be payable to the awarding authority, Midlothian Independent School District, as the named Oblige, and it must be approved as to form by such awarding authority.
2. This bond must be furnished before any work is commenced.
3. Surety must be a corporate surety duly authorized to do business in Texas.
4. This PAYMENT BOND must be in the FULL amount of the contract.
5. Power of Attorney from Corporate Surety should be attached to this Payment Bond.

END OF BOND

SECTION 00 62 50

TEXAS CERTIFICATE OF EXEMPTION

Purchaser's Name

Street Address

City, State, Zip Code

I claim an exemption from payment of sales and use taxes for the purchase of taxable item described below or on the attached order or invoice:

Description of items (or attached order or invoice) to be purchased:

I claim this exemption for the following reason:

I understand that I will be liable for payment of sales tax which may become due for failure to comply with the provisions of the state, city, county and/or metropolitan transit authority/city transit department sales and use tax laws and Comptroller rules regarding exempt purchases. Liability for the tax will be determined by the price paid for the taxable items purchased or the fair market rental value for the period of time used.

I understand that it is a misdemeanor to give an exemption certificate to the seller for taxable items which I know, at the time of purchase, will be used in a manner other than that expressed in this certificate and, upon conviction, may be fined up to $500 per offense.

Seller:

Street Address:

City, State, Zip Code:

Purchaser's
Signature: _____ Date: _____ Phone: _____

Title: _____

This certificate does not require a number to be valid.

Sales and use of tax "exemption numbers" or "tax exempt numbers" do not exist.

This certificate should be furnished to the supplier. Do not send the completed certificate to the Comptroller of Public Accounts.

END OF TEXAS CERTIFICATE OF EXEMPTION

DOCUMENT 00 83 00

WAGE RATE SCHEDULE

PART 1 - GENERAL

1.1 REQUIREMENTS

A. Pay not less than minimum wage scale and benefits indicated on "Minimum Wage Schedule" as outlined below.

B. Listed wages are minimum rates only.

C. No claims for additional compensation will be considered by the Owner because of payments of wage rates in excess of applicable rate contained in this Contract.

1.2 APPLICABLE STANDARDS

A. The Midlothian Independent School District has adopted the Federal Davis-Bacon wage rates for the use of contractors in determining wage rates in the District's area. Contractors may access the Department of Labor website at the following address to obtain these rates: http:// www.access.gpo.gov/davisbacon/index.html.

1.3 PAYROLL

A. The Owner reserves following rights:

1. To receive weekly payroll records.
2. To have Contractor provide required earning statements to employees.

1.4 MINIMUM WAGE RATES

A. Pay prevailing basic wage rate listed below, plus any applicable fringe benefits.

B. This determination of prevailing wage rates shall not be construed to prohibit payment of more than rates named. Under no condition shall any laborer, workman or mechanic employed on this job be paid less than minimum wage rate.

C. In execution of this Contract, Contractor must comply with all applicable state and federal laws, including but not limited to laws concerned with labor, equal employment opportunity, safety and minimum wage.

END OF DOCUMENT

SECTION 01 01 00

SUMMARY OF WORK

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of this Contract consists of the furnishing of all labor, materials, services, equipment, and appliances required in conjunction with or properly incidental to the Arena Renovations at Midlothian High School (Midlothian, Texas) for the Midlothian Independent School District.

B. The Drawings and Specifications do not necessarily indicate or describe all work required for completion of Project. Contractor shall provide and install all incidentals reasonably inferable from the Contract Documents that are required for a complete Project.

C. These documents describe the essential elements sufficiently to determine the scope of the Project.

D. Provide all items required for complete operating systems including items not necessarily shown in these documents, but that can be reasonably inferred as being required for a complete operating system.

E. The Drawings and Specifications indicate the basic quality of material and quality of construction required for entire Project.

1.2 RELATED REQUIREMENTS

A. Division 1 - General Requirements of Project Manual governs execution of Specification Sections within Divisions 2 through 28, inclusive.

1.3 WORK SEQUENCE

A. Construct Work in stages to accommodate Owner's use of premises during construction period. Coordinate construction schedule and operations with Owner's Representative:

1. Do not interrupt any existing utilities while school is in session.
2. Existing utilities must be maintained and uninterrupted as noted above and in accordance with provisions in Supplementary Conditions to the Contract.

B. Minimum disruption of school operation and use of adjacent facilities and access to those facilities is required. Cooperation with Owner to minimize inconvenience is essential.

C. Construct the Work in stages to provide for public convenience. Do not close off public use of facilities until completion of one stage of construction will provide alternative usage.

D. Stages of construction are those indicated on Drawings, unless noted otherwise.

E. Owner may require certain work to be performed after normal working hours or on holidays or weekends. Refer to Supplementary Conditions of the Contract for specific requirements.

1.4 CONTRACTOR'S USE OF PREMISES

A. Contractor shall have complete use of the immediate premises of the Project site for execution of the Work of this Contract after issuance of notice to proceed.

B. Coordinate use of premises under direction of Engineer and Owner. Contractor shall be responsible for monitoring the use of premises by Contractor's employees and sub-contractors.

C. Access routes for delivery of materials and equipment shall be as indicated by the Owner. Do not use access routes other than those indicated without permission of the Owner.

D. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site. Store materials and products only in those areas indicated for staging.

E. Move any stored Products, under Contractor's control, which interfere with operations of the Owner or separate contractor, or as required by Engineer. Do not unnecessarily encumber project site with materials and equipment.

F. Staging and material storage shall be limited to the areas indicated by the Owner. Obtain specific permission from the Engineer for the use of other areas for storage and staging.

G. Do not overload existing or new structures with weight that would compromise safety. Verify design loads for structure if necessary prior to loading structure.

H. Obtain and pay for the use of additional storage or work areas needed for operations.

I. Protect existing lawns, sidewalks, pavements, curbs and utilities subject to damage by work under this Contract. Repair or replace any existing work damaged by the Contractor. Replace existing lawns damaged by Contractor's activities with sod to provide full stand of replacement grass.

J. Parking areas for Contractor's personnel shall be as acceptable to Owner.

1.5 WORK ON EASEMENTS, R.O.W., AND ADJACENT PROPERTY

A. Obtain permission from other property Owners, obtain and pay all fees required by applicable governing authorities, prior to commencing with work on easements, right-of-ways, and adjacent property. This also applies to the transport of cranes and other related equipment.

B. Post all notices and warning signs required by applicable governing authorities.

C. Perform work on easements, right-of-ways, and adjacent property in accordance with local codes and ordinances and utility company requirements.

1.6 OWNER OCCUPANCY

A. Cooperate with Owner's Representative in all construction operations to minimize conflict and to facilitate Owner usage.

B. Contractor shall at all times conduct his operations as to ensure least inconvenience to general public.

C. Maintain at all times safe access and egress from existing building. Maintain safe exit paths from building for emergency egress.

D. All construction equipment, materials or work must be adequately fenced and protected.

E. Any damage or interruption to any of Owner's existing utilities or services described above in Item 1.4 shall be repaired immediately. Contractor shall immediately place an adequate work force at place of disruption to minimize time required for repairs. Contractor shall make every effort to expedite repairs, regardless of cause of damage, or responsibility for damage, to return damaged utility or service to full operation as quickly as possible.

1.7 PARTIAL OWNER OCCUPANCY

A. Contractor agrees to use and occupancy of Project by Owner prior to Substantial Completion of entire Project.

B. Use and occupancy prior to Substantial Completion of entire Project does not relieve Contractor of responsibility to maintain specified insurance coverages on 100% basis for benefit of Owner, Contractor and subcontractors until Project is complete and accepted by Owner.

C. Contractor provides for:

1. Access for Owner's personnel.

2. Temporary operation of heating, ventilating, air-conditioning and electrical systems.
3. Access for public to extent allowed by Owner.

D. Operation: During occupancy, mutually acceptable arrangements shall be negotiated between Owner and Contractor regarding warranties and insurance requirements respecting portions of Work affected by partial occupancy and regarding operation and cost of building services so that costs attributable to partial occupancy shall be borne by Owner and costs attributable to performance of Work shall be borne by Contractor.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 02 00

ALLOWANCES

1.1 REQUIREMENTS INCLUDED

A. Include in Contract Sum allowances stated in the Contract Documents.

B. Designate in construction progress schedule delivery dates for Products specified under each allowance.

C. Designate in Schedule of Values quantities of materials required under each unit cost allowance.

1.2 RELATED SECTIONS

A. Conditions of the Contract.

B. Section 01 02 50: Measurement and Payment.

1.3 ALLOWANCES FOR PRODUCTS

A. The amount of each allowance includes:

1. The cost of the Product to the Contractor or Subcontractor, less any applicable trade discounts.
2. Delivery to the site.
3. Labor required under the allowance, except when labor is specified to not be included in the allowance.
4. Applicable taxes.

B. In addition to the amount of each allowance, include in the Contract Sum the Contractor's costs for the following, unless otherwise noted:

1. Handling at the site; including unloading, uncrating, and storage.
2. Protection from the elements and from damage.
3. Labor for installation and finishing where labor is specified to not be a part of the allowance.
4. Other expenses required to complete the installation.
5. Contractor's and Subcontractor's overhead and profit.

1.4 SELECTION OF PRODUCTS UNDER ALLOWANCES

A. Engineer's Duties:

1. Consult with the Contractor in consideration of Products and suppliers or installers.
2. Make selection in consultation with the Owner.
3. Obtain Owner's written decision, designating:

a. Product, model and finish.
b. Accessories and attachments.
c. Supplier and installer as applicable.
d. Cost to Contractor, delivered to the site or installed, as applicable.
e. Manufacturer's Warranties.

4. Transmit Owner's decision to the Contractor.
5. Prepare Change Orders.

B. Contractor's Duties:

1. Assist Engineer and Owner in determining qualified suppliers or installers.
2. Obtain proposals from suppliers and installers when requested by Engineer.
3. Make appropriate recommendations for consideration of the Engineer.
4. Notify Engineer promptly of:

a. Any reasonable objections Contractor may have against any supplier, or party under consideration for installation.
b. Any effect on the Construction Schedule anticipated by selections under consideration.

1.5 CONTRACTOR RESPONSIBILITY FOR PURCHASE, DELIVERY AND INSTALLATION

A. On notification of selection, execute purchase agreement with designated supplier.

B. Arrange for and process Shop Drawings, Product Data and Samples, as required.

C. Make all arrangements for delivery.

D. Upon delivery, promptly inspect products for damage or defects.

E. Submit claims for transportation damage.

F. Install and finish products in compliance with requirements of referenced specification sections.

1.6 ADJUSTMENT OF COSTS

A. Should the net cost be more or less than the specified amount of the allowance, the Contract Sum will be adjusted accordingly by Change Order.

1. The amount of the Change Order will recognize any changes in handling costs at the site, labor, installation costs, overhead, profit, and other expenses caused by the selection under the allowance.
2. For products specified under a unit cost allowance, the unit cost shall apply to the quantity listed in the Schedule of Values.

3. For products specified under unit allowance, unit cost allowance shall apply to quantities actually used with nominal amount for waste, as determined by receipts, invoices or by field measurement.

B. Submit any claims for anticipated additional costs at the site, or other expenses caused by the selection under the allowance, prior to execution of the work.

C. Submit documentation for actual additional costs at site, or other expenses caused by selection under allowance within 60 days after completion of execution of Work.

D. Failure to submit claims within the designated time will constitute a waiver of claims for additional costs.

E. At contract closeout, reflect all approved changes in contract amounts in the final statement of accounting.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 CONTINGENCY ALLOWANCE

A. Include in Contract Sum lump-sum "Owner's Betterment Allowance" in the amount as follows:

1. Five Percent (5%) of the total proposal amount.
2. Amounts authorized under a Contingency Allowance Expenditure Authorization (CAEA) shall not include any additional amounts for bonds, insurance, overhead or profit, as these additional costs for the allowance are to be included in the contract sum.
3. Change orders will include such additional costs as provided in the Conditions of the Contract.

B. Monies in contingency allowance will be used only on issuance of contingency allowance expenditure authorization or change order.

C. At closeout of Contract, monies remaining in contingency allowance will be credited to Owner by change order.

END OF SECTION

SECTION 01 02 50

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Unit prices.

B. Application for Payment.

C. Change Order Procedures.

1.2 RELATED REQUIREMENTS

A. Conditions and Provisions of the Contract.

1.3 APPLICATIONS FOR PAYMENT

A. Progress payments shall be made as the Work proceeds at intervals stated in the Contract.

B. All Work covered by Progress Payments shall, at the time of payment, become the property of the Owner.

C. Form of Application for Payment will be notarized AIA Document G702 - Application and Certification for Payment, supported by AIA Document G703 - Continuation Sheet, submitted in quadruplicate.

D. Contractor to submit to Engineer within 15 days of execution of Owner/Contractor Agreement proposed sample of Lien Waiver and Bills Paid Affidavit forms for review and acceptance by Engineer for use on this Contract.

E. Conditions governing regular schedule for applications, payment, and retainage are as stated in the Contract.

F. Monthly Applications for Payment shall include Waivers of Liens for all Work included in the previous months' Application for Payment. Waiver of Liens for the subcontractors and materialmen shall be the total amount paid prior to the previous month's Application for Payment.

G. With each Application for Payment, Contractor shall certify that such Application for Payment represents a just estimate of cost reimbursable to Contractor under terms of Contract, and shall also certify that there are not any Mechanics' or Materialmen's Liens outstanding at the date of this Application for Payment, that all due and payable bills

with respect to the Work have been paid to date or shall be paid from proceeds of that Application for Payment, and that there is no known basis for the filing of any Mechanics' or Materialmen's Liens against the surety in connection with the Work, and that Waivers and Bills Paid Affidavit forms from all subcontractors and materialmen have been, or will be, obtained in the form specified in the Contract.

1.4 CONSTRUCTION CHANGE ORDER PROCEDURES

A. Contractor to submit to Engineer within 15 days of execution of Owner/Contractor Agreement name of individual authorized to accept changes on behalf of Contractor, and to be responsible for informing others in Contractor's employ of changes in the Work.

B. Change Order forms will be furnished and issued by Engineer.

C. Contractor Documentation of Changes:

1. Maintain detailed records of Work done on an accounting basis acceptable to Engineer and Owner. Provide full information required for evaluation of proposed changes.
2. Document each quotation for a change in cost or time with sufficient data to allow evaluation of quotation.
3. On request, provide additional data to support computations:
    a. Quantities of products, labor and equipment.
    b. Insurance and bonds.
    c. Overhead and profit.
    d. Justification for any change in Contract Time.
    e. Credit for deletions from Contract, similarly documented.
4. Support each request for additional costs, and for Work proposed on a time and material basis, with description of products, equipment, cost of labor and subcontracts, completely documented.
5. Computation for changes in Work will be computed in one of the manners described in the Conditions of the Contract.

D. Initiation of Changes:

1. Engineer may submit Proposal Request which includes detailed description of change with supplementary or revised Drawings and Specifications.
2. Contractor may initiate a proposed change by submittal of a request to Engineer describing proposed change with statement of reason for change, and proposed effect on Contract Sum and Contract Time with full documentation, and a statement of the effect on Work of separate contractors. Document any requested substitutions. Submission of such requests and receipt of same by Engineer does not mean acceptance, or approval, of proposed change.
3. Contractor shall incorporate into his Construction Progress Schedule sufficient time for Owner's review process. Proposed changes, not within the scope of the

Contingency Allowance described in Section 01 02 00, will be reviewed and approved or rejected only by the Richardson Independent School District at their next regularly scheduled meeting after proposal is prepared by Engineer. Meetings of the School Board are regularly scheduled at four (4) week intervals.

4. Owner's schedule for review and acceptance or rejection of proposed changes will not be grounds for extensions in Contract Time.

E. Authorization:

1. The Owner may request, through the Engineer, a Construction Change Directive, in writing, instructing Contractor to proceed with changes of all or in part of Work, for subsequent inclusion in a Change Order that is pending. Directive will propose basis for necessary adjustments, if any, to Contract Sum or Time.
2. All changes that affect Contract Sum and/or Contract Time will require a Change Order signed by the Owner and the Engineer. Contractor's signature indicates agreement. Any other orders, written or oral, by the Owner through the Engineer or by the Engineer shall be treated as a Change Order only if Contractor gives Owner proper written notice as described in Conditions of Contract.
3. Promptly execute the change in Work only upon receipt of approved Change Order or Owner's written Construction Change Directive.

F. Execution:

1. Engineer will issue Change Orders for signatures of parties as provided in Conditions of Contract.
2. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust Contract Sum as shown on Change Order.
3. Promptly revise Progress Schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of Work affected by Change, and resubmit Schedule.
4. Promptly enter Changes in Project Record Documents.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 03 00

ALTERNATES

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. This Section identifies each Alternate by number, and describes the basic changes to be incorporated into the Work, only when that Alternate is made a part of the Work by specific provisions in the Owner-Contractor Agreement.

1.2 RELATED REQUIREMENTS

A. Owner-Contractor Agreement: Incorporation of Alternates accepted by Owner into the Work.

B. Sections of the Specifications as listed under the respective Alternates.

C. Referenced sections of specifications stipulate pertinent requirements for products and methods to achieve the work stipulated under each Alternate.

D. Coordinate pertinent related work and modify surrounding work as required to properly integrate the work under each Alternate, and to provide the complete construction required by Contract Documents.

1.3 DESCRIPTION

A. Alternates will be accepted and executed at Owner's option.

B. This Section identifies each Alternate by number, and describes the basic changes to be incorporated into the Work, only when that Alternate is made a part of the Work by specified provisions in the Owner-Contractor Agreement.

C. Related Requirements in other Sections:

1. Section 01 01 00: Summary of Work.
2. Sections of Specifications as listed under the respective Alternatives.

D. Referenced Sections of Specifications stipulate pertinent requirements for products and methods to achieve the work stipulated under each Alternative.

E. Coordinate pertinent related work and modify surrounding work as necessary to properly integrate work under each Alternative, and to provide complete construction required by Contract Documents.

1.4 DESCRIPTION OF ALTERNATES

ALTERNATE BID No. 1

Provide the added cost to provide DMX controlled RGB lighting around the perimeter of the Arena to include all associated wiring, controls, conduit, etc. Refer to drawings and specifications.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 04 00

COORDINATION

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. General Project coordination of different Contract phases, trades and disciplines.

1.2 RELATED REQUIREMENTS

A. Section 01 01 00: Summary of Work.

B. Section 01 04 50: Cutting and Patching.

C. Section 01 30 00: Submittals.

D. Section 01 60 00: Material and Equipment.

E. Section 01 70 00: Contract Closeout.

1.3 GENERAL COORDINATION

A. Coordinate scheduling, submittals, and work of various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements with provisions for accommodating items furnished by Owner to be installed by Contractor.

B. Coordinate sequence of Work to accommodate partial Owner occupancy as specified in Section 01 01 00.

C. Contractor shall review and coordinate requirements of Divisions 22, 23, and 26 in Project Manual, and M.E.P. drawings with other Work. Report discrepancies to Engineer.

D. Contractor shall maintain services of major subcontractors throughout duration of Contract, except as required by provisions of Conditions of Contract. Contractor shall notify Engineer in writing of intention to replace subcontractor(s), outlining reasons for the action and naming proposed replacement subcontractor.

E. Contractor shall be responsible for coordination of Work of subcontractors, and for recording subcontractor installation data on Project Record Drawings in accordance with Section 01 70 00.

F. Communications to Owner from Contractor regarding Contract requirements shall be through Engineer unless otherwise noted.

1.4 COORDINATION MEETINGS

A. In addition to Progress Meetings scheduled in Section 01 20 00, Contractor shall hold coordination meetings and pre-installation meetings with Contractor's personnel, subcontractors, material men, and Engineer, as necessary, to assure coordination of different trades and disciplines.

1.5 COORDINATION OF SUBMITTALS

A. Schedule and coordinate submittals.

B. Coordinate Work of various trades having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate requests for substitutions to assure compatibility of space, of operating elements, effect on Work of other trades, and on Work scheduled for early completion.

1.6 COORDINATION OF SPACE AND INSTALLATION SEQUENCE

A. Coordinate use of Project space and sequence of installation of equipment, walks, mechanical, electrical, plumbing, or other Work that is indicated diagrammatically on Drawings. Follow routings shown for tubes, pipes, ducts, conduits, and other items as closely as practical, with due allowance for available physical space. Make runs parallel with lines of building, unless noted otherwise. Utilize space efficiently to maximize accessibility for other installations, for Owner maintenance, and for repairs.

B. In finished areas, except as otherwise shown, conceal ducts, pipes, wiring, and other non-finish items within construction. Coordinate locations of concealed items with finish elements.

C. Coordinate with engineering reflected ceiling plans exact location and dimensioning of items which occur within hung ceilings. In event of conflict, request clarification from Engineer prior to proceeding with fabrication or installation.

D. Contractor shall be responsible for coordination of Work. Each subcontractor shall be responsible for coordination of their respective Work with the Work of the Contractor and other trades.

1.7 COORDINATION OF CONTRACT CLOSEOUT

A. Coordinate completion and cleanup of Work of separate phases and sections in preparation for Substantial Completion of portions of Work designated for Owner partial occupancy as designated in Section 01 01 00.

B. After Owner occupancy of premises, coordinate access to site by requirements of individual Specification Sections regarding correction of defective Work and Work not in accordance with Contract Documents. Minimize disruption of Owner's operations.

C. Assemble and coordinate Closeout submittals in accordance with Section 01 70 00.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 04 50

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Requirements and limitations of cutting and patching of Work.

B. Contractor shall be responsible for all cutting, fitting and patching, required to complete the Work or to:

1. Make its several parts fit together properly.
2. Uncover portions of the Work to provide for installation of ill-timed work.
3. Remove and replace defective work.
4. Remove and replace work not conforming to requirements of Contract Documents.
5. Remove samples of installed work as specified for testing.
6. Provide routine penetrations of non-structural surfaces for installation of mechanical and electrical Work.
7. Uncover work that has been covered prior to Engineer's required observation.

1.2 RELATED REQUIREMENTS

A. Conditions of the Contract: basic responsibilities of each party to Contract.

B. Section 01 01 00: Summary of Work.

C. Section 01 04 00: Coordination.

D. Section 01 30 00: Submittals.

E. Section 01 40 00: Quality Control.

F. Section 01 60 00: Material and Equipment.

G. Divisions 2 through 28: Cutting and patching incidental to Work of respective Sections.

1.3 SUBMITTALS

A. Submit a written request to Engineer well in advance of executing any cutting or alteration which affects:

1. Work of the Owner or any separate contractor.
2. Structural value or integrity of any element of the Project.
3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
4. Efficiency, operational life, maintenance or safety of operational elements.
5. Visual qualities of sight-exposed elements.

B. Request shall include:

1. Identification of the Project.
2. Location and description of affected work.
3. The necessity for cutting, alteration or excavation.
4. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of Project.
5. Description of proposed work:

a. Scope of cutting, patching or alteration.
b. Trades who will execute the work.
c. Products proposed to be used.
d. Extent of refinishing to be done.
e. Cost proposal when applicable.
f. Alternatives to cutting and patching.

6. Alternatives to cutting and patching.
7. Written permission of any separate contractor whose work will be affected.

C. Should conditions of Work or the schedule indicate a change of products from original installation, Contractor shall submit request for substitution as specified in Section 01 60 00.

D. Submit written notice to Engineer designating the date and the time the work will be uncovered or altered.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with specifications and standards for each specific product involved.

B. Should conditions of work or schedule indicate change of products from original installation, submit a request for substitution as specified in Section 01 60 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing conditions of Project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, inspect conditions affecting installation of Products, or performance of work.

C. Report unsatisfactory or questionable conditions to Engineer in writing; do not proceed with work until Engineer has provided further instructions.

D. Beginning of cutting or patching operations shall be considered as acceptance of existing conditions by Contractor.

3.2 PREPARATION

A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of Work.

B. Provide devices and methods to protect other portions of Project from damage.

C. Provide protection from elements for that portion of the Project which may be exposed by cutting and patching work.

D. Maintain excavations free from water.

3.3 DUST CONTROL

A. Provide positive methods of dust control and apply dust control materials to minimize raising dust from cutting and patching operations.

B. Conform to requirements for temporary barriers and enclosures described in Section 01 50 00 for cutting and patching operations, and additional temporary controls.

3.4 PERFORMANCE

A. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

B. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

C. Restore work which has been cut or removed; install new products to provide completed Work in accordance with requirements of the Contract Documents.

D. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces. Where fire-rated separations are penetrated, fill space around pipe or insert with material with physical characteristics equivalent to fire-resistance requirement of penetrated surface.

E. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:

1. For continuous surfaces, refinish to nearest intersection.
2. For an assembly, refinish entire unit.

END OF SECTION

SECTION 01 05 00

FIELD ENGINEERING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish and pay for field engineering services required for Project.

1. Civil, structural or other professional engineering services specified, or required to execute Contractor's construction methods.
2. Survey work required for execution of Work.
3. Coordinate field engineering services with Project Engineer.

1.2 RELATED SECTIONS

A. Conditions of the Contract.

B. Section 01 01 00 - Summary of Work.

C. Section 01 30 00 - Submittals.

D. Section 01 70 00 - Contract Closeout.

E. Divisions 2 through 26: Requirements of individual Sections.

1.3 QUALIFICATIONS OF ENGINEER

A. Qualified engineer acceptable to Contractor and Owner.

B. Registered professional engineer of discipline required for this Project licensed in the State of Texas.

1.4 SUBMITTALS

A. Submit name and address of professional engineer to Project Engineer.

B. Submit documentation to certify accuracy of field engineering work.

C. Submit certificate signed by registered engineer certifying that locations of improvements are in conformance, or non-conformance, with Contract Documents.

D. Maintain complete and accurate record data on all deviations in work as encountered during the execution of Work. Record data on Project Record Documents in accordance with requirements of Section 01 70 00.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 06 00

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Division 1 - General Requirements of the Project Manual governs the execution of all Specification Sections within Divisions 2 through 26.

1.2 CODES

A. Where references are made on Drawings or Specifications to codes, they shall be considered an integral part of the Contract Documents as minimum standards. Nothing contained in the Contract Documents shall be so construed as to be in conflict with any law, bylaw or regulation of the municipal, State, Federal or other authorities having jurisdiction.

B. Perform Work in compliance with:

1. 2015 International Building Code, with amendments.
2. 2015 International Fire Code, with amendments.
3. 2015 International Mechanical Code, with amendments.
4. 2015 International Plumbing Code, with amendments.
5. 2015 International Energy Conservation Code, with amendments.
6. 2014 National Electric Code, with amendments.
7. Applicable reference standards and requirements of:
    a. American Society for Testing and Materials (ASTM).
    b. National Fire Protection Association (NFPA).
8. National, state and local barrier free codes, laws and ordinances.

1.3 GOVERNING LAWS

A. Additional information with legal implications regarding applicable governing laws and jurisdictions can be found in Conditions of Contract.

1.4 FIRE RATINGS

A. Where material, component, or assembly is required to be fire rated, fire rating shall be determined or listed by one of the following testing agencies or authorities:

1. Underwriters Laboratories, Inc.
2. Factory Mutual Laboratories.
3. The National Board of Fire Underwriters.

B. Where reference is made to only one testing authority, equivalent fire rating as determined or listed by another of above testing authorities is acceptable if approved by applicable governing authorities having jurisdiction.

1.5 PERMITTING

A. Contractor shall, without additional expense to Owner, obtain necessary licenses and permits, and be responsible for complying with any Federal, state, county, and municipal laws, codes, and regulations applicable to the performance of the Work, including, but not limited to, any laws or regulations requiring the use of licensed contractors to perform parts of the Work.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 07 00

DEFINITIONS AND TERMINOLOGY

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Division 1 - General Requirements of the Project Manual governs the execution of all Specification Sections within Divisions 2 through 26.

1.2 SPECIFICATION TERMINOLOGY

A. "Directed", "Designated", "Selected", or words of similar import: Direction, designation, selection, or similar action of Engineer is intended unless otherwise stated.

B. "Require" and words of similar import: As required to complete the Work and as required by Engineer, unless otherwise stated.

C. "Perform": Contractor, at his own expense, shall perform operations necessary to complete Work, including furnishing of necessary labor, tools and equipment, and further including and installing of materials indicated, specified or required to complete such performance.

D. "Provide": Contractor, at his own expense, shall furnish and install Work complete in place and ready for use, including furnishing of necessary labor, materials, tools, equipment and transportation. Definitions apply same to future, present and past tenses, except word "provide" may mean "contingent upon" where such context is apparent.

E. "Other acceptable manufacturer", "equal", "acceptable equal", "equivalent", or words of similar import: It shall be understood that such words are followed by expression "in sole opinion of the Engineer" even though such words may not appear in print, unless otherwise stated.

F. "Acceptance", "acceptable", or words of similar import: Acceptance, acceptable or similar words shall be of Engineer, unless otherwise stated.

G. "At no extra cost to Owner", "With no extra compensation to Contractor", "At Contractor's own expense", or words of similar import: Such terms shall be understood to mean that Contractor shall perform or provide specified operation of Work at no increase to Contract Sum stated in executed Contract.

H. "NIC": Work of this Project which is not being performed or provided as part of Contract; term shall mean "Not in This Contract" or "Not a Part of the Work to be

Performed or Provided by Contractor". "NIC" work is indicated as aid to Contractor in scheduling amount of time and materials necessary for completion of Contract.

1.3 SPECIFICATION SENTENCE STRUCTURE

A. Specifications are written in modified brief style. In general, words "the", "a", "an", "shall", "shall be", and "all" are not used. Requirements indicated and specified apply to all work of same kind, class, and type even though word "all" is not stated.

B. Simple imperative mood of sentence structure is used in Specification Sections which places verb as first word in sentence. Where such words as "perform", "provide", "install", "erect", "furnish", "connect", "test", or words of similar import are used, it shall be understood that such words include meanings of phrase "The Contractor Shall..." before such words.

C. Standard paragraph titles and other identifications of subject matter in Specifications are intended as aid in locating and recognizing various requirements in Specifications. Titles do not define, limit or otherwise restrict Specifications text. Capitalizing of words in text does not signify or mean that such words convey special or unique meanings having precedence over other parts of Contract Documents. Specification text shall govern over titling and shall be understood to be interpreted as a whole.

1.4 DOCUMENT ORGANIZATION

A. Organization of Project Manual and Contract Drawings are not intended to control or to lessen the responsibility of Contractor in dividing Work among his subcontractors, or in establishing extent of Work to be performed by any trade.

B. The Drawings, Specifications, and Supplementary Contract Documents are intended to be complimentary and to describe a complete Work. In cases of discrepancies, the Engineer shall be the sole determiner of the intent. Such interpretations by Engineer shall be in writing, and shall be consistent with, and reasonably inferable from, the intent of Contract Documents. In all other cases, the more expensive or higher quality of the questionable items will govern.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 12 00

ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Division 1 - General Requirements of Project Manual governs the execution of all Specification Sections within Divisions 2 through 28.

1.2 RELATED REQUIREMENTS

A. Section 01 01 00: Summary of Work.

B. Section 01 04 50: Cutting and Patching.

C. Section 01 30 00: Submittals.

D. Section 01 50 00: Construction Facilities and Temporary Controls.

E. Section 01 70 00: Contract Closeout.

1.3 SYSTEM DESCRIPTION

A. Schedule Work in sequence and within time specified in Section 01 01 00.

B. Submit separate detailed sub-schedule for alterations work, coordinate with Construction Schedules. Indicate the following as a minimum:

1. Each stage of work and dates of occupancy of areas.
2. Date of Substantial Completion for each area of alterations work, as appropriate.
3. Trades and subcontractors employed in each stage.

1.4 QUALITY ASSURANCE

A. Coordinate work of trades and schedule elements of alterations and renovation work by procedures and methods to expedite completion of Work.

B. In addition to demolition work specified in Section 23 00 00 and that specifically shown, cut, move or remove items as necessary to provide access or to allow alterations and new work to proceed including items as follows:

1. Repair or removal of unsanitary conditions.
2. Removal of abandoned items and items serving no useful purpose, such as abandoned piping, conduit and wiring.

3. Removal of unsuitable or extraneous materials not indicated for salvage, such as abandoned furnishings and equipment, and debris, such as rotted wood, rusted metals and deteriorated concrete.
4. Cleaning of surfaces, and removal of surface finishes as needed to install new work and finishes.

C. Patch, repair and refinish existing items to remain, to specified condition for each material, with smooth transition to adjacent new items of construction.

D. Assign work of moving, removal, cutting and patching, to trades qualified to perform work in manner to cause least damage to each type of work and provide means of returning surfaces to appearance of new work.

E. Perform cutting and removal work to remove minimum necessary, and in manner to avoid damage to adjacent work. Cut finish surfaces such as masonry, tile, plaster or metals, by methods to terminate surfaces in straight line at natural point of division.

F. Perform cutting and patching as specified in Section 01 04 50.

G. Protect existing finishes, equipment and adjacent work which is scheduled to remain from damage. Protect existing and new work from weather and extremes of temperature. Maintain existing interior work above 60 degrees F. Provide weather protection, waterproofing, heat and humidity control as needed to prevent damage to remaining existing work and to new work.

H. Provide temporary enclosures to separate work areas from existing building and from areas occupied by Owner, and to provide weather protection.

I. Discoveries of construction, furnishings and articles having historic or private value shall remain in the possession of Owner.

1. Promptly notify Engineer of discovery.
2. Protect discovery from damage from elements of work.
3. Engineer will promptly transmit Owner's decision for disposition of discovery.
4. Contractor shall store items to be retained by Owner in safe, dry place on site, or shall dispose of items which Owner releases.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Salvage sufficient quantities of cut or removed material to replace damaged work of existing construction, when material is not readily obtainable on current market. Store salvaged items in dry, secure place on site.

B. Items not required for use in repair of existing work shall remain property of Owner.

C. Do not incorporate salvaged or used material in new construction except with permission of Engineer.

2.2 PRODUCTS FOR PATCHING, EXTENDING AND MATCHING

A. Provide same products or types of construction as that in existing structure, as needed to patch, extend or match existing work. Generally Contract Documents will not define products or standards of workmanship present in existing construction. Contractor shall determine products by inspection and any necessary testing and by use of existing as sample of comparison.

B. Presence of product, finish or type of construction, requires that patching, extending or matching shall be performed as necessary to make Work complete and consistent to identical standards of quality.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor's Examination of Site:

1. By executing contracts, Contractor and each subcontractor shall represent that they have:
    a. Visited the site.
    b. Made due allowances for difficulties and contingencies to be encountered.
    c. Compared Contract Documents with work in place.
    d. Informed themselves of existing conditions and work by others being performed.
    e. Notified the Engineer of any ambiguity, inconsistency or error they have discovered within the Contract Documents or between the Contract Documents and existing conditions.
2. Failure to visit site shall in no way relieve Contractor or subcontractor from furnishing materials or equipment or performing work that may be required to complete Work in accordance with Contract Documents at no additional cost.
3. Contractor or subcontractors will not be given extra payment for work related to conditions which can be determined by examinations of the site conditions.
4. Contractor or subcontractors will not be given extra payment for work related to ambiguities, inconsistencies or errors within the Contract Documents and the existing conditions, when such ambiguities, inconsistencies or errors are known or should have been known by Contractor or subcontractors prior to execution of Contract, unless Contractor or subcontractors have notified Engineer in writing of such condition prior to execution of Owner/Contractor Agreement.

3.2 PREPARATION

A. Existing building will remain in use by Owner.

B. Access by Contractor to portions of Owner's property beyond the actual area of Work under this Contract is denied, except where necessary to perform the Work, and then only with specific written approval from Owner for each incidence.

C. Contractor shall accept site and existing building in condition in which they exist at time he is given access to begin the Work.

D. While Work under this Contract is in progress, protect existing buildings, grounds, contents and occupants, including those on adjacent property, whether private or public, from damage or harm due to Work under this Contract.

3.3 APPLICATION

A. Quality of patched or extended work shall not be less than that specified for new work.

B. When new work abuts or finishes flush with existing work, make smooth transition. Patched work shall match existing adjacent work in texture and appearance so that patch or transition is invisible at distance of 5'.

C. When finished surfaces are cut in such manner that smooth transition with new work is not possible, terminate existing surface in straight line at natural line of division, and provide trim appropriate to finished surface.

3.4 ADJUSTING

A. Where extreme change of plane of 2" or more occurs, request instructions from Engineer as to method of making transition.

B. Provide adequate support of substrate prior to patching finish.

C. Refinish patched portions of painted or coated surfaces in manner to produce uniform color and texture over entire surface. When existing surface finish cannot be matched, refinish entire surface to nearest intersections.

3.5 CLEANING

A. Perform periodic and final cleaning.

B. At completion of work for each trade, clean area and make surfaces ready for work of successive trades.

C. At completion of alterations work in each area, provide final cleaning and return space to condition suitable for use by Owner.

END OF SECTION

SECTION 01 20 00

PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. General requirements of all specification sections.

1.2 REQUIREMENTS INCLUDED

A. Contractor shall schedule and administer pre-construction meeting, periodic progress meetings, and specially called meetings and conferences throughout progress of Work.

1. Prepare agenda for meetings.
2. Distribute written notice of each meeting four working days minimum in advance of meeting date.
3. Make physical arrangements for meetings.
4. Preside at meetings.
5. Record minutes and attenders; include significant proceedings and decisions.
6. Reproduce and distribute copies of minutes after each meeting to participants in meeting and to parties affected by decisions made at meeting.
7. Furnish four copies of minutes to Engineer.

B. Representatives of Contractor, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of entity each represents.

C. Engineer will attend meetings to ascertain that Work is expedited consistent with Contract Documents and construction schedules.

1.3 PRE-CONSTRUCTION MEETING

A. A pre-construction meeting will be held at the construction job site prior to beginning of work at a time designated by the Engineer, but not later than 15 days after date of Notice to Proceed.

B. Representatives of the Owner, Engineer and Contractor, Contractor's Superintendent, and major subcontractors shall be present.

C. The following shall serve as a minimum agenda:

1. Major subcontractors and suppliers.
2. Tentative construction schedule (ref. Item 1.4 below).
3. Critical work sequencing and phasing of construction.
4. Major equipment deliveries and priorities.
5. Designation of responsible personnel.

6. Procedures and processing of field decisions, proposal requests, submittals, color coordination, change orders and applications for payment.
7. Adequacy of distribution of Contract Documents.
8. Procedures for maintaining Record Documents.
9. Review of Shop Drawings.
10. Use of premises.
11. Construction facilities, controls and construction aids.
12. Temporary utilities.
13. Safety and first-aid procedures.
14. Security procedures.
15. Housekeeping procedures.
16. Discussion of project quality control procedures and requirements.

1.4 PRE-CONSTRUCTION SCHEDULING MEETING

A. Within 15 days of written Notice-to-Proceed, Contractor, major subcontractors, Engineer and Owner shall meet to review scheduling requirements.

B. The following shall serve as a minimum agenda:

1. Designation of each parties representative in regard to scheduling.
2. Designation and discussion of scheduling methodology.
3. Schedule content requirements.
4. Preliminary Network.
5. Detailed Network.
6. Schedule and Cost Report.
7. Updates.
8. Revisions.
9. Progress payments.
10. Time Impact Analysis.

1.5 PROJECT PROGRESS MEETINGS

A. Schedule regular periodic progress meetings at the project field office, as required.

B. Hold additional meetings as necessary by progress of construction activity.

C. Representatives of the Engineer and his consultants as needed, Owner's project representative as needed, Contractor's Superintendent and major subcontractors as appropriate to the agenda, shall be present.

D. The following shall serve as a minimum agenda:

1. Review/approval of memorandum of previous meeting.
2. Review of work progress since previous meeting.
3. Field observations, problems, conflicts.
4. Problems which impede Construction Schedule.
5. Review of off-site fabrication, delivery schedules.
6. Corrective measures and procedures to regain projected schedule.

7. Revisions to Construction Schedule.
8. Progress schedule for succeeding work period.
9. Coordination of schedules.
10. Review submittal schedules and status of submittals.
11. Maintenance of quality standards.
12. Pending changes and substitutions.
13. Review proposed changes for effect on construction schedule, on completion, date and effect on other contracts of Project.
14. Other applicable business.

E. Additional progress meetings shall be held by the Contractor at the project field office as required.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 30 00

SUBMITTALS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Prepare and submit Construction Progress Schedule immediately after award of Contract. The Construction Progress Schedule shall be the integration of a horizontal bar chart schedule and a progress payment schedule.

1. The purpose of the schedule shall be to encourage adequate planning of the Work to establish the standard to monitor work progress and progress payment requests, and relating submittal processing to work.
2. Designate in the schedule, or in a separate coordinated schedule, the dates for submission and the dates reviewed Shop Drawings, Product Data and Samples will be needed.

B. Submit Shop Drawings, Product Data and Samples required by Contract Documents.

C. Schedule of Values:

1. Prepare and submit Schedule of Values prepared in AIA Document Forms G702 and G703. Contractor's standard forms and automated printout will be considered for approval by Engineer upon Contractor's request. Identify schedule with:
   a. Title of Project and location.
   b. Engineer and Engineer's project number.
   c. Name and address of Contractor.
   d. Contract designation.
   e. Date of submission.
2. Schedule shall list the installed value of the components parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.

1.2 RELATED WORK

A. Conditions of the Contract.

B. Section 01 01 00: Summary of Work.

C. Section 01 20 00: Project Meetings.

D. Section 01 70 00: Contract Closeout - Record Documents.

1.3 CONSTRUCTION PROGRESS SCHEDULE DEVELOPMENT

A. Format:

1. Schedule shall develop and identify major Contract milestones in accordance with the requirements of this Project.
2. Prepare schedules as a minimum in the form of a horizontal bar chart.
3. Listings shall read from left to right, in ascending order for each activity. Identify each activity with the applicable specification section number.
4. Scale and spacing shall be sufficient to allow for notations and revisions.

B. Schedule Requirements:

1. Prepare horizontal bar chart schedule showing sequence, interdependency and time estimates for activity required for complete performance of work. The horizontal bar time duration shall consider the following:
    a. Work required to be completed before each activity can start.
    b. Work activities that can be done concurrently.
    c. Work required to start immediately following the completion of each activity.
    d. Major construction methodology, procedure or manpower restriction associated with sequence, phasing and Owner occupancy.
2. Failure to include any element of Work in the schedule required for the performance of the Contract shall not excuse the proper completion of the Work required within the time allowed for completion regardless of the acceptance of the Construction Progress Schedule.
3. Provide a value for each activity. The total of the activity values shall equal the total Contract amount. General Conditions costs, profit and bonds costs, and other Contractor overhead costs shall be prorated to each activity. Activity values shall be related and summarized to match any schedule of values and shall be considered in determining project status. For this purpose, the rate of activity value installation into the Work shall be assumed to be linear with time.

C. Progress Schedule Updating:

1. Construction Progress Schedule, following its initial acceptance, shall be updated monthly for recording, monitoring, and development of Progress Payment requests.
    a. Contractor and Engineer shall meet monthly to review actual progress made to date, activities started and completed to date, and the percentage of the work complete to date on each activity started but not completed.
    b. To evaluate the percentage of completed work, a review of scheduled activities estimates and supporting data will be used.
    c. Engineer will mark the schedule as to current project status and transmit data to Contractor.

d. Concurrently with the processing of the schedule update, Contractor shall utilize percentage completions as required for preparation of his monthly requisition for partial payment.

2. Procedure for monthly progress revisions:
   a. Any revisions require the Engineer be notified in writing, stating the reason for proposed revisions.
   b. Upon review of these proposed revisions and acceptance, the Engineer may request proposed revisions to be incorporated into schedule, at no additional cost to Owner.
   c. Revisions to be incorporated shall be approved in writing at least two weeks prior to schedule update. Written notice shall describe revisions and reasons for revisions.
   d. Reasonable requests revisions will be implemented by Engineer at his discretion.
3. Revisions of schedule:
   a) Schedule revisions shall be current to the date of the latest update.
   b) Engineer will determine if the actual progress is in sequence with the schedule.
   c) Engineer will be the determiner of schedule status.
   d) Revisions concerning schedule of activity or redistribution of cost shall be made only in the approved manner and amounts.
4. When requested, provide a narrative report including:
   a. Discussion of problem areas, including current and anticipated delay factors, and their impact.
   b. Corrective action taken or proposed, and its effect.
   c. Description of revisions:
      1) Effect on schedule due to change in scope.
      2) Revisions in duration of activity.
      3) Other changes that may affect schedule.

D. Progress Payments:

1. The monthly updated Construction Progress Schedule shall be an integral part and basic element for which Progress Payment Certification shall be made.
2. Upon failure or refusal to provide this information, the Owner shall deem this failure to provide the estimate and that progress payment shall not be made.
3. The exceptions to the progress schedule shall be made within ten days of the receipt of the schedule.
4. Partial payment will be verified on the basis of the sum of the value of percentage complete multiplied by activity cost values for activities in progress. The same percentage complete shall apply to both time and cost value.
5. Application for progress payment shall be in accordance with requirements of Conditions of Contract provided by Owner.

E. Distribution of progress schedule:

1. Distribute copies of Construction Progress Schedule to the following:

a. Job site.
b. Subcontractors.
c. Other concerned parties; Engineer to approve distribution to parties that do not have a contractual interest in the Project.

1.4 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Furnish schedule listing submittals required by various specification sections for shop drawings, product data and samples. Indicate sequence of submittals and dates required, include dates reviewed submittals will be required back from Engineer to maintain schedule. Allow sufficient time of 12 working days for Engineers review per submission.

1. Engineer reserves right to hold submittals until all applicable and related submittals are in Engineer's office to allow selection of all related items.

B. Shop Drawings:

1. Present drawings in clear and thorough manner.
2. Identify details by reference to sheet and detail, schedule or room numbers as shown on Contract Documents.
3. Consecutively number shop drawings for each section of Work. Retain numbering system throughout all revisions.
4. Show detail, materials, dimensions, thicknesses, methods of assembly, attachments, relation to adjoining Work and other pertinent data and information.
5. Verify dimensions and field conditions. Clearly indicate field dimensions and field conditions.
6. Check and coordinate shop drawings of any section or trade with requirements of other sections or trades as related thereto and as required for proper and complete installation of Work.
7. Prepare composite shop drawings and installation layouts when necessary or requested to depict proposed solutions for tight field conditions. Coordinate in field and with affected subcontractors for proper relationship to work of other trades based on field conditions.

C. Product Data:

1. Preparation:

a. Clearly mark each copy to identify pertinent products or models.
b. Show performance characteristics and capacities.
c. Show dimensions and clearances required.
d. Show wiring or piping diagrams and controls.
e. Indicate finish.

2. Manufacturer's standard schematic drawings and diagrams:
    a. Modify drawings and diagrams to delete information which is not applicable to the Work.
    b. Supplement standard information to provide information specifically applicable to the Work.

D. Samples:

1. Provide 3 office samples of sufficient size to clearly illustrate:
    a. Functional characteristics of the product, with integrally related parts and attachment devices.
    b. Full range of color, texture and pattern.
2. Field samples and mock-ups:
    a. Erect, at the Project site, at a location acceptable to the Engineer.
    b. Size or area: That specified in the respective specification section.
    c. Fabricate each sample and mockup complete and finished.
    d. Remove mock-ups at conclusion of Work or when acceptable to the Engineer.
3. Pay costs of samples and prepay delivery charges.

E. Coordination of Trades:

1. Contractor shall be responsible for coordination of Work. Each structural, mechanical and electrical subcontractor shall be responsible for coordination of their portions of the Work with Contractor and with each affected trade.
2. Hold a coordination meeting with all trades attending to coordinate the work of the trades of each phase, each floor, and each mechanical area.
3. Coordinate with the architectural reflected ceiling plans the exact location and dimensioning of items which occur within hung ceilings. In the event of conflict, request a clarification from the Engineer as to the correct location of items in question.

F. Contractor Review:

1. Review submittals prior to transmittal.
2. Apply Contractor's stamp to submittals, initialed or signed by authorized person and dated, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of information within submittal with requirements of work and of Contract Documents.
3. Submittals without Contractor's stamp and submittals which, in Engineer's opinion are incomplete, contain numerous errors or have not been checked or have only been checked superficially, will be returned without disposition. Delays resulting therefrom shall be Contractor's responsibility.
4. Clearly note proposed deviations from Contract Documents or submittals.
5. Contractor shall be responsible for quantities and dimensions shown on submittals.

G. Submittals shall contain:

1. The date of submission and the dates of any previous submissions, when applicable.
2. The Project title and number.
3. Contract identification.
4. The names of:
    a. Contractor.
    b. Supplier.
    c. Manufacturer.
5. Identification of the product, with the specification section number.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the Work or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Identification of deviations from Contract Documents.
10. Identification of revisions on resubmittals.
11. An 8 in. x 3 in. blank space for Contractor and Engineer stamps.
12. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents.
13. Submittal numbering system acceptable to Engineer.

H. Resubmission Requirements:

1. Make any corrections or changes in the submittals required by the Engineer and resubmit as required until approved.
2. Shop Drawings and Product Data:
    a. Revise initial drawings or data, and resubmit as specified for the initial submittal.
    b. Indicate any changes which have been made other than those requested by the Engineer.
3. Samples: Submit new samples as required for initial submittal.
4. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Engineer's review of submittals unless Engineer gives written acceptance of specific deviations.

I. Engineer's Duties:

1. Review submittals with reasonable promptness and in accord with schedule for conformity to requirements of Contract Documents and to design intent.
2. Review of submittals is only for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at job site, information that pertains solely to the fabrication process or to techniques of construction and for coordination of the work of all trades. Approval shall not

relieve Contractor of responsibility for any deviation from the requirements of the Contract Documents.
3. Affix stamp and initials or signature, and indicate requirements for revisions and resubmittal, if any.
4. Return submittals to Contractor for distribution, or for resubmission.

J. Distribution:

1. Distribute reproductions of Shop Drawings and copies of Product Data which have been reviewed by the Engineer and do not require revisions.
    a. Job site file.
    b. Record Documents file.
    c. Other affected contractors.
    d. Subcontractors.
    e. Supplier or Fabricator.
2. Distribute samples which have been approved by the Engineer as directed by the Engineer.
3. Shop Drawings, product data, and samples used for field installation shall bear the review stamp of the Engineer.

1.5 SCHEDULE OF VALUES

A. Follow the table of contents of this Project Manual as the format for listing component items.

1. Identify each line item with the number and title of the respective major section of the specifications.

B. For each major line item list sub-values of major products or operations under the item.

C. For the various portions of the Work:

1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
2. For items on which progress payments will be requested for stored materials, break down the value into:
    a. The cost of the materials, delivered and unloaded, with taxes paid.
    b. The total installed value.
3. Submit a sub-schedule for each separate stage of work, building or area.

D. The sum of all values listed in the schedule shall equal the total Contract Sum.

E. Itemize separate line item cost for each of following general cost items:

1. Performance and Payment Bonds.
2. Field supervision and layout.
3. Temporary facilities and controls.

4. Contractor's fee.

F. Submit quantities of designated materials. List quantities of materials specified under unit price allowances.

G. Initial Submittal:

1. Submit initial schedule at least 15 days prior to first application for payment for review by the Engineer.
2. Upon request of Engineer, support values with data which will substantiate their correctness.

H. Resubmittal:

1. After review by Engineer, revise and resubmit schedule as necessary.
2. Resubmit revised schedule monthly in same manner.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 40 00

QUALITY CONTROL

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Contractor shall employ and pay for the services of an Independent Testing Laboratory to perform specified testing of work and materials at the Project Site.

1. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.

B. Contractor shall employ and pay for the services of an Independent Testing Laboratory to perform specified services and testing of work and materials at the point of manufacture or fabrication.

1.2 RELATED REQUIREMENTS

A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities:

B. Respective sections of specifications: Certification of products.

C. Each specification section listed: Laboratory test required, and standards for testing.

1.3 QUALIFICATION OF CONTRACTOR'S LABORATORY

A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.

B. Meet basic requirements of ASTM E329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction."

C. Authorized to operate in the State of Texas.

D. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

E. Testing Equipment:

1. Calibrated at reasonable intervals by devices of accuracy traceable to either:
    a. National Bureau of Standards.
    b. Accepted values of natural physical constants.

1.4 LABORATORY DUTIES

A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice from Contractor.

B. Perform specified inspections, sampling and testing of materials and methods of construction:

1. Comply with specified standards.
2. Ascertain compliance of materials with requirements of Contract Documents.

C. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of work or products.

D. Promptly submit written report of each test and inspection; one copy each to Engineer and Owner. Three copies each to Contractor, and one copy to Record Documents File. Each report shall include:

1. Date issued.
2. Project title and number.
3. Testing laboratory name, address and telephone number.
4. Name and signature of laboratory inspector.
5. Date and time of sampling or inspection.
6. Record of temperature and weather conditions.
7. Date of test.
8. Identification of product and specification section.
9. Location of sample or test in the Project.
10. Type of inspection or test.
11. Results of tests and compliance with Contract Documents.
12. Interpretation of test results, when requested by Engineer.

E. Perform additional tests as required by Engineer or the Owner.

1.5 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Contract Documents.
2. Approve or accept any portion of the Work.
3. Perform any duties of the Contractor.
4. Stop the Work.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to Work, to manufacturer's operations.

B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.

D. Furnish copies of Products test reports as required.

E. Furnish incidental labor and facilities:

1. To provide access to Work to be tested.
2. To obtain and handle samples at the Project site or at the source of the product to be tested.
3. To facilitate inspections and tests.
4. For storage and curing of test samples.

F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

G. Make arrangements with laboratory and pay for services to perform additional inspections, sampling and testing required:

1. For the Contractor's convenience.
2. When initial tests indicate Work does not comply with Contract Documents.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 50 00

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Furnish, install and maintain temporary utilities required for construction, remove on completion of Work.

B. Provide temporary personnel traffic and materials handling equipment and facilities required for construction, remove at completion of construction.

C. Provide construction aids, inspection aids and equipment required to facilitate execution of the Work.

D. Provide and maintain lighted barriers for the protection of personnel and materials in accordance with the Drawings and requirements of applicable codes and regulations.

E. Provide and maintain temporary storage facility on-site for the storage of salvaged products to be reused in the Work of this Contract.

F. Remove construction facilities and temporary controls at completion of project. Restore site to original condition.

G. Provide and maintain temporary construction partitions for proper phasing of work. Remove as required by phasing at end of Contract.

1.2 RELATED REQUIREMENTS

A. Section 01 01 00: Summary of Work.

B. Section 01 04 50: Cutting and patching.

C. Section 09 90 00: Painting.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with National Electric Code.

B. Comply with Federal, State and local codes and regulations and with utility company requirements.

PART 2 - GENERAL

2.1 MATERIALS, GENERAL

A. Materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

B. Provide warning signs to help prevent damage and injury.

C. Should it become necessary to remove safety items it shall be the Contractors responsibility to replace the item immediately, in conformance with applicable regulations.

D. Wood materials used in barricades and barriers within the building and in material storage areas shall be fire-retardant.

2.2 TEMPORARY ELECTRICITY AND LIGHTING

A. Owner is to pay for temporary power used during construction as available in the existing building. Contractor is to verify the voltage/amperage and available circuitry of the existing building electrical system. The Contractor shall provide and pay for all power required for construction activities not available in the existing building. Contractor is to arrange with utility company and pay for tap to provide service required for power and lighting of any and all construction trailers (if any).

B. Contractor is to install circuit and branch wiring as required at Contractor's expense, with area distribution boxes located so that power and lighting is available throughout the construction by the use of construction-type power cords.

C. Provide adequate artificial lighting for all areas of work when natural light is not adequate for work, and for areas accessible to the public.

2.3 TEMPORARY HEAT AND VENTILATION

A. Provide temporary heat and ventilation as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials, and to protect materials and finishes from damage due to temperature or humidity.

B. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.

C. Portable heaters shall be standard approved units complete with controls.

D. Pay all costs of installation, maintenance, operation and removal, and for fuel consumed.

E. Open flame heating equipment is not permissible under any circumstances.

2.4 TEMPORARY WATER

A. Owner will pay for temporary water used for construction purposes as is available in the existing building. Contractor is to verify availability, quantity and type of water in the existing building, and to provide and pay for any additional water service or requirements for construction activities not available in the existing building.

B. Install branch piping with taps located so that water is available throughout the construction by the use of hoses. Protect piping and fittings against freezing.

2.5 TEMPORARY TELEPHONE SERVICE

A. Arrange with local telephone service company and pay for installation to provide direct line telephone service at construction site for use of personnel and employees.

B. Pay all costs for installation, maintenance and removal, and service charges for local calls. Toll charges shall be paid by the party who places the call.

2.6 TEMPORARY SANITARY FACILITIES

A. Contractor's employees are to use existing restroom within existing building that is designated by the Owner for the Contractor's use. Contractor is to clean and maintain this restroom and restore it to original condition upon completion of the project.

2.7 TEMPORARY FIRE PROTECTION

A. Take necessary precautions in welding or cutting operations to keep work area free of combustible materials. Do not use welding equipment around flammable liquids or vapors.

2.8 TEMPORARY SIGNAGE

A. Informational Signs:

1. Painted signs with painted lettering, or standard products.
2. Size of signs and lettering to be as required by regulatory agencies or as appropriate to usage.
3. Colors to be as required by applicable regulatory agencies, or otherwise of uniform colors throughout job as selected by Owner’s Representative.
4. Erect informational signs at locations necessary to provide required information.

B. Quality Assurance:

1. Sign painter with professional experience in type of work required.
2. Finishes and painting adequate to resist weathering and fading for scheduled construction period.
3. Maintain temporary signs and supports in neat, clean condition; repair damages to structure, framing and sign.
4. Relocate informational signs as required by progress of work.
5. Repair any damage to permanent structures or finishes caused by placement or removal of temporary signage.

2.9 SCAFFOLDING

A. Provide scaffolding, ramps, runways, platforms, guardrails, stairs and ladders as required by job conditions.

2.10 LIFTING AND HOISTING

A. Provide hoists, cranes or other lifts as required for material handling.

B. Contractor shall be responsible for determining need, providing appropriate equipment, coordinating installation and location with Engineer and Owner, and maintaining properly throughout use.

2.11 CONSTRUCTION BARRIERS

A. Provide construction barrier around material storage and construction areas to prevent unauthorized access.

2.12 DEBRIS CONTROL

A. Maintain areas under Contractor's control free of unnecessary debris.

B. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas or along roads and haul routes.

1. Provide containers for deposit of debris.
2. Prohibit overloading of trucks to prevent spillage on access and haul routes.
3. Provide periodic inspection of traffic areas to enforce requirements.

C. Schedule periodic collection and disposal of debris as indicated. Provide additional collections and disposal of debris whenever periodic schedule is inadequate to prevent accumulation. All debris is to be removed from the site and base and properly disposed of.

2.13 POLLUTION CONTROL

A. Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by discharge of noxious substances from construction operations.

B. Provide equipment and personnel, perform emergency measures required to contain any spillage, and to remove contaminated soil or liquids. Excavate and dispose of contaminated earth off site and replace with suitable compacted fill and topsoil.

C. Take special measures to prevent harmful substances from entering public waters. Prevent disposal of wastes, effluence, chemicals or other substances adjacent to streams or in sanitary or storm sewers.

D. Provide systems for control of atmospheric pollutants. Prevent toxic concentrations of chemicals. Prevent harmful dispersal of pollutants into atmosphere.

2.14 TEMPORARY FACILITIES

A. Construction (If Required):

1. Structurally sound, weathertight, with floors above grade.
2. Insulated space.
3. Portable office may be used.
4. Provide necessary HVAC, lighting, plumbing and sewer.

B. Storage Sheds: As required to serve the needs of the stored items. Sheds shall be constructed to protect the products stored within. Products that could be damaged by environmental conditions shall be appropriately protected by the Contractor and shall be replaced if damaged by storage conditions provided by Contractor.

2.15 DRINKING WATER

A. Furnish potable water for all personnel connected with Work, water as available in the existing building may be used.

B. Pipe or transport to keep clean and fresh.

PART 3 - EXECUTION

3.1 GENERAL

A. Comply with applicable requirements specified in Division 22 & 23 – Pluming & Mechanical, and in Division 26 - Electrical.

B. Maintain and operate systems to assure continuous service.

C. Modify and extend systems as work progress requires.

3.2 PREPARATION

A. Review site conditions and factors which affect construction procedures and construction facilities, including adjacent properties and public facilities which may be affected by execution of the Work.

3.3 INSTALLATION

A. Comply with applicable requirements of each Specification Section.

B. Maintain and operate systems to assure continuous service. Modify and extend systems as work progress requires.

C. Install facilities of neat and reasonable, uniform appearance, structurally adequate for required purposes. Maintain during entire construction period.

D. Prior to start of Work at project site, install enclosure fence with locked entrance gates.

E. Construct or locate construction offices and sheds on proper foundation, with utility connections, provide steps and landing at entrances.

F. Locate a thermometer in a convenient location, out of direct sunlight.

G. Locate construction offices and sheds as directed by Owner.

3.4 MAINTENANCE

A. Provide cleaning and maintenance of construction office, sheds, furnishings, and equipment as required.

3.5 REMOVAL

A. Completely remove temporary materials and equipment when their use is no longer required.

B. Clean and repair damage caused by temporary installations or use of temporary facilities.

C. Completely remove barricades when construction has progressed to point that they are no longer required, and when approved by Owner’s representative or Engineer.

D. Remove construction office and sheds including foundations and contents at completion of the project.

E. Grade site to required elevation and clean the area.

F. Replace any landscaping damaged by Contractor's operations

END OF SECTION

SECTION 01 60 00

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. General requirements of each specification section of the Project Manual.

1.2 RELATED REQUIREMENTS

A. Section 01 30 00: Submittals.

B. Section 01 70 00: Contract Closeout.

1.3 MATERIAL AND EQUIPMENT INCORPORATED INTO WORK

A. Comply with applicable specifications and standards.

B. Comply with size, make, type and quality specified or as specifically accepted in writing by Engineer.

C. Design, fabricate, assemble and install products in accordance with engineering and shop practices normal to trade.

D. Manufacture like parts of duplicate units to standard interchangeable sizes and gauges. Two or more items of same kind shall be identical by same manufacturer.

E. Products shall be suitable for intended purpose.

F. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically accepted in writing.

G. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.4 QUALITY ASSURANCE

A. Where materials or equipment are specified by trade or brand name, it is not intended to omit equivalent products of another manufacturer, except where specifically noted.

B. Materials specified are to define standard of quality or performance and to establish basis for evaluation of proposals.

1.5 PRODUCTS LIST

A. Within 15 days after award of Contract, submit to Engineer five copies of complete list of major Products which are proposed for installation.

B. Tabulate Products by Specification Section number and title.

C. For products specified only by reference standards, list for each such Product:

1. Name and address of manufacturer.
2. Trade name.
3. Model or catalogue designation.
4. Manufacturer's data:

    a. Reference standards.
    b. Performance test data.

D. Engineer will reply promptly in writing stating whether there is reasonable objection to listed items. Failure to object to a listed item shall not constitute a waiver of the requirements of Contract Documents.

1.6 PRODUCT OPTIONS

A. For Products specified only by reference standard, select Product meeting that standard, by any manufacturer.

B. For Products specified by naming several Products or manufacturers, select any one of products and manufacturers named which complies with Specifications.

C. For Products specified by naming one or more Products or manufacturers and stating "or equal", submit a request as for substitutions, for any Product or manufacturer which is not specifically named.

D. For Products specified by naming only one Product and manufacturer, there is no option and no substitution will be allowed.

1.7 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of work shall comply with manufacturers printed instructions, obtain and distribute copies of instructions to parties involved in installation, including two copies to Engineer, prior to commencing work.

B. Maintain one set of complete instructions at job site during installation and until complete.

C. Maintain copies for Project Record Documents.

D. Handle, install, connect, clean, condition and adjust products in strict accord with manufacturer's instructions and in conformity with specified requirements.

E. Should job conditions or specified requirements conflict with manufacturer's instructions, notify Engineer in writing for further instructions. Do not proceed with work without clear instructions.

F. Perform Work in accordance with manufacturer's instructions. Do not omit preparatory steps of installation procedures unless specifically modified or exempted by Contract Documents.

1.8 SUBSTITUTIONS

A. Within a period of 30 days after award of Contract, Engineer will consider formal requests from the Contractor for substitution of Products in place of those specified.

1. After end of that period, requests will be considered only in case of Product no longer manufactured.

B. Submit separate request for each substitution. Support each request with:

1. Complete data substantiating compliance of proposed substitution with requirements stated in Contract Documents:
    a. Product identification, including manufacturer's name and address.
    b. Manufacturer's literature; identify:
        1) Product description.
        2) Reference standards.
        3) Performance and test data.
    c. Samples, as applicable.
    d. Name and address of similar projects on which product has been used, and date of each installation.
2. Itemized comparison of the proposed substitution with product specified; List significant variations.
3. Data relating to changes in construction schedule.
4. Any effect of substitution on separate contracts.
5. List of changes required in other work or Products.
6. Accurate cost data comparing proposed substitution with product specified.
    a. Amount of any net change to Contract Sum.
7. Designation of required license fees or royalties.
8. Designation of availability of maintenance services, sources of replacement materials.

C. Substitutions will not be considered for acceptance when:

1. They are indicated or implied on shop drawings or product data submittals without a formal request from Contractor.
2. They are requested directly by a subcontractor or supplier.
3. Acceptance will require substantial revision of Contract Documents.
4. Additional cost to Owner.

D. Substitute products shall not be ordered or installed without written acceptance of Engineer.

E. Engineer will determine acceptability of proposed substitutions.

F. If proposed substitution is not accepted by Engineer, provide specified product or material.

1.9 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules. Coordinate to avoid conflict with work and conditions at site. Avoid congesting traffic.

B. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

C. Immediately upon delivery, inspect shipments to assure compliance with requirements of Contract Documents and accepted submittals and that products are properly protected and undamaged.

D. Promptly remove unsatisfactory materials from site.

E. Furnish equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.10 STORAGE

A. Store materials subject to damage from exposure to weather in weathertight storage facilities of suitable size with floors raised above ground. Materials not subject to weather damage may be stored on blocks off ground.

B. Store fabricated products in accordance with manufacturer's instructions, seals and labels intact and legible. Store products subject to damage by elements in weathertight enclosures. Maintain temperature and humidity within ranges required by manufacturer's instructions.

C. Cover materials which are subject to deterioration with breathable, impervious sheet covering providing adequate ventilation to avoid condensation.

D. Arrange storage in manner to permit easy access for inspections.

E. Protect metal from damage, dirt or dampness. Furnish flat, solid support for sheet products during storage.

F. Make periodic inspections of stored materials to verify that products are maintained under specified conditions and are free from damage or deterioration.

G. Do not use materials in work which have deteriorated, become damaged or are otherwise unfit for use.

H. Store paints in assigned room or area kept under lock and key.

I. Remove oil, rags and other combustible materials daily and take precautions to prevent fire hazards.

J. Do not load structure during construction by storing materials with load greater than structure is calculated to support safely.

1.11 PROTECTION

A. Furnish protection against weather. Cover building openings to protect interior of building from weather.

B. Maintain work, materials, apparatus and fixtures free from damage.

C. Protect items having factory finish to prevent damage to finish and equipment.

D. At end of day's work, cover new work likely to be damaged or otherwise protect as necessary.

E. After installation, secure substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations.

F. Remove protection when no longer needed. Upon completion of work, remove storage facilities from site.

1.12 CONTRACTOR'S REPRESENTATION

A. In making formal request for substitution Contractor represents that:

1. He has investigated proposed product and has determined that it is equal to or superior in all respects to that specified.
2. He will provide same warranties or bonds for substitution as for product specified.
3. He will coordinate installation of accepted substitution into the Work, and will make such changes as may be required for the Work to be complete in all respects.
4. He waives claims for additional costs caused by substitution which may subsequently become apparent.
5. Cost data is complete and includes related costs under his Contract, but not:

    a. Costs under separate contracts.

b. Engineer's costs for redesign or revision of Contract Documents.

6. Material will remain available as a standard for a minimum of five (5) years.

1.13 ENGINEER DUTIES

A. Engineer will determine acceptability of proposed substitutions.

B. Engineer will review requests for substitutions with reasonable promptness and notify Contractor in writing of decision to accept or reject proposed substitution.

C. Review of Engineer, acceptance or failure to take exceptions to substitutions or other review documents, shall not relieve Contractor of his responsibility for item actually meeting performance or other requirements of Contract Documents.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 70 00

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

B. Execute cleaning, during progress of Work, and at completion of the Work, as required by General Conditions.

C. Maintain at site for Owner one Record Set copy of following:

1. Contract Drawings.
2. Contract Project Manual.
3. Addenda.
4. Change Orders and other Modifications to Contract.
5. Engineer issued Field Orders or other written instructions or clarifications.
6. Accepted Shop Drawings, Product Data and Samples.
7. Field Test Reports.

D. Compile Product Data and related information appropriate for Owner's maintenance and operation of products and equipment furnished under Contract.

E. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

F. Compile specified warranties.

G. Review submittals to verify compliance with Contract Documents.

1.2 RELATED SECTIONS

A. Conditions of the Contract: Fiscal provisions, legal submittals and additional administrative requirements.

B. Section 01 01 00 - Summary of Work.

C. Section 01 30 00 - Submittals.

D. Respective Sections of Specifications: Closeout Submittals Required of Trades.

1.3 SUBSTANTIAL COMPLETION

A. When Contractor considers Work is substantially complete, he shall submit to Engineer:

1. Written certification that Work, or designated portion thereof, is substantially complete.
2. List of items to be completed or corrected.

B. Within reasonable time after receipt of such certificate, Engineer will make examination to determine status of completion.

C. Should Engineer determine that Work is not substantially complete:

1. Engineer will promptly notify Contractor in writing, stating reasons.
2. Contractor shall remedy deficiencies in Work, and send a second written notice of substantial completion to Engineer.
3. Engineer will re-examine Work.

D. When Engineer concurs that Work is substantially complete, he will:

1. Prepare Certificate of Substantial Completion on AIA Form G704, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by Engineer.
2. Submit Certificate to Owner and Contractor for written acceptance of responsibilities assigned in Certificate.

E. After Work is substantially complete, Contractor shall:

1. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
2. Obtain Certificate of Occupancy.
3. Complete work listed for completion or correction within designated form.
4. Perform final cleaning.

1.4 FINAL INSPECTION

A. When Contractor considers Work complete, he shall submit written certification that:

1. Contract Documents have been reviewed.
2. Work has been examined for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in presence of Owner's representative and are operational.
5. Work is completed and ready for final examination.

B. Engineer will make examination to verify status of completion with reasonable promptness after receipt of such certification.

C. Should Engineer consider that Work is incomplete or defective:

1. Engineer will promptly notify Contractor in writing, listing incomplete or defective work.
2. Contractor shall take immediate steps to remedy stated deficiencies, and send second written certification to Engineer that Work is complete.
3. Engineer will re-examine Work.

D. When Engineer finds that Work is acceptable under Contract Documents, he shall request Contractor to make closeout submittals.

1.5 REINSPECTION FEES

A. Should Engineer perform re-examinations due to failure of Work to comply with claims of status of completion made by Contractor:

1. Owner will compensate Engineer for such additional services.
2. Owner will deduct amount of such compensation from final payment to Contractor.

1.6 CLEANING DISPOSAL REQUIREMENTS

A. Hazards Control:

1. Store volatile wastes in covered metal containers.
2. Remove containers from premises daily.
3. Prevent accumulation of wastes which create hazardous conditions.
4. Provide adequate ventilation during use of volatile or noxious substances.

B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws:

1. Do not burn or bury rubbish and waste materials on Project site.
2. Do not dispose of wastes into streams or waterways.
3. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.

1.7 MAINTENANCE OF RECORD DOCUMENTS AND SAMPLES

A. Store documents and samples in Contractor's field office apart from documents used for construction.

1. Provide files and racks for storage of documents.
2. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with CSI Masterformat.

C. Maintain documents in clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

D. Make documents and samples available at all times for examination by Engineer.

E. Incomplete or out of order documents and samples will be grounds for not approving application for payment.

F. Provide felt tip marking pens for recording information in color code designated by Engineer.

G. Label each document "PROJECT RECORD" in neat large printed letters.

H. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

I. Maintain clean, undamaged set of mylar Contract Drawings and Shop Drawings as Record Drawings.

1. Mark set to show actual installation where installation varies substantially from Work as originally shown.
2. Obtain from Engineer and pay for reproduction costs of reproducible mylar sepias and blue line prints for keeping accurate records during construction. Each subcontractor shall post, on the project record drawings, any changes occurring during the pay period, prior to submission of application for payment. Failure to maintain such records shall constitute cause for denial of a progress payment. Drawings will be reviewed during progress meetings. Upon completion of the project the Contractor shall transfer all conditions and marks to a final set of 3 mil. mylars furnished by the Owner.
3. Record Drawings shall be created on 3-mil sepia mylar reproductions made at Contractor's expense from either Engineer's original drawings with seals and logos removed (architectural, structural, and MEP) or from Contractor's shop electronic drawings. Additionally, provide as-builts in AutoCadd 2020 or higher format on CD with printed as-builts.

J. Contractor shall retain competent drafting services, as necessary, for transfer of "mark-up notations" from information recorded during construction.

K. Legibly mark in color code designated by Engineer to record actual construction on designated Record Drawing prints:

1. Depths of various elements of foundation in relation to finish first floor datum.
2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
4. Field changes of dimension and detail.
5. Changes made by Field Order or by Change Order.
6. Details not on original contract drawings.
7. Record information on a daily basis, or as often as necessary.
8. References to related shop drawings and modifications.
9. Mark whichever drawing is most capable of showing conditions fully and accurately.

10. Where shop drawings are used, record cross-reference at corresponding location on Contract Drawings.
11. Give particular attention to concealed elements that would be difficult to measure and record at later date.
12. Mark new information that is important to Owner, but was not shown on Contract Drawings or Shop Drawings.
13. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, and other identification on cover of each set.

L. Contractor provide 1 set of reproducable mylars and 2 sets of bluelines of Record Drawings. Reproduction costs will be paid by Owner through Engineer.

M. Legibly mark each Specification Section to record Addenda items:

1. Manufacturer, trade name, catalogue number, and Supplier of each Product and item of equipment actually installed.
2. Changes made by Field Order or by Change Order.

1.8 OPERATING AND MAINTENANCE DATA

A. Form of Submittals:

1. Prepare data in form of an instructional manual for use by Owner's personnel.
    a. Assemble data in durable 3-ring binders, indexed and tabbed for each separate product or piece of operating equipment.
    b. Provide 3 copies of each manual type to Owner.

B. Content of Manuals:

1. Provide neatly typewritten table of contents for each volume, arranged in systematic order.
    a. Contractor, name of responsible principal, address and telephone number.
    b. A list of each product required to be included, indexed to content of volume.
    c. List, with each product, name, address and telephone number of subcontractor or installer and local source of supply for parts and replacement.
    d. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
2. Product Data:
    a. Include only those sheets which are pertinent to specific product.
    b. Annotate each sheet to clearly identify specific product or part installed and data applicable to installation.

3. Drawings:
    a. Supplement Product Data with drawings as necessary to clearly illustrate relations of component parts of equipment and systems and control and flow diagrams.
    b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
    c. Do not use Project Record Documents as maintenance drawings.
4. Provide written text, as required to supplement Product Data for particular installation, organized in consistent format and in logical sequence of instructions for each procedure.
5. Provide copy of each warranty, bond and service contract issued.

C. Manual for Equipment and Systems:

1. Submit five copies of complete manuals in final form.
2. Content, for each unit of equipment and system, as appropriate:
    a. Description of unit and component parts.
        1) Function, normal operating characteristics, and limiting conditions.
        2) Performance curves, engineering data and tests.
        3) Complete nomenclature and commercial number of replaceable parts.
    b. Operating procedures:
        1) Start-up, break-in, routine and normal operating instructions.
        2) Regulation, control, stopping, shutdown and emergency instructions.
        3) Summer and winter operating instructions.
        4) Special operating instructions.
    c. Maintenance Procedures:
        1) Routine operations.
        2) Guide to "trouble-shooting".
        3) Disassembly, repair and reassembly.
        4) Alignment, adjusting and checking.
    d. Servicing and lubrication schedule.
    e. Manufacturer's printed operating and maintenance instructions.
    f. Description of sequence of operation by control manufacturer.
    g. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
    h. As-installed control diagrams by controls manufacturer.
    i. Each subcontractor's coordination drawings including as-installed color coded piping diagrams.
    j. Charts of valve tag numbers, with location and function of each valve.

k. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
l. Other data as required under pertinent sections of specifications.

3. Content, for each electric and electronic system, as appropriate:
   a. Description of system and component parts.
      1) Function, normal operating characteristics, and limiting conditions.
      2) Performance curves, engineering data and tests.
      3) Complete nomenclature and commercial number of replaceable parts.
   b. Circuit directories of panelboards.
      1) Electrical service.
      2) Controls.
      3) Communications.
   c. As-installed color coded wiring diagrams.
   d. Operating procedures:
      1) Routine and normal operating instructions.
      2) Sequences required.
      3) Special operating instructions.
   e. Maintenance procedures:
      1) Routine operations.
      2) Guide to "trouble-shooting".
      3) Disassembly, repair and reassembly.
      4) Adjustment and checking.
   f. Manufacturer's printed operating and maintenance instructions.
   g. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
   h. Other data as required under pertinent sections of specifications.
4. Additional requirements for operating and maintenance data as included in respective Sections of Specifications.
5. Provide complete information for products and equipment specified in:
   a. Division 22: Plumbing Systems.
   b. Division 23: Mechanical Systems.
   c. Division 26: Electrical Systems.

1.9 WARRANTIES AND BONDS

A. Submittal Requirements:

1. Assemble warranties and service and maintenance contracts, executed by each of respective manufacturers, suppliers, and subcontractors.
2. Table of Contents: Neatly typed, in orderly sequence.
3. Provide complete information for each item.
    a. Product or work item.
    b. Firm, with name of principal, address and telephone number.
    c. Scope.
    d. Date of beginning of each warranty or service and maintenance contract.
    e. Duration of Warranty or service maintenance contract.
    f. Provide information for Owner's personnel:
        1) Proper procedure in case of failure.
        2) Instances which might affect validity of warranty.
    g. Contractor, name of responsible principal, address and telephone number.

B. Form of Submittals:

1. Prepare in duplicate packets.
2. Format:
    a. Size: 8-1/2" x 11", punch sheets for standard 3-ring binder, fold larger sheets to fit into binders.
    b. Identify each packet with typed or printed cover:
        1) Title: "WARRANTIES AND BONDS".
        2) Title of Project.
        3) Name of Contractor.
3. Binders: Commercial quality, 3-ring, with durable and cleanable plastic covers.
4. Provide 3 complete copies of warranty and bond submittal in final form.

C. Time of Submittals:

1. Make submittals within 10 days after Date of Substantial Completion, prior to final request for payment.
2. For items of work, where acceptance is delayed materially beyond Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

D. Emergency Repairs: Owner reserves right to make emergency repairs as required to keep equipment or materials in operation or to prevent damage to persons or property without voiding Contractor's warranty or bond, or relieving Contractor of his responsibilities during contract, warranty or warranty periods.

1.10 ATTIC STOCK

A. Provide attic stock of paint. Engineer will review for compliance with contract requirements. Contractor to submit letter of transmittal for each type of stock. Refer to section for amount.

1.11 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

A. Evidence of compliance with requirements of governing authorities:

1. Certificate of Occupancy.
2. Certificates of Inspection: Mechanical and Electrical systems as required by respective sections.

B. Project Record Documents.

C. Operating and Maintenance Data, Instructions to Owner's Personnel:

1. Submit one copy of completed data in final form 30 days prior to demonstration of equipment.
2. Copy will be returned accepted or with comments for revisions.

D. Warranties and Bonds.

E. Certificate of Insurance for Products and Completed Operations.

1.12 EVIDENCE OF PAYMENTS AND RELEASE OF LIENS

A. Contractor's Affidavit of Payment of Debts and Claims: AIA G706.

B. Contractor's Affidavit of Release of Liens: AIA G706A with following:

1. Consent of Surety to Final Payment: AIA G707.
2. Contractor's Release or Waiver of Liens.
3. Separate releases of waivers of liens from subcontractors, suppliers and others with lien rights against property of Owner, together with list of those parties.

C. All submittals shall be duly executed before delivery to Owner.

1.13 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit final statement of accounting to Engineer.

B. Statement shall reflect all adjustments to Contract Sum:

1. Original Contract Sum.
2. Additions and deductions resulting from:

a. Previous Change Orders.
b. Allowances.
c. Unit Prices.
d. Deductions for uncorrected Work.
e. Penalties and Bonuses.
f. Deductions for liquidated damages.
g. Deductions for re-examination payments.
h. Other adjustments.

3. Total Contract Sum, as adjusted.
4. Previous payments.
5. Sum remaining due.

C. Engineer will prepare final Change Order, reflecting approved adjustments to Contract Sum which were not previously made by Change Orders.

1.14 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of operating equipment and systems. Operating and maintenance manual shall constitute basis of instruction.

B. Review contents of manual with Owner's personnel in full detail to explain all aspects of operations and maintenance.

C. Amount of time to be devoted to instructions shall be reasonable and consistent with size and complexity of equipment.

1.15 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit final Application for Payment in accordance with procedures and requirements stated in Conditions of Contract.

1.16 POST-CONSTRUCTION INSPECTION

A. Prior to expiration of one year from Date of Substantial Completion, Owner will make visual inspection of Project in company of Contractor to determine whether further correction of Work is required in accordance with provisions of Contract.

B. Owner will promptly notify Contractor, in writing, of any observed deficiencies.

C. Contractor will contact Owner to arrange time and establish schedule for correction of deficiencies.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 73 00

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements the preparation and submittal for operating and maintenance manuals including the following:

1. Operating and maintenance manuals for building systems or equipment.
2. Instruction manual covering the care, preservation and maintenance of architectural products and finishes.
3. Instruction of Owner's operating personnel in operation and maintenance of building systems and equipment.

1.2 FORM OF SUBMITTALS

A. Prepare instructional manuals and data bound in commercial quality 3-ring binders:

1. Organize with index tabs according to sequence of Specification Sections.
2. Identify each volume with type or printed title as instructed by Architect.

1.3 CONTENT OF MANUALS

A. Arrange typewritten table of contents for each volume, in systematic order:

1. List of each product required to be included with name, address, and telephone number of:
    a. Subcontractor or installer.
    b. Maintenance contractor, as appropriate.
    c. Local source of supply for parts and replacement.
2. Identifying each product by product name and other identifying symbols.

B. Product Data:

1. Include only those sheets which are pertinent to specific product with product clearly identified.
2. Delete references to inapplicable information.
3. Annotate each sheet to clearly identify specific product or part installed, and data applicable to installation.

C. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate relations of component parts of equipment and systems and control and flow diagrams.

2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.

D. Written Text: As required to supplement product data for particular installation to provide logical sequence of instructions for each procedure, organized in a consistent format and in logical sequence of instructions for each procedure.

E. Recommended Spare Parts: Furnish a list of recommended spare parts for each equipment item that will be needed to support that item of equipment for a 12 month period. Spare parts list shall contain the following information:

1. Parts Descriptions.
2. Manufacturer's Part Number.
3. Shelf Life.
4. Recommended Quantity.
5. Unit Price.
6. Name and address of the part manufacturer.
7. Name and address of a local supplier for the part.

1.4 EQUIPMENT AND SYSTEMS MANUAL REQUIREMENTS

A. Submit three copies of completed manuals in final form.

B. Content, for each unit of equipment and system, as appropriate:

1. Description of unit and component parts.
    a. Function, normal operating characteristics, and limiting conditions.
    b. Performance curves, engineering data and tests.
    c. Complete nomenclature and commercial number of replaceable parts.
2. Operating procedures:
    a. Start-up, break-in, routine and normal operating instructions.
    b. Regulation, control, stopping, shutdown and emergency instructions.
    c. Summer and winter operating instructions.
    d. Special operating instructions.
3. Maintenance Procedures:
    a. Routine operations.
    b. Guide to "trouble-shooting".
    c. Disassembly, repair and reassembly.
    d. Alignment, adjusting and checking.
4. Servicing and lubrication schedule, including list of lubricants required.
5. Manufacturer's printed operating and maintenance instructions.
6. Description of sequence of operation by control manufacturer.

7. Original manufacturer's parts list, price lists, illustrations, assembly drawings and diagrams required for maintenance, predicted life of parts subject to wear and items recommended to be stocked as spare parts.
8. As-installed control diagrams by controls manufacturer.
9. Each subcontractor's coordination drawings including as-installed color coded piping diagrams.
10. Charts of valve tag numbers, with location and function of each valve.
11. Water treatment procedures and tests.
12. Final balancing reports for mechanical systems.
13. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
14. Other data as required under pertinent sections of specifications.

C. Content, for each electric and electronic system, as appropriate:

1. Description of system and component parts.
    a. Function, normal operating characteristics, and limiting conditions.
    b. Performance curves, engineering data and tests.
    c. Complete nomenclature and commercial number of replaceable parts.
2. Circuit directories of panelboards.
    a. Electrical service.
    b. Controls.
    c. Communications.
3. As-installed color coded wiring diagrams.
4. Operating procedures:
    a. Routine and normal operating instructions.
    b. Sequences required.
    c. Special operating instructions.
5. Maintenance procedures:
    a. Routine operations.
    b. Guide to "trouble-shooting".
    c. Disassembly, repair and reassembly.
    d. Adjustment and checking.
6. Manufacturer's printed operating and maintenance instructions.
7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
8. Other data as required under pertinent sections of specifications.

D. Include warnings of detrimental maintenance practices.

E. Prepare and include additional data when need for such data becomes apparent during instruction of Owner's personnel or as required under pertinent Specification Section.

F. Refer to individual Sections of Project Manual for additional requirements for operating and maintenance data.

G. Provide complete information for products and equipment specified in:

1. Division 22: Plumbing Systems.
2. Division 23: Mechanical Systems.
3. Division 26: Electrical Systems.

1.5 ARCHITECTURAL PRODUCTS MANUAL REQUIREMENTS

A. Submit three copies of complete manual in final form.

B. Refer to individual Sections of Project Manual for submittal requirements.

C. Content: Manufacturer's data, giving full information on products, catalog numbers, sizes, and composition; and finish designations.

D. Information required for re-ordering.

E. Instructions for care and maintenance.

1. Manufacturer's recommended lubricants.
2. Manufacturer's recommendations for types of cleaning agents and methods.
3. Cautions against cleaning agents and methods which are detrimental to product.
4. Recommended maintenance and cleaning schedule.

F. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

1.6 SUBMITTAL SCHEDULE

A. Submit one copy of completed data in final form 30 days prior to demonstrations of equipment.

B. Copy will be returned approved or with comments for revisions.

C. Submit specified number of copies of approved data in final form within 10 days prior to equipment demonstrations and prior to final inspection or acceptance.

1.7 INSTRUCTIONS OF OWNER'S PERSONNEL

A. Prior to final inspection, instruct the Owner's personnel in operation, adjustment, and maintenance of products equipment and systems. Provide instruction at mutually agreed upon times.

1. For equipment that requires seasonal operation, provide similar instruction during other seasons.

2. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work includes painting and finishing of interior and exterior exposed items and surfaces scheduled for finish, including surface preparation, priming and painting of finishing. Work is in addition to shop-priming and surface treatment under other Sections.

B. Provide labor, materials, tools, ladders, scaffolding and other equipment necessary for completion of Work.

C. Examine specifications for other trades and become thoroughly familiar with other provisions for painting. Surfaces left unfinished by other Sections shall be painted or finished under this Section, unless otherwise indicated.

D. Painting shall mean coating systems materials, primers, emulsions, enamels, sealers and fillers, whether used as prime, intermediate or finish coats.

1.2 REFERENCE STANDARDS

A. ASTM E84: Surface Burning Characteristics of Building Materials.

B. FS TT-C-535: Two Coat Epoxy Coatings for Interior Use.

C. FS TT-C-550: Chemical Resistance.

D. FS TT-F-1098: Surface Fillers for Porous Surfaces.

E. FS TT-P-29: Interior Latex Base Paint.

1.3 SUBMITTALS

A. Product data:

1. Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.
2. Submit product performance data printed on manufacturer's technical data sheets.

B. Samples:

1. Prepare samples, of each color selected, on same materials to which respective finishes are required to be applied.

2. Prepare stained wood samples on type and quality of wood specified for use on project.
3. Make samples not less than 12" x 12".

C. Schedule: Submit painting schedule including manufacturer's product name and substrate proposed for painting.

D. Certificates: Furnish manufacturer's certificates indicating that materials comply with Specification requirements.

E. Test Samples:

1. When requested by Architect, obtain test samples from material stored at Project site or source of supply.
2. Contractor is to retain all paint cans and lids on site until authorized to discard by Architect.

F. Closeout submittal: Prepare samples of actual colors applied in accordance with requirements of Section 01700.

1.4 QUALITY ASSURANCE

A. Paint materials manufacturer:

1. Provide materials in brand and quality specified. No claims by paint applicator to unsuitability or unavailability of materials specified will be considered unless claim is submitted in writing with proposal to Contractor.
2. Paints, varnishes, enamels, lacquers, stains, fillers and similar materials must be delivered in original containers with unbroken seals and labels intact. Retain containers with labels until reviewed by Architect.

B. Applicator qualifications:

1. Employ skilled mechanics to ensure highest quality workmanship. Materials to be applied by craftsmen experienced in use of specific product involved.
2. Submit documentation of following minimum qualifications for paint applicator:
    a. Minimum five years commercial painting experience.
    b. Minimum three successful projects of similar scope and complexity.
    c. List of references for completed projects.

C. Include on label of each container:

1. Manufacturer's name.
2. Manufacturer's stock number.
3. Type of paint.
4. Color.
5. Instructions for reducing, where applicable.
6. Label analysis.

D. Interface:

1. Provide finish coats which are compatible with prime paints used.
2. Review other sections of Specifications in which prime paints are provided to ensure compatibility of total coatings system for various substrates.
3. Upon request from other trades, furnish information on characteristics of finish materials proposed for use to ensure compatible prime coats are used.
4. Provide barrier coats over incompatible primers or remove and reprime as required.

E. Regulatory requirements: Contractor and applicator shall comply with applicable codes, regulations, ordinances and laws regarding use and application of painting systems and volatile organic compounds (VOC's).

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver paint materials in sealed original labelled containers, bearing manufacturer's name, type of paint, brand name, color designation and instructions for mixing and/or reducing.

B. Provide adequate storage facilities. Store paint materials at minimum ambient temperature of 45 degrees F. in well ventilated area.

C. Take precautionary measures to prevent fire hazards and spontaneous combustion. Soiled or used rags, waste and trash must be removed from building daily.

1.6 ENVIRONMENTAL CONDITIONS

A. Comply with manufacturer's recommendations for environmental conditions under which systems can be applied.

B. Do not apply finish in areas where dust is being generated.

C. Apply water-base paints only when temperature of surface to be painted and surrounding air temperatures are between 50 degrees F. and 90 degrees F.

D. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F. and 90 degrees F.

E. Do not apply paint in snow, rain, fog, mist or when relative humidity exceeds 85%, or to damp or wet surfaces.

F. 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.

G. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 50 degrees F. for 24 hours before, during and 48 hours after application of finishes.

H. Provide minimum 25 foot candles of lighting on surfaces to be finished.

I. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture contents of surfaces are below following maximums:

1. Veneer plaster and gypsum wallboard: 12%.
2. Masonry, concrete and concrete block: 12%.
3. Interior located wood: 15%.

1.7 PROTECTION

A. Adequately protect other surfaces from paint and damage. Repair damage as a result of inadequate or unsuitable protection.

B. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation area.

C. Remove electrical plates, surface hardware, fittings and fastenings, prior to painting operations. These items to be carefully stored, cleaned and replaced on completion of work in each area. Do not use solvent to clean hardware that may remove permanent lacquer finish.

PART 2 - PRODUCT

2.1 MANUFACTURERS

A. Acceptable manufacturers:

1. Kelly-Moore.

2.2 MATERIALS

A. Provide best quality grade of paint regularly manufactured by manufacturer.

B. Materials selected for coating systems for each type surface shall be product of single Manufacturer.

C. Paint materials to be ready-mixed except field catalyzed coatings. Pigments fully ground maintaining soft paste consistency, capable of being readily and uniformly dispersed to complete homogeneous mixture.

D. Paint accessory materials (linseed oil, shellac, turpentine and other materials not specifically indicated herein but required to achieve finishes specified) to be of best and highest quality and grade and be approved by paint manufacturer.

2.3 COLORS AND FINISHES

A. Prior to beginning work, District will furnish color chips of surfaces to be painted selected from Contractor submittals.

B. Use representative colors when preparing samples for review.

C. Final acceptance of colors will be from samples applied on job.

D. Acceptable products: Paint system numbers specified in this Section represent acceptable paint system products manufactured by Pratt & Lambert or Tnemac Company, Inc., and establish acceptable standard for paint systems.

2.4 MIXING AND TINTING

A. Deliver paints ready-mixed to job site.

B. Accomplish job mixing and job tinting only when acceptable to Architect. Use only thinners approved by paint manufacturer and use only within recommended limits.

C. Mix only in mixing pails placed in suitably sized nonferrous or oxide resistant metal pans.

D. Use tinting colors recommended by manufacturer for specific type of finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Thoroughly examine surfaces scheduled to be painted prior to commencement of work.

1. Report in writing to Architect any surface condition that cannot be put in proper condition by cleaning, sanding and puttying operations that may potentially affect proper application.
2. Do not commence until such defects have been corrected.

B. Do not proceed with finishing until surface is acceptable. Application of paint or finish to surface constitutes acceptance of surface.

3.2 GENERAL PREPARATION

A. Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently or not to be painted.

B. Furnish sufficient drop cloths, shields and protective equipment to prevent spray and droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation area.

C. Place cotton waste, cloths and material which may constitute fire hazard in closed metal containers and remove daily from site.

D. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions for each particular substrate condition.

E. Mildew, efflorescence and foreign material shall be removed from surfaces by appropriate methods.

F. 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 processes will not fall onto wet, newly-painted surfaces.

G. Remove hardware, hardware accessories, machined surfaces, plates, and other items not to be painted, or provide protection prior to surface preparation and painting operations.

H. Do not paint moving parts of operating units, mechanical and electrical parts including valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts, and sprinkler heads unless otherwise noted. Provide covering and tape in place during spray paint operations.

I. Sand and featheredge abraded or damaged areas of shop coats of paint before touch-up painting.

3.3 SURFACE PREPARATION

A. Ferrous metal surfaces:

1. Prepare unprimed surface in accordance with recommendations or directions of metal manufacturer or rust-inhibitive primer.
2. Clean primed surfaces as recommended by primer manufacturer.
3. Feather edges of sound paint by grinding if necessary.

B. Repainting Previously Coated Surfaces:

1. Remove all surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, efflorescence and sealers.
2. Existing glossy surfaces of paint films should be thoroughly washed with abrasive cleaner to clean and dull surface, or wash thoroughly and sand.
3. Remove sanding dust.
4. Spot prime bare spots with appropriate primer for new finish.
5. When applying new coatings to existing painted surface, check for compatibility by applying 3 square feet of test patch of new coating over prepared and cleaned existing surface. Allow to dry and verify adhesion.

3.4 PAINT APPLICATION

A. General requirements:

1. Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer.
2. Apply paint with suitable brushes, rollers or spraying equipment.
3. Rate of application shall not exceed rate recommended by paint manufacturer for surface involved.
4. Keep brushes, rollers and spraying equipment clean, dry, free from contaminates and suitable for required finish.
5. Comply with recommendation of product manufacturer for drying time between successive coats.
6. Vary slightly color of successive coats.
7. Sand and dust between each coat to remove defects visible from distance of 5'-0".
8. Provide light sand texture finish coats, free of brush marks, streaks, laps, or pile up of paints and skipped or missed areas.
9. Leave parts of moldings and trim clear and true to details with no undue amount of paint in corners or depressions.
10. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.
11. Refinish whole wall where portion of finish has been damaged or is not acceptable.
12. Latex paint may be spot retouched if acceptable to Architect.
13. Runs on faces not permitted.
14. Provide temporary signs required to protect wet finishes.

B. Examination:

1. Do not apply additional coats until completed coat has been reviewed by Architect.
2. Only reviewed coats of paint will be considered in determining number of coats applied.

3.5 FIELD QUALITY CONTROL

A. Applicator shall apply materials in accordance with manufacturer's recommendations and to minimum dry film thickness specified.

B. Applicator shall initiate and maintain for duration of Project field quality control program to ensure application in conformance with Project requirements.

3.6 CLEANING

A. Touch up and restore finish where damaged.

B. Remove spilled, splashed or splattered paint from surfaces.

C. Do not mark surface finish of item being cleaned.

D. Leave storage space clean and in condition required for equivalent spaces in Project.

3.7 MAINTENANCE STOCK

A. Provide five unopened gallon cans of each type and color paint used.

B. Each can to be tightly closed and clearly labeled to contents.

C. Maintenance stock shall be delivered to Owner's Maintenance Building at 220 South 2nd Ave., Midlothian, Texas 76065 at a time scheduled with Owner. Midlothian I.S.D. representative must be present to accept and sign for stock, indicating on transmittal form location of stock for reference in Project Closeout documents (refer to 01 70 00).

3.8 PAINTING SCHEDULE

A. Conduit:	
Type	Alkyd Enamel.
Finish	Match Existing Surrounding
Location	Interior exposed locations, as indicated, vertical and horizontal surfaces.
System:	
Touch-Up	Touch up abraded surfaces of shop coat with same primer.
Primer	One coat Tnamec Series 10-99 (DFT 2.0-2.5 mils). (Omit on shop-primed surfaces).
2nd, 3rd Coats	Two coats Tnemec Series 23 (Min. DFT 2.0 Mils each coat).
B. Plaster or Gypsum:	
Type	Latex.
Finish	Match existing.
Location	Interior exposed locations, as indicated on drawings, vertical and horizontal surfaces.
System:	
1st, 2nd Coats	Two coats Pratt & Lambert Latex House and Trim Finish. (Min. DFT 1.2 Mils each coat).

END OF SECTION

11 66 03

INTERIOR SCOREBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Single-sided LED basketball scoreboard

1.2 REFERENCES

A. Standard for Electric Signs, UL 48

B. Standard for CSA C22.2 #207

C. Federal Communications Commission Regulation Part 15

D. National Electric Code

1.3 RELATED SECTIONS

A. Section 271030 – Telephone and Data Cabling.

1.4 SUBMITTALS

A. Product data: Submit manufacturer’s product illustrations, data and literature that fully describe the scoreboards and accessories proposed for installation.

B. Shop drawings: Submit mechanical and electrical drawings.

C. Maintenance data: Submit manufacturer’s installation, operation, and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Product delivered on site

B. Scoreboard and equipment to be housed in a clean, dry environment

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install scoring equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

B. Field Measurements: Coordinate scoreboard location and height with the customer. Verify dimensions by field measurements.

C. Supply weight and mounting method for owner to verify that building structure is capable of supporting the scoreboard's weight in addition to the auxiliary equipment.

1.7 QUALITY ASSURANCE

A. For indoor use only

B. Source Limitations: Obtain each type of scoring equipment and electronic displays through one source from a single manufacturer.

C. ETL listed to UL 48

D. NEC compliant

E. FCC compliant

F. ETLC listed to CSA 22.2 #207

1.8 WARRANTY

A. Provide 5 years of no cost parts exchange including standard shipping on electronics parts and radios due to manufacturing defects

B. Provide toll-free service coordination

C. Provide technical online and phone support during Daktronics business hours

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Daktronics, Inc., or approved equal.

2.2 PRODUCT

A. Daktronics BB-2103 single-sided basketball scoreboard displays period time to 99:59, HOME and GUEST scores to 199, PERIOD to nine, team FOULS to 19, PLAYER number to 99, player FOUL to nine and indicates possession and bonus. During the last minute of the period, scoreboard displays time to 1/10 of a second. Scoreboard can also score volleyball, wrestling and any sport requiring a clock, score and period function.

2.3 SCOREBOARD

A. General information

1. Dimensions: 6'-0" (1.83 m) high, 8'-0" (2.44 m) wide, 0'-6" (152 mm) deep
2. Base weight: 180 lb (82 kg) – options may increase weight
3. Base power requirement: 210 W – options may increase wattage
4. Color: provide over 150 colors to choose from

B. Construction

1. All-aluminum construction
2. Scoreboard back, face, and perimeter: 0.063" (1.60 mm) thick
3. Cabinet withstands high-velocity impact from air-filled sports balls without the need for protective screens

C. Digits & Indicators

1. LED digit technology: PanaView® (PV) – discrete LEDs protrude through the scoreboard face
2. LED color: All White digits and indicators (*PanaView only*)
3. Clock and score digits: 13" (330 mm) high
4. PERIOD, FOULS and PLAYER/FOUL digits: 10" (254 mm) high
5. Bonus indicators: 4" (102 mm) high
6. Possession arrows: 3" (76 mm) high
7. Seven bar segments per digit

D. Captions

1. Vinyl applied directly to scoreboard face
2. HOME and GUEST captions: 6" (152 mm) high
3. PERIOD, FOULS/SCORE and PLAYER/FOUL/MATCH captions: 4" (102 mm) high
4. Color: standard white or others available upon request

E. Horn

1. Vibrating horn mounted inside the scoreboard cabinet behind the face
2. Sounds automatically when period clock counts down to zero
3. Sounds manually as directed by operator

F. Power Cord

1. Cord is 11' (3.35 m) long
2. Cord plugs into a standard grounded outlet

G. Accessory Equipment

1. Vinyl striping applied around the clock and scoreboard face
2. Programmable Team Name Message Centers (TNMCs) in place of vinyl HOME and GUEST captions – add 15 lb (7 kg) and 60 W
3. Two 17" (432 mm) high, 21" (533 mm) wide aluminum panels in upper corners with vinyl logo/sponsor decoration.

2.4 SCORING CONTROL SOFTWARE

A. Modern interface allows control via provided laptop and/or touchscreen tablet.

B. Score the following sports:

1. Basketball
2. Volleyball
3. Football
4. Soccer

C. Create team profiles, rosters, and matchups ahead of game time.

D. Assign common or custom rule profiles to fit the level of play.

E. Seamlessly switch between scoring the game and changing display content with Display Software Hot Buttons:

1. Manually play content directly from the Scoring Control Software.
2. Automatically play content via game triggers, such as when a team scores.

F. Multiple data outputs send Real-Time Data (RTD) to video displays and control fixed-digit numeric scoreboards.

G. Create custom color schemes for different teams/operators. All colors including custom colors to be available, and shall be selected by owner, using actual color samples.

H. Support for tactile start/stop switches ensures precise timing during critical moments.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that mounting surface is ready to receive scoreboard. Verify that placement of conduit and junction boxes are as specified and indicated in plans and shop drawings.

3.2 INSTALLATION

A. Power conduit, cables and outlet boxes to be provided and installed by the electrical contractor. Signal raceways, conduit and boxes to be provided by the electrical contractor. Electrical contractor is also responsible for any required wire and terminators between each scoreboard and control location.

B. Mount scoreboards and interior displays to wall in location detailed and in accordance with manufacturer's instructions. Unit to be plumb and level.

3.3 INSTALLATION - CONTROL CENTER

A. Provide boxes, cover plates and jacks as required to meet control specification requirements. Control cables to control panels shall be concealed.

B. Test the operation of the scoreboard, controller and all control jacks; leave control unit in carrying case and other loose items with owner's designated representative.

C. Conduct operator training on the scoreboard/controller operation.

END OF SECTION

11 66 04

INDOOR LIVE VIDEO DISPLAY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. LED matrix display

1.2 REFERENCES

A. Standard for Electric Signs, UL-48, 14th Edition

B. Standard for Control Centers for Changing Message Type Signs, UL-1433, 4th Edition

C. Standard for CAN/CSA C22.2 No. 207-M89

D. Federal Communications Commission Regulation Part 15

E. National Electric Code

1.3 RELATED SECTIONS

A. Section 271030 – Telephone and Data Cabling.

1.4 SUBMITTALS

A. Product data: Submit manufacturer's product illustrations, data and literature that fully describe the displays and accessories proposed for installation.

B. Shop drawings: Submit mechanical and electrical drawings.

C. Maintenance data: Submit manufacturer's installation, operation, and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Product delivered on site

B. Display and equipment to be housed in a clean, dry environment

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

B. Field Measurements: Coordinate display location and height with the customer. Verify dimensions by field measurements.

C. Supply weight and mounting method for owner to verify that building structure can support the display's weight in addition to the auxiliary equipment.

1.7 QUALITY ASSURANCE

A. For indoor use only

B. Source Limitations: Obtain each type of electronic display through one source from a single manufacturer.

C. ETL listed to UL Standards 48 and 1433

D. ETLC listed to CAN/CSA 22.2

E. CE compliant

F. FCC compliant

G. EU EMC Directives 55022/55024/61000 compliant

H. Installed per NEC

1.8 WARRANTY

A. Provide 1 year of no cost parts exchange including ground shipping on electronics parts due to manufacturing defects. Depending on the circumstances and at our discretion, Daktronics will exchange or repair and return failed parts.

B. Provide toll-free service coordination.

C. Provide technical online and phone support during Daktronics business hours.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Daktronics, Inc., or approved equal.

2.2 COMMUNICATION TYPE

A. Fiber Optic (50/125 µm multi-mode)

2.3 PRODUCT

A. LVN displays show live and recorded video clips, real-time scores/stats, animations, graphics, and text messages. Modules feature SMD (3-in-1) LED packages with 5.9mm

row and column spacing to provide wider viewing angles and extremely close viewing distances.

2.4 DISPLAY 1 FOR CENTERHUNG

General information

Cabinet Dimensions: 5.19' (1.58 m) high, 15.03' (4.58 m) wide, 6.0625" (154 mm) deep
Matrix size: 252 x 756

Weight: 417 lb (189 kg)
Power requirements: 4620 W

2.5 DISPLAY 2 LED RIBBON DISPLAY

A. General information

1. Cabinet Dimensions: 3.54' (1.08 m) high, 15.03' (4.58 m) wide, 6.0625" (154 mm) deep
2. Matrix size: 168 x 756
3. Weight: 303 lb (137 kg)
4. Power requirements: 3084 W

B. Cabinet Paint Color

1. Black

C. Construction

1. Aluminum and Steel
2. Service Access: Front

D. Display Capabilities

1. Color Capacity: 16 bit (281 trillion colors)
2. LED Refresh Rate: 3840 Hz as defined by the number of times per second the LED image is repainted in intensity
3. Display has signal redundancy allowing for signal path both forward and backwards through panels allowing for loss of only 1 panel vs. rows or blocks of multiple panels in case of failure.

E. Viewing Characteristics

1. Calibrated Intensity: 1400 nits
2. Brightness Control: 256 levels (manual, scheduled or automatic)
3. Suggested Viewing Angle: 140° horizontal and +60°/-80° vertical

F. Pixel Characteristics

1. Each pixel consists of one RGB 3-in-1 surface-mount device LED.

2. Pixel spacing measurement must be measured from the center points of neighboring physical pixels, rather than neighboring physical and virtual pixels.

G. LED Module Characteristics

1. Module shall be for indoor use.
2. Module shall have anti-reflective paint or coating applied to display face. Black state across all modules shall exhibit a Delta E color variation of no more than .4.
3. Modules shall have horizontal louvers running between LEDs or pixels.
4. Modules shall be able to be removed and installed from the front of the display.
5. It is not necessary to remove or insert screws in order to remove or install modules.

H. Video Processing

1. Video Frame Rate: 50/60 frames per second
2. Graphic Frame Rate: 30 frames per second
3. Processing Architecture: 22 bit (distributed)
4. System Architecture: 100% digital
5. Video Enhancement: Color space conversion, adjustable gamma correction, proprietary sharpening technology and enhancement algorithms for optimal picture quality

I. LED Quality

1. Quality Control: Sorted by intensity and color wavelength
2. LED Lifetime: 100,000 hours of operation as defined by time at which display intensity has decreased to 50 percent of the original intensity

J. Calibration

1. Pixel-to-pixel and module-to-module optical color calibration must be performed at the factory. The manufacturer must also provide easy-to-use calibration software that allows individual modules and pixels to be independently adjusted while in the display.
2. If modules should need replacement during the life of the display, the calibration software must match newer modules' brightness levels to older modules' levels to preserve picture quality and maintain a uniform display appearance.

K. Display Interface

1. The full-color video display must be able to interface and display real-time data from the control system without the need for a duplicate or redundant input.

2.6 1 VIDEO INPUT CONTROL SYSTEM

A. Equipment Rack

1. Dimensions: 25.75" (654 mm) H x 19.25" (489 mm) W x 26" (660 mm) D; 14RU
2. A larger rack may be required based on additional optional equipment.

B. Media Player

1. Provide a Digital Media Player (DMP).
2. Resolution: 1080p 59.94
3. Video Input: HD-SDI or HDMI
4. Video Output: DisplayPort to Daktronics Display Interface
5. Audio Output: balanced 3-pin XLR
6. Ports: USB 2.0 @2, USB 3.0 @4
7. Memory: 16 GB of DDR4 SODIMM
8. Storage: 1 TB SATA solid state drive
9. Networking: 10/100/1000 Ethernet (RJ-45 LAN) @1
10. Dimensions: Half-width 2RU; 3.4" (86 mm) H x 8.7" (221 mm) W x 12.5" (318 mm) D

C. Display Interface

1. Provide a Display Interface (DI).
2. Video Input: DisplayPort from Daktronics DMP
3. Video Output: Daktronics ProLink® 6 (fiber optic) @4
4. Storage: 32GB mSATA, SLC
5. Networking: 10/100/1000 Ethernet (RJ-45 LAN) @1
6. Dimensions: Half-width 2RU; 3.4" (86 mm) H x 8.7" (221 mm) W x 12.5" (318 mm) D

D. Network Router

1. 16-port gigabit

E. Primary/Backup System

1. Allows switching to live/hot backup system via control software if primary system goes down. No physical swapping of cables or devices is required.
2. Includes one (1) Primary and one (1) Backup Digital Media Player along with one (1) Primary and one (1) Backup Display Interface.
3. Content and files are automatically backed up to Backup System when files are loaded on Primary System, as both systems are always live.

2.7 CONTROL COMPUTER

A. Laptop

1. Operating System: Windows® 10 Pro 64
2. Processor: Intel® Core™ i5
3. Memory: 16 GB DDR4-2666
4. Hard Drive: 1 TB
5. Form Factor: HP ProBook 650 G5

2.8 CONTROL SOFTWARE

A. Manufacturer must provide a Windows® 10 based laptop computer with the control software loaded, configured, and ready to control display at startup.

B. Must be developed by the manufacturer of the Display, Media Player, and Display Interface.

C. The display's control software must provide simple, user-friendly features for creating, editing, scheduling, running and deleting messages.

D. Display Software features:

1. Direct control of an infinite number of displays located on a network
2. Simultaneous display and edit capability
3. Content playlists with loop, shuffle, random and next play functionality
4. Thumbnail preview of content clips
5. Onscreen display monitor
6. Unlimited, color-coded buttons with adjustable sizes
7. Multiple operator workspaces
8. Support input devices such as a mouse, keyboard, touch screen, and dual monitor
9. Icon and pull-down menu programming features
10. Help screens

E. Content Editor Software features:

1. Display of TrueType fonts and other Windows® compatible character fonts
2. Inline text editing
3. Outlined, Drop shadowed, Bold, Italic, and Underlined text modes
4. Ability to copy and paste text from most Windows applications
5. Import common image and animation formats, including BMP, JPEG and AVI
6. Content preview
7. Content layering
8. Real-time data (RTD) integration allows operators to create messages with information that automatically updates without user intervention. Such data may include scores, game time, player/team statistics, time-of-day, date or temperature.
9. Profanity protection and Spell Check
10. Multiple transition effects for entry, hold and exit

2.9 SCORING CONTROL SOFTWARE – ALLSPORT PRO

A. Modern interface allows control via provided laptop and/or touchscreen tablet.

B. Score the following sports:

1. Basketball
2. Volleyball
3. Football
4. Soccer

C. Create team profiles, rosters, and matchups ahead of game time.

D. Assign common or custom rule profiles to fit the level of play.

E. Seamlessly switch between scoring the game and changing display content with Display Software Hot Buttons:

1. Manually play content directly from the Scoring Control Software.
2. Automatically play content via game triggers, such as when a team scores.

F. Multiple data outputs send Real-Time Data (RTD) to video displays and control fixed-digit numeric scoreboards.

G. Create custom color schemes for different teams/operators.

H. Support for tactile start/stop switches ensures precise timing during critical moments.

2.10 PRODUCT

A. Daktronics BB-2115 single-sided basketball game and shot clock timer displays game time to 99:59 and shot times up to a value of 99 seconds. It can also count down from any preset time between 0 and 99 seconds. During the last minute of the period, game time is displayed to 1/10 of a second. A hand-held start/stop/reset switch is included with purchase.

2.11 SCOREBOARD

A. General information

1. Dimensions: 2'-4" (711 mm) high, 2'-5" (737 mm) wide, 0'-6" (152 mm) deep
2. Weight: 30 lb (14 kg)
3. Power requirement: 50 W
4. Color: provide over 150 colors to choose from

B. Construction

1. All-aluminum construction
2. Scoreboard back, face, and perimeter: 0.063" (1.60 mm) thick
3. Cabinet withstands high-velocity impact from air-filled sports balls without the need for protective screens

C. Digits

1. LED digit technology: PanaView® (PV) – discrete LEDs protrude through the scoreboard face
2. Shot clock digits: 13" (330 mm) high
3. Game clock digits: 7" (178 mm) high
4. Shot clock digits: red LEDs
5. Game clock digits and colon: amber LEDs
6. Seven bar segments per digit

D. Horn

1. Internal horn sounds automatically when shot clock counts down to zero
2. Sound is distinctly different from the game-clock horn

2.12 SCORING CONSOLE

A. Controller not included with standard purchase; timer will be controlled by the same console controlling the basketball scoreboard(s).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that mounting surface is ready to receive the display. Verify that placement of conduit and junction boxes are as specified and indicated in plans and shop drawings.

3.2 INSTALLATION

A. Power conduit, cables and outlet boxes to be provided and installed by the electrical contractor. Signal raceways, conduit and boxes to be provided by the electrical contractor. Electrical contractor is responsible for pulling signal wire and terminators between each display and control location. Display vendor to terminate signal wire of controller and conduit to display.

B. Mount interior displays to wall in location detailed and in accordance with manufacturer's instructions. Unit to be plumb and level.

3.3 INSTALLATION—CONTROL CENTER

A. Provide boxes, cover plates and jacks as required to meet control specification requirements. Control cables to control panels must be concealed.

B. Test the operation of the display, controller and all control jacks; leave control unit and other loose items with owner's designated representative.

C. Conduct operator training on the display/controller operation.

D. Manufacturer must supply all required signal conversion hardware to allow for direct wire control of electronic display.

END OF SECTION

SECTION 26 00 00

ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Division and all Electrical sections contained hereinafter are subject to the Contract Documents of Division 1 whether attached or not, the various Divisions of the General Construction specifications and Division 23 of the Construction specifications and respective plans.

B. All drawings, material in other Divisions of these specifications, addenda, and other pertinent documents are considered to be a part of the technical requirements of this Division of the specifications insofar as they are applicable.

C. The material contained in this section shall be applicable to other sections of the specifications under this Division.

1.2 DEFINITIONS

A. The following definitions shall apply to all sections of this Division:

1. "Owner" shall mean the Owner or his designated representative.

1.3 SCOPE OF WORK

A. This Division and all electrical sections of the specifications include all labor and material to complete all electrical systems as specified or shown on the Drawings.

B. All work shown and specified shall be completely installed and connected in a workmanlike manner by mechanics properly qualified to perform the work required. All work shall be left in a satisfactory operating condition as determined by the Owner.

C. Provide all services and perform all operations required in connection with or properly incidental to the construction of complete and fully operating systems with all accessories as herein specified or shown on the Drawings.

1.4 GENERAL

A. The accompanying plans show diagrammatically the location of the various light fixtures, devices, conduits and equipment items, and methods of connecting and controlling them. It is not intended to show every connection in detail or all fittings required for a complete system. The Contractor shall carefully lay out his work at the site to conform to the conditions, to avoid obstructions and provide proper routing of

raceways. Exact locations of light fixtures, devices, equipment, and connections thereto shall be determined by reference to the accompanying Plans, etc., by field measurement at the project, and in cooperation with other Contractors and Sub-Contractors, and in all cases shall be subject to the approval of the Owner. Minor relocations necessitated by the conditions at the site or directed by the Owner shall be made without any additional cost to the Owner.

B. These specifications and the accompanying drawings are intended to describe and illustrate systems which will not interfere with the structures, which will fit into available spaces, and which will insure complete and satisfactorily operating installations. The Contractor shall be responsible for the proper fittings of his material and apparatus into the building and shall prepare installation drawings for all critical areas illustrating the installation of his work as related to the work of all other trades. Interferences with other trades or with the building structures shall be corrected by the Contractor before the work proceeds. Should any changes become necessary due to failure to comply with these stipulations, the Contractor shall make such necessary changes at his own expense.

C. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted on the Drawings.

D. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide those details or special construction as well as to provide material and equipment usually furnished with such systems or required to complete the installation.

E. The Contractor, by submitting a bid on this work, sets forth that he has the necessary technical training and ability and that he will install his work in a satisfactory manner which is up to the best standards of the trade, complete and in good working order. If any of the requirements of the Drawings and Specifications are impossible to perform, or if the installation when made in accordance with such requirements will not perform satisfactorily, he shall report such occurrences to the Owner promptly after discovery of the discrepancy.

F. No extra compensation will be allowed for extra work or changes caused by failure to comply with the above requirements.

1.5 INSPECTION OF THE SITE

A. The Contractor shall visit the site, verifying all existing items indicated on the Drawings or specified, and familiarize himself with the existing work conditions,

hazards, grades, actual formations, soil, conditions, and local requirements. The submission of bids shall be deemed evidence of such visit.

B. All proposals shall take these existing conditions into consideration, and the lack of specific information on the Drawings shall not relieve the Contractor of any responsibility.

C. All site visits shall be coordinated and scheduled with the Owner.

1.6 CUTTING AND PATCHING

A. When cutting or patching becomes necessary to permit the installation of any work under this contract, or should it become necessary to repair any defects that may appear in patching up to the expiration of the guarantee, such cutting shall be done under the supervision of the Architect by the trade or Contractor whose work is to be disturbed. After the necessary work has been completed, damage shall be repaired by the Contractor or trade whose work has been disturbed. The cost of all such cutting and patching shall be paid by the Contractor requiring it to be done.

1. Refer to Division 1 requirements.

B. The Contractor shall do all necessary cutting and drilling of present walls, floors, ceilings, etc. for the installation of new work or for modifications to the existing work, but no structural work shall be cut unless specifically approved by the Architect. Patching and painting of services as required shall be by the General Contractor unless specified otherwise hereinafter.

C. Locations of the various existing services, walls, and equipment to be altered, removed or connected to have been taken from plans of the existing building and other substantially reliable sources and are offered as a general guide only, without guarantee as to their accuracy. This Contractor shall examine the site and shall verify to his own satisfaction the location of all existing work and shall adequately inform himself as to their relation to and effect on the work before entering into a contract. Submission of a bid shall constitute evidence that the submitting Contractor has inspected the site of the proposed work.

D. The Contractor shall examine the existing building and plans for the new work and note the sizes of the openings available and shall be responsible for any cutting, patching, and alterations required to place new equipment in the building.

E. Where walls, acoustical tile, suspended ceilings, etc., not scheduled to be re-worked or re-finished under the general contract are damaged during installation of new raceways, or other work, etc., such walls, tiles, etc., shall be replaced by the General Contractor at the expense of the Contractor.

F. All damage done to the existing equipment, services, etc., incurred in the execution of this contract shall be repaired and restored to its original conditions by the Contractor.

G. Holes through concrete shall be drilled with "Mole", or "Core-It", or equal diamond point hole saw.

1.7 DEMOLITION OF EXISTING EQUIPMENT

A. Certain types of equipment will be retained by the Owner. The Owner will provide a list of all such salvage items. Before removal of any equipment, contact the Architect, who will determine the disposition. Equipment designated to be salvaged and remain the property of the Owner shall be carefully removed to prevent damage and delivered to a location on the site as directed by the Architect. Any equipment not retained by the Owner shall become the property of the Contractor and shall be removed from the premises.

B. The Contractor shall visit the site and verify all outlets, devices, wall switches, light fixtures, etc., that are to be removed due to remodeling work and building additions.

C. The attendant raceways, hangers, wiring, foundations, etc., of those items of existing equipment to be removed and not intended for reuse, shall also be removed in their entirety. No raceways, hangers, etc., shall be abandoned in place except those raceways concealed in existing walls or buried below grade.

1.8 CODE REQUIREMENTS

A. All work shall comply with the provisions of these specifications, as illustrated on the accompanying drawings, or as directed by the Architect, and shall satisfy all applicable local codes, ordinances, or regulations of the governing bodies, and all authorities having jurisdiction over the work, or services thereto. In all cases where alterations to, or deviations from, the drawings and specifications are required by the authority having jurisdiction, report the same in writing to the Architect and secure his approval before proceeding. Upon completion of the work, furnish a statement from the inspecting authority stating that the installation has been accepted and approved. Provide complete utility service connections as directed, and submit, as required, all necessary drawings; secure all permits and inspections necessary in connection with the work, and pay all legal fees on account thereof. In the absence of other applicable local codes acceptable to the Architect, the National Electrical Code shall apply to this work.

1.9 RECORD DRAWINGS

A. The Contractor shall, during the execution of the work, maintain a complete set of drawings upon which all locations of equipment, panels, and all deviations and/or changes in the work shall be recorded. All underground and overhead utilities provided

under, or affected by, work of this Division shall be accurately located by dimensions. These "Record" drawings shall be delivered to the Architect in good condition upon the completion and acceptance of the work and before final payment is made.

1. Refer to Division 1 requirements.

1.10 RECORDS AND INSTRUCTIONS FOR OWNER

A. The Contractor shall accumulate, during the project's progress, the following sets, prepared in neat brochures or packet folders and turned over to the Architect for checking and subsequent delivery to the Owner:

1. All warranties and guarantees and manufacturer's directions on equipment and material covered by the Contractor.
2. Approved equipment brochures, wiring diagrams and control diagrams.
3. Copies of reviewed Shop Drawings.
4. Operating instructions for all systems. Operating instructions shall include recommended maintenance procedures.
5. Any and all other data and drawings required during construction.
6. Repair parts lists of all major items and equipment including name, address, and telephone number of local supplier or agent.

B. All of the above data shall be submitted to the Architect for review at such time as the Contractor makes application for final payment, but in no case less than two weeks before final observation.

C. The Contractor shall also give not less than two (2) days of operating instructions, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of the equipment. The written operating instructions referred to in above paragraphs shall be used as a basis for this on-the-job instruction.

D. Refer to Division 1 requirements.

1.11 SHOP DRAWINGS AND SUBMITTALS

A. The Contractor shall submit, to the Architect, shop drawings and catalog data on all equipment and materials designated on the Drawings and specified herein.

B. The submittal will be reviewed for compliance with general requirements of design and arrangement only; it is not a contract document and acknowledgement of compliance does not relieve the Contractor from responsibility for performance of the work in compliance with all provisions and requirements of the Contract Documents. Job measurements and the coordination of all the dimensions for proper fit of all parts of the work and performance of all equipment supplies to meet specification requirements are and remain specific responsibilities of the Contractor.

C. Shop Drawings shall be furnished by the Contractor for the work involved after receiving approval on the make and type of material and in sufficient time so that no delay or changes will be caused. This is done in order to facilitate progress on the job, and failure on the part of the Contractor to comply shall render him liable to stand the expense of any and all delays, changes in construction, etc., occasioned by his failure to provide the necessary detailed drawings. Also, if the Contractor fails to comply with this provision, the Architect reserves the right to go directly to the manufacturer he selects and secure any details he might deem necessary, and should there be any charges in connection with this, they shall be borne by the Contractor.

D. The Shop Drawings submitted shall not consist of manufacturers' catalogues or tear sheet therefrom that contain no indication of the exact item offered. Rather, the submission on individual items shall designate the exact item offered.

1. Shop Drawings submitted without indicating markings or Contractor's stamp shall not be reviewed and will be returned to the Contractor for correction of such discrepancies.

E. The Shop Drawings are not intended to cover detailed quantitative lists of electrical specialties, and similar items, as the plans and specifications illustrate and describe those items, and it is the Contractor's responsibility to procure the proper sizes and quantities required to comply with the established requirements.

F. Any Shop Drawings prepared to illustrate how equipment can be fitted into available spaces will be examined under the assumption that the Contractor has verified all the conditions, and obtained any approval thereon shall not relieve the Contractor of responsibility in the event the material cannot be installed as shown on those Drawings.

G. Various material submissions of such as raceways, switches, panelboards, and related items shall be assembled in brochures or in other suitable package form and shall not be submitted in a multiplicity of loose sheets.

H. Each Contractor shall process his submitted data to insure that it conforms to the requirements of the plans and specifications and that there are no omissions, errors or duplications.

I. Shop Drawings shall be accompanied by certification from this Contractor that Shop Drawings have been checked by him for compliance with Contract Drawings.

J. Samples of various products or mock-ups of particular details or systems may be required by various sections of this Specification.

K. Refer to Division 1 requirements.

1.12 PENETRATIONS THROUGH FIRE-RATED ASSEMBLIES

A. Seal voids around ducts and pipes penetrating fire-rated assemblies and partitions using fire-stopping materials and methods in accordance with provisions in Division 1.

1.13 CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

A. All equipment furnished under other Divisions of the specification requiring service connections shall be connected by this Contractor. Materials and labor required for the connection of this equipment shall be furnished under Division 26. The respective supplier shall furnish proper roughing-in diagrams for the installation of these items. All items shall be roughed-in and connected in strict accordance therewith. All equipment requiring connection may not be specified herein, but may be included in other Division documents. This Contractor shall ascertain for himself all equipment so specified is included as part of his work.

B. Refer to Section 26 05 23.

1.14 DRAWINGS

A. The drawings show diagrammatically the locations of the various conduits, fixtures, and equipment, and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system. The systems shall include, but are not limited to, the items shown on the drawings. Exact locations of these items shall be determined by reference to the general plans and measurements at the building and in cooperation with other trades and, in all cases, shall be subject to the approval of the Architect. The Architect reserves the right to make any reasonable change in the location of any of this work without additional cost to the Owner.

B. Should any changes be deemed necessary in items shown on the contract drawings, the shop drawings, descriptions, and the reason for the proposed changes shall be submitted to the Architect for approval.

C. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention before bids are submitted; otherwise, the Contractor shall be responsible for the cost of any and all changes and additions that may be necessary to accommodate his particular apparatus.

D. Lay out all work maintaining all lines, grades, and dimensions according to these drawings with due consideration for other trades and verify all dimensions at the site prior to any fabrication or installation; should any conflict develop or installation be impractical, the Architect shall be notified before any installation or fabrication and the

existing conditions shall be investigated and proper changes effected without any additional cost.

E. Titles of Sections and Paragraphs in these specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or tabulation of the various units of material and/or work. The Architect does not assume any responsibility, either direct or implied, for omissions or duplications by the Contractor due to real or alleged error in the arrangement of matter in the Contract Documents.

1.15 COOPERATION

A. All work under these specifications shall be accomplished in conjunction with other trades on this project in a manner which will allow each trade adequate time at the proper stage of construction to fulfill his work.

B. Maintaining contact and being familiar with the progress of the general construction and the timely installation of sleeves and inserts, etc., before concrete is placed shall be the responsibility of this trade as will the installation of the required systems in their several stages, at the proper time to expedite this contract and avoid unnecessary delays in the progress of other contracts.

C. Should any question arise between trades as to the placing of lines, ducts, conduits, or equipment, or should it appear desirable to remove any general construction which would affect the appearance or strength of the structure, reference shall be made to the Architect for instructions.

1.16 MATERIALS AND EQUIPMENT

A. All materials purchased for this Project shall be new.

1. Where specified product is not manufactured, manufacturer's current product meeting specification shall be substituted, subject to written approval of Engineer.

B. Space allocations in electrical spaces are based on equipment scheduled in each case. Should the Contractor offer equipment of another make, he shall verify that such equipment will fit in the spaces allowed.

C. Manufacturers' names are listed herein to establish a standard. The products of other manufacturers will be acceptable; if, in the opinion of the Architect, the substitute material is of a quality as good or better than the material specified, and will serve with equal efficiency and dependability, the purpose for which the items specified were intended.

D. It is fully the Contractor's responsibility to assemble and submit sufficient technical information to fully illustrate that the material or equipment proposed for substitution is

equal or superior as the Architect or his Engineer is under no obligation to perform the service for the Contractor. The proposal shall be accompanied by manufacturers' engineering data, specification sheet, and a sample, if practical or if requested. In no event shall a proposal for substitution be cause for delay of work.

E. Should a substitution be accepted under the above provisions, and should the substitution prove defective or otherwise unsatisfactory for the intended service, within the warranty period, the Contractor shall replace the substitution with the equipment or material specified, and on which the specifications required him to base his proposal.

1.17 STORAGE AND PROTECTION OF MATERIALS

A. The Contractor shall provide his own storage space for protection and storage of his materials and assume complete responsibility for all losses due to any cause whatsoever. All storage shall be within the property lines of the building site, or as directed by the Owner's representative. In no case shall storage interfere with traffic conditions in any public or project thoroughfare.

B. All work and material shall be protected at all times. This Contractor shall make good any damage caused, either directly or indirectly, by his workmen. He shall be responsible for safe handling of all electrical equipment and shall replace, without charge, all items damaged prior to acceptance by the Owner.

1.18 FOUNDATIONS

A. Provide bases and foundations for all equipment specified or shown, unless specifically noted to the contrary. Foundations are generally to be built in compliance with the equipment manufacturer's shop drawings which have been approved by the Architect, or as directed by the Architect. Vibration or noise created in any part of the building by the operation of any equipment furnished or installed under this portion of the work will be objectionable. Take all precautions against same by isolating the various items of equipment from the building's structure, and by such other means as may be necessary to eliminate all excessive vibration and objectionable noise produced by any equipment installed; install all foundations, supports, etc., for raceway system and equipment with this end in view.

1.19 SCHEDULE OF WORK

A. The work under the various sections must be expedited and close coordination will be required in execution of the work. The various Contractors shall perform their work at such times as directed so as to insure meeting scheduled completion dates, and to avoid delaying any other Contractor. The Architect will set up completion dates, schedule the times of work in the various areas involved, etc. This Contractor shall cooperate in

establishing these times and locations and shall process his work so as to insure the proper execution of it.

1.20 CONTINUATION OF SERVICES

A. The Contractor shall realize that the existing building must continue in operation during the construction period, except as the Architect and the Owner may direct otherwise.

B. Under no conditions shall any work be done in the present building that would interfere with its natural use during the normal hours of occupancy, unless special permission is granted by the Owner. This is particularly applicable where new connections are to be made to present services or items of equipment in the building or where present equipment items in the building are to be relocated or modified in any way.

C. Existing utility systems shall continue to function with a minimum of interruptions in service. This Contractor shall install any temporary lines, connections, etc., required to place and maintain the electrical systems in operation unless otherwise directed by the Architect.

D. Arrange for and provide temporary electric and telephone services to the building where new construction conflicts with existing utility locations.

1.21 COMMISSIONING OF EQUIPMENT AND SYSTEMS

A. The Contractor shall provide qualified personnel, as requested by the Owner and Architect, to assist in all on-site testing and commissioning of all equipment.

1.22 CLEANING UP

A. The Contractor shall be responsible for cleaning up his work as specified in the General Requirements of these Specifications.

1.23 FINAL OBSERVATION

A. Schedule: Upon completion of the Contract, there shall be a final observation of the completed installation. Prior to this observation, all work under this Division shall have been completed, tested, and balanced and adjusted in final operating condition and the test report shall have been submitted to and approved by the Owner.

B. Qualified personnel representing the Contractor must be present during final observation to demonstrate the systems and prove the performance of the equipment.

1.24 CERTIFICATIONS

A. Before receiving final payment, the Contractor shall certify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications.

B. Furnish, at the completion of the job, a final Inspection Certificate from the local inspecting authority.

1.25 GUARANTEE

A. The guarantee provision of this specification requires prompt replacement of all defective workmanship and materials occurring within one year of final job acceptance. This includes all work required to remove and replace the defective item and to make all necessary adjustments to restore the entire installation to its original specified operating condition and finish at the time of acceptance. The Contractor shall also guarantee that the performance of all equipment furnished and/or installed under this Division of the specifications shall be at least equal to the performance as called for in the specifications and as stated in the equipment submittals. Should there be indication that the equipment and installation is not producing the intended conditions, the Contractor shall make further tests as the Engineer may direct to demonstrate that the equipment installed meets the specifications. If there is indication that the equipment does not meet the specifications, the Contractor shall, at his expense, institute a program to demonstrate the adequacy of the installation. This program shall include all necessary testing and testing equipment. Should the Contractor not have the equipment or technical skill to perform the tests, it shall be his responsibility to provide recognized experts to perform the tests and shall provide certified laboratory tests, certified factory reports and work sheets, or other certified data to support results of any tests required.

B. Refer to Division 1 requirements.

PART 2 - PRODUCTS

NOT USED

PART 3 - INSTALLATION

3.1 DEVICE MOUNTING REQUIREMENTS

A. Mounting heights listed in Drawings shall be defined as measured from the centerline of the device or outlet box to finished floor elevation. Unless specifically noted otherwise on the Drawings. Device heights shall be in accordance with the Texas Accessability Standards or the Americans with Disabilities Act.

B. Where devices are grouped together, they shall be mounted at the same height.

C. Coordinate all mounting dimensions with Owner's requirements and coordinate with architectural elevations and details.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Provide systems of wires and cables for electric power, signaling and control.

B. Related work specified in other sections

1. 26 00 00 - Electrical
2. 26 05 20 - Cable Connections
3. 26 05 23 - Control Voltage Electrical Power Cables
4. 26 05 32 - Raceways
5. 26 05 33 - Raceway and Boxes for Electrical Systems

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

A.	ICEA 5-61-402	Thermoplastic Insulated Wire and Cable
B.	ICEA 5-66-524	Cross Linked Thermosetting Polyethylene Insulated Wires and Cables
C.	ICEA 5-68-516	Ethylene Propylene Rubber Insulated Wire and Cable
D.	ICEA 5-19-81	Rubber Insulated Wire and Cable
E.	ANSI 1581	Standard of Electrical Wires, Cables, and Flexible Cords.
F.	UL 83	Thermoplastic Insulated Wires and Cables
G.	UL 1569	Metal Clad Cables

H. ASTM B3 Standard Specification for Soft or annealed Copper Wire

I. ASTM B8 Standard Specification for Concentric Lay Standard Copper Conductors

1.5 SUBMITTALS

A. Where products are of a manufacturer other than listed as acceptable manufacturers, submit manufacturer's product literature completely describing conductors and cable assembles and evidence of U.L. Listing.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver conductors and cable assemblies to the project in the manufacturer's standard reels or boxes marked with conductor material, insulation type, conductor size and U.L. Label.

B. Store conductors and cable assemblies in a clean, dry location to prevent damage from moisture, dust, personnel and equipment.

C. Handle conductors and cables in a manner to prevent damage to conductor, insulation, jackets, and identifying markings.

1.7 MANUFACTURERS

A. The material shall be the product of a manufacturer with a minimum of ten years experience in the manufacture of similar material.

B. Acceptable Manufacturers:

1. AFC Cable Systems.
2. Cerro Wire, Inc.
3. General Cable
4. Southwire Company
5. Okonite Company

1.8 WARRANTY

A. The material shall be warranted to be free from defect and in proper working order for one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Copper Conductors

1. Conductors shall be copper unless specifically noted otherwise on the Drawings.
2. Copper conductors shall be soft drawn annealed copper, minimum conductivity 98% of pure copper per ASTM ASTM-B3.
3. Sizes No. 10 AWG and smaller shall be solid conductor, single strand.
4. Sizes No. 8 AWG and larger shall be concentric lay Class B stranding.
5. Shall conform to the Conductor Properties proscribed in the NEC.

B. Insulation

1. Type THW: 600 volt moisture and heat resistant thermoplastic rated 75 Deg.C. in wet or dry loactions.
2. Type THW-2: 600 volt moisture and heat resistant thermoplastic rated 90 Deg.C. in wet or dry location.
3. Type THWN: 600 volt moisture and heat resistant thermoplastic rated 75 Deg.C. in wet or dry.
4. Type THWN-2: 600 volt moisture and heat resistant thermoplastic rated 90 Deg.C. in wet or dry locations.
5. Type XHHW: 600 volt moisture resistant cross linked polyethylene rated 75 Deg.C. in wet or dry locations.
6. Type XHHW-2: 600 volt moisture resistant cross linked polyethylene rated 90 Deg.C. in wet or dry locations.

C. Cable Assemblies:

1. Type UF: 600 volt moisture and heat resistant, rated 75 Deg.C. for wet, dry or underground direct burial installations.
2. Type NM: 600 volt moisture and heat resistant, rated 75 Deg.C. foe normally dry locations as permitted by the NEC.
3. Type MC Branch Circuit Cable: 600 volt, Type THHN/THWN conductors size 12 AWG through 10 AWG, including a green insulated grounding conductor, with steel interlocked armor applied over the assembly.
4. Type MC Feeder Cable: 600 volt, Type THHN/THWN-2 conductors size 1 AWG through 750 MCM rated 90 Deg.C., with care copper grounding conductor, steel interlocked armor applied over the assembly, and flame retardant, sunlight resistant PVC jacket.

PART 3 - EXECUTION

3.1 USES PERMITTED

A. Unless specifically noted on the drawings, permitted by the NEC and local codes and ordinances, wiring shall be Types THW-2, THWN-2 or XHHW-2 installed in metal raceways as specified in 26 05 32, Raceways.

B. Where specifically noted on the drawings, permitted by the NEC and local ordinances, Type UF cable assemblies shall be permitted for underground branch circuit wiring.

C. Where specifically noted on the drawings, permitted by the NEC and local codes and ordinances, type NM cable assemblies shall be permitted for above ground branch circuit wiring.

D. For final connections from junction boxes mounted on the building structure to recessed lighting fixtures. Type MC cable assemblies shall be permitted, with the cable assembly length not to exceed six feet and with supports as required by the NEC. Fixture-to-fixture chain wiring is not permitted.

E. Where specifically noted on the drawings, permitted by the NEC and local ordinances, Type MC Branch Circuit cable shall be permitted for branch circuit wiring and where concealed in stud spaces of dry wall partitions. NEC requirements for supporting from the structure independent of ceiling systems or ceiling support wires will be strictly mandated.

F. Where specifically noted on the drawings, permitted by the NEC, Type MC Feeder Cable shall be permitted in exposed unfinished spaces and above ceilings. NEC requirements for supporting from the building structure will be strictly mandated.

3.2 COLOR CODING

A. Where available, insulation shall be color coded by factory pigmentation for each phase and each voltage system employed on the project.

B. 120/208 and 120/240 volt systems:

1. Phase A - Black
2. Phase B - Red
3. Phase C - Blue
4. Neutral - White
5. Ground - Green

C. 277/480 volt systems:

1. Phase A - Brown
2. Phase B - Orange
3. Phase C - Yellow

4. Neutral - Gray
5. Ground - Green

D. Switch legs, travelers and special systems shall be continuous color scheme throughout the project as selected by the Contractor.

E. Where factory pigmentation is not available, code conductors with 1-1/2" colored tape band at each terminal and at each pull or junction box.

F. Type NM cable jackets shall be color coded in accordance with conductor ampacity:

1. No.14 AWG - White
2. No.12 AWG - Yellow
3. No.10 AWG - Orange
4. No.8 AWG - Black

3.3 GROUNDING CONDUCTORS

A. All branch circuits and feeders shall include an insulated equipment grounding conductor. Raceway systems shall not be used as the sole equipment grounding path without specific approval.

3.4 MULTIWIRE BRANCH CIRCUITS

A. Multiwire branch circuits shall not be permitted unless required by the device served, such as for connection to modular furniture systems or track lighting systems.

B. Where multiwire branch circuits are required, branch circuit breakers shall be two or three pole with common trip and one handle.

3.5 MINIMUM SIZE

A. Conductors shall be of the minimum size shown on the drawings, lighting and power branch circuit wiring shall be minimum No.12 AWG.

B. Feeder circuit wiring shall be sized to limit the effect of voltage drop, based on the actual installed conductor length to limit voltage drop to 2% of nominal system voltage.

C. Branch circuit wiring shall be size to limit the effect of voltage drop, based on the actual installed conductor length, to limit voltage drop to 3% or less of nominal system voltage.

D. Circuits shall be grouped in raceways and grouped together when passing through enclosures to have phases and neutral grouped together to minimize circuit reactance.

3.6 INSTALLATION

A. Examine the system in which the conductors are to be installed for defects in equipment and installation which may cause damage to the conductors, insulation, or jackets.

B. Pull a swab or mandrel through conduit systems immediately before pulling conductors to insure a full bore, clean raceway system.

C. Do not exceed the conductor manufacturer's maximum pulling force or minimum bending radius.

D. Use pulling lubricant compound where necessary and recommended by the manufacturer.

E. Conductors or cables which have insulation or jackets damaged in the pulling process shall be removed and replace with new material.

3.7 FIELD QUALITY CONTROL

A. Test all wiring insulation with a megohm meter prior to energization:

1. Phase to ground
2. Phase to phase
3. Phase to neutral
4. Neutral to ground

B. Perform test in accordance with manufacturer's recommendation and to meet manufacturer's published minimum insulation values.

C. Correct all defects revealed by such tests including replacing material with new as required.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Provide connections from the grounding electrode system to:

1. The electric power system grounded circuit conductor (neutral).
2. The electric power system non-current carrying enclosures and equipment ground conductors (equipment ground).

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

A. National Electrical Code, NFPA 70.

B. EIA/TIA Standard 607

C. IEEE - Standard 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.

D. IEEE Standard 81 - Guide for Measuring Earth Resistivity.

1.5 SUBMITTALS

A. Where products are of a manufacturer other than listed as acceptable manufacturers, submit manufacturer's product literature completely describing conductors and cable assembles and evidence of U.L. Listing.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver conductors and cable assemblies to the project in the manufacturer's standard reels or boxes marked with conductor material, insulation type, conductor size and U.L. Label.

B. Store conductors and cable assemblies in a clean, dry location to prevent damage from moisture, dust, personnel and equipment.

C. Handle conductors and cables in a manner to prevent damage to conductor, insulation, jackets, and identifying markings.

1.7 MANUFACTURERS

A. The materials shall be the products of a manufacturer with a minimum of ten years experience in the manufacture of similar material.

B. Acceptable manufacturers shall be as listed with the material descriptions.

1.8 WARRANTY

A. The material shall be warranted to be free from defect and in proper working order for a period of one year following the date of final acceptance.

1.9 TESTING

A. Grounding Electrode:

1. The earth resistance of the main ground electrode shall be not more than 5 ohms.
2. Perform a measurement of ground resistance by one of the means described in IEEE Standard 81, Guide for Measuring Earth Resistivity.
3. Provide written certification of the ground resistance measurements upon request.

B. Grounding Continuity:

1. Provide continuity tests and checks of equipment grounding and isolated grounding conductor systems to insure electrical continuity.
2. Provide written certification of continuity checks upon requests.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1- General Requirements and related documents.

B. All sections of this Specification.

1.2 DESCRIPTION

A. Work Included: Provide miscellaneous materials for the supporting of electrical material and equipment.

B. Related work specified in other sections:

1. 26 00 00 Electrical
2. 26 05 32 Raceways
3. 26 27 16 Electrical Cabinets and Enclosures
4. 26 05 33 Boxes for Electrical Systems

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 SUBMITTALS

A. Product Data: If materials are by manufacturers other than specified, submit product data giving complete description.

1.5 MANUFACTURERS

A. Listed with Materials.

B. Acceptable Manufaturers

1. Kindorf
2. Unistrut
3. Caddy

PART 2 - PRODUCTS

2.1 MATERIALS

A. Continuous Slotted Channel: #12 gauge steel, electrogalvanized, with zinc chromate, bases and dimensions as required for application.

B. Hanger Rods: Continuous thread, electrogalvanized, with zinc chromate, sizes as required for loads imposed.

C. Hex Head Cap Screws and Nuts: No. H-113 and No. H-114, respectively.

D. One-Hole Pipe Straps: Series HS-100, galvanized steel

E. Single Bolt Channel Pipe Straps: Steel, with machine screws and nut, Series C-105 and Series C-106.

F. Lay-In Pipe Hanger: Series C-149.

G. Conduit and Pipe Hanger: Series 6H.

H. Beam Clamps: Series 500, RC, EC, and PC for applications.

I. Concrete Inserts, Spot: Series D-256 or No. D-255.

J. Concrete Inserts, Channel: Series D-980 or Series D-986.

K. Riser Clamps: Series C-210.

L. Cable Supports: O-Z/Gedney Type S.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Carefully lay out and provide concrete inserts.

B. Securely fasten and support conduits and raceways to the building structure.

C. Suspend horizontal runs of conduit and raceways from the floor and roof construction by rod hangers spaced 10 feet on less on centers for sizes 2-1/2 inches and greater and 9 feet or less on centers for sizes 2 inch and smaller.

D. Fasten single runs of conduit to the structure with one-hole pipe straps and beam clamps or hang on rod hangers.

E. Support multiple runs of conduit and raceways from continuous channel inserts or from trapeze hangers constructed of rod hangers and channels.

F. Fasten single conduits to rod hangers with adjustable lay-in pipe hangers or for 2 inches and smaller conduits with Series 6H pipe hangers.

G. Fasten conduits to channels with pipe channel straps.

H. Support conduits and raceways within 3 feet of each end of each bend, of each termination, and at other intervals to maintain horizontal and vertical alignment without sag and deformation.

I. Do not use cable, strap, and wire hangers as fasteners.

J. Provide riser clamps for conduits at floor lines. Provide wire and cable supports in pull boxes for risers in accordance with NEC Section 300-19 and Table 300-19 (a).

K. Install supports to permit equally distributed expansion and contraction of conduits and raceways with expansion joints. Use guides or saddles and U-bolts and anchors designed for equal effectiveness for both longitudinal and transverse thrusts.

L. Do not support conduits and raceways for equipment connections.

M. Provide special supports with vibration dampers to minimize transmission of vibrations and noises.

N. Provide trapeze hangers for conduits and raceways where routing interferes with ducts

O. Provide hangers, racks, cable cleats and supports for wires and cables in cable chambers and other locations to make a neat and substantial installation.

P. Provide angle iron and channel supports to the floor and structure for panelboards, cabinets, pull and junction boxes. Support independently from entering conduits and raceways. Provide supports as specified for conduits and raceways for outlet boxes and pull boxes 100 cubic inches and smaller.

Q. Provide supports sized for the ultimate loads to be imposed.

3.2 CLEANING

A. Clean surfaces to be painted.

END OF SECTION

SECTION 26 05 32

RACEWAYS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide a mechanically and electrically complete conduit system.

B. Related work specified in other sections:

1. 26 00 00 Electrical
2. 26 05 19 Low Voltage Electrical Power Conductors and Cables
3. 26 05 29 Hangers and Supports for Electrical Systems

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 SUBMITTALS

A. Samples: Provide samples upon specific request.

B. Product Data: If materials are by manufacturers other than those specified, submit product data giving complete description for sizes employed, material types, and installation methods.

C. Certificates:

1. Labels of Underwriters' Laboratories, Inc. affixed to each item of material.
2. If materials are by manufacturers other than those specified submit certification that material meets applicable Underwriters' Laboratories, Inc. Standards.
3. Labels of ETL Verified PVC-001 affixed to each PVC Coated Galvanized Rigid Conduit.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect conduits and finishes from damage.

1.6 MANUFACTURER

A. The materials shall be the products of a manufacturer with a minimum of ten years experience in the manufacture of similar equipment.

B. Acceptable Manufacturers

1. Metallic Conduits: Allied, and Wheatland.
2. Nonmetallic Conduits: Cantex, and SEDCO.
3. PVC Coated Metallic Conduits: Plastibond, Permacote, and Korkap.
4. Others: As listed with products.

1.7 WARRANTY

A. The materials shall be warranted to be in proper working condition for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rigid Metal Electrical Conduit: Hot-dipped galvanized steel with zinc coated threads and an outer coating of zinc bichromate, complete with one coupling and one end thread protector. Intermediate metal conduit (IMC) is not allowed.

B. Electrical Metallic Tubing: Welded, electro-galvanized thin wall steel tubing.

C. Flexible Metal Electrical Conduit: Hot-dipped galvanized steel strip core with integral copper ground wire on sizes 1-1/4" and smaller.

D. Liquidtight Flexible Metal Electrical Conduit: Hot-dipped galvanized steel strip core with extruded polyvinyl jacket.

E. Rigid Nonmetallic Electrical Conduit: Schedule 40 heavy wall polyvinylchloride, high impact resistant.

F. PVC Coated Galvanized Rigid Conduit: The PVC coated galvanized rigid conduit must be UL Listed. The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations must be UL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material. Applicable UL standard may include: UL 6

Standard for Safety, Rigid Metal Conduit, UL514B Standard for Safety, Fittings for Conduit and Outlet Boxes.

G. Elbows and Bends:

1. Rigid nonmetallic conduit systems: Rigid metal electrical conduits.
2. Other Conduit Systems: Same material as the conduit with which they are installed.
3. All Types: Size 1-1/4 inch and larger shall be factory manufactured.

H. Bushings:

1. 1-1/4" and Smaller: Same material as the conduit with which they are installed.
2. 1-1/2" and Larger: Hot-dipped galvanized with thermosetting phenolic insulation, 150 Deg.C.

I. Locknuts:

1. 1-1/2" and Smaller: Zinc plated heavy stuck st eel, O-Z/Gedney.
2. 2" and Larger: Cadmium plated malleable iron, O-Z/Gedney.
3. Hubs: Cadmium plated malleable iron, tapered threads, neoprene "O" ring, insulated throat, O-Z/Gedney.
4. E.M.T. Compression Connectors: Gland compression type, zinc plated steel body, cadmium plated, malleable iron nut, insulated throat, O-Z/Gedney.
5. E.M.T. Compression Couplings: Gland compression type, zinc plated steel body, cadmium plated malleable iron nut, O-Z/Gedney.
6. Liquidtight Conduit Connectors: Cadmium plated malleable iron body and nut, cadmium plated steel ferrule, insulated throat, integrally cast external ground lug, O-Z/Gedney.
7. Seals for Watertight Wall and Floor Penetrations: Malleable iron body, oversize sleeve, sealing ring, pressure clamp and rings and sealing grommet, hex head cap screws, O-Z/Gedney.
8. Seals for Penetrations through Existing Walls: Thunderline Corporation Link-Seal watertight sleeves, complete with wall and casing seals.
9. Fire Seals: Galvanized iron pipe sleeves sealed with approved foam type fireproofing.
10. Expansion Fittings: Hot-dipped galvanized malleable iron with bonding jumpers selected for linear or linear with deflection, as required.
11. Escutcheons: Chrome plated sectional floor and ceiling plates, Crane No. 10.
12. Accessories: Reducers, bushings, washers, etc., shall be cadmium plated malleable iron on the forms and dimensions best suited for the application.
13. Identifying Tape for Underground Conduits: Polyethylene tape, 6 inches wide, with continuous printing along length, Brady Identoline:
14. For Electric Power Conduits: Yellow with black letters.
15. For Other Services: Green with black letters.

J. Bituminous Paint: Shall be manufactured by the Koppers Company.

K. Sleeves: 22 gauge galvanized steel sleeves where conduits pass through walls and floors. Standard galvanized steel pipe where conduits pass through beams, outside walls, or structural members.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to which conduits are to be secured for:

1. Defects which will adversely affect the execution and quality of work.
2. Deviations from allowable tolerances for the building material.

B. Do not start work until defects and deviations are corrected.

3.2 INSTALLATION

A. Size conduits as indicated on the drawings and as required by the NEC for the number and sizes of wires to be drawn into conduit. Do not use conduit sized less than 3/4" unless specified otherwise.

B. Conceal conduits from view in all areas except mechanical and electrical equipment rooms and crawl spaces. Should it appear necessary to expose any conduit:

1. Bring to the attention of the Architect, immediately, and
2. Rearrange the work to facilitate an approved installation.

C. Install all conduits at elevations and locations to avoid interference with grading of other work, the structure, finished ceilings, walls. Avoid causing cutting of masonry units.

D. To prevent displacement, securely support and hold in place all conduits installed in advance of other work and to be concealed in the building structure.

E. Carefully lay out conduits run within the structure, such as floors, beams, walls, to avoid densities excessive for the construction. Relocate those conduits when excessive densities occur.

F. Ream, remove burrs, and swab inside conduits before conductors are pulled in.

G. Cap or plug conduits with standard manufactured accessories as soon as the conduits have been permanently installed in place.

H. Bends and offsets in 1" and smaller conduits may be done with approved bending devices. Do not install conduits which have had their walls crushed and deformed and their surface finish damaged due to bending.

I. Where space conditions prohibit the use of standard ells, elbows, and conduits, use cast ferrous alloy fittings of such forms and dimensions as best required for the application.

J. Make all conduit joints mechanically tight, electrically continuous, and watertight. Pitch conduits in a manner to avoid creating moisture traps.

K. Install insulated throat threaded hubs on conduits entering enclosures without threaded hubs where exposed to damp or wet locations.

L. Connect and couple E.M.T. with compression type fittings. Do not use indentor and set screw fittings.

M. Install and neatly rack exposed conduits parallel with and perpendicular to the building walls. Do not install exposed diagonal conduit runs.

N. Route and suspend conduits crossing expansion joints to permit expansion, contraction, and deflection utilizing approved fittings to prevent damage to the building, conduits, and supporting devices in accordance with the National Electrical Code.

O. Do not run conduits exposed on the roof unless approval is obtained prior to installation.

P. Do not place conduits in close proximity to equipment, systems, and service lines, such as hot water supply and return lines, which could be detrimental to the conduit and its contents. Maintain a minimum 3" separation, except in crossing, which shall be a minimum 1".

Q. Connect motors, equipment containing motors, equipment mounted on an isolated foundation, and other equipment and devices which are subject to vibration and which require adjustment with flexible metallic conduit from the device to the conduit serving it. Size the flexible conduit length more than 12 diameters, but less than 18 diameters. Rigidly support the points of attachment on each side of the connection.

R. Install escutcheons on all exposed conduits passing through interior floors, walls, or ceilings. Install fire sealing materials on all conduits passing through fire rated partitions. Install wall and floor fire seals on all conduits passing through exterior walls and floors.

S. Install rigid metal electrical conduit for all uses in damp and wet locations, in hazardous areas, in crawl spaces, in concrete slabs, in locations subject to physical damage, and for feeder sizes 2-1/2" and larger.

T. Apply two (2) coats of bituminous paint to all portions of rigid metal conduits in contact with concrete and/or the ground.

U. Install electrical metallic tubing for branch circuits concealed in walls and above ceiling and for feeder sizes 2" and smaller.

V. Install rigid non-metallic conduit with manufactured spacers and with concrete encasement with 3 cover top, bottom, and sides for feeders and service entrances run below grade exterior to the building. Use rigid metal electrical conduit for elbows, and exposed portions. Concrete shall have red pigment.

W. Where permitted by authorities having jurisdiction, flexible metal conduit may be used for final connection to individual light fixtures from junction boxes mounted on, or suspended from, the building structure. Maximum length shall be 6'-0", minimum of 3'-0". Minimum size shall be 1/2". Flexible conduit connections between light fixtures are not allowed.

X. Use liquid-tight flexible conduit in damp and wet locations, and in food service connections.

Y. Conduit sleeves shall be sized to permit insertion of conduit with adequate clearance for movement due to expansion and contraction. Where conduits pass through outside walls, watertight fittings, as specified herein, shall be used.

Z. Provide pullstring in each empty conduit. Label pullstring when conduit termination is not obvious.

END OF SECTION

SECTION 26 05 33

BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 REFERENCE DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all of the Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide outlet boxes for the installation of wiring devices, lighting fixtures, and power and control connections.

B. Related work specified in other section:

1. Electrical: Section 26 00 00
2. Wiring Devices: Section 26 27 26
3. Control Voltage Electrical Power Cables: Section 26 05 23

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 SUBMITTALS

A. Samples: Provide samples upon specific request.

B. Product Data: If materials are by manufacturers other than those specified, submit product data giving complete description for sizes employed, material types, and electrical ratings.

1.5 MANUFACTURERS

A. Listed with Materials.

1. Appleton Electric Company
2. Raco
3. Steel City
4. Crouse Hinds

5. Hubbell
6. Raceway Components
7. Walker

PART 2 - PRODUCTS

2.1 MATERIALS

A. Flush Mounted Outlet Boxes: Standard, stamped galvanized steel with factory conduit knockouts, one piece and welded construction:

1. Series 4S and 4S0 square boxes with covers.
2. Series M1, M2, M3 - 250 and Series M1, M2, M3 - 350 masonry boxes with covers.
3. Series 2G and GC-5075 switch boxes with covers.
4. Series OCR concrete rings with Series OCP and OCP-3/8 back plates.
5. Series 40 and 40D octagonal boxes with raised covers.
6. Series SX expandable bar hangers.

B. Surface Mounted Outlet Boxes: Cast metal with threaded hubs. Type FS and FD of form suited to the application.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine building structure to which outlet boxes are to be secured for defects which affect the execution and quality of work.

B. Do not start work until defects are corrected.

3.2 PREPARATION

A. Carefully measure and lay out exact locations in conference with the Construction Manager.

B. Owner may change outlet box locations a distance of 5 feet before rough-in without additional cost.

3.3 INSTALLATION

A. In dry walls for single and two gang outlet provide 4S and 4D boxes; for 3 or more outlets use masonry boxes.

B. In block and masonry walls provide masonry boxes of depths required for wall thickness.

C. In concrete ceiling provide OCR rings.

D. In other ceilings provide 40 and 40D boxes. Omit covers if standard canopy and device plates entirely cover the ceiling opening.

E. In exposed work, exterior of the building, in wet locations, and flush in non-waterproofed walls below grade provide FS and FD boxes.

F. Submit for approval special boxes for special devices and applications. Size according to device and application in accordance with NEC.

G. Do not provide through-the-wall and back-to-back boxes unless specifically noted on the drawings.

H. Provide plaster rings and covers where required by the building structure.

I. In brick finished walls, locate to work brick in a brick course where possible, and to permit conduits and raceways to enter from the rear without cutting brick, where possible.

J. Rigidly attach to structure and ceiling supporting members in suspended ceilings to avoid cutting mechanical ceiling members.

K. Label all junction boxes with circuit information as to its use for special system equipment. Use an indelible marker to mark information on cover.

3.4 CLEANING

A. Clean surfaces to be painted.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 REFERENCE DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all of the Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Provide identification of electrical equipment.

B. Provide identification of over current devices.

C. Provide identification of branch circuits, outlets, and wiring devices.

D. Provide identification of required clear working spaces for electrical equipment.

E. Provide identification of rooms and spaces for access by qualified personnel.

F. Related work specified in other section:

1. Section 26 05 33: Boxes for Electrical Systems.
2. Section 26 22 13: Low Voltage Distribution Transferences.
3. Section 26 24 16: Panelboards.

1.3 QUALITY ASSURANCE

A. Signs and plackards shall meet the requirements by OSHA.

1.4 SUBMITTALS

A. Submit literature describing all signage and marking materials to the Architect for approval prior to installation.

PART 2 - PRODUCTS

2.1 PLACKARDS

A. Plackards shall be engraved phenolic name plates with black lettering engraved onto a white field. Lettering shall be minimum 24 point type in basic block font.

B. Plackards shall be securely and permanently adhered to the equipment enclosures without fasteners or penetrations into the enclosures.

2.2 LABELS

A. Labels shall be typewritten, adhesive backed printed labels. Lettering shall be minimum 18 point type in basic black font.

2.3 MARKING MATERIALS

A. Materials for marking of required working clearance shall be adhesive backed yellow tape, equal to 3M Company 471 Series. Clean and prepare floor surface in accordance with manufacturer's instructions.

2.4 SIGNAGE

A. Signage for electrical equipment rooms shall be preprinted manufactured sign units providing warning of the Danger of Electrical Equipment Hazards and limiting access to Qualified Personnel only.

B. Signage shall be securely and permanently adhered to the door surface without fasteners or penetrations into the door surface.

C. All signage shall be approved by the Architect prior to installation.

PART 3 - EXECUTION

3.1 DISTRIBUTION SWITCHBOARDS AND PANELBOARDS

A. Provide each switchboard and panelboard with a plackard identifying.

1. The name of the equipment.
2. The supply system voltage.
3. The name of the equipment supplying the switchboard or panelboard.
4. The circuit number of the overcurrent device supplying the switchboard or panelboard.

B. Provide each feeder protective device with a plackard identifying the name of the device or circuit number and the name of the equipment or load served.

3.2 OTHER EQUIPMENT

A. Provide other electrical and mechanical equipment with plackards identifying.

1. The name of the equipment.
2. The name of the supply source equipment.
3. The circuit number of the overcurrent device supplying the equipment.

3.3 OUTLET BOXES, JUNCTION BOXES AND WIRING DEVICES

A. Provide labels affixed to the inside cover for each outlet box, junction box, and wiring device identifying the panel name and branch circuit numbers for the overcurrent devices supply the circuits.

3.4 REQUIRED WORKING CLEARANCES

A. Provide marking on the floor around each item of equipment defining the required working clearances in accordance with the National Electrical Code.

3.5 ELECTRICAL EQUIPMENT ROOMS

A. Provide each entry door into a room or space containing electrical power distribution equipment providing Warning of the Electrical Hazard and restricting entrance to Qualified Personnel only.

END OF SECTION

SECTION 26 09 24

LIGHTING CONTROL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The following specification details the minimum compliance and related criteria for a complete and fully operational wireless digital addressable lighting control system for all interior lights.

B. Section Includes:

1. Wireless occupancy/vacancy sensors
2. Wireless daylighting sensors
3. Wireless multisensors
4. Wired load control module with wireless communications
5. Plug load control
6. Zone relay control
7. Zone 0-10V dimming control
8. Wired receptacles with wireless communications
9. Wired wallstation with wireless communications
10. Wired luminaires with integrated sensors and wireless communications
11. Wired luminaires with wireless communications
12. Wireless gateway for centralized control, monitoring and system integration
13. Software for integration, configuration, data, and troubleshooting

1.2 SCOPE OF WORK

A. Provide new wireless control system as specified herein and withing other documents included with project.

B. Contractor to include required network cabling installation including subcontracting of the owners approved cabling systems installer for a complete and fully operational lighting control system.

1. Approved Network Cabling Systems Installer;
    a. Superior Fiber & Data Services, Inc.

        Contact person: Matt Brashear
        Office: 972-245-6014
        Mobile: 817-832-9032
        mbrashear@sfdcabling.com
        www.sfdcabling.com

C. Contractor to include factory startup, programming, training and required adjustments required for the proper operation of the system.

Contractor include startup reports indicating proper startup and setup of each of the control systems.

1.3 RELATED SECTIONS

A. Section 265100 –Lighting Fixtures.

B. Section 271030 – Telephone and Data Cabling.

1.4 REFERENCES

A. American National Standards Institute/ (ANSI) (www.ansi.org)C62.41-1991 – Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

B. Institute of Electrical and Electronic Engineers (IEEE) (www.ieee.org) 802.3af-2003 – Power over Ethernet standard

C. International Electrotechnical Commission (www.iec.ch)IEC/EN 61000-4-2:2009 Electrostatic Discharge Testing Standard.

D. International Organization for Standardization (ISO) (www.iso.ch)9001:2000 – Quality Management Systems.

E. National Electrical Manufacturers Association (NEMA) (www.nema.org)WD1 (R2005) - General Color Requirements for Wiring Devices.

F. Underwriters Laboratories, Inc. (UL) (www.ul.com)916 – Energy Management Equipment

G. Federal Communications Commission (FCC) (www.fcc.gov)Title 47 CFR Part 15 Class A

1.5 COORDINATION REQUIREMENTS

A. Coordination

1. Coordinate the placement of lighting control panels
2. Coordinate the placement of sensors, wallstations and other user input devices
3. Coordinate the placement of daylight sensors to achieve optimal daylight dimming

B. Prewire meeting: conducted on-site or during design meeting with lighting control system manufacturers or designated representative prior to commencing work as part of the manufacturer's standard practice and startup services. Manufacturer to review with the installer:

1. Installation of lighting control panels and locations
2. Lighting control network wiring
3. Network IT requirements
4. Low voltage wiring requirements
5. Lighting control integration requirements
6. Lighting control system integration network wiring and connectivity
7. Installer responsibilities
8. Startup and training schedule and actions

1.6 SUBMITTALS

A. Specification conformance document - indicate whether the submitted equipment:

B. Meets specification exactly as stated.

C. Meets specification via an alternate means and indicate the specific methodology used.

D. Shop drawings; include:

1. Schematic (one-line diagram) will be specific to the project. Generic one-line diagrams will not be accepted. Provide drawing details for field installation that are specific to the project.
2. Wiring diagrams for typical application installation configurations.
3. Wiring diagrams for typical device installation configurations.

E. Product data: catalog data sheets with performance specifications demonstrating compliance with specified requirements and are specific to the project.

F. Sequence of operation to describe how each component operates and how any building wide functionality is achieved to exceed local energy code (California Title 24 2018, ASHRAE 90.1 2016, IECC 2018, or any newer versions of these codes.

G. Provide a description of the system.

H. System setup and programming to be provided by certified technician or factory field service personnel.

1. Include any required cost for this service.

I. Follow-up by field services for “fine tuning” and additional configuration to occur approximately 90 days after system turnover.

1. This will involve an additional charge.

J. Re-occurring service contractor for site audit and continuing configuration on a 1 year schedule after system turnover.

1. Include any required cost for this service.

1.7 CLOSEOUT SUBMITTALS

A. Sustainable design closeout documentation.

B. Wireless lighting control system manufacturer to provide an operation and maintenance manual that details the start-up procedure being performed including a process to follow, details on tests performed and an area that documents any test results.

1.8 QUALITY ASSURANCE

A. Product shall confirm to requirements outlined in NFPA 70

B. Manufacturer: manufacturer shall have at least 10 years of experience in the manufacture of lighting control systems. Manufacturers that do not have at least 10 years of experience shall not be acceptable.

C. System components:

D. Listed by UL specifically for the electronic ballast/driver loads. Provide evidence of compliance upon request.

E. Listed by FCC specifically for the required wireless communication protocols. Provide evidence of compliance upon request.

F. Listed by UL 2900-01 Standard for Software Cybersecurity for Network-Connectable Products.

1.9 APPROVALS

A. 10-working days prior approval before bid date is required for alternate proposals.

B. Complete catalog data, specifications and technical information on alternate equipment must be furnished to the architect and owner at least 30 business days in advance of the submission of approved construction documents.

C. For wired alternatives, manufacturer shall provide wiring diagrams and architectural details of interconnecting wiring for power signal and control. Contractor shall provide a labor cost (adder or deduction) to install the wired alternative to the lighting control system.

1.10 DELIVERY, STORAGE AND HANDLING

A. Ensure products are delivered as shipped, including pallet assembly and packaging has not been damaged in shipment.

B. Store products in a clean, dry location in manufacturers original packaging.

C. Store products in an environment that meets products ambient and storage temperature per products specification sheets.

D. Store products in an environment that meets products relative humidity of less than 90 percent, non-condensing as outlined on the product specification sheets.

E. The contractor is responsible for complete installation of the entire system according to strict factory standards and requirements.

F. Handling: packaging will include clear installation instructions for all components with typical illustrations of installation locations and connections. The installing contractor can easily match each package to the layout on the design floor plans.

1.11 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:

B. Ambient temperature for indoor devices: 0 degrees to 50 degrees C (32 degrees to 122 degrees F).

C. Ambient temperature for outdoor devices: -35 degrees to 65 degrees C (-31 degrees to 150 degrees F).

D. Relative humidity: Maximum 90 percent, non-condensing.

E. Wireless lighting control system must be protected from dust during installation.

F. Ambient temperature for Lighting Management Appliance: 10 degrees C to 35 degrees C (50 degrees F – 90 degrees F).

G. Coordinate layout and installation of luminaries and controls with other construction.

H. Coordinate site commissioning with manufacturer no less than 21 days prior to required date

1.12 WARRANTY

A. Provide manufacturer’s enhanced 5 year limited warranty:

1. 5-year limited warranty for the replacement of defective system components from the date of system shipment (except software application).

B. Insight Manager hardware: One year 100 percent parts coverage, one year 100 percent manufacturer labor coverage.

C. Contractor shall provide limited workmanship warranty for one year from customer acceptance.

D. Eaton wireless fixtures with standard 0-10V dimmable ballast or driver module warranty is [5] years. When purchased with the WaveLinx Wireless Lighting Control system this warranty shall also be [5] years by the lighting fixture manufacturer.

E. Extended warranty options may be provided for an additional charge to extend the system warranty to a total of ten [10] years.

F. Recommended extra materials:

1. Wavelinx ceiling sensors: provide 1 of each product type for every 200 installed, to be used for maintenance.
2. Tilemount daylight sensors: provide 1 of each product type for every 100 installed, to be used for maintenance.
3. Wavelinx wallstations: provide 1 of each product type for every 200 installed, to be used for maintenance.
4. Wavelinx receptacle: provide 1 of each product type for every 100 installed, to be used for maintenance.
5. Wavelinx relay switchpack: provide 1 of each product type for every 200 installed, to be used for maintenance.
6. Wireless area controller: provide 1 of each product type for every 100 installed, to be used for maintenance.

1.13 COMMISSIONING

A. Provide factory-certified field service engineer to a site visit to ensure proper system installation and operation under following parameters:

B. Qualifications for factory-certified field service engineer:

1. Certified by the equipment manufacturer on the system installed.

C. Make a visit upon completion of installation of central dimming control system:

1. Verify connection of power feeds and load circuits.
2. Verify connection Wallstation controls.
3. Verify proper connection iCAN link.
4. Download system panel data to dimming panels.
5. Check dimming panel load types and currents and remove by-pass jumpers.
6. Verify system operation control by control, circuit by circuit.
7. Obtain sign-off on system functions.
8. User to be trained on system operation.

1.14 MAINTENANCE MATERIAL SUBMITTALS

A. The manufacturer shall make available to the End-User a method of ordering new equipment for expansions, replacements and spare parts through established distributor channels.

B. The manufacturer shall make new replacement parts available for minimum of 5 years from date of manufacture.

C. The manufacturer shall make directly available to the owner additional software apps that may be desired for a minimum of 10 years from the system's date of purchase.

D. [The manufacturer shall provide extended support that is billable at an hourly rate] OR [support that can be purchased on an annual maintenance contract basis.]

1.15 SYSTEM DESCRIPTION & OPERATION

A. The wireless lighting control system shall be capable of providing all of the following functions for all lighting:

1. Continuous dimming and automatic on/off controls.
2. Occupancy control.
3. Vacancy control.
4. Daylight harvesting.
5. Outdoor load control.
6. Receptacle control.
7. Load management.
8. Multi-level scene control.
9. 7 Day scheduling.
10. Astronomic scheduling.
11. Demand Response.
12. Task Tuning.
13. Power measurement data reporting.
14. Mobile device configuration and control.
15. Automatic Code Commissioning.
16. Integration with third party system via BACnet/IP and Public (REST) API.
17. Alarms monitoring console.

B. The wireless lighting control system shall be capable of continuous dimming and switching allowing each fixture to monitor its local environment and provide distributed control in response to environmental changes.

C. The wireless lighting control system shall provide network communication of all sensor and device data for all light fixtures including power measurement, occupied/unoccupied status, scene status and daylight information.

D. The wireless lighting control system shall provide out-of-the-box functionality of all light fixtures with integrated sensors providing occupancy automatic on to 75% light level and automatic off after 20 minutes. Systems that do not include out-of-the-box functionality shall not be acceptable

E. The wireless lighting control system shall provide a method for the installer to verify wireless communications and address all wireless devices with a single push button.

Systems that require device addressing using a manual data entry method through software shall not be acceptable.

F. The wireless lighting control system shall provide visible indication on all wireless devices when as each wireless device joins the wireless network. Systems that do not provide a visual indicator per device to the installer shall not be acceptable.

G. The wireless lighting control system shall provide the capabilities for the installer to create a construction group of all wireless occupancy sensors and wireless wallstations to control all installed wireless light fixtures.

H. The wireless lighting control system shall be able to be completely programmed and configured using a mobile application. Systems that require web or pc software for configuration shall not be acceptable.

I. The wireless lighting control system shall allow addressed wireless light fixtures with integrated sensors to be identified by shining a laser or bright flashlight into the sensor. Identified light fixtures shall provide visible indication on the mobile application. Systems that do not permit reverse identification method shall not be acceptable.

J. The wireless lighting control system shall allow wireless wallstations, receptacles, relays and remote sensors to be identified by simple pushbutton method on each device. Identified devices shall provide visible indication on the mobile application. Systems that do not permit reverse identification method shall not be acceptable.

K. The wireless lighting control system shall support standalone and networked topologies. In a standalone topology the wireless area controllers are not connected to an ip network. The user shall be able to program the standalone area controller via a mobile app. In a networked topology, the wireless area controllers are connected to an ip network and communicate with a supervisory system.

L. The wireless lighting control system includes the following components:

1. Integrated sensors shall include passive infrared sensor, digital photocell, microprocessor, a wireless radio (IEEE 802.15.4), and a load controller for ON/OFF/DIM.
2. Relay Switchpack with 0-10V control shall contain a utility grade power meter chip and a latching relay to control 20Amp load and 120mA 0-10V sink. Device shall include LED indication and pushbutton for device override and identification.
3. Tilemount daylight sensor shall include a digital photocell, microprocessor, a wireless radio (IEEE 802.15.4), and a load controller for ON/OFF/DIM.
4. Wallstation shall be mains powered (120/277VAC), including the following features:
    a. Numerous button configurations, supporting small and large engraved buttons
    b. Individual button LED indication
    c. Universal light icon with raise/lower buttons

d. Each button fully programmable for Area Scene or Zone control
e. Wireless radio (IEEE 802.15.4)

5. Battery powered, wireless ceiling sensor shall include the following features:
   a. Passive infrared sensor
   b. Daylight sensor
   c. Wireless radio (IEEE 802.15.4)
   d. LED indication and pushbutton for device identification.

6. Receptacle control shall include a constant hot and controlled plug output and include the following features:
   a. The receptacle control shall provide a single input for incoming power, devices that require constant hot and switched inputs shall not be acceptable.
   b. The receptacle control shall be clearly marked “Controlled” and with the NEMA defined controlled symbol ⏻
   c. The receptacle control shall include a wireless radio (IEEE 802.15.4) to provide control and power measurement data.

7. Wireless Area Controllers shall wirelessly communicate (IEEE 802.15.4) with all wireless sensors, wireless wallstations, wireless relays, and wireless receptacles to coordinate control areas, and zones. The Wireless Area Controller shall support the following features:
   a. Power over Ethernet port to power the wireless area controller and allow the connection of a wireless area controller to a local area network (LAN).
   b. 802.11 radio acting as a Wi-Fi AP allowing a mobile device to connect to the wireless area controller to program the lighting system.
   c. 802.11 radio acting as a wireless gateway allowing a mobile application or a supervisory system to communicate with the wireless area controller via a wireless local area controller.
   d. Up to 16 areas
   e. Up to 16 zones per area
   f. Area scene configurations
   g. Multiple occupancy sets per area
   h. Multiple daylight sets per area
   i. Demand Response reduction values
   j. Scheduling configuration
   k. System backup and restore capabilities
   l. Automatic Code Commissioning
   m. Built-in astronomical clock

8. Mobile application shall communicate using Wi-Fi to a single Wireless Area Controller or a building IT network with multiple Wireless Area Controllers. The Mobile application shall include the following features:

a. Ability to connect to multiple Wireless Area Controllers
b. Administrative and user login credentials
c. Demonstration and Live mode
d. Automatic Code Commissioning
e. Drag and drop or multi select programming of wireless lighting system

9. Supervisory system able to aggregate data from the wireless area controllers and display the data to the user on a human machine interface as well as to third party system via BACnet/IP and Public (REST) API. The supervisory system shall include the following feature:

a. Ability to discover and connect to multiple wireless area controllers
b. Aggregate data from the wireless area controllers
c. Display the health data, i.e. devices faults notifications, and other system's notifications on a web-based HMI application
d. Provide troubleshooting tips for each detected fault that would allow the individuals responsible to maintain the system easily troubleshoot the system.
e. Expose the data aggregated from the networked wireless area controllers to third party system via BACnet/IP and Public (REST) API
f. Receive automatic demand response signal for load shedding from third party system via BACnet/IP and Public (REST) API and broadcast it to the connected wireless area controllers.
g. Manage the supervisory system's user accounts
h. Manage the supervisory system's software upgrades
i. Backup/restore the Supervisory System (OS, application and database)

1.16 LIGHTING CONTROL APPLICATIONS

A. Minimum lighting control performance required, unless local energy code is more stringent.

B. Occupancy/vacancy requirements – provide an occupancy/vacancy sensors with manual on/ automatic off or automatic on/ automatic off functionality in all spaces. Manual on vacancy sensors should be used for any enclosed space with a manual on switch that does not require hands free operation. Spaces with multiple occupants or where line of sight might be obscured ceiling or corner mount sensors and manual wallstations would be required. Automatic on of lighting via occupancy sensor cannot exceed 50% of lighting. Systems that do that allow the user to select occupancy or vacancy mode shall not be acceptable.

C. Bi-level switching – provide multi-level switching and/or variable dimming for maximum energy savings.

D. Task lighting / receptacle control – provide automatic shut off of non-essential plug loads and task lighting in all spaces. Provide manual on or automatic on of receptacles whenever spaces are occupied. Receptacle control will only be shut off when no occupancy is detected within the space. Systems that do not provide receptacle control for a full 20 amp circuit shall not be acceptable.

E. Daylight zones – primary sidelit or toplit areas within an enclosed space shall be controlled separately and automatically by individual integrated daylight sensors. Adjustments to the daylight zones must be provided by a simple to use, intuitive mobile application.

F. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to dim electric light to the lowest light level and off.

G. Provide the ability to adjust the high end and low end trim of the dimmers to ensure the lighting automatically provides energy saving even when daylighting calls for full illumination.

H. Provide the ability for the dimmers and the relays to function separately. Systems where the 0-10v dimmers and relays are tied together reduce design capabilities and shall not be acceptable.

I. Shall be capable of automatically responding to a demand response signal and adjusting the lighting level, without the need of programming or software. Systems that require software or commissioning to provide demand response integration shall not be acceptable.

J. Additional controls:

1. Provide occupancy or vacancy sensors (Auto On or Manual On) for any enclosed office, conference, meeting or training rooms. Spaces with multiple occupants or where line of sight may be obscured require ceiling or wall/corner mounted sensors with Manual On switches.
2. Conference, meeting, training, auditoriums and multi-purpose rooms shall have controls that allow for scene based and independent control of each output. Rooms larger than 300 square feet shall support at least four (4) pre-set lighting scenes. Occupancy or vacancy sensors shall ensure all lighting, receptacles.
3. Egress lighting control shall be integral to the system. The system shall provide an automatic control of adjacent corridor and/or egress lighting based upon room occupancy. Systems that do not ensure that adjacent corridor and/or egress lighting is controlled with room occupancy shall not be acceptable.
4. Shall be able to communicate with third party system such as a building automation system by means of native BACnet/IP communication hosted on the supervisory system. The supervisory system shall be on the same subnet as the third party system.

5. Shall be able to communicate with third party systems such as IoT platforms or AV systems by means of restful API commands via the public API interface hosted on the supervisory system. The supervisory system shall be able to communicate to the third system via the IP network provided by the customer through the proper ports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Eaton Lighting Systems

B. Basis of design product: Eaton WaveLinx Wireless Connected Lighting system or subject to compliance and prior approval with specified requirements of this section, one of the following:

1. Eaton WaveLinx Wireless Connected Lighting (WCL) system
2. Pre- Approved Equal

C. Substitutions:

D. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.

E. Any substitutions provided by the contractor shall be reviewed at the contractor's expense by the electrical engineer at a rate of [$200.00] per hour.

F. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices and wiring. The contractor shall provide complete engineered shop drawings (including power and control wiring) with deviations from the original design, highlighted in an alternate color, to the engineer for review and approval prior to rough-in.

2.2 CONNECTED DEVICES

A. Load control devices.

1. Product: WaveLinx Relay Switchpack with 0-10 [WSP-MV-10]
    a. Plenum rated
    b. Integrated, self-contained unit consisting internally of an isolated load switching control relay [and a power supply to provide low voltage power].
    c. 20amp 120/277VAC General Purpose
    d. 16amp 120/277VAC electronic ballast (LED load)

e. Single class 2 0-10V dimming output (IEC 60929 Annex E) sinks up to 120mA per (40 μA max per circuit leakage to line)
f. 0-10V output supports up to 60 ballasts/drivers that draw a standard 2mA each
g. Power measurement accuracy of 5%, reporting data to the Wireless Area Controller for display on the WaveLinx Mobile Application
h. Shall be compatible with electronic ballast, LED, incandescent, magnetic or electronic low voltage, and magnetic or electronic fluorescent, as well as motor loads.
i. Shall be capable of controlling up to 20Amp receptacle or plug loads.
j. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.
k. Relay Switchpack shall be FCC certified.
l. Relay Switchpack shall be a Class 1 device

2. Product: WaveLinx 347VAC Relay Switchpack with 0-10 [WSP-CA-10]
    a. Plenum rated
    b. Integrated, self-contained unit consisting internally of an isolated load switching control relay [and a power supply to provide low voltage power].
    c. 20amp 347VAC General Purpose
    d. 16amp 347VAC electronic ballast (LED load)
    e. Single class 2 0-10V dimming output (IEC 60929 Annex E) sinks up to 30mA
    f. 0-10V output supports up to 30 ballasts/drivers that draw
    g. Power measurement accuracy of 5%, reporting data to the Wireless Area Controller for display on the WaveLinx Mobile Application
    h. Shall be compatible with electronic ballast, LED, incandescent, magnetic or electronic low voltage, and magnetic or electronic fluorescent, as well as motor loads.
    i. Shall be capable of controlling up to 20Amp receptacle or plug loads.
    j. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.
    k. Relay Switchpack shall be FCC certified.
    l. Relay Switchpack shall be a Class 1 device

3. Product: WaveLinx Receptacle [WR-15]
    a. Integrated, self-contained unit providing a constant hot plug connection and a controlled plug connection.
    b. 15amp 120VAC constant hot
    c. 15amp 120VAC controlled load

d. Controlled load plug shall be labelled with “Controlled” and NEMA standard symbol for controlled plug loads.
e. Power measurement accuracy of 5%, reporting data to the Wireless Area Controller for display on the WaveLinx Mobile Application
f. Shall provide LED indication of status and wireless communication as well as override button.
g. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.
h. WaveLinx Receptacle shall be FCC certified.
i. WaveLinx Receptacle shall be a Class 1 device

4. Product: WaveLinx Receptacle [WR-20]

a. Integrated, self-contained unit providing a constant hot plug connection and a controlled plug connection.
b. 20amp 120VAC constant hot
c. 20amp 120VAC controlled load
d. Controlled load plug shall be labelled with “Controlled” and NEMA standard symbol for controlled plug loads.
e. Power measurement accuracy of 5%, reporting data to the Wireless Area Controller for display on the WaveLinx Mobile Application
f. Shall provide LED indication of status and wireless communication as well as override button.
g. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.
h. WaveLinx Receptacle shall be FCC certified.
i. WaveLinx Receptacle shall be a Class 1 device

2.3 CONTROL DEVICES.

A. Product: WaveLinx Wallstation [W1L-*], [W1L-RL-*], [W2L-*], [W2L-RL-*], [W3L-*], [W2S-*], [W2S-RL-*], [W4S-*], [W4S-RL-*], [W5S-*], [W6S-*]

1. Mains powered wireless wallstation providing multi-level control of an area or zone
2. 120VAC input
3. Shall provide individual button LED indication of status and wireless communication as well as selected button.
4. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.
5. WaveLinx Wallstation shall be FCC certified.

6. WaveLinx Wallstation shall be a Class 1 device
7. Wireless momentary pushbutton switches in 2, 3, 4, 5 and 6 button configuration; available in white, ivory, grey and black; compatible with wall plates with decorator opening. Wallstations shall include the following features:
8. Multi-level scene selection
9. Scene raise/lower
10. Toggle ON/OFF
11. Removable buttons for field replacement with engraved buttons and/or alternate color buttons [ENGRV-*BTNL-*], [ENGRV-*BTNS-*]. Button replacement may be completed without removing the switch from the wall.
12. Intuitive button labeling to match application and load controls.
13. Pre-defined digital button configurations. Each wallstation is shipped with pre-defined digital button configurations which are automatically mapped to specific area/zone controls when added to an area in the WaveLinx Mobile Application.
14. Multiple WaveLinx wallstations may be installed in an area by simply connecting them to the WaveLinx network. No additional configuration will be required to achieve multi-way switching.
15. WaveLinx wallstations are delivered with pre-defined functions including, raise, lower, Half Lights, Full Lights, Read, Relax, Dimmed, Night, manual and scene control.
16. Optional custom labeling is available for application or location specific wallstation button labels.

2.4 CONNECTED SENSORS

A. Ceiling mounted or fixture integrated sensors.

1. Product: WaveLinx Ceiling Sensor [CWPD-1500]

   a. Occupancy Sensing:

      1) PIR multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
      2) Products tested in identical manner, complaint to NEMA WD 7 -2011 Occupancy Motion Sensors Standards
      3) Sensor shall have time delays from 10 to 20 min
      4) Sensor battery life shall be 10 years based on approximately 30 activations and wireless signals per day.

   b. Daylight Sensing:

      1) Open loop daylight sensor
      2) 100-900lux
      3) Light input within 60° cone

   c. Power failure memory:

1) Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.
2) Sensor is battery powered by standard AA batteries

d. Sensor wireless reporting:

1) Battery life through the WaveLinx Mobile Application
2) Occupancy status
3) Ambient light level

e. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation
f. Sensor shall wirelessly transmit occupancy; light level, power to the WaveLinx Wireless Area Controller which allows the data to be stored in a central location on premises and displayed via the WaveLinx Mobile Application.
g. Sensors shall be fully adaptive with the ability to have the sensitively and timing to be remotely adjusted to ensure optimal lighting control for any use of the space.
h. Sensors have remotely adjustable settings for dimming levels, occupied/unoccupied light levels, occupancy/vacancy sensing, and sensitivity to changes in motion and changes in ambient light levels.
i. Sensors have the ability to remotely adjust light output to reduced levels and remain at that reduced level for an adjustable time period before turning off when a space is vacant.
j. Programming is stored in each sensor in addition to the Wireless Area Controller. Sensors operate independently of from Wireless Area Controller, so there cannot be single point failure. Systems must operate so there is no single point of failure.

2. Product: WaveLinx Integrated Sensor [SWPD1]

a. Sensing mechanism:
b. [Infrared]: Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
c. [Daylight]: Utilize integrated daylight sensor to provide closed loop daylight dimming control. Each WaveLinx Integrated Sensor provides an individual daylight dimming zone to provide highly accurate daylight levels at the work surface throughout the entire space.
d. Power failure memory:

1) Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.

e. Products tested in identical manner, complaint to NEMA WD 7 -2011 Occupancy Motion Sensors Standards
f. Sensor shall have time delays from 10 to 20 min
g. Sensor shall provide unique daylight calibration taking into account for light level at the sensors, work surface and integrated luminaire light output.
h. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation

1) Green LED indication when sensor is in out-of-the-box operation mode
2) White LED indication when sensor has been connected to the WaveLinx wireless lighting control system

i. Test mode- fifteen second time delay
j. Walk-through mode
k. Sensors are RoHS compliant
l. Sensor shall provide out-of-the-box functionality of occupancy detection, directly controlling integrated fixture.

1) Occupied default light level is 75%
2) Unoccupied default light level is OFF
3) Occupancy default time out is 20 minutes

m. Sensors shall monitor changes in occupancy, changes in ambient light levels and communicate digital control commands to light fixtures according to a control strategy.
n. Sensor shall wirelessly transmit occupancy; light level, power to the WaveLinx Wireless Area Controller which allows the data to be stored in a central location on premises and displayed via the WaveLinx Mobile Application.
o. Sensors shall be fully adaptive with the ability to have the sensitively and timing to be remotely adjusted to ensure optimal lighting control for any use of the space.
p. Sensors have remotely adjustable settings for dimming levels, occupied/unoccupied light levels, occupancy/vacancy sensing, and sensitivity to changes in motion and changes in ambient light levels.
q. Sensors have the ability to remotely adjust light output to reduced levels and remain at that reduced level for an adjustable time period before turning off when a space is vacant.
r. Programming is stored in each sensor in addition to the Wireless Area Controller. Sensors operate independently of from Wireless Area Controller,

so there cannot be single point failure. Systems must operate so there is no single point of failure.

3. Product: WaveLinx Tile mount Daylight Sensor [TMSWPD1]
    a. Sensing mechanism:
    b. [Daylight]: Utilize Tile mount daylight sensor to provide closed loop daylight dimming control to a circuit of connected fixtures.
    c. Power failure memory:
        1) Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.
    d. Tile mount sensor connects to a control module which supports up to 3Amps of connected fixtures.
    e. Tile mount is designed to be installed in a ½" or ¾" ceiling tile within 54" of the control module and connected fixtures.
    f. Sensor shall provide unique daylight calibration taking into account for light level at the sensors, work surface and integrated luminaire light output.
    g. All sensors shall provide an LED as a visual means of indication and diagnostics.
    h. Sensors are RoHS compliant
    i. Control Module:
        1) Sensor shall connect to a 0-10V dimmable ballast or driver via a control module or connect to a WaveLinx enabled drivers without the use of WaveLinx control module.
        2) Sensor shall connect to a controller via a low voltage cable for interior applications.
        3) If power dropouts in the event of a brown-out or black-out, when power is restored, the lighting system should recover quickly and automatically return to the last lighting levels. A momentary interruption (1 or 2 seconds) of power should not cause extended periods (20 seconds or more) without lighting while the system reboots and all other electrical equipment is back on.
        4) Control Module shall be installed by luminaire manufacturer and is shipped as an integral component to the luminaire.
    j. Sensor shall be FCC certified.
    k. Sensor shall be a Class 2 device.
    l. System shall support user initiated manual demand response and utility or BMS initiated automatic demand response.

4. Control Module Components:

a. Power Measurement capable of 5% power measurement accuracy.
b. Controller to include latching relay, to decrease power requirements of the power pack.
c. Operate Bounce Time: 3 ms. Max.
d. Max Switching Voltage 277VAC and 125VDC.
e. Insulation Rating: Class B and Class F.
f. Operations:
    1) Control Module and Sensor shall communicate energy usage Wireless Area Controller.
g. Listed to UL 916.
h. FCC Part 15 Class A certified.
i. Manufacturer to pre-wire control module in fixture.
j. Control module shall be plenum rated.
k. Connection between sensors and control module shall be Class 2, 18-24 AWG, stranded or solid depending on the application U.L Classified, PVC insulated or TEFLON jacketed cable suitable for use in plenums.

B. Wireless Outdoor Load Control Module

1. Product: WaveLinx Outdoor Load Control [WOLC]
    a. Power failure memory:
        1) Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.
    b. Control wireless reporting:
        1) Load status
    c. Outdoor load control shall turn ON/OFF/DIM connected outdoor luminaire based on wireless communications signal from the WaveLinx Wireless Area Controller.
    d. The WaveLinx Wireless Area Controller shall control the Outdoor load controller using the following:
        1) Time Schedule
        2) Astronomic time schedule
        3) Manual pushbutton from a connected wallstation
        4) BACnet command
        5) API command

e. Controller shall wirelessly transmit; light level, power to the WaveLinx Wireless Area Controller which allows the data to be stored in a central location on premises and displayed via the WaveLinx Mobile Application.
f. Controller shall have remotely adjustable settings for dimming levels, time based light levels.
g. Controller shall have the ability to remotely adjust light output to reduced levels and remain at that reduced level for an adjustable time period before turning off when a space is vacant.
h. Programming is stored in each controller in addition to the Wireless Area Controller. Controllers operate independently of from Wireless Area Controller, so there cannot be single point failure. Systems must operate so there is no single point of failure.

2.5 CONNECTED SPACES

A. WaveLinx Wireless Area Controller [WAC-POE]

1. Spaces shall be equipped with a control device to automatically shut off lighting in those areas. This automatic control device shall function on either:

a. A timeclock scheduling basis where the interior and exterior lights controlled by the wireless area controller are changed based on the time of day or the astronomic (sunrise and sunset).

1) The astronomical timeclock shall be integrated into the wireless area controller and shall not require any internet connection to maintain its time.
2) The timeclock programming and time clock settings shall be retained after a power loss.
3) The timeclock shall allow weekly recurrences
4) Time clock events can be scheduled to:

a) Set areas to desired scenes
b) Zone light levels to the desired light level
c) Zone light levels when occupied
d) Zone light levels when unoccupied

b. An occupancy basis where the interior and exterior lights controlled by the wireless area controller are changed based on the occupancy set status. The occupancy set is composed of one or more occupancy sensors and it shall turn lighting off within 20 minutes of an occupant leaving a space
c. A manual command basis where a user or a program send an override command using a wireless wallstation, the mobile application or via bacnet/IP or Public API. The bacnet/IP and Public API signal will received via the Insight Manager/supervisory system.

2. Provide Wireless Area Controllers [WAC-POE] in the locations and capacities as indicated on the plans and schedules. Each Wireless Area Controller [WAC-POE] shall have the following capabilities:
    a. The Wireless Area Controller [WAC-POE] is a server class appliance that discovers, programs and manages WaveLinx connected devices, connected sensors and connected Apps.
    b. Uses industry standard HTTPS security with AES-128 encryption safeguards the integrity of the entire system. Backups prevent data loss and restore fixtures to operational modes. It constantly monitors areas to ensure that spaces are managed according to the assigned user preferences and tasks being performed.
    c. Powered-over-Ethernet (PoE) at 48V device (IEEE802.3af), utilizes the building PoE network switches (by others) or a PoE injector [WPOE-120] (accessory by Eaton) for power and network connection.
    d. Maximum CAT 6/CAT6e cable distance between the Wireless Area Controller and a network PoE switch is 330 feet. Care shall be taken when routing the cable to not exceed the 330-foot limitation including travel distance up and down structures.
    e. Wi-Fi access point and wireless client capabilities. Wi-Fi capabilities are automatically disabled if the Wireless Area Controller is physically connected to a building LAN and receives an IP address. Systems that allow multiple simulations methods of network connection (Wi-Fi & LAN) shall not be acceptable.
    f. 2.4 GHz Transceiver for IEEE 802.15.4 wireless radio for communication to connected devices and sensors.
    g. Shall support AES 128-bit encryption
    h. LED indicators for status of various wireless radios and communications.
    i. Shall be FCC Part 15 Class A, RoHS certified.
    j. Wireless Area Controller connection cables shall be plenum rated.
    k. Shall be Class 2 devices.
    l. Construction Grouping
        1) PAIR button to allow automatic creation of Construction Group allowing simplified automatic control of all connected devices and sensors.
        2) The patent-pending Construction Grouping mode permits contractors to complete a quick system start-up to confirm that the devices have been installed correctly, instead of waiting for factory-trained technicians to get the lights on a project in working order. Contractors follow a simple process to pair the wireless devices with the appropriate WAC and initiate occupancy-based lighting control functionality. This saves

lighting energy during the construction phase of the project by ensuring that the lights are turned off when the area is unoccupied.

3) Construction grouping provides visual indication to the installer that devices have received wireless communication from the Wireless Area Controller and received a unique individual address. Systems that do not provide visual indication of device connection to the wireless network shall not be acceptable.
4) Construction grouping provides automatic grouping of connected devices to provide simple occupancy-based and wallstation control of all devices, without the need of a factory trained technician. Systems that require special software or training to group wireless devices shall not be acceptable.

m. Scalability and Data Integrity

1) The Wireless Area Controller can be deployed as a dedicated installation managing up to 200 wireless device (connected devices, connected sensors). When deployed as a dedicated installation the Wireless Area Controller acts as a local wireless access point for Wi-Fi connection method to the WaveLinx Mobile Application.
2) The Wireless Area Controller can be deployed as a network installation managing up to 200 wireless devices (connected devices, connected sensors) per Wireless Area Controller. When deployed as a network installation the Wireless Area Controller connects to the building LAN or wireless network as a client using DHCP. The maximum number or Wireless Area Controllers on the building network is dependent upon the building network configuration.

B. Insight Manager [ELS-IMPRO1, ELS-IMENT1, ELS-IMVRT1]

1. The Insight Manager shall support up to 500 Wireless Area Controllers. The entry level model for the Insight Manager shall support up to 20 Wireless Area Controllers while the enterprise level model for the Insight Manager shall support up to 500 Wireless Area Controllers.

2.6 CONNECTED APPLICATIONS

A. WaveLinx Mobile Application [WAPP]

1. Administrative programming and editing may be conducted via an intuitive iOS or Android mobile application.
2. WaveLinx Mobile shall support the following features:
   a. Network discovery of multiple Wireless Area Controllers
   b. Naming and identification of Wireless Area Controllers
   c. Unique administrative login credentials for each Wireless Area Controller

d. Discovery of wireless devices per Wireless Area Controller (Find Devices)
e. Creation of up to 16 Areas per Wireless Area Controller
f. Creation of up to 16 Zones per area
g. Creation of multiple Occupancy Sets per area
h. Creation of Daylight Sets for each integrated luminaire
i. Creation of Demand Response values for each area
j. Definition of scene values for each area
k. Definition of schedules for each Wireless Area Controller
l. Blink identification and reverse identification of each connected devices and sensor
m. Identified connected devices and sensors will indicate on the WaveLinx Mobile Application their selection by the device icon pulsing on the screen.
n. Ability to utilize drag and drop, multi select and filter capabilities for easy association of connected devices and sensors to a defined area.
o. Automatic Code Commissioning features include:

1) Automatic association of all devices added to an area to provide a California Title 24 2016 code compliant sequence of operations
2) All occupancy sensors are joined together to provide an Automatic ON to 50% light level
3) All occupancy sensors are joined together to provide an Automatic OFF of all luminaires and plug loads after 20 minutes of with no occupancy detected.
4) Automatic closed loop daylighting to approximately 500lux
5) Automatic wallstation button mapping providing the dominant button providing a 50% light level all other buttons provide multi-level dimming control from 30%-100%
6) Automatic display of area power measurement data
7) Automatic Demand Response of 20%
8) Additional screens if needed to adjust Automatic Code Commissioning settings.

B. Lighting Xpert Insight [LXI]

1. The application shall be accessible via HTML5 compatible web browsers such as Internet Explorer, Chrome and Safari.
2. The application shall support multiple computing device types, i.e. smartphone, tablet, laptops and desktop.
3. The software application shall support touch interaction.
4. The application shall utilize HTTPS (industry-standard certificate-based encryption and authentication for security).
5. The system shall display system’s fault in near real-time. System faults include loss of communication with the Wireless Area Controller, wireless wallstation,

wireless ceiling sensor, wireless switchpack, wireless daylight sensor, wireless control module and low battery alarms.

6. The system shall offer context-sensitive troubleshooting tips for each alarm
7. The system shall be able to send e-mail notifications to subscribe users for each fault. The user shall provide the SMTP server information to allow the Lighting Xpert Insight to send out email notifications.

C. BACnet Interface

1. The BACnet/IP interface shall support the following capabilities:
    a. BACnet integrator can monitor:
        1) Area scene
        2) Area power usage
        3) Dimming zone level (0-100%)
        4) On/off zone level (on/off)
        5) Occupancy sensor's occupied/unoccupied status
        6) Daylight sensor's level
    b. BACnet integrator can command:
        1) System-wide Demand Response enable/disable
        2) Area scene
        3) Dimming zone level (0-100%)
        4) On/off zone level (on/off)
        5) Occupancy sensor
2. The system shall be able to allow users to select which object types the system shall expose, i.e. Area, Zones, input devices and output devices.
3. The system shall be able to generate the electronic PICS document and allow users to be able to send the PICS document to the proper stakeholders.

D. The Public API shall support the following capabilities:

1. The Public API interface shall support the following capabilities:
    a. Get:
        1) Building hierarchy information (areas, zones, devices)
        2) Area scene
        3) Area power usage
        4) Dimming zone level (0-100%)
        5) On/off zone level (on/off)
        6) Occupancy sensor's occupied/unoccupied status
        7) Daylight sensor's level
    b. Put:
        1) System-wide Demand Response enable/disable

2) Area scene
3) Dimming zone level (0-100%)
4) On/off zone level (on/off)
5) Occupancy sensor

PART 3 - EXECUTION

3.1 INSTALLATION

A. The control system shall be installed and fully wired as shown on the plans by the installing contractor. The contractor shall complete all electrical connections to all control circuits.

B. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated.

C. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:

D. Sensor parameters, time delays, sensitivities and daylighting setpoints.

E. Sequence of operation, (e.g. manual ON, Auto OFF. etc.).

F. Load parameters (e.g. blink warning, etc.).

3.2 PRODUCT SUPPORT AND SERVICE

A. Factory telephone support shall be available at no cost to the owner. Factory assistance shall consist of solving programming or application questions concerning the control equipment.

3.3 FACTORY COMMISSIONING (OPTIONAL)

A. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with twenty one working days written notice of the system startup and adjustment date.

C. Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

D. Qualifications for factory certified field service engineer:

1. Certified by the equipment manufacturer on the system installed.

E. Make first visit upon completion of installation of WaveLinx Wireless Connected Lighting system:

1. Verify locations of Wireless Area Controllers
2. Verify implementation of Construction Group process
3. Identify connected devices and program using WaveLinx Mobile and Automatic Code Commissioning.
4. Verify that system operation control based on defined sequence of operations (SOO).
5. Obtain sign-off on system functions.

F. Make second visit (optional) to demonstrate and educate Owner's representative on system capabilities, programming, fine tuning and maintenance.

G. Due to building operations, start-up of WaveLinx Wireless Connected Lighting system may be required outside of normal business hours (Monday through Friday, 7 a.m. to 5 p.m.).

3.4 CLOSEOUT ACTIVITIES

A. Training Visit

B. Lighting control system manufacturer to provide [4] days additional on-site system training to site personnel. This shall be a part of the second visit by field service to the site. A separate third visit will require an additional charge.

C. During this visit, the manufacturer's Field Service Engineer will perform tasks, at the request of the facility representative or Commissioning Agent, such as to demonstrate wall control functions, explain or describe occupancy and/or daylight sensor functionality.

D. On-site Walkthrough

E. Lighting control system manufacturer to provide a factory certified Field Service Engineer to demonstrate system functionality to the Commissioning Agent.

3.5 MAINTENANCE

A. Capable of providing on-site service support within 48 hours anywhere in continental United States and within 72 hours worldwide except where special visas are required.

B. Offer renewable service contract on yearly basis, to include parts, factory labor, and annual training visits. Make service contracts available up to ten years after date of

system startup. Additional service contracts and warranties need to be verified as being available.

C. Prior to bid, confirm if an on-site meeting between the Lighting Control System Manufacturer and a Facility Representative will be required to evaluate system usage after the building has been in operation for a predetermined period of time. If a field service visit is required for Acceptance Testing or building commissioning, it shall be as an additional charge unless specifically stated in the specification and confirmed on the WaveLinx Wireless Connected Lighting bill of materials.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for Coordination of work with other portions of the work.

1.2 DESCRIPTION

A. Work Included: Provide low voltage fuses for overcurrent protection in fusible devices.

B. Related Work specified in other sections:

1. Electrical: Section 26 00 00
2. Panelboards: Section 26 24 16
3. Enclosed Switches and Circuit Breakers: Section 26 28 16

1.3 QUALITY ASSURANCE

A. The equipment provided shall meet the requirements of the National Electrical Code and local codes and ordinances.

B. The equipment provided shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 REFERENCE STANDARDS

A. NEMA FU1 Low Voltage Cartridge Fuses

B. UL 248 Low Voltage Fuses

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's bulletins, and minimum melting and total clearing time charts for each type of fuse.

1.6 JOB CONDITIONS

A. Deliver fuses to the project in the manufacturers new unopened shipping containers.

B. Store fuses in a clean, dust free, cool environment until required for installation to energize equipment.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacture of similar equipment.

B. Acceptable Manufacturers

1. Bussman
2. Littlefuse
3. Ferraz - Shawmut

1.8 WARRANTY

A. Fuses shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 FUSES - 600A AND BELOW

A. All fuses shall have a separate overload and short-circuit elements. Fuses shall incorporate a spring activated thermal overload element that has a 284 degrees Fahrenheit melting point alloy.

B. The fuses shall have time-delay capabilities in accordance with UL standards for Class RK1, J, or CC fuses and an interrupting rating of 300,000 amperes RMS symmetrical, listed by a nationally recognized testing laboratory.

C. Peak let-through currents and I^2t let-through energies shall not exceed the values established by UL for Class RK1 or J fuses.

2.2 MOTOR CIRCUITS

A. The fuses shall be applied for all motors protected by properly sized overload relays:

1. Class RK1 fuses shall be installed in ratings of 130%, or 150% for Class J fuses, of motor full-load current (or next size larger if this does not correspond to a fuse size), except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuses may be sized at 175% of the motor full-load current, or the next standard size larger if 175% does not correspond to a standard fuse size.
2. Class L fuses shall be installed in ratings of 175% of motor full-load current (or next size larger if this does not correspond to a fuse size), except where high ambient temperatures prevail, or where the motor drives a heavy revolving part

which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuses may be sized up to 300% (or next size smaller).

3. Class CC fuses shall be installed in ratings of 200% of motor full-load current (or next size larger if this does not correspond to a fuse size), except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuses may be sized up to 400% (or next size smaller).
4. Fuses shall be tested and have documentation verifying compliance of Type 2 protection requirements for motor starters per UL508E or IEC 60947-4 for motor controllers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fuses shall not be installed until equipment is ready to be energized. This measure prevents fuse damage during shipment of the equipment for the manufacturer to the job site, or from water that may contact the fuse before the equipment is installed.

B. Final tests and inspections shall be made prior to energizing the equipment. This shall include a thorough cleansing, tightening, and review of all electrical connections and inspection of all grounding conductors.

3.2 SPARES

A. In addition to fuses consumed during testing, furnish 10%, but not less than three of each, of each size and type fuse used for the project, and store in spare fuse cabinet.

B. Provide Bussmann SFC spare fuse cabinet in main electrical room.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide disconnect switches and enclosed circuit breakers for branch circuit, motor circuits, and items of equipment.

B. Related work specified in other sections:

1. Division 23
2. 26 00 00 Electrical
3. 26 28 13 Fuses

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

A. UL 977 Fused Power Circuit Devices

B. NEMA KS1 Enclosed Switches

1.5 SUBMITTALS

A. Submit shop drawings including:

1. Enclosure outline drawings and dimensions.
2. Nameplate schedule.
3. Assembly ratings including:
    a. Main lug ratings and location.
    b. Voltage ratings.
    c. Short circuit ratings.

4. Conduit entry and exit locations, dimensions, and knock-outs.
5. Cable terminal sizes.
6. Fuse types and ratings.
7. Manufacturer's literature describing circuit breakers and trip units.

1.6 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and off loaded in accordance with the manufacturer's published instructions.

B. Upon arrival, inspect equipment for damage insured in shipping.

C. Store and protect equipment from moisture and dust by storing in a clean, dry, heated space. Provide additional heavy plastic cover to protect the equipment and components. Provide auxiliary heating in the sections in accordance with the manufacturer's recommendations.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacture of similar equipment.

B. Acceptable Manufacturers:

1. Square D Company.
2. General Electric.
3. Eaton.
4. Siemens.

1.8 WARRANTY

A. The equipment shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Enclosed Switches

1. Provide enclosed switches where indicated on the drawings or required by NEC.
2. Switches shall be NEMA Type HD, haevy duty, rated 600 volts, with quick-make, quick break switch units and external operator, rated 100,000 A.I.C.
3. Switches shall be fused or unfused as shown on the drawings and as required by NEC, capacity and number of poles as indicate don the drawings.
4. Enclosures shall be provided with interlocks to prevent opening the enclosure without first opening the switch and to prevent operating the switch with the enclosure open.

5. Enclosures shall be provided with a means for pad locking in the open position.
6. Enclosures shall be provided with an equipment grounding lug.
7. Enclosures for use on four wire shall be provided with an insulated neutral bus.
8. Line side and load side terminals shall be provided with insulating cover to prevent accidental contact.
9. Indoor locations shall be provided with NEMA Type 1 Enclosures.
10. Outdoor locations shall be provided with NEMA Type 3R Enclosures and water tight threaded hubs for conduit entry.

B. Enclosed Circuit Breakers

1. Units shall be 600 volt or 250 volt as required and unless noted otherwise shall be 42,000 A.I.C.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect building structure to which disconnects are to be secured for defects which affect the execution and quality of work.

B. Do not start work until defects are corrected.

3.2 PREPARATION

A. Carefully measure and lay out exact locations maintaining working clearances required by the National Electrical Code.

3.3 INSTALLATION

A. Provide disconnects where indicated and where required by the National Electrical Code and all equipment where integral disconnects are not provided by the manufacturers.

B. Provide disconnects mounted to building structure ahead of flexible conduit final connection to each fan powered terminal box.

C. Install within sight of equipment served.

D. Provide final connection to equipment served.

E. Provide engraved lamicoid name plate secured to cabinet with designation of equipment served, operating voltage, and circuit designation.

END OF SECTION

SECTION 26 29 13

ENCLOSED CONTROLLERS

PART 1 – GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. All sections of this specification.

1.2 DESCRIPTION

A. Work Included: Provide and coordinate motor control centers, and the devices for each starter unit.

1.3 QUALITY ASSURANCE

A. Source Quality Control:

1. Manufacturer's tests to meet applicable Underwriters' Laboratories, Inc., Standards.
2. Equipment designed and manufactured to meet applicable ANSI, NEMA, and IEEE Standards.

1.4 SUBMITTALS

A. Manufacturer's Data: Submit copies of the manufacturer's literature, completely describing the motor control center, motor starter units, and controls.

B. Shop Drawings: Submit copies of shop drawings completely describing motor control center dimensions, motor starter units, interconnecting wiring, fuses, and capacities.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Square D Electric Company

B. General Electric Company

C. Westinghouse Electric Company

D. Siemens - ITE Electrical Products

2.2 PRODUCTS

A. Furnish and install Combination motor starter and disconnect switches in NEMA Type 1 enclosures.

B. Combination motor controller and disconnect units shall be equipped with individual control power transformers with one secondary control fuse. The other secondary lead shall be grounded. Starter units shall contain two spare auxiliary contacts, one N.C. and one N.O. in addition to those required for equipment interlock and temperature control wiring systems; and unit-mounted pilot devices and indicating lights.

C. Padlocking arrangements shall permit locking the disconnect device OFF with padlocks. Unit disconnect operating handle shall be mounted on the disconnect, not on the unit door and shall indicate ON and OFF. Overload relays shall be reset from outside the enclosure by means of an insulated bar or button.

D. All starters shall be full voltage, non-reversing type, single or two speed, as scheduled and as required by the load served. Coordinate with manufacturer's data for the equipment actually installed. Motor starter contactors shall be NEMA horsepower rated to meet or exceed the horsepower rating of the motors installed.

E. Each starter unit shall be provided with quick-make, quick-break fusible switch unit disconnect, properly sized fuses, magnetic contactor with replaceable operating coil, overload relay with replaceable thermal elements, control power transformer with fuse, and hand-off-auto switch with on/off pilot lights or high-low-off-auto switch with high/low/off pilot lights. Two-speed relays shall be provided with adjustable time interval decelerating relays.

F. Disconnect units shall be fusible switch per-drawing(s) with quick-make, quick-break units with rejection type Fuse clips and provisions for padlocking on or off.

PART 3 - EXECUTION

3.1 COORDINATION

A. This Contractor shall verify at the job site the voltage, phase, horsepower and number of speeds characteristic of each load item of equipment and furnish the proper size and type of starter required, fused as recommended by the manufacturer for the load and as required by the National Electrical Code.

3.2 NAME PLATES

A. Provide engraved lamacoid plastic name plates with the designation of each motor control center and the service voltage, and for each control unit with the circuit designation and the name of the item served.

B. Designations shall be in 3/4" letters, and name plates shall be permanently secured to control center enclosures.

END OF SECTION

SECTION 26 51 00

LIGHTING

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide lighting fixtures, lamps, and accessories for interior and exterior illumination of the building.

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

C. Laboratory Testing: Photometric testing shall be by Independent Testing Laboratories, Inc., based on Illuminating Engineering Society published procedures, and shall include candlepower distribution tabulation and zonal cavity coefficient of utilization tabulation.

D. Design Criteria: Poles and standards for exterior lighting shall be designed for 100 miles per hour wind loading in accordance with American Association of State Highway and Transportation Officials published procedure.

1.4 REFERENCE STANDARDS

A. Underwriters' Laboratories No. 57 - Fixtures, Electric Lighting.

B. Underwriters' Laboratories No. 1570 - Fixtures, Fluorescent Lighting.

C. Underwriters' Laboratories No. 1572 - Fixture, High Intensity Discharge Lighting.

D. Underwriters' Laboratories No. 1571 - Fixtures, Incandescent Lighting.

E. Underwriters' Laboratories No. 935 - Ballasts, Fluorescent Lamps.

F. Underwriters' Laboratories No. 1029 - Ballasts, High Intensity Discharge Lighting.

G. Underwriters' Laboratories No. 924 - Emergency Lighting and Power Equipment.

H. Certified Ballasts Manufacturers Association - Lamps and Ballasts Combinations Safety and Performance Standards.

1.5 SUBMITTALS

A. Submit manufacturer's literature giving materials, finishes, dimensions, coefficients of utilization, and lamp types for each fixture which is the product of one of the listed acceptable manufacturers.

B. Submit large scale shop drawings and copies of independent testing laboratory test report, along with manufacturer's literature for each fixture which is the product of any manufacturer not listed as acceptable.

C. Submit samples of fixtures upon specific request.

D. Certificates: Labels of Underwriters' Laboratories, Inc.; Certified Ballasts Manufacturers, and Electrical Testing Laboratories affixed to each item of material.

1.6 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be included and off loaded in accordance with the manufacturer's published instructions.

B. Upon arrival, inspect equipment for damage incurred in shipping.

C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacturer of similar equipment.

B. Listed in schedule and with materials.

1.8 WARRANTY

A. The equipment shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lighting Fixtures:

1. Fixtures shall be of the lighting fixture types scheduled on the drawings according to the letter type designations on the plans.
2. If letter type designation is omitted from any fixture shown on the plans, provide the same fixture type as employed in rooms of similar usage.
3. Where manufacturer's model numbers are used to describe fixtures, the intent is to establish the kind and quality of the fixture. The Contractor is responsible for examining the drawings to establish correct ordering information for each fixture including but not limited to number of ballasts to accommodate switching schedule, ballast voltage for the branch circuit supply, ceiling trim and mounting means for the ceiling material.
4. Fixtures that utilize double ended lamps and contain ballasts that can be services in place shall have a disconnecting internal to each fixture.
5. LED Source Package Lamps:
    a. LED source packages, arrays or modules and power supplies shall be tested in accordance with LM-79-08.
    b. LED light source packages, arrays or modules shall be tested in accordance with LM-80 depreciation test and L70 rated life result shall be a minimum of 50,000 hours.
    c. LED lamp color temperature of 4000K with minimum 80% CRI is required for LED lamps. Lamp lumen minimum values as scheduled.
    d. Luminaire power factor shall be minimum 90%.
6. LED Power Supplies / Drivers:
    a. LED power supplies shall operate LEDs within the current limit specification of the manufacturer.
    b. Shall operate from 60 Hz input source and have input power factor >90% and a minimum efficiency of 70% at full rate load of the driver.
    c. Shall have short circuit and overload protection.
    d. Shall have a minimum starting temperature of 0◦F and a maximum case temperature rating of at least 70◦F
    e. Power supply output shall be regulated to ±5% across published load range.
    f. Shall have as Class A sound rating.
    g. Shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47CFR part 15, non-consumer (Class A) for EMI/RFI.
    h. Shall contain no PCBs.

i. Shall carry a five (5) year minimum warranty from date of manufacturer against defects in materials or workmanship, including a replacement for operation at or below the maximum case temperature specification. For LED lamps and internal power regulation components for defects resulting in a fixture lumen depreciation >30%.
j. Dimmable power supplies shall allow the light output to be maintained at the lowest control setting (prior to off) without dropping out.

B. Emergency Battery Ballast Units

1. Selected to operate the lamp and ballast combination for the specific light fixture for a minimum of 90 minutes at not less than 1100 initial lumens for one lamp.
2. Include nickel-cadium battery, charger, and inverter for either switched fixture or unswitched fixture operation.
3. Include status indicator light, to monitor charger, fault condition and battery and test switch.
4. Include controls for automatic self-test for 30 seconds every 30 days and for 90 minutes once per year, with audible and visual signal to indicate test result.
5. For switched fixture installations, provide unswitched branch circuit conductor to the fixture from the same branch circuit serving the area.

C. Accessories: Manufacturers' standard mounting ring, trim flanges, hanger bars, spacers, supports, plaster frames of non-ferrous material or cadmium plated steel. Do not use painted steel plaster frames.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect Architectural drawings and specifications, including ceiling alternates, to determine ceiling material to be installed.

B. Inspect Architectural reflected ceiling plans.

C. Inspect installed ceiling components and pole bases for defects affecting the quality and execution of work.

3.2 PREPARATION

A. Verify ceiling material and alignment.

B. Layout exact locations of fixtures in accordance with reflected ceiling plans, fixtures' and switches' outlet boxes and supports, and poles and standard bases.

C. Provide outlet boxes and conduit.

D. Do not support light fixtures from the ceiling system if the weight of the fixture causes the total dead load to exceed the ceiling system design load or deflection specification.

In such cases, light fixtures shall be supported by supplementary hangars located within 6 inches of each corner, or supported independently from the structure.

E. Where existing fixtures are required to have ballasts replaced, fixtures that utilize double ended lamps shall be provided with a disconnecting means internal to each fixture.

3.3 INSTALLATION

A. Provide lighting fixtures, lamps, switches, and control systems, and wiring.

B. If designation omitted on drawings, provide same type fixtures employed in rooms of similar usage.

C. Provide spacers for fixtures mounted on low density ceiling material.

D. Provide plaster frames for recessed fixtures in plaster or gypboard ceilings.

E. Install fixtures in and on acoustical tile ceilings in alignment with tile joints.

F. Install fixtures in gypsum board ceilings to recess in the space available between structural members where the ceiling is installed tight against the structure.

G. Prepare fixtures, trim, and poles and standards required to be painted.

H. Note: Outlet boxes locations on drawings are diagrammatic only. Position outlet boxes to coincide with suspension hangers and knockouts.

I. Install in accordance with manufacturer's instructions, submittal data, and details on the drawings.

J. Where 0-10 volt dimming is called for, provide 0-10 volt dimming conductors to each fixture.

K. For fixtures noted to be integrated with a spate emergency lighting system, coordinate all requirements with the emergency lighting system manufacturers, and provide required optional components for proper operation with such system.

3.4 ADJUSTMENT AND CLEANING

A. Adjustment: Adjust lamp positions for desired effects. Align fixtures with building walls and tile joints.

B. Cleaning: Remove dirt, grease, and foreign materials from fixtures. Remove fingerprints, smudges, and dirt from fixture's lenses and lamps.

3.5 FOUNDATIONS

A. For exterior lighting ground mounted fixtures or poles, provide concrete foundations with steel reinforcing designed in accordance with AASHTO Standards referenced herein and as shown on the drawings.

B. Provide 1/2" x 8 ft. copper clad ground rod adjacent to each concrete foundation.

C. For each concrete foundation, provide #6 AWG bare copper conductor from the copper weld ground rod up to a connection at the pole grounding lug. Provide cadweld connection between the #6 AWG bare copper conductor and the ground rod.

D. Provide two (2) 1" spare conduits stubbed out from each pole foundation for security system requirements.

3.6 LIGHTING FIXTURE SCHEDULE

A. Reference drawings for Lighting Fixture Schedule.

END OF SECTION

SECTION 26 51 01

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide LED lighting fixtures and accessories for interior illumination of the building.

B. Related work specified in other Sections:

1. 26 00 01 General Provisions
2. 26 05 19 Low Voltage Electrical Power Conductors and Cables
3. 26 05 29 Hangars and Supports for Electrical Systems
4. 26 05 32 Raceways
5. 26 05 33 Boxes for Electrical Systems
6. 26 09 26 Occupancy Sensor Lighting Controls

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

C. Laboratory Testing: Photometric testing shall be by Independent Testing Laboratories, Inc., based on Illuminating Engineering Society published procedures, and shall include candlepower distribution tabulation and zonal cavity coefficient of utilization tabulation.

1.4 REFERENCE STANDARDS

A. Underwriters' Laboratories No. 57 - Fixtures, Electric Lighting.

B. Underwriters’ Laboratories No. 924 - Emergency Lighting and Power Equipment.

C. Underwriters’ Laboratories No. 1598 - Luminaires

D. Underwriters' Laboratories No. 2043 - Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces

1.5 SUBMITTALS

A. Submit manufacturer's literature giving materials, finishes, dimensions, coefficients of utilization, and lamp types for each fixture which is the product of one of the listed acceptable manufacturers.

B. Submit large scale shop drawings and copies of independent testing laboratory test report, along with manufacturer's literature for each fixture which is the product of any manufacturer not listed as acceptable.

C. Submit samples of fixtures upon specific request.

D. Certificates: Labels of Underwriters' Laboratories, Inc.; affixed to each item of material.

1.6 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be included and off loaded in accordance with the manufacturer's published instructions.

B. Upon arrival, inspect equipment for damage incurred in shipping.

C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years' experience with the manufacturer of similar equipment.

B. Listed in schedule and with materials.

1.8 WARRANTY

A. The equipment shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lighting Fixtures:

1. Fixtures shall be of the lighting fixture types scheduled on the drawings according to the letter type designations on the plans.
2. If letter type designation is omitted from any fixture shown on the plans, provide the same fixture type as employed in rooms of similar usage.
3. Where manufacturer's model numbers are used to describe fixtures, the intent is to establish the kind and quality of the fixture. The Contractor is responsible for examining the drawings to establish correct ordering information for each fixture including but not limited to voltage for the branch circuit supply, ceiling trim and mounting means for the ceiling material.

B. Exit Signs:

1. Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
    a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
    f. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

C. LED Source Package Lamps:

1. LED fixtures, source packages, arrays or modules and power supplies shall be UL 1598 and 2043 listed.
2. LED source packages, arrays or modules and power supplies shall be tested in accordance with LM-79/LM80.
3. LED light source packages, arrays or modules shall be tested in accordance with LM-80 depreciation test and L70 rated life result shall be a minimum of 50,000 hours.
4. LED lamp color temperature of 4000K with minimum 80% CRI is required for LED lamps. Lamp lumen minimum values as scheduled.
5. Luminaire power factor shall be minimum 90%.
6. LED fixtures, source packages, arrays or modules and power supplies shall be Design Lights Consortium (DLC) qualified.

D. LED Power Supplies/Drivers:

1. LED power supplies shall operate LEDs within the current limit specification of the manufacturer.
2. Shall operate from 60 Hz input source and have input power factor >90% and a minimum efficiency of 70% at full rate load of the driver.
3. Shall have short circuit and overload protection.
4. Shall have a minimum starting temperature of 0°F and a maximum case temperature rating of at least 70°F.
5. Power supply output shall be regulated to ±5% across published load range.
6. Shall have as Class A sound rating.
7. Shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47CFR part 15, non-consumer (Class A) for EMI/RFI.
8. Shall contain no PCBs.
9. Shall carry a five (5) year minimum warranty from date of manufacturer against defects in materials or workmanship, including a replacement for operation at or below the maximum case temperature specification. For LED lamps and internal power regulation components for defects resulting in a fixture lumen depreciation >30%.
10. Dimmable power supplies shall allow the light output to be maintained at the lowest control setting (prior to off) without dropping out.

E. Integrated Lighting Controls

1. Where indicated in the documents, provide integrated lighting controls. Refer to section 26 09 24 Lighting Controls and the Light Fixture Schedule.
2. Include at a minimum;
    a. Occupancy/Vacancy Senor
    b. Daylight Sensor
    c. Wireless Controls

F. Emergency Lighting Units with Battery Packs:

1. Self-contained units complying with UL 924.
    a. Battery: Sealed, maintenance-free, lead-acid type.
    b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    c. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

G. LED Source Package Lamps:

1. LED fixtures, source packages, arrays or modules and power supplies shall be UL 1598 and 2043 listed.
2. LED source packages, arrays or modules

H. Lighting Fixture Support Components:

1. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
2. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
3. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
4. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
5. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
6. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
7. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

I. Accessories: Manufacturers' standard mounting ring, trim flanges, hanger bars, spacers, supports, plaster frames of non-ferrous material or cadmium plated steel. Do not use painted steel plaster frames.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect Architectural drawings and specifications, including ceiling alternates, to determine ceiling material to be installed.
B. Inspect Architectural reflected ceiling plans.
C. Inspect installed ceiling components and pole bases for defects affecting the quality and execution of work.

3.2 PREPARATION

A. Verify ceiling material, type, support method and alignment.

B. Layout exact locations of fixtures in accordance with reflected ceiling plans, fixtures' and switches' outlet boxes and supports, and poles and standard bases.
C. Provide specified outlet boxes and conduit system for the light fixtures including conduit support system.
D. All lighting fixtures shall be supported from building structure. Do not support lighting fixtures from the ceiling system. Fixtures shall be supported by supplementary hangars located within 6 inches of each corner, or supported independently from the structure. Do not support lighting fixtures from other building systems located above the ceiling such as fire sprinkler piping, HVAC piping, plumbing piping, equipment or ductwork.

3.3 INSTALLATION

A. Provide lighting fixtures, control systems and wiring.

B. If designation omitted on drawings, provide same type fixtures employed in rooms of similar usage.

C. Provide spacers for fixtures mounted on low density ceiling material.

D. Provide plaster frames for recessed fixtures in plaster or gypboard ceilings.

E. Install fixtures in and on acoustical tile ceilings in alignment with tile joints.

F. Install fixtures in gypsum board ceilings to recess in the space available between structural members where the ceiling is installed tight against the structure.

G. Install in accordance with manufacturer's instructions, submittal data, and details on the drawings.

3.4 ADJUSTMENT AND CLEANING

A. Adjustment: Adjust lamp positions for desired effects. Align fixtures with building walls and tile joints.

B. Cleaning: Remove dirt, grease, and foreign materials from fixtures. Remove fingerprints, smudges, and dirt from fixture's lenses and lamps.

3.5 LIGHTING FIXTURE SCHEDULE

A. Reference drawings for Lighting Fixture Schedule.

END OF SECTION

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SECTION 26 51 07

EMERGENCY INVERTERS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide a standby, single or three-phase, solid-state, interruptible power supply for lighting and motor loads.

B. Related work specified in other Sections:

1. 26 00 00 Electrical
2. 26 05 19 Low Voltage Electrical Power Conductors and Cables
3. 26 95 32 Raceways
4. 26 05 33 Boxes for Electrical Systems
5. 26 51 01 Interior Lighting
6. 26 51 02 Exterior Lighting
7. 26 51 05 Networked Lighting Controls

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

A. UL 924 Standard Emergency Lighting and Power Equipment

B. UL 924A Auxiliary Lighting

C. ANSI C62.41 (IEEE 587)

D. ANSI C62.42.45 (Cat. A & B)

E. National Electrical Code

F. NFPA- 101

G. OSHA and Life Safety Code

1.5 SUBMITTALS

A. Submittals shall include, but not be limited to, the following:

1. Voltage Ratings.
2. Overall Inverter Dimensions.
3. Interior Mounting Dimensions.
4. 1/4" scale layout of proposed equipment location including required working clearances, interference with other equipment and available recessing depth where applicable.
5. Location and arrangement of internal batteries.
6. Location and arrangement of internal transformer.
7. Number of poles, trip ratings, and interrupting ratings of circuit breakers.
8. Top and bottom conduit entries and knockouts.
9. Enclosure NEMA Type.
10. Enclosure deadfront, trim, door, hinge and locking provisions.
11. Manufacturer's literature describing circuit breakers and trip units for each type and frame employed.
12. System configuration with single-line diagrams.
13. Functional relationship of equipment including weights dimensions and heat dissipation.
14. Descriptions of equipment to be furnished, including deviations from these specifications.
15. Size and weight of units to be handled by installing contractor.
16. Detailed installation drawings including all terminal locations.

1.6 DELIVERY STORAGE AND HANDLING

A. Equipment shall be included and off loaded in accordance with the manufacturer's published instructions.

B. Upon arrival, inspect equipment for damage incurred in shipping.

C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacture of similar equipment.

B. Acceptable Manufacturer

1. SureLitesInverter Systems, Inc.
2. Approved equal.

1.8 WARRANTY

A. Provide a two year parts and one year labor warranty. Warranty coverage shall begin at the time of Project Substantial Completion.

1.9 FACTORY TESTING

A. Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

PART 2 - PRODUCTS

2.1 ELECTRONICS MODULE

A. Nominal input/output Voltage: The Input and Output voltage of the inverter shall be pre-configured to match the user specified input and load requirements. Available voltages are 120, 208, 240, 277 or 480 Vac. Reference drawings for exact inverter input and output voltage(s).

B. Output Load Capacity: The output load capacity of the IPS shall be rated in kVA at unity power factor. The inverter shall be able to supply the rated kW from .5 lagging to .5 leading. Reference drawings for exact output load capacity.

2.2 BATTERY SYSTEM

A. Battery Cells: The inverter shall be provided with sealed, valve regulated front access lead acid batteries.

B. Reserve Time: The battery system shall be sized to provide the necessary reserve time to feed the inverter in case of a mains failure for 120 minutes (2 hours).

C. Recharge Time: The battery charger shall recharge the fully discharged batteries within a 24 hour period. The charger shall be an integrated three step with microprocessor controlled and temperature compensating.

2.3 TRANSFORMER MODULE

A. For systems with mixed input / output voltages the use of an isolation and / or autotransformer may be required. The input and/or output transformer(s) are not bypassed when optional maintenance bypass circuit is activated.

2.4 MODES OF OPERATION

A. The inverter shall be designed to operate with a 50-millisecond transfer time:

1. Normal: The inverter is an off line stand by system and the commercial AC power continuously supplies the critical load. The input converter (bi-directional transformer) derives power from the commercial AC power source and supplies to the inverter while simultaneously providing floating charge to the batteries.
2. Emergency: Upon a failure or brown out of the commercial AC power, the inverter, with a maximum of 50-millisecond break, switches its power supply from the input converter to the battery system. There shall be no more than a 50-millisecond loss of power to the critical load upon failure or restoration of the utility source. The system shall come standard with a normally off output (loads that are only powered during an emergency) capable of supporting full system load.
3. Recharge: Upon restoration of commercial AC power after a power outage, the input converter shall automatically restart and start charging the batteries. The critical loads are powered by the commercial AC power again.

2.5 AC INPUT

A. Voltage Configuration as shown on drawings.

B. Voltage Range: (+10%, -15%)

C. Frequency: 60 Hz (+/- 3%)

D. Power Factor: .5 lagging / leading

E. Inrush Current: 1.25 times nominal input current, 10 times 1 line cycle for incandescent loads

F. Current Limit: 125% of nominal input current

G. Current Distortion: 10% maximum from 50% to full load

H. Surge Protection: Sustains input surges without damage per standards set in UL924.

I. AC OUTPUT

J. Voltage Configuration as shown on drawings.

K. Static Voltage Stability: Load current changes +/- 2%, battery discharge +/- 12.5%

L. Dynamic Voltage Stability: +/- 2% (25% step load), +/- 3% (50% step load)

M. Dynamic Recovery Time to within 1% of nominal: 3 cycles (0-100% load step)

N. Output Harmonic Distortion: < 3% THD (with linear load)

O. Frequency: 60 Hz (+/- .05Hz during emergency mode)

P. Load Power Factor Range: 0.5 lagging to 0.5 leading

Q. Output Power Rating: kVA = kW

R. Overload Capability:

1. to 100% continuous rating
2. to 115% for 10 minutes
3. to 150% for 16 line cycles

S. Crest Factor: <= 2.8

T. Efficiency 97- 98%

2.6 ENVIRONMENTAL CONDITIONS

A. The inverter shall be capable to operate within the specified design and performance criteria provided that the following environmental conditions are met:

1. Storage/Transport Temperature: 0 to 104 deg. F (-18 to 40 deg. C) with batteries, however, maximum recommended storage temperature for batteries is 77 deg. F for up to six months. Storage at up to 104 deg. F is acceptable for a maximum of three months.
2. Relative Humidity: 0 to 95% non-condensing:
3. Audible Noise: 45 dBA @ 1 meter from surface of the UPS During Emergency Mode.

2.7 FABRICATION

A. All materials shall be new, of current manufacture, high grade, free from all defects and shall not have been in prior service except as required during factory testing.

B. The inverter module and batteries shall be housed in a single freestanding NEMA type 1 enclosure. Front access only shall be required for installation, adjustments and expedient servicing (MTTR: < 15 minutes). All components shall have a modular design and quick disconnect means to facilitate field service.

C. The cabinet shall be powder painted with the manufacturer's standard color. The inverter shall be constructed of replaceable subassemblies. Like assemblies and like components shall be interchangeable.

D. Cooling of the inverter shall be forced-air in emergency mode with internally mounted fans to minimize audible noise. Fans shall not operate in the standby mode. Fan power shall be provided by the IPS. No air filters shall be required

2.8 COMPONENTS

A. Inverter Module - The inverter module shall contain an inverter, an AC distribution module with an input circuit breaker, back-feed relay, a transfer switch, control, and monitoring subsystems.

B. Battery Module - The battery module shall contain the battery plant required to produce the reserve energy to supply the inverter during abnormal AC mains conditions. The battery module shall be contained in same cabinet as electronics regardless of the system VA.

2.9 BATTERY CHARGER

A. General: In the standard configuration the charger converts ac voltage to dc voltage. With commercial power present, the inverter power transformer is powered and the IGBT modules are microprocessor controlled to recharge the batteries. The temperature compensated battery charger circuit supplies constant voltage and constant current to the batteries. Once the batteries have received a full recharge, a constant trickle charge maintains batteries at maximum level. Recharge time is 24 hours maximum at nominal ac input voltage. The dc output's ripple current meets the battery manufacturer specification, thus ensuring the maximum battery lifetime.

B. AC Input Current: The charger unit is provided with an ac input current limiting circuit whereby the maximum input current shall not exceed 125% of the output full current rating.

C. Automatic Restart: Upon restoration of utility AC power, after a utility AC power outage and after a full IPS automatic end-of-discharge shutdown, the IPS will automatically restart, performing the normal

D. DC Filter: The charger shall have an output filter to minimize AC ripple voltage into the battery. Under no conditions shall ripple voltage into the battery exceed 2% RMS.

E. Battery Recharge: The charger is capable of producing battery-charging current sufficient enough to recharge the fully discharged battery bank within a 24-hour period. After the battery is recharged, the charger shall maintain full battery charge until the next emergency operation.

F. Over-voltage Protection: The charger is equipped with a DC over-voltage protection circuit so that if the DC voltage rises above the pre-set limit, the charger is to shut down automatically and initiates an alarm condition.

2.10 INVERTER

A. General: The inverter converts dc voltage supplied by the battery to ac voltage of a precisely stabilized amplitude and frequency that is suitable for powering most sophisticated electrical equipment. The inverter output voltage is generated by sinusoidal pulse width modulation (PWM). The use of a high carrier frequency for PWM and a dedicated ac filter circuit consisting of a transformer and capacitors, ensure a very low distortion of the output voltage (THD<3% on linear loads).

B. Overload Capability: The inverter during emergency modes shall be capable of supplying current and voltage for overloads exceeding 100% and up to 150% of full load current for 16 line cycles, 115% for 10 minutes.

C. Output Power Transformer: A dry type power transformer provides the inverter AC output. The transformer is built with copper wiring exclusively. The hottest winding temperature of the transformer shall not exceed the temperature limit of the transformer insulation class of material at ambient temperature.

2.11 DISPLAY AND CONTROLS

A. Monitoring and Control: The IPS system provides operation monitoring and control, audible alarms, and diagnostics. The front-mounted control panel includes a 4-line by 20-character vacuum fluorescent display and a keypad for user interface. The display will be menu driven. The system will have a continuous scrolling display of the following: Date & Time, System Status (AC Status, Battery Status, Charger Status) and any system faults: This allows the operator to easily "watch" system functions as they occur and check on virtually any aspect of the system's operation. Monitoring and control are microprocessor-based for accuracy and reliability. To ensure only authorized personnel can operate the unit, the system is multi-level password protected for all control functions and parameter changes.

B. Metering: Scrolling through the meter functions can monitor the following measurements:

1. Utility input voltage
2. System output voltage
3. Battery voltage
4. Battery current
5. System output current
6. System output VA
7. Inverter wattage
8. System temperature
9. Date & time

C. Audible Alarm: Audible alarm will activate with any of the following conditions and automatically store the 75 most recent events.

2.12 RS-232 INTERFACE

A. The system shall be equipped with an RS-232 serial port (DB9) for remote communications.

2.13 MANUAL AND PROGRAMMABLE TESTING

A. The system shall incorporate a manual test function and two automatic test modes. The system will perform a programmable, self-diagnostic monthly test for 5 minutes, and the user can program the event date and time of day. The yearly self-diagnostic test is for 90 minutes and the user can program the time of the day the event is to take place. The microprocessor automatically records the last 75 test events in its own separate test result log.

2.14 BATTERY ASSEMBLY

A. The batteries are front access sealed, lead-acid valve regulated battery cells with a one-year full, and nine year prorated warranty. Batteries shall be interconnected via buss bars and cables will be provided for shelf interconnects where required. A disconnect means shall be included for isolation of battery assembly from the IPS module.

2.15 OUTPUT CIRCUIT BREAKERS

A. Distribution circuit breakers are for output load protection. Protection for the normally on and/or the normally off loads. A maximum of 24 unsupervised 1-pole and a maximum of 15 supervised 1-pole circuit breakers are available.

2.16 OUTPUT CIRCUIT BREAKER TRIP ALARM

A. An audible and visual alarm activates when an output distribution circuit breaker is open or has tripped.

2.17 DIMMER BYPASS

A. Internal relays with individual overload protection circuit breakers that will allow individual dimmed circuits to be used as emergency circuits.

2.18 SUMMARY FORM “C” CONTACTS

A. Form “C” contacts rated at 5 amps maximum at 250VAC/30VDC. Dry contacts will change state when any system alarm activates. Contacts change states with the following alarms: High/low battery charger fault, near low battery, low battery, load reduction fault, output overload, high/low AC input volts, high ambient temperature, inverter fault, system test fault, and with optional circuit breaker trip alarm.

2.19 MAINTENANCE BYPASS SWITCH

A. This device is internally mounted in the system and permits maintenance personnel to easily bypass the protected equipment directly to the AC utility power. The make before break switch isolates the system to perform routine maintenance or servicing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wiring:

1. All branch circuit wiring shall be installed in an approved raceway.
2. Low voltage wiring shall be installed in an approved raceway where concealed in inaccessible locations or exposed. Where low voltage wiring is concealed in accessible ceiling plenums, it may, with pre-approval from the Owner and Engineer, be routed without a raceway using air plenum rated cable.
3. All low voltage wiring shall be color coded and identified or tagged at terminals to assist with future maintenance.

3.2 UNIT START-UP AND SITE TESTING

A. Site start-up and testing shall be provided by the manufacturer's field service representative during normal working hours (Mon. - Fri. 8 a.m. - 5 p.m.). Site testing shall consist of a complete test of the inverter and accessories by the manufacturer in accordance with manufacturer's standards. Manufacturer's approved service representative must perform commissioning for two-year warranty to apply.

3.3 DEMONSTRATION/TRAINING

A. Upon completion of testing and adjustment, the Contractor shall demonstrate operation of the system to representatives of the Owner and Engineer.

B. The Contractor shall provide four hours of instruction the Owner's personnel in proper maintenance and operation of the system.

3.4 Project Closeout Documentation

A. Provide a factory published manual

1. Warranty
2. Technical support contact
3. Electronic manual

END OF SECTION

SECTION 27 10 30

DATA AND TELEPHONE CABLE PLANT

PART 1 - GENERAL

1.1 WORK INCLUDES

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

B. Provide network cabling for the Lighting Controls system as shown on contract documents, and as required by the Lighting Control System manufacturer for the operation of the lighting control system.

C. Provide network/communication cabling for the scoreboard system as shown on contract documents, and as required by the scoreboard manufacturer for the operation of the timing and scoring system.

D. Provide network/communication cabling for the video display system as shown on contract documents, and as required by the video display manufacturer for the operation of the video diplay system.

E. Provide all equipment, materials, labor, supervision, and services necessary for or incidental to the installation and testing of a complete data (computer network) and telephone cable plant providing all permanent premise cabling and wiring devices required to support a facility wide computer network system and telephone system and as shown or indicated on the drawings and/or as specified.

F. Utilize existing MDF/IDF network equipment for new data cabling required.

G. All other electronic equipment, telephone-switching units and cross connect; telephone sets, network switching equipment, transceivers, fiber optic patch cords/attenuators, routers, network interface cards, computers, and software are not included in this section.

H. It shall be the responsibility of the Electrical Contractor to provide and install all conduit systems, standard boxes, ground bus bars (See Section 26 05 34), and operating power for the data and telephone cable plant as outlined on the project drawings. The Data and Telephone Cable Plant Contractor shall coordinate all system requirements with and provide any special back boxes to the Electrical Contractor prior to installation of conduit.

I. The station (horizontal) cabling shall extend from each designated data and telephone jack to the nearest existing IDF or the MDF in a star topology.

J. The MDF (Main Distribution Frame) shall be connected by the data backbone cabling to each IDF (Intermediate Distribution Frame) in a star pattern. Each data backbone run shall be a 12-strand armored single mode fiber optic cable and a 12-strand armored OM4 multi-mode fiber optic cable.

K. Conduct spool Testing, as described in Part 3, for all requirements shall be performed on all cable spools before installation.

L. Conduct final testing, as described in Part 3, for all requirements shall be performed with all labeling, cable, supports, wiring devices, and connectors in place. The cable shall not be disturbed for any reason after successful final testing. A certification report shall be provided for each cable run.

M. Provide all documentation and training as outlined in these specifications.

N. Provide an extended warranty as outlined in these specifications.

1.2 RELATED SECTIONS

A. Section 26 05 34 - Provisions for Communication, Security, and Safety Systems.

B. Section 27 05 00 - General Communication Systems Requirements.

1.3 CODES AND REGULATIONS

A. Perform all work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are exceeded by the contract documents.

B. The equipment, materials, and installation shall confirm to the latest version of all applicable codes, standards and regulations of authorities having jurisdiction including the following:

1. NFPA 70, National Electrical Code.
2. NFPA 101, Code for Safety to Life from Fire in Buildings and Structures.
3. ANSI/EIA/TIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces.
4. ANSI/IEEE Standard 802.3, also known as ISO 8802-3 - Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications. Ethernet UTP 10 Base-T, Fiber Optic 10 Base-FX.
5. ANSI/TIA/EIA-568-3 Commercial Building Telecommunications Cabling Standard.
6. ANSI/TIA/EIA-568-B.2-10:2008 Transmission Performance Specifications for 4-Pair 100 Ohm Augmented Category 6 Cabling.
7. ANSI/TIA-568-C.2 Commercial Building Telecommunications Cabling Standard.
8. ANSI/TIA-569-C Commercial Building Standard for Telecommunications Pathways and Spaces.

9. ANSI/TIA/EIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
10. ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
11. CENELEC EN 50289-1-14 Coupling attenuation or screening attenuation of connecting hardware.
12. DIN IEC 60068 Basic environmental testing procedures.
13. EIA-364 Electrical Connector/Socket test Procedures Including Environmental Classifications.
14. IEC 60603-7-51. Ed. 1.0 Detailed specification for 8-way, shielded free and fixed connectors, for data transmissions with frequencies up to 500 MHz
15. IEEE 802.3-2002 Information Technology - Telecommunication & Information Exchange Between Systems - LAN/MAN - Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications.
16. IEEE 802.3ae IEEE Standard for Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications-Media Access Control (MAC) Parameters, Physical Layer and Management Parameters for 10Gig Operation.
17. IEEE 802.3an Physical Layer for 10Gig (10GBASE-T) operation over balanced twisted pair structured cabling systems
18. IEEE Standard 802.3u Fast Ethernet UTP 100 Base-Tx, 100 Base-T, 100 Base-T4, Fiber Optic 100 Base-FX.
19. ISO / IEC 60603-7-1 First Edition. 2002 Detailed Specification for 8-way, shielded free and fixed connectors with common mating features
20. ISO/IEC 11801 ed. 2.1 Amd 2:2008 Information Technology - Generic Cabling for Customer Premises
21. TIA/EIA TSB 67 Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.
22. TIA/EIA-758 Customer-Owned Outside Plant Telecommunications Cabling Standard
23. Universal Service Ordering Code (USOC).
24. All applicable parts will be Underwriters Laboratories, Inc. approved.
25. All applicable parts will be FCC Class B approved.
26. International Building Codes (IBC).
27. Americans with Disabilities Act.
28. Texas Accessibility Standards.
29. Local and State Building Codes.
30. All requirements of the local Authority Having Jurisdiction (AHJ).

1.4 RELATED SECTIONS

A. Section 116603 – Interior Scoreboards.

B. Section 116604 – Interior Video Displays.

C. Section 260924 – Lighting Controls.

D. Section 265100 –Lighting Fixtures.

1.5 SUBMITTALS

A. Submittal procedures: See Section 27 05 00.

B. Submit a complete submittal package within 30 calendar days after award of this work for approval. Equipment is not to be ordered without approval. Partial submittals are not acceptable for review. Each submittal shall include a dated transmittal.

C. Submittal may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.

D. Quality Assurance Submittal: The selected contractor must be a local certified Panduit One Partner with current Platinum Status and an active deploy competency certificate. The Contractor must be a certified Integrator/Installer authorized by Panduit (the Manufacturer) to provide a Panduit Structured Cabling System 25-year Warranty (no exceptions) to the Owner covering all network cable and connectivity hardware products comprising this installation site. All UTP cable and all wiring devices installed shall be products of one approved manufacturer or joint manufacturers program and approved for use in their extended warranty program. The Contractor and Manufacturer shall jointly provide the Owner an extended warranty of the installed system against defects in material or workmanship for a period of twenty-five (25) years from the date of substantial completion. Provide a copy of contractor Panduit One Partner with current Platinum Status certification to provide a Panduit Structured Cabling System and sample warranty text.

E. Product Data Submittal including special boxes, cable, and other material as requested by the Architect including:

1. A cover sheet with the name and location of the project, the name, address, and telephone number of the Contractor, and the name, address, and telephone number of the submitting sub-contractor. Include on or after the cover sheet sufficient space for review stamps.
2. An indication of any deviations from Contract Document requirements, including variations and limitations. Show any revisions to equipment layout required by use of selected equipment.
3. A product data index and complete equipment list including for each product submitted for approval the manufactures name and part number, including options and selections.
4. Cut-sheets or catalog data illustrating the physical appearance, size, function, compatibility, standards compliance, and other relevant characteristics of each product on the equipment list. Indicate by prominent notation (an arrow, circle, or other means) on each sheet the exact product and options being submitted.

5. Submit design data, when the scope of work requires, including calculations, schematics, risers, sequences, or other data.
6. Submit a sample of the extended product warranty language.
7. Any resubmittal shall include a complete revised equipment list and any product data that is revised.

F. Submit shop drawings locating all components of the system. Shop or coordination drawings shall include information that will allow to the Contractor to coordinate interdisciplinary work and when necessary guide the manufacturer or fabricator in producing the product. Shop or coordination drawings shall be specifically prepared to illustrate the submitted portion of work, this may require diagrams, schedules, details, and accurate to scale equipment and device layouts prepared using a CAD or BIM engineering drawing program.

1.6 QUALIFICATIONS OF A PROPOSED CONTRACTOR

A. Proposed contractors who do not currently possess the necessary qualifications, trained and experienced personnel, financial capacity, and meet the other requirements herein described will be disqualified.

B. The proposed contractor, as a business entity, shall be a local certified Panduit One Partner with current Platinum Status and an active deploy competency certificate, an authorized distributor and designated representative of the equipment manufacturer, with full extended warranty privileges. The proposed contractor shall have been actively engaged in the business of selling, installing, and servicing commercial building commercial cable systems for a period of at least 5 years.

C. Recently formed companies are acceptable only if specific pre-approval is requested, and granted by the Architect/Engineer, based on experience of key personnel, current and completed projects, and all licensing requirements are met 10 working days prior to the contract proposal date.

D. The proposed contractor shall have an office within 150-miles of the job site, staffed with trained technicians who are qualified and licensed to supervise the installation, to be responsible that the system is installed as submitted, to conduct system start up and perform a 100 percent operational audit of all installed devices, to instruct the Owners representatives in the proper operation of the system, and to provide service throughout the warranty period. The contractor shall be capable of dispatching technicians to repair a system within six hours of a service request.

E. The proposed contractor shall be fully experienced in the design and installation of the type of system herein specified, and shall furnish with the contract proposal an itemized list of the installations of the type specified herein. The list shall include the name of the project, date of completion, the amount of the contract, the name, and telephone

number of a qualified person to contact for reference. This list must contain at least two (2) projects within a 150-mile radius of the school district to allow school administration officials to visit the job site for review of the system installation and service. Each reference project listed must utilize equipment by the same manufacturer as the proposed system.

F. The contractor shall employ factory-trained technicians capable of supporting the maintenance of the system. No contract employees are allowed unless they have been to the factory service school within the last 18 months. A certificate of this training shall be provided with the contractors' submittal.

G. The proposed contractor shall not have any grievances or complaints of record regarding workmanship, code compliance, or service response. A proposed contractor that has any prior finding(s) of a code violation or has any litigation in process concerning the installation of a cable plant is unacceptable.

H. The ability of a proposed contractor to obtain plans and provide a performance bond shall not be regarded as the sole qualification of the contractors' competency and responsibility to meet the requirements and obligations of the contract.

I. The Builder shall be satisfied that a proposed Contractor meets all the requirements expressed herein before including the Contractor's proposal in the project.

J. The Owner may investigate, as they deem necessary to determine the ability of the proposed Contractor to perform the work. The proposed contractor shall furnish to the Owner with any information or data requested for this purpose.

K. The Owner reserves the right to reject any contract proposal if the evidence submitted, or their investigation, fails to indicate that the Contractor is qualified to fulfill of any part of the contract or to complete the work contemplated therein.

L. The Owner reserves the right to reject the proposal of any contractor who has previously failed to perform properly, or complete on time, contracts of a similar nature.

PART 2 - PRODUCTS

2.1 GENERAL

A. All cable and wiring devices provided shall be listed and labeled by Underwriters Laboratories, Inc. for the intended use under the latest appropriate testing standard.

B. Label the cable run designator on both ends of all cables, patch panel jacks, termination cabinet connectors, and all jack wall plates and housings. In addition, label the cable run designator(s) on the ceiling grid bar at jack locations that are concealed above a drop ceiling; including those for wireless access points, cameras, projectors, etc. Labels

shall be polymer film Turn-Tell flexible non-smear, or equivalent, machine printed labels complying with EIA/TIA 606 standards. Utilize a Panduit PanTher LS8EQ Printer with R Series Turn-Tell labels, or equivalent.

C. Only equipment devices have been shown on the contract drawings. Specific wiring between equipment has not been shown.

D. All equipment and components shall be new, and the manufacturers' current model. All like devices shall be of the same manufacturer and model number.

E. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., cable shall not be supported by or lay on suspended ceilings). Fasteners and supports shall be adequate to support the required load.

F. Installation subject to approval, inspection, and test of the Architect/Engineer.

2.2 SPECIAL REQUIREMENTS FOR CATEGORY 6A CABLE DROPS

A. The Category 6A standard covers several variations including UTP unshielded and F/UTP F/FTP shielded/grounded cabling and connectivity, however nothing in this specification should be misconstrued to indicate that any system other than a U/UTP solution incorporating reduced diameter station (horizontal) cable and connectors with a non-conductive, non-grounded, metallized material tape isolation wrap designed to minimize alien crosstalk would be acceptable.

B. Category 6: The Augmented Category 6 end-to-end solution provided shall be a Panduit TX6A 10Gig UTP Cabling System, per configuration one (up to 100 meters) and three of the ANSI/TIA-568-C.2 Category 6A standard, and shall be compliant with the IEEE 803.3ae standard for up to 10Gig networking (10GBASE-T Ethernet channel performance). The system shall fully support a network operating at a swept frequency of 500 MHz, with backward compatibility for 10/100/1000Base-T network equipment. The data cable plant shall include station (horizontal) copper data cabling, workstation outlets, racks, patch panels, patch cables, and fiber optic network backbone cabling.

C. Category 6A: The structured cable system provided shall constitute a Category 6A UTP (also designated U/UTP) (unshielded twisted pair) solution incorporating station (horizontal) cable with a non-conductive, non-grounded, metallized material tape isolation wrap placed directly beneath the outer jacket. The jack modules shall also feature a suppression barrier to provide extended frequency isolation. In addition, the cable system shall support advanced PoE applications at extended operating temperatures. This isolation shall suppress both electric and magnetic coupling between adjacent cables, reducing alien crosstalk, and allowing for a 20% reduction in overall cable diameter in comparison to Category 6A UTP cable without an isolation wrap. The isolation barriers shall eliminate the need for field testing for alien crosstalk.

D. The lighter, smaller-diameter, lower thermal resistance, Category 6A cable shall enable efficient use of pathway spaces for improved energy efficiency with better airflow through racks and cabinets improving space utilization and thermal management for advanced PoE applications up to 25W per device at extended operating temperatures up to 167°F (75°C).

E. In comparison with earlier types of Category 3 through 6 UTP network cables, Category 6A UTP cable requires a larger installed bend radius necessitating cable pathways larger in dimension and with wider contact areas in order to prevent cable deformation, including all wire management, tray, conduits, backboxes, and support devices. 10Gig patch panels and electronics, including switches, may feature a lower density layout and increased power requirements requiring additional rack space and design provisions to dissipate heat.

F. The contractor shall design and implement the cable pathways and supports to overcome installation and management challenges associated with Category 6A UTP cable as specified herein when compared to Category 3 through 6 UTP cable types. Category 6A UTP is a stiffer cable designed to operate at a high frequency and with higher wattage loads, which will require mitigation of heat dissipation issues.

G. The former installation practice of tightly routed “combed, dressed, and bundled” cable trunks, which was common with Category 5 cable, is prohibited. Limit UTP cable bundles to 48 cables. Network cables shall be routed with adequate air space and by neatly randomized pathways to ensure adequate airflow. The complete system shall yield overall channel performance in a high-density physical infrastructure environment and shall achieve 10 Gbit/sec performance with minimum alien crosstalk.

2.3 ACCEPTABLE MANUFACTURES

A. Descriptions and details, acceptable manufacturers' names listed, and specific manufacturer and model number items indicated in the plans and specifications shall establish a standard of quality, function, and design. Manufacturers and model numbers listed "no exceptions" shall not be substituted without specific notice in an addendum. Otherwise, where a specific manufacturer's product is indicated, products of other manufacturers listed as acceptable may be submitted for approval based on the substitute product being, in the opinion of the Engineer, of equivalent or better quality than that of the product specified.

B. Proposed contractors wishing to propose any product substitution must do so in writing to the specifying authority at least ten (10) days prior to the proposal opening.

C. For manufacturers equipment or models other than that specified, the proposed contractor shall supply proof that such substitute equipment equals or exceeds the

features, functions, performance, and quality of the specified equipment. Proposals must include detailed information showing all deviations from the system as specified.

D. Substitute products for which the proposed contractor does not obtain prior approval will not be considered acceptable for this project. Final approval of any alternate products shall be based on the decision of the Owner and Architect. Prior approval to make a proposal for this project does not automatically insure products will be an acceptable equivalent.

E. It is the responsibility of the Contractor to provide all features and functions as outlined in these specifications. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

F. The selected contractor must be a certified Integrator/Installer authorized by one of the Manufacturers listed below to provide an extended warranty to the Owner covering all network cable and connectivity hardware products comprising this installation site. All UTP cable, fiber optic cable, and all wiring devices installed shall be products of one approved manufacturer or joint manufacturers program and approved for use in their extended warranty program. The Contractor and Manufactured shall jointly provide the Owner an extended warranty of the installed system against defects in material or workmanship; provide a copy of contractor certification.

G. The manufacturers model numbers, functions, and features described in this specification section are those of the Panduit and General Cable PanGen Plus 6 and 6A Structured Cabling Solution with a 25 year warranty (no exceptions) per District standards, no exceptions, and this shall constitute the quality and performance of the equipment to be furnished.

2.4 SYSTEM DESCRIPTION

A. Provide a copper data structured cabling system that meets and exceeds the Category 6 or Category 6A standards as indicated and shall provide improved electrical performance by reducing harmful NEXT and Alien NEXT interference.

1. The Category 6 data network copper cabling system runs shall support up to 1-Gigabit Ethernet using parallel transmission schemes.
2. The Category 6A data network copper cabling system (wireless access point drops only) runs shall support up to 10-Gigabit Ethernet using parallel transmission schemes.

B. Each jack shall be terminated and mounted in a suitable faceplate for all wall, enclosure, millwork, floor box, modular furniture, etc. locations.

C. All wall plates shall have machine printed labels meeting EIA/TIA 606 standards inserted behind built-in clear plastic windows, or engraved plastic nameplates

permanently attached, indicating cable run identification number(s). Engraved labels shall be 1/16" thick two ply black/white acrylic sheet engraving stock with all sides beveled.

D. All jacks shall be suitable for data grade use; only the rating, color, icons, and marking cable shall be different.

E. This system shall allow all the additional equipment required to complete the telephone system and computer network to be plugged in. This specification section does not specify or include any electronic equipment, telephone switching units or cross connect, telephone sets, modular telephone cords, network switching equipment, routers, fiber transceivers, network interface cards, computers, or software that constitute a complete computer network or telephone system.

F. All jacks shall be shielded 8-pin modular female connectors (RJ-45). All cabling and connectors provided shall meet and be tested to TIA/EIA 568-A Style B, Category 6 or Category 6A/Class EA requirements.

G. All Category 6 data, telephone card access, clock, and camera jacks shall be wired with Category 6 copper cable supporting data transmission rates up to 250 MHz Media shall be 4-pair (8-wire), 100 Ω unshielded twisted pair (UTP) cable. All related cabling, terminations and devices shall meet and be tested to Category 6 standards.

H. All Category 6A wireless access point jacks shall be wired with Category 6A UTP unshielded twisted pair copper cable supporting data a transmission rate of 500 MHz Media shall be 4-pair (8-wire), 100 Ω unshielded twisted pair (UTP) cable. All related cabling, terminations and devices shall meet and be tested to Category 6A standards.

I. The cable plant will provide the permanent part of the building wiring (cable plant) required to provide connection for telephones, IP devices, and network computers.

2.5 WALL PLATE COLOR

A. Color of device/wall plates to best match project light switches and electrical outlets, coordinate with the Electric Contractor.

2.6 COLOR-CODING

A. Station (horizontal) cabling jackets shall be color-coded as follows:

1. Orange Category 6 (data) – All Lighting Control Cable.
2. [Color as selected by owner] – All scoreboard and timing systems network cabling.
3. [Color as selected by owner] – All video display systems network cabling.

B. Patch cords and jacks are to be color coded as follows and the jacks in the patch panels are to be grouped together for each designated color and use:

1. Orange, Lighting Controls, Category 6.

2.7 CABLE RUN DESIGNATOR LABELING SCHEME

A. Each patch panel jack, wall plate jack, terminal cabinet connector, and both ends of each cable run shall be labeled with a cable scheme run designator utilizing self-laminating, flexible vinyl film, non-smear, machine printed labels installed according to EIA/TIA 606 standards. Utilize a DYMO Rhino 5200 Label Printer or equivalent. All labeling shall conform to industry standards and best practices.

B. Labeling types and scheme and shall be verified and coordinated with the MISD Technology department prior to any installation.

2.8 DATA/TELEPHONE CABLING PLAN

A. Provide adjacent to the equipment rack in each MDF and IDF a plan view of all building areas covered by the equipment closet meeting the following requirements:

1. Framed and secured to the wall and plan covered with clear acrylic panel.
2. Size to clearly show all required information.
3. "YOU ARE HERE" indicator with arrow.
4. Room names and numbers. Verify with Owner.
5. Show each device with symbol and identification address number as designated by owner.
6. Symbol legend.
7. True north arrow
8. Scale indicator

2.9 DATA/DESK TELEPHONE STATION WALL PLATES AND JACK INSERTS

A. Provide multiple jack modular wall plates where shown on plans or required. The number next to symbol on plans indicates the quantity of data lines/jacks at that location, single outlets are not numbered. The back of each jack wiring device shall have color-coded insulation displacement contact (IDC) type connections. The front shall have eight-position modular jack (RJ-45) and utilize T568B pin/pair assignments. One jack shall be provided at the end of each cable run. Each data or telephone jack shall be terminated and mounted in a suitable faceplate for all wall, enclosure, millwork, floor box, modular furniture, etc. locations. All terminations shall be made per the manufacturers' instructions with Panduit part number CWST wire snipping and stripping tool, and EGJT termination tool, or equivalent.

B. Data RJ-45 inserts to be Category 6 Panduit part number CJ688TGBU, Mini-Com TX6 Plus, blue color, Category 6 Mini-Com modular jacks.

C. CCTV Camera RJ-45 inserts to be Category 6 Panduit part number CJ688TGGR, Mini-Com TX6 Plus, green color, Category 6 Mini-Com modular jacks.

D. Wireless Access Point RJ-45 inserts to be Category 6A Panduit part number CJ6X88TGYL yellow color, Category 6A Mini-Com 10Gig modular jacks.

E. Provide blanks for unused ports to be Panduit part number CMBXX-X, Mini-Com Blank Modules.

F. Use a single gang faceplate with label window for all standard wall outlets, use NEMA duplex or Decora style frames as required for floor boxes, surface raceway, etc.

1. Single gang faceplate with label window for up to two Mini-Com Modules Panduit part number CFPE2XXY.
2. Single gang faceplate with label window for up to four Mini-Com Modules Panduit part number CFPE4XXY.
3. NEMA duplex style faceplate frame for up to two Mini-Com Modules Panduit part number CF1062XXY.
4. NEMA duplex style faceplate frame for up to four Mini-Com Modules Panduit part number CF1064XXY.
5. Decora style faceplate frame for up to two Mini-Com Modules Panduit part number CFG2XX.
6. Decora style faceplate frame for up to four Mini-Com Modules Panduit part number CFG4XX.
7. Modular furniture faceplates for up to four Mini-Com Modules Panduit part number UICFFP4XX.

2.10 LIGHTING CONTROL SYSTEM WIRELESS CONTROLLER S LOCATIONS AND JACKS

A. Provide a surface mount housing Panduit part number CBXQ2XX "biscuit block" for one or two Mini-Com Modules (two Category 6A jacks for wireless access points) with Category 6/Category 6A non-keyed RJ-45 data jack, and Category 6/Category 6A cable to nearest MDF/IDF patch panel.

B. For drop ceiling mounting locations, surface mount housing to be mounted to structure or equivalent concealed above the finished ceiling.

C. For open structure mounting locations, provide a Wiremold/Legrand model WAPBRKT overhead device bracket with removable cover. The bracket shall be constructed of galvanized steel with a large capacity device compartment: 12 3/4" long x 9 1/2" wide x 3 1/8" deep. The bracket shall be securely attached to the overhead building structure by the included strap hardware or by an all thread rod.

2.11 SCOREBOARD SYSTEM CONTROLLER S LOCATIONS AND JACKS

A. Provide a surface mount housing Panduit part number CBXQ2XX "biscuit block" for one or two Mini-Com Modules (two Category 6A jacks for wireless access points) with

Category 6/Category 6A non-keyed RJ-45 data jack, and Category 6/Category 6A cable to nearest MDF/IDF patch panel.

B. For drop ceiling mounting locations, surface mount housing to be mounted to structure or equivalent concealed above the finished ceiling.

C. For open structure mounting locations, provide a Wiremold/Legrand model WAPBRKT overhead device bracket with removable cover. The bracket shall be constructed of galvanized steel with a large capacity device compartment: 12 3/4" long x 9 1/2" wide x 3 1/8" deep. The bracket shall be securely attached to the overhead building structure by the included strap hardware or by an all thread rod.

2.12 VIDEO DISPLAY CONTROLLER S LOCATIONS AND JACKS

A. Provide a surface mount housing Panduit part number CBXQ2XX "biscuit block" for one or two Mini-Com Modules (two Category 6A jacks for wireless access points) with Category 6/Category 6A non-keyed RJ-45 data jack, and Category 6/Category 6A cable to nearest MDF/IDF patch panel.

B. For drop ceiling mounting locations, surface mount housing to be mounted to structure or equivalent concealed above the finished ceiling.

C. For open structure mounting locations, provide a Wiremold/Legrand model WAPBRKT overhead device bracket with removable cover. The bracket shall be constructed of galvanized steel with a large capacity device compartment: 12 3/4" long x 9 1/2" wide x 3 1/8" deep. The bracket shall be securely attached to the overhead building structure by the included strap hardware or by an all thread rod.

2.13 INTERIOR SINGLE MODE FIBER OPTIC DATA BACKBONE CABLE (ARMORED)

A. Single mode fiber optic interior data runs shall consist of twelve-fiber optic cable assemblies with 900µm tight buffered fibers, Indoor Interlocking Armored Cable construction with strength elements. Single-mode glass strands shall be 8.3µm single-mode optical fiber. Outer jackets shall provide 2,000 N/cm crush resistance and 2,000 impacts w/1.6 N-cm impact resistance.

B. Provide twelve (12) strand single-mode fibers per run with all fibers terminated with LC duplex style connectors and bulkhead splice bushings at each end. Labeling shall note cable type, run designation, "Tx" for the transmit fiber connectors, and "Rx" for the receive fiber connectors.

C. Single mode cable shall be General Cable Part Number AP0121PNU-ILPA Opti-Core Fiber Optic Indoor Interlocking Armored Central Cable, 12-fiber, yellow color jacket, OS2, single mode plenum rated distribution cable.

2.14 INTERIOR MULTIMODE FIBER OPTIC DATA BACKBONE CABLE (ARMORED)

A. Interior data backbone runs shall consist of twelve multi-mode fiber optic cable assemblies with 900µm tight buffered fibers, Indoor Interlocking Armored Cable construction with strength elements. Multi-mode glass strands shall be 50/125/900 µm 10Gig OM4 laser optimized optical fiber. Outer jackets to provide 2,000 N/cm crush resistance and 2,000 impacts w/1.6 N-cm impact resistance.

B. Provide twelve (12) multi-mode fibers per run with all fibers terminated with duplex LC style connectors and bulkhead splice bushings at each end. Labeling shall note cable type, run designation, "Tx" for the transmit fiber connectors, and "Rx" for the receive fiber connectors.

C. Multi-mode cable shall be General Cable Part Number BL0121PNU-ILPA Opti-Core Fiber Optic Distribution Cable, 6-fiber, aqua color, 10Gig 50/125µm (OM4) armored multi-mode plenum rated distribution cable.

2.15 INDOOR/OUTDOOR SINGLE-MODE FIBER OPTIC DATA BACKBONE CABLE (ARMORED)

A. Exterior data backbone runs shall consist of twelve-fiber single-mode optic cable with loose tube fibers, 125µm buffer coating, interlocking aluminum armored construction, UV resistant cable sheathing and Dry water-blocking technology. Single-mode glass strands shall be 9/125µm OS2 optical fiber. Outer jackets to provide 2,000 N/cm crush resistance and 2,000 impacts w/1.6 N-cm impact resistance.

B. Provide twelve (12) single-mode fibers per run with all fibers terminated with duplex LC style connectors and bulkhead splice bushings at each end. Labeling shall note cable type, run designation, "Tx" for the transmit fiber connectors, and "Rx" for the receive fiber connectors.

C. Portions of fiber optic backbone cables run underground shall be fully enclosed in continuous underground or overhead conduit for additional protection.

D. Single-mode Plenum Rated Indoor/Outdoor Interlocking Armored Cable shall be General Part Number AP0121ANU-ILPA 12-fiber 9/125µm (OS2) distribution cable.

E. At the MDF termination end for each run, install a Panduit part number ACG24K Interlock-Armor Cable Grounding Kit or equivalent connected to the telecommunications room ground bar.

2.16 INDOOR/OUTDOOR MULTI-MODE FIBER OPTIC DATA BACKBONE CABLE (ARMORED)

A. Indoor/Outdoor data backbone runs shall consists of 10Gig 50/125µm (OM4) interlocking aluminum armored indoor/outdoor multi-mode fiber cable with dry water-blocking technology, and a UV-resistant outer jacket. Multi-mode glass strands shall be 50/125/900 µm 10Gig OM4 laser optimized optical fiber. Outer jacket shall provide 110 N/cm 100 cycle crush resistance and 2 cycle at 44.1 N/cm impact resistance.

B. Provide twelve (12) strand multi-mode fibers per run with all fibers terminated with duplex LC style connector bulkhead splice bushings at each end. Labeling shall note cable type, run designation, "Tx" for the transmit fiber connectors, and "Rx" for the receive fiber connectors.

C. Portions of fiber optic backbone cables run underground shall be fully enclosed in continuous underground or overhead conduit for additional protection.

D. Multi-mode Plenum Rated Indoor/Outdoor Interlocking Armored cable shall be General part number BL0121ANU-ILPA Opti-Core Fiber Optic Indoor/Outdoor Cable, 12 fiber, 10Gig 50/125µm (OM4).

E. At the MDF termination end for each run, install a Panduit part number ACG24K Interlock-Armor Cable Grounding Kit or equivalent connected to the telecommunications room ground bar.

2.17 RACK MOUNT FIBER OPTIC TERMINATION CABINETS

A. Provide in racks requiring fiber optic cable termination a rack mount cabinet with removable door and cover for easy access. Shall contain a fiber radius hoop, integral strain relief bars, and plastic grommets at each cable entrance and exit. Cabinet to be 18-gauge steel, dual compartment, with a dividing plate fitted with pre-drilled coupler plates for LC duplex style bulkhead connectors. Mount in the top of rack, above the patch panels. Size for the number of terminations required plus 25% spare fiber optic connector mounting holes. To be rack mount Panduit OPTICOM QuickNet, FRME4 in the MDF and FRME1U in the IDF locations.

B. For MDF to IDF single mode fiber runs, provide Panduit LC OPTICOM part number FAP6WBUDLCZ LC, FAPs loaded with six LC duplex 9/125µm single mode fiber (OS2) fiber optic adapters (Blue) with zirconia ceramic split sleeves.

C. For MDF to IDF multi-mode fiber runs, provide Panduit LC OPTICOM™ part number FAP6WAQDLC, 10Gig 50/125µm (OM4) multi-mode Fiber Adapter Panels (FAPs) loaded with six LC duplex multi-mode fiber optic adapters.

D. Mount on the lower portion of each rack one AC outlet strip. Provide a Tripp Lite part number IBAR12-20ULTRAhorizontal power strip.

E. All termination cabinets shall bear a warning label similar to the following: CAUTION - Never look into the end of a fiber optic cable or connector when using laser light output. Permanent eye damage can result. When cabinet is open wear eye protection and avoid touching unterminated fiber optic cable ends. Fiber fragment splinters can be difficult to remove.

F. Permanently mark terminations with EIA/TIA 606 compliant machine printed labels noting cable type, run designation, "Tx" for the transmit fiber connectors, and "Rx" for the receive fiber connectors.

2.18 FIBER OPTIC JUMPERS

A. For the new single mode fiber backbone runs, provide two (2) duplex fiber optic patch cords in each closet. Fiber Optic jumpers shall be Panduit part number F92ELNLNSNM002, 2 meter lengths.

B. For the new multi-mode fiber backbone runs, provide two (2) duplex fiber optic patch cords in each closet. Fiber Optic jumpers shall be Panduit part number FX2ERLNLNSNM002, 2 meter length.

2.19 19" OPEN EQUIPMENT RACKS

A. In the MDF, provide two (2) Four Post Racks, to accommodate the drop count and owner provided network equipment. In each IDF, provide at least two (2) Two Post Racks as required to accommodate the drop count. Dimensions to be 84" high x 19” wide, with 6” wide uprights with cable management provisions and rack space "U" identification markers. Rack shall be securely bolted to the floor and the overhead ladder rack. Four post rack to be Chatsworth Product Inc. (CPI) Part No. 15217-703 Cable Rack. Two post rack to be CPI part no. 55053-703.

B. Mount of each side of each rack, one vertical cable organizer with black finish. Provide Panduit Vertical Cable Mangers part number PR2VD10 for cable quantities with front and rear doors.

C. Ladder type cable tray shall be routed over all floor mounted racks from wall to wall, provided all necessary hardware to attach the ladder rack to the top of the floor rack and to the walls. All field cuts shall be filed smooth, dressed square, and painted to match. Utilize tray splicing, support, and coupling hardware supplied by and installed as recommended by the manufacturer. Cable tray and rack shall be securely supported and grounded. Cable tray shall be of heavy duty tubular steel construction with black powder coat finish, 18" wide, with cross members at 12" intervals. Provide CPI part

number 10250-718 Tubular Runway. At the top of each rack, provide a CPI part number 10506-718 6” elevation kit, CPI part number 10595-718 Top Plate and CPI part number 12101-711 Radiused Drop Out Waterfall. At each wall, provide a CPI part number 11421-718 18” Angle Wall Support Bracket. Provide single support hanger brackets and 5/8” all-thread rod hanger supports from the building structure at any span that exceeds 60” from other support (rack and wall mounting locations), at intervals of 60” on center maximum.

D. Mount fiber termination cabinets in the top portion of the rack and then the patch panels. Reserve the lower 50% of rack space for mounting of network electronics by the Owner.

2.20 WIRELESS ACCESS POINTS

A. These shall be owner furnished and contractor installed (OFCI).

2.21 IP EMERGENCY STROBES

A. Provide and install the following IP Emergency Strobe devices in large areas as noted on plans. Owner shall provide programming of device into the Informacast system. Refer to plans for locations and quantities.

1. ALGO Model 8128 SIP Strobe Light.

2.22 IDF EQUIPMENT BACKBOARDS

A. Provide a 4' x 8' x 3/4" C/D, exterior grade, plywood panel(s) as required, anchored to wall as required at no less than six points per panel. Equipment backboards are to be attached to wall studs or internal bracing with 1/4” minimum toggle bolts with washers. Plywood shall be new. Paint with fire retardant paint meeting UL 723 requirements - two full coats - color to be white unless otherwise directed by Architect.

2.23 GROUNDING

A. In the new intermediate (secondary) telecommunications room (IDF) provide a 1/4" x 4" x 10” to 12" long copper ground bar with insulated wall mounting brackets - Panduit part number GB4B0612TPI-1, Newton Instrument Company ordering number 0030580010, or approved equivalent.

B. The telecommunications grounding backbone, #2 AWG insulated wire minimum, shall bond each telecommunications ground bar to the building ground system.

2.24 CABLE ROUTING AND INSTALLATION

A. System wiring and equipment installation shall be in accordance with good engineering practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical code requirements.

B. The performance of the provided cabling system will be required to support of the 10Gig network 10GBASE-T standard. The contractor shall avoid outdated industry practices that can create worst-case conditions regarding heat dissipation and alien crosstalk. This includes the practice in which a large number of cables are routed together in a smooth very tightly packed form and the bundles are tie wrapped at close intervals (usually referred to as a "combed and laced"). A 10GBASE-T solution requires:

1. Cable management strap installation shall not exceed 3 times per meter (once every foot). Plastic Tie wraps shall never be used. Cable management straps must not distort the cable jackets.
2. Cable tray vertical depths no more than 6 inches, with hardware providing sweeping edges and well controlled entry points.
3. Limit UTP cable bundles to 48 cables.
4. Equipment cords may be bundled by combing to eliminate crossovers and may be tie wrapped, although separate minimum lengths may be required. Bundling is typical for long equipment cords. Cross-connect cords and work area cords shall not be combed and bundled, these cord applications shall be randomly placed or routed separately.

C. For initial installation, the maximum fill capacity for pathways (i.e. conduit, raceways, trays, baskets) shall be 40 percent.

D. Cable pathways, conduit, and cable support systems shall be complete with bushings, deburred, cleaned, and secure prior to installation of cable.

E. All wiring shall test free from opens, grounds, or shorts. All communications cable shall be supported from the building structure and bundled. Do not attach any supports to joist bridging or other lightweight members.

F. The support system shall provide a protective pathway to eliminate stress that could damage the cabling. The cable shall not be crushed, deformed, skinned, crimped, twisted, or formed into tight radius bends that could compromise the integrity of the cabling.

G. Communications cable must not be fastened to electrical conduits, mechanical ductwork/piping, sprinkler pipes, or routed to obstruct access to hatches, doors, utility access panels, or service work areas. Do not route cables through fire doors, ventilation shafts, grates, or parallel with line voltage electrical conductors. Communication cables shall not be run loose on ceiling grid or ceiling tiles.

H. Support shall be provided by mounting appropriate fasteners that may be loaded with multiple cables. Provided that the weight load is carried by the support rod or wire, the support assembly may attach to the ceiling grid for lateral stabilization. The required support wires for the ceiling grid or light fixtures shall not be utilized. Any fastener attached to the ceiling grid shall not interfere with inserting or removing ceiling tiles. The cable pathway of supports must be positioned at least 12 inches above the ceiling grid.

I. Communication cables shall be run in conduits, where stubs are provided, from wall or floor jacks to accessible areas above finished ceilings. Conduit shall be required only within walls and concealed spaces to provide access.

J. Provide bushings to protect the cable from damage for conduit ends, box openings, and passage through metal studs.

K. Communication cables shall be run in bundles above accessible ceilings and supported from building structure. Limit UTP cable bundles to 48 cables. Cabling shall be loosely bundled with cable Velcro hook ties randomly spaced at 30 to 48 inches on center, cable ties shall not be tight enough to deform cabling and shall not be used to support the cabling.

L. Both ends of all cables, all terminal blocks, patch panels, and network system components shall be labeled utilizing self-laminating, flexible vinyl film, non-smear, machine printed labels according to EIA/TIA 606 standards. Utilize a Panduit PanTher™ LS8E Printer or equivalent.

M. Each cable run shall include a three-foot service loop with Velcro hook ties located in the ceiling above the rack. This is to allow for future re-termination or repair.

N. All cabling shall be placed with regard to the environment, EMI/RFI interference, and its effect on communication signal transmission.

O. Non-conductive fiber optic cable is immune from EMI/RFI interference. Give priority when selecting a route to minimize exposure to possible cable damage from maintenance or service of all systems in the attic space.

P. Do not route any data cable within two feet of any light fixture, HVAC unit, service access area, electric panel, or any device containing a motor or transformer.

Q. Communication cable will not be installed in the same conduit, raceway, tray, duct, or track with line voltage electrical cable without a metallic barrier meeting NEC requirements.

R. Maximum cable pulling tension should not exceed 25 pounds force (110 N) or the manufactures recommendation, whichever is less.

S. Any pulling compounds utilized must be thin film lubricants approved by the cable manufacturer and shall not degrade the strength or electrical characteristics of the cable.

T. No terminations or splices shall be installed in or above ceilings.

U. Cable bends shall not be tighter that the manufacturers' suggested bend radius.

V. Mount all equipment firmly in place. Route cable in a professional, neat and orderly installation.

W. Provide for adequate ventilation to all equipment racks and take precautions to prevent electromagnetic or electrostatic hum.

2.25 UTP CABLE TERMINATION PRACTICES

A. Insulation Displacement Contact (IDC) connectors shall be used and installed per the manufactures' recommendations.

B. Strip back only as much cable jacket as required to terminate.

C. Preserve wire-pair twists as closely as possible to point of termination (0.5" maximum) to keep signal impairment to a minimum.

D. Avoid twisting cable jacket during installation.

E. Take care to insure all data UTP wiring devices are installed as T568B wiring, T568A devices use a different pair assignment and should not be mixed.

F. Panduit part number CWST wire snipping and stripping tool, and EGJT termination tool, or equivalent.

G. Score for removal approximately 3" of cable jacket using a manufacturer's recommend stripping tool set to cut through the outer jacket. Note that the suppression barrier tape is not to be grounded.

H. Gently bend the cable's jacket back and forth to free it and remove that portion of the outer jacket.

I. Snip the end of the suppression barrier tape, split it, fold it down and trim it even with the outer jacket.

J. Bend back the four pairs and cut the center spline. It is not necessary to provide a completely flush cut as attempting to do so may damage the conductors.

K. Trim the pairs to length per the per the manufactures' recommendations.

L. Without untwisting or pre-arranging the pairs, feed each pair into the correct opening in the jack stuffer housing.

M. Push the cable fully into the jack stuffer housing.

N. Trim the pair ends of with the manufactures' recommended trimming tool.

O. Loosen the pair twists only enough to seat the conductors into the color-coded IDC slots.

P. Snip off the conductor ends flush with the jack stuffer housing.

Q. Insert the stuffer housing into the jack outer housing and clamp them tight using the manufactures' recommended termination tool.

R. Once the other end of the cable is terminated, test the cable from end to end with a cable tester. Be sure that all eight conductors have proper connection.

S. Data and Telephone Cable UTP T568B, Identical to AT&T 258A and WECO, Pin/Pair Assignments (All RJ-45 modular jacks):

Pin:	Line/Pair:	Color:
1	Tx 2	White/Orange Band
2	Rx 2	Orange
3	Tx 3	White/Green Band
4	Rx 1	Blue
5	Tx 1	White/Blue Band
6	Rx 3	Green
7	Tx 4	White/Brown Band
8	Rx 4	Brown

2.26 OPTICAL FIBER CABLE INSTALLATION AND TERMINATION PRACTICES

A. The following fiber optic connector installation methods are acceptable; fusion splice connection of factory made pigtail connectors, epoxy/polish style connectors, or non-epoxy compression cam gel style connectors. In each case, the connector manufactures' instructions shall be followed and the recommended tools and supplies, including break out kits when required, shall be used for termination and testing. All Fiber strands to be terminated including future use pairs.

B. During optical fiber connector termination, visually inspect all terminations with a 200 power microscope (minimum). Follow all of the connector manufacturers' recommendations. Unacceptable flaws in the terminations will include, but not be limited to, scratches, full or partial cracks, bubbles, pits, or residual dirt, dust, oil, moisture, grinding or sanding debris in the connector. The acceptable final inspection shall show a connector tip that is properly aligned and free of imperfections in 100% of the core and 80% of the cladding. Any connectors that fail testing shall be inspected and re-tested after rework.

C. During installation of optical fiber cable, do not allow pulling tension to exceed cable manufacturers' specification for the cable being installed. Only the strength member of the cable shall be subjected to the pulling tension.

D. Clean all optical fiber connector tips prior to inserting them into mating receptacles or bulkheads and re-install dust covers. Clean the tester launch cord prior to each insertion, as well.

2.27 CABLE SUPPORT

A. Conduit, duct, or track shall be used for communication cable in exposed areas.

B. Cable fill shall not exceed the manufacturers' instructions for each type of support.

C. All conduit, ducts, track, and raceways shall be supported from the structure at industry standard intervals for the size specified, utilizing proper anchoring devices.

D. Solid, ladder, or mesh cable tray/duct shall be required for narrow depth cable routes that would allow sags to rest upon the ceiling, electrical conduits, HVAC equipment, ducts, or lighting fixtures.

E. Vertical cable runs exceeding 12" in equipment closets shall require ladder or mesh type cable support tray. Attachment shall utilize appropriate mounting hardware and accessories for vertical placement and allow a minimum of 2" clearance between the wall and runway. Cable attachment shall be made by Velcro hook ties in a basket type configuration.

F. All vertical supports shall be attached to the building support structure or concrete ceiling with anchors load rated for 100-lbs. minimum. Down rods shall be a minimum of 1/4" diameter. Steel uni-strut cross supports shall be 2" minimum.

G. Cable runway or tray shall be grounded to an appropriate building ground at each end and bonded at each joint.

H. Rubber or plastic boots shall be installed at the ends of horizontal support rails to prevent cable damage or injuries to personnel.

2.28 BUSHINGS

A. Provide a plastic snap in bushing at each box opening, passage through a metal stud, and at the end of all open conduit stubs or sleeves prior to cable installation to protect the cabling from damage:

1. Box openings - Thomas & Betts Knockout Bushing Series 3210, or equivalent.
2. Metal stud passage - Thomas & Betts Twist It Bushing Catalog Number SB1216-SC, or equivalent.

3. Conduit ends - Thomas & Betts Anti-Short Bushing Series 390 or Tite-Bite Combination couplings Series 442, or equivalent.

2.29 J-HOOKS

A. Attachments for cabling support shall be spaced at approximately 48 to 60 inches on center. Cable bundles shall not be allowed to sag down more than 12-inches mid-span between attachments.

B. All attachments shall be approved for Category 6A cabling. Attachments shall be Caddy part numbers as follow, or equivalent, sized as follows:

1. CAT16HP, 1" diameter Capacity 7 to 10 Category 6A cables.
2. CAT21HP, 1.31" diameter Capacity 12 to 24 Category 6A cables.
3. CAT32HP, 2" diameter Capacity 25 to 35 Category 6A cables.
4. CAT48HP, 3" diameter Capacity 48 Category 6A cables.
5. Split bundles greater than 48 cables (maximum allowed bundle size) or provide cable tray.

C. Do not mix different signal strength cables on the same J-Hook (i.e. fire alarm with data and telephone cable). Multiple J-Hooks can be placed on the same attachment point, up to the rated weight load of the attachment device.

2.30 CABLE TIE WRAPS

A. Hook and loop cable management straps shall be furnished and installed to manage wire bundles as required. Straps shall be installed loosely to not deform or support cable.

B. Velcro hook cable ties shall be furnished and installed to attach wire bundles to supports and for appropriate wire management as required. Provide and install Panduit TAK-TY Plenum rated cable ties or equivalent.

C. Saf-T-Grip® Open Loop Series or equivalent for free vertical hanging cable. Chastworth Products Inc. part number 02006-201 Open Loop, 6" long (for 2" diameter bundles)

D. Saf-T-Grip® End Grommet Buckle Series or equivalent to mount cable along walls, backboards, and horizontal cable runs. Chastworth Products Inc. part number 05006-201 End Grommet & Buckle, 6" long (for 2" diameter bundles)

E. Hard plastic or metal tie wraps will not be allowed on any data cable (Category rated twisted pair).

2.31 MEASURING PULLING TAPE (MULE TAPE)

A. All future use innerduct and conduit cable pathways shall include a Measuring Pulling Tape (Mule Tape) made of woven Polyester, Aramid, Kevlar, or an equivalent fiber blend. Measuring Pulling Tape shall have a minimum tensile strength of 1250 lbf. or as required and shall be pre-lubricated for prevention of burn though and marked for measuring in feet. Measuring Pulling Tape installed in underground pathways shall incorporate a 22-gauge minimum solid corrosion resistant copper conductor for use in radio signal locating procedures.

2.32 LADDER TYPE CABLE TRAY

A. Ladder type cable tray shall be routed over all floor-mounted racks from wall to wall, provide all necessary hardware to attach the ladder rack to the top of the floor rack and to the walls. All field cuts shall be filed smooth, dressed square, and painted to match. Utilize tray splicing, support, and coupling hardware supplied by and installed as recommended by the manufacturer. Cable tray and rack shall be securely supported and grounded. See 19” Open Equipment Racks section.

2.33 CABLE TRAY (INSTALLED IN IT/CYBER SEC LAB)

A. Mesh constructed cable tray systems shall be utilized for high capacity and special pathway support requirements. Mesh cable tray shall be constructed from steel wires. All edges and welds are to be smooth and free of burs or sharp edges. Mesh tray assemblies shall be zinc plated after fabrication. All field cuts shall be filed smooth, dressed square, and touched up with zinc bearing paint to prevent rust formation. Mesh openings shall not exceed 2” x 4”. Provide size 6” wide x 2” deep as required for a 50% maximum initial fill rate. Provide straight sections, vertical offsets, tees, crosses, radiused bends, reducers, and radiused dropouts/waterfalls as required. Utilize tray splicing, support, and coupling hardware supplied by and installed as recommended by the manufacturer. Support from building structure. Provide WBT WBT2X6 series as required.

2.34 FIRE OR DRAFT STOPPING, PENETRATIONS, AND CORING

A. UL Listed fire stopping methods that match the fire rating of the wall or floor being penetrated are to be used at all fire barrier penetrations. Seal the interior of the conduit sleeve around the cables and around the outside of the sleeve on each side of the penetration with fire-stop caulk or putty, install according to the manufacturers’ instructions.

B. All penetrations through fire rated walls or floors shall feature a suitable length of metal conduit. Hole diameter shall not exceed ½” larger than the conduit or sleeve to be installed. The hole shall be neatly cut, not oversize or irregular. Do not share wall/floor penetrations with ductwork, piping, line voltage electrical conduits, etc.

C. All gypsum board or plaster penetrations shall tool cut using an appropriate hole saw mandrel or manufactured assembly.

D. Draft/Noise Stopping - This Contractor prepares for and applies draft/noise stopping to all non-rated wall penetrations. Draft/Noise stopping shall minimize the movement of air and sound from enclosed areas to other parts of the building. This shall include but not limited to:

1. Neatly cutting all non-rated wall/floor penetrations with a 1" maximum clearance. All gypsum board or plaster penetrations shall tool cut using an appropriate hole saw / mandrel or manufactured assembly. The hole shall be neatly cut, not oversize or irregular. Do not share wall/floor penetrations with two types of ductwork, piping, line voltage electrical conduits, communications cabling, etc.
2. Provide and install non-combustible mineral wool, fiberglass, cellulose insulation, caulk, and sealant as required. Seal the interior of conduit sleeves around the cables and around the outside of the sleeve on each side of the penetration with caulk or putty, install according to the manufacturers' instructions.

E. The Contractor shall make every effort to coordinate with the building Architect, Engineer, Builder and Electrical Contractor to have sleeves placed in new construction so that later coring or drilling of building structural members will not be required. The Contractor must consult with the building Architect, Engineer, and Builder prior to drilling, coring, or sawing of any wall, floor, etc. All penetrations shall be made at approved, appropriate, locations.

F. Upon approval, the Contractor shall be required to supply all labor, equipment, tools, and materials to create any additional penetrations, and shall provide the sleeve, temporary and final fire stopping. Special care shall be taken not to stress, overheat, or penetrate any building support member. Coring shall be made with equipment appropriate for the dry penetration of concrete and block materials. Under no circumstances shall penetrations be made utilizing a chisel or percussion type equipment. Concrete, block, or plaster cores shall be made by dry saw/core methods only.

PART 3 - EXECUTION

3.1 WARRANTY, SERVICE, TESTING, CERTIFICATION

A. The Contractor must provide an extended warranty that is inclusive of the Manufacturer's warranty to the Owner covering all network cable and connectivity hardware products comprising this installation site. The Contractor and Manufactured shall jointly provide the Owner an extended warranty of the installed system against defects in material or workmanship for a period of no less than twenty years (period as is customary for the Manufacturer) from the date of substantial completion. Any

equipment or cabling shown to be defective shall be replaced, repaired, or adjusted free of charge. All labor and materials shall be provided at no expense to the Owner.

3.2 UTP CABLE AND LINK TESTING

A. The System Contractor shall make a thorough inspection of the complete installation to ensure the following:

1. Complete and functional system.
2. Installed in accordance with manufacturers' instructions.
3. All cabling shall test free from all grounds, opens, and shorts.
4. A representative of the Owner may be present for all final testing. Coordinate final testing with Owner, schedule as near as possible to acceptance date.

B. Acceptance Testing: Test each conductor of every cable on the reel to verify length and continuity. Cables that have been damaged in transit must be replaced. Installed cable that proves to be defective will be replaced at the contractor's expense.

C. Final Testing: All UTP cabling will be certified to meet and or exceed the specifications as set forth for Permanent Link Testing of all 10GBASE-T electrical parameters including alien crosstalk performance. Testing shall meet TIA/EIA compliant standards appropriate for each device type including:

1. Category 3 and 5e per TIA/EIA-568B / TIA Category 5 (1000BASE-T) per TIA TSB-95 / TIA
2. Category 6-CLASS E/D Permanent Link Testing per TIA TSB-67 / TIA
3. Category 6A/Class EA per TIA/EIA-568B.2-10 / TIA TSB-155 / ISO/IEC 11801 Class C, D, and E / ISO/IEC 11801 Class EA, F / EN 50173 Class C, D, E / EN 50173 Class F / ANSI TP-PMD; Networking Standards: IEEE 802.3 / I.

D. Test alien crosstalk (near-end and far-end loss) for a cabling system using a network analyzer with 100-Ω pair terminations as follows;

1. Frequency range from 1 to 500 MHz (250 MHz for Category 6);
2. The test device consists of two jacks; one jack is connected to a main test unit and the other to a remote test unit; the main test unit and the remote test unit are connected with a field tester communication channel (patch cord or link);
3. Six-around-one cable-bundle configuration throughout the tested length;
4. Cable ties placed 12 inches apart for the entire length of the bundle, except the last 3.2 feet from each end; no cable-tie-induced deformation of the bundle;
5. Modeling four-connector channel configurations using the worst-case maximum and minimum configurations to determine the worst-case for different parameters;
6. Long channels with 90 meters of permanent link, 5 meters between the consolidation point and the telecommunications outlet, 10 meters of patch cords used to connect active equipment and cross-connect panels;
7. Measurement of alien crosstalk (near-end and far-end loss) between all pairs of the middle disturbed cable and each pair of all adjacent cables;
8. Measurement of power sum of all 24 adjacent pair cables.

E. The cable tester shall a UL Level III tester or equivalent with the latest version of firmware and shall produce a printed report, noting label information, for each cable run. These reports are to be included in the close-out documentation. Testing shall be conducted with a Fluke DTX 1800, or equivalent, copper/fiber/OTDR cable analyzer with DTX 10 Gig kit including alien crosstalk communication modules, permanent link adapters, high-performance channel adapters, termination plugs, 8-pin modular couplers and analysis software. Certifications shall include the following parameters from up to 1 to 500 MHz for each pair of each cable installed:

1. Characteristic Impedance 100 Ω +/- 15%
2. Wire map (pin to pin and ground connectivity)
3. Cable Length Permanent Link, station (horizontal) cable from patch panel to jack, should not exceed 295 feet (Channel length not to exceed 328 feet).
4. Attenuation
5. Pair to pair NEXT
6. PSNEXT
7. FEXT (Far end crosstalk)
8. Pair to pair ELFEXT (Equal level far end crosstalk)
9. PSELFEXT
10. Return Loss
11. PSACR
12. Propagation Delay
13. Delay Skew
14. Alien Crosstalk

3.3 OPTICAL FIBER TESTING

A. Acceptance Testing: Test each strand of every optical fiber cable on the reel with an OTDR, to verify length and continuity. Fiber cables that have been damaged in transit must be replaced. Installed fiber cable that proves to be defective will be replaced at the contractor's expense.

B. Final Testing: After termination each individual fiber of each cable segment shall be tested using an OTDR, both to determine the installed length and continuity. All individual fibers of each cable segment will be tested using a power meter to determine the actual loss. These readings will be taken at the 850 nm and 1300 nm windows for Multimode and 1310 nm and 1550 nm windows for single mode. Testing will be in both directions. The final readings shall be listed in the certification report. These readings must not be higher than the "Optimal Attenuation Loss." The OAL will be calculated using the manufacturers' factory certified test results, (dB/Km) converted to the actual installed lengths plus the manufacturers' best published attenuation losses for the connector and/or splice installed on this project. (0.20 for Connectors and 0.10 for

splices.) The OAL shall be used for comparison with the end to end power loss test results prior to acceptance by the construction manager.

C. Fiber optic cable shall be subjected to bi-directional testing meeting EIA/TIA 568B, Section B.3, testing recommendations. The cable tester shall produce a printed report, noting label information, for each cable run. These reports are to be included in the close-out documentation.

3.4 DRAWINGS, MANUALS, AND TRAINING

A. As-built drawings and operating and maintenance manuals may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.

B. Upon completion of the installation, and prior to final inspection, the Contractor shall furnish as-built drawings.

C. In addition, the contractor shall furnish complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets. Manuals shall include wiring diagrams to indicate internal wiring for each device and the interconnections between the items of equipment. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system. Provide a parts list with manufacturer and model number for commonly replaced parts. Include complete instructions for the inspection, testing, and maintenance of the system. Place final cable certification test results in manuals.

D. All cable paths and wiring methodology shall be documented. All cables shall have both ends labeled and included in the as-built documentation. Provide an MS Excel worksheet compatible format spreadsheet file cross referencing all cable run numbers, architectural room number, and owners room number for the origin and destination of each cable run.

E. A formal on-site training session shall be provided by the Contractor to the Owners Representative / Maintenance personnel and shall include instruction on the documentation, location, inspection, maintenance, testing, and operation of all system components. Provide a minimum of two (2) hours of documented general instruction.

END OF SECTION