

**CONTRACT
DOCUMENTS
AND
SPECIFICATIONS**

**PROJECT NAME: BLACK & WILLIAMS
COMMUNITY CENTER ENERGY EFFICIENCY
IMPROVEMENTS**

PREPARED BY: PALADIN, INC.

TABLE OF CONTENTS
CONTRACT DOCUMENTS
BLACK & WILLIAMS COMMUNITY CENTER
ENERGY EFFICIENCY IMPROVEMENTS

Spetember 2011

Part I	Advertisement for Bids
Part II	Information for Bidders
Part III	Form of Proposal
Part IV	General Conditions
Part V	Special Conditions
Part VI	Contract Agreement
Part VII	Performance and Payment Bonds
Part VIII	Technical Specifications
Part IX	Addenda
Addendum #1	Special Terms and Conditions
Addendum #2	Confined Space Program

PART I

ADVERTISEMENT FOR BIDS

INDEX

1. INVITATION
2. DESCRIPTION OF WORK
3. OBTAINING PLANS, SPECIFICATIONS, AND BID DOCUMENTS
4. METHOD OF RECEIVING BIDS
5. METHOD OF AWARD
6. BID WITHDRAWAL
7. BID SECURITY
8. SUBMISSION OF BIDS
9. RIGHT TO REJECT
10. NOTIFICATION FOR AFFIRMATIVE ACTION PLAN AND CURRENT WORKFORCE
11. NOTICE CONCERNING DBE GOAL

ADVERTISEMENT FOR BIDS

1. INVITATION

Sealed proposals for the following work will be received by the Lexington-Fayette Urban County Government until 2:00 p.m., local time, **Thursday, October 6, 2011** for furnishing all labor and/or materials and performing all work as set forth by this advertisement, conditions (general and special), specifications, and/or the drawings prepared by and for Lexington-Fayette Urban County Government, Division of **Facilities & Fleet Management**. Immediately following the scheduled closing time for reception of bids, all proposals which have been submitted in accordance with the above will be publicly opened and read aloud.

2. DESCRIPTION OF WORK

Consisting of the construction and/or furnishing of various items as listed in the Bid Schedule beginning on page **P-7** of this document, plus incidentals necessary to complete the work.

Black and Williams Community Center is located at 498 Georgetown St, Lexington. The two-story building was constructed in 1915 and renovated in 1974 and 1990. Gross floor area is 26,884 square feet, including basement. A detached, one-story gymnasium is also on the property. The gym was constructed in 1928 and renovated in 1980. The floor area of the gym is 5,073 square feet. To improve energy efficiency and building performance, a variable refrigerant volume system shall be installed to replace the current steam boiler heating and thru-the-wall air conditioning systems. The majority of the mechanical work is contained in the main building, while the only work in the detached gym is electrical.

The Lexington-Fayette Urban County Government is responsible for the abatement of hazardous materials. CONTRACTORS are responsible for following the Waste Management Plan presented in Part V(6) and coordinating with the LFUCG project manager, in advance, any work that will disturb the fabric of the building (i.e. walls, floors or ceilings).

CONTRACTORS are responsible for filling or patching holes and penetrations that result from demo or new work. Finish and detail work will be completed by LFUCG staff with the intent that exposed surfaces reasonably match in-place adjacent surfaces.

Variable refrigerant flow multi-split heat pump and air conditioning systems are not subject to the Buy American provision of the American Recovery and Reinvestment Act. The U.S. Department of Energy issued a “non-availability” waiver on May 24, 2010

which is still in effect. This waiver includes the main condenser and heat pump units, wall and fan coil units, zone controllers, remote controls, and any other component of the larger HVAC system. Reference http://www1.eere.energy.gov/recovery/ba_waivers.html

3. OBTAINING PLANS, SPECIFICATIONS, AND BID DOCUMENTS

Plans, Specifications, and Contract Documents may be obtained from Lynn Imaging, 328 Old Vine Street, Lexington, KY 40507, (859) 255-1021 for a non-refundable fee for each full set of plans and documents.

Specifications, Plans, and Bid Documents may be examined at the following places:

Associated General Contractors of KY, Inc.
132 Venture Court, Suite 13
Lexington, Kentucky 405011
(859) 231-8453

Reed Construction Data/ABC
2020 Liberty Road, Suite 110
Lexington, Kentucky 40505
(859) 231-8570

Reed Construction Data/ABC
1812 Taylor Avenue
Louisville, KY 40213
(800) 762-5703

Builders Exchange
of Kentucky
P.O. Box 5398
Louisville, KY 40255-0398

McGraw-Hill Co./F.W. Dodge
2321 Fortune Dr., Ste. 112-A
Lexington, KY 40509

4. METHOD OF RECEIVING BIDS

Bids will be received from Prime Contracting firms on a **Line Item Unit Price and Lump Sum** Basis, for total Project Area. Bids shall be submitted in the manner and subject to the conditions as set forth and described in the Instruction to Bidders and Special Conditions.

5. METHOD OF AWARD

The Contract will be awarded to the bidder who submits the lowest evaluated bid that provides the best value to the Lexington-Fayette Urban County Government, according to the alternative(s) selected by the OWNER. Bid evaluation score sheet is shown on the following page.

Bid #94-2011 Evaluation Scoring Sheet

Bid # 94-2011 Evaluation Sheet					
Consultant Name:					
Selection Criteria	Notes	Total Points	Score(1-5)	Weighted Score	Comment
Special experience, technical capabilities, professional competence, and qualifications of the Offeror and qualifications of proposed personnel assigned to the project. Demonstrated knowledge and understanding of local conditions and all pertinent codes and regulations		10	0		Weighted Score= (Total Points/5)xScore
Expertise and experience of Offeror relative to the specific project. Indicate similar project and/or similar types of projects designed and furnished by the Offeror.		10	0		Weighted Score= (Total Points/5)xScore
Current workload and ability to complete the required work within reasonable time frame.		10	0		Weighted Score= (Total Points/5)xScore
Clearly demonstrated understanding of the work to be performed and completeness and reasonableness of the proposing Offeror's plan for accomplishing the tasks.		10	0		Weighted Score= (Total Points/5)xScore
Past performance on similar projects		10	0		Weighted Score= (Total Points/5)xScore
Estimated cost of services.		50	0		Weighted Score= (Total Points/5)xScore
Final Score		100			

Description	Adjective	Numeric Rating
Fails to meet minimum requirements; major deficiencies which are not correctable	Unacceptable	1
Fails to meet requirements, significant deficiencies that may be correctable	Poor	2
Meets requirements; only minor deficiencies which can be clarified	Acceptable	3
Meets requirements and exceeds some requirements; no deficiencies	Good	4
Exceeds most, if not all requirements; no deficiencies	Excellent	5

6. BID WITHDRAWAL

No bidder may withdraw his bid for a period of sixty (60) calendar days after the closing date for receipt of bids. Errors and omissions will not be cause for withdrawal of bid without forfeit of bid bond. Bids may be withdrawn in person prior to the closing date of receipt of bids.

7. BID SECURITY

All bids shall be accompanied by a bid bond of not less than five percent (5%) of the amount of the bid executed by a Surety Company authorized to do business in the Commonwealth of Kentucky and countersigned by a licensed Kentucky Resident Agent, representing the Surety Company. A certified check or irrevocable letter of credit may be submitted in lieu of a bid bond. Check or bond shall be payable to Lexington-Fayette Urban County Government.

8. SUBMISSION OF BIDS

CONTRACTORS shall submit their bids to the Lexington-Fayette Urban County Government, Division of Purchasing, 200 East Main Street, Room 388, Lexington, Kentucky 40507. Bids shall be submitted in a sealed envelope not later than 2:00 p.m. Local Time **Thursday, October 6, 2011**. Sealed proposals shall be marked clearly on the outside of the container “**Sealed Proposal for: Black & Williams Community Center Energy Efficiency Improvements**” to be opened at 2:00 p.m. Local Time **Thursday, October 6, 2011**. Bids received after the scheduled closing time for receipt of bids will not be considered and will be returned unopened.

Bidding Schedule	
Bid Advertisement	September 1, 2011
PreBid Conference	At 10:00 AM on September 20, 2011
Final Submission of Questions	September 29, 2011
Bid Submission	By 2:00 PM on October 6, 2011
Bid Opening	At 2:00 PM on October 6, 2011

9. RIGHT TO REJECT

The Purchasing Agent for the Lexington-Fayette Urban County Government reserves the right to reject any and all bids and to waive all informalities and/or technicalities where the best interest of the Lexington-Fayette Urban County Government may be served.

10. NOTIFICATION TO THE LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT FOR AFFIRMATIVE ACTION PLAN AND CURRENT WORKFORCE

The successful bidder must submit, prior to award of the bid the following items to the Lexington-Fayette Urban County Government:

1. Affirmative Action Plan for his/her firm.
2. Current Workforce Analysis Form.

Failure to submit these items as required herein may result in disqualification of the Bidder from the award of the contract.

All submissions should be directed to:

Lexington-Fayette Urban County Government
Division of Central Purchasing,
200 East Main Street, 3rd floor, Room 338
Lexington, Kentucky 40507

11. NOTICE CONCERNING DBE GOAL

Notice of requirement for Affirmative Action to ensure Equal Employment Opportunities and Disadvantaged Business Enterprises (DBE) contract participation.

The Lexington-Fayette Urban County Government has set a goal that not less than ten percent (10%) of the total value of this contract be subcontracted to Disadvantaged Business Enterprises. The goal for the utilization of Disadvantaged Business Enterprises as subcontractors is a recommended goal. Contractors who fail to meet such goal will be expected to provide written explanation to the Director of the Division of Central Purchasing of efforts they have made to accomplish the recommended goal, and the extent to which they are successful in accomplishing the recommended goal will be a consideration in the procurement process.

For assistance in locating Disadvantaged Business Enterprises Subcontractors contact :

Marilyn Clark, Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street, 3rd Floor, Room 338
Lexington, Kentucky 40507
(859) 258-3320

PART II
INFORMATION FOR BIDDERS

INDEX

1. RECEIPT AND OPENING OF BIDS
2. PREPARATION OF BID
3. SUBCONTRACTS
4. QUALIFICATION OF BIDDER
5. BID SECURITY
6. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT
7. EXAMINATION OF CONTRACT DOCUMENTS AND SITE
8. ADDENDA AND INTERPRETATIONS
9. SECURITY FOR FAITHFUL PERFORMANCE
10. POWER OF ATTORNEY
11. TAXES AND WORKMAN'S COMPENSATION
12. LAWS AND REGULATIONS
13. PREVAILING WAGE LAW AND MINIMUM HOURLY RATES
14. AFFIRMATIVE ACTION PLAN
15. CONTRACT TIME
16. SUBSTITUTION OR "OR-EQUAL" CLAUSE
17. ALTERNATE BIDS
18. SIGNING OF AGREEMENT
19. ASSISTANCE TO BE OFFERED TO DISADVANTAGED BUSINESS ENTERPRISE
CONTRACTORS

PART II

INFORMATION FOR BIDDERS

1. RECEIPT AND OPENING OF BIDS

The Lexington-Fayette Urban County Government (herein called the OWNER) invites bids from prime contracting firms on the project described in the Advertisement for Bids. The OWNER will receive bids at the Division of Central Purchasing, at the time and in the manner set forth in the Advertisement for Bids, and the Bids will then be publicly opened and read aloud. The OWNER may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 60 days after the actual time and date of the bid opening, but OWNER may, in its sole discretion, release any bid and return the Bid Security prior to that date.

The Lexington-Fayette Urban County Government assumes no responsibility for bids that are not addressed and delivered as indicated in the Advertisement for Bids. Bids that are not delivered to the Division of Central Purchasing by the stated time and date will be rejected.

2. PREPARATION OF BID

Each bid must be submitted on the prescribed Form of Proposal. All blank spaces for the bid prices must be filled in, either in ink or typewritten, for both unit prices and extensions. Totals for each bid item must be added to show the total amount of the bid. Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, their address, the name of the project, the invitation number and time and date for which the bid is submitted. Bids must be addressed to the Director of Central Purchasing, Lexington-Fayette Urban County Government, Room 338, 200 East Main Street, Lexington, Kentucky 40507. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified above, the company name and address, bid invitation number, and the bid title on the outside of the envelope. .

3. SUBCONTRACTS

The bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract must be acceptable to the OWNER. All proposed subcontractors must be identified on the Form of Proposal. Prior to the award of Contract, the OWNER or the OWNER'S representative will advise the CONTRACTOR of the acceptance and approval thereof or of any action necessary to be taken. Should any Subcontractor be rejected by the OWNER, the CONTRACTOR shall present a new name and/or firm to the OWNER at no change in the Contract Price.

4. QUALIFICATION OF BIDDER

The OWNER may make such investigations as deemed necessary to determine the ability of the bidder to perform the Work, and the bidder shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the OWNER that such bidder is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein. Conditional bids will not be accepted.

If the OWNER requires filling out a detailed financial statement, the bidder may provide its current certified financial statement(s) for the required time interval.

Corporate firms are required to be registered with and in good standing with the requirements and provisions of the Office of the Secretary of State, Commonwealth of Kentucky.

Good standing with Public Works Act - any CONTRACTOR and/or subcontractors in violation of any wage or work act provisions (KRS 337.510 to KRS 337.550) are prohibited by Statutory Act (KRS 337.990) from bidding on or working on any and all public works contracts, either in their name or in the name of any other company, firm or other entity in which he might be interested. No bid from a prime contractor in violation of the Act can be considered, nor will any subcontractor in violation of the Act be approved and/or accepted. The responsibility for the qualifications of the subcontractor is solely that of the prime contractor.

5. BID SECURITY

A. Each bid must be accompanied by a bid bond prepared on a Form of Bid Bond and attached hereto, duly executed by the bidder as principal and having as surety thereon a surety company approved by the OWNER, in the amount of 5% of the bid. Such bid bond will be returned to the unsuccessful bidders only upon written request, within seven (7) days of opening of bids, to the Director of Central Purchasing. A certified check or irrevocable letter of credit may be submitted in lieu of a bid bond. Bid bond or check shall be made payable to the Lexington-Fayette Urban County Government.

B. Bonds shall be placed with an agent licensed in Kentucky with surety authorized to do business within the state. When the premium is paid for such coverage, the full commission payable shall be paid to such local agent who shall not divide such commission with any person other than a duly licensed resident local agent.

6. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

The successful bidder, upon his failure or refusal to execute and deliver the Contract and bonds required within ten (10) days after he has received notice of the acceptance of his bid,

shall forfeit to the OWNER, as liquidated damages for such failure or refusal, the security deposited with his bid.

7. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

- A. It is the responsibility of each Bidder before submitting a Bid, to (a) examine the Contract Documents thoroughly, (b) visit the site(s) to become familiar with local conditions that may affect cost, progress, performance or furnishing of the work, (c) consider Federal, State and Local laws and regulations that may affect cost, progress, performance or furnishing of the work, (d) study and carefully correlate Bidder's observations with the Contract Documents, and (e) notify OWNER of all conflicts, errors or discrepancies in the Contract Documents.
- B. Bidders should examine the requirements of section 4 of the General Conditions for information pertaining to subsurface conditions, underground structures, underground facilities, and availability of lands, easements, and rights-of-way. The completeness of data, presented in the Contract Documents, pertaining to subsurface conditions, underground structures, and underground facilities for the purposes of bidding or construction is not assured. The Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (surface and subsurface) which may affect cost, progress, performance or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents. On request in advance, OWNER will provide access to the site to conduct such explorations and tests as each Bidder deems necessary for submission of a bid. Bidder shall fill all holes, clean up and restore the site to its former condition upon completion of such explorations.
- C. The submission of a Bid will constitute an incontrovertible representation by the Bidder that Bidder has complied with every requirement of this paragraph; that without exception the Bid is premised upon performing and furnishing the Work required by the Contract Documents and such means, methods, techniques, sequences or procedures of construction as may be indicated in or required by the Contract Documents; and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

8. ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the Plans, Specifications or other pre-bid documents will be made to any bidder orally. Every request for such interpretation should be in writing addressed to the OWNER, who in turn will have an addendum issued under signature of the Engineer for the Lexington-Fayette Urban County Government, and to be given consideration must be received prior to the opening of bids. Any and all such

interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed or will be faxed with instructions concerning acknowledgment to all prospective bidders. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the Contract Documents.

9. SECURITY FOR FAITHFUL PERFORMANCE

- A. Simultaneously with his delivery of the executed Contracts, the CONTRACTOR shall furnish a surety bond or bonds as security for the faithful performance of this Contract and for payment of all persons performing labor on the Project under this Contract and furnishing materials in connection with this Contract, as specified in the General Conditions. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the OWNER and authorized to do business in the Commonwealth of Kentucky.
- B. All bonds required by this Contract and laws of this State shall be placed with agents licensed in the State of Kentucky. When the premium is paid for such coverages, the full commission shall be paid to such local agent who shall not divide such commission with any person other than a duly licensed resident local agent.
- C. **Contractor shall use Performance and Payment Bond documents provided with this contract book or AIA form A312-1984 (or later). Each document will be for 100% of the contract bid amount.**

10. POWER OF ATTORNEY

Attorney-in-fact who signs bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

11. TAXES AND WORKMEN'S COMPENSATION

The CONTRACTOR and subcontractor will be required to accept liability for payment of all payroll taxes, sales and use tax, and all other taxes or deductions required by local, state or federal law, such as old age pension, social security, or annuities measured by wages. Each shall carry Workmen's Compensation Insurance to the full amounts as required by Statutes and shall include the cost of all foregoing items in the proposal. The CONTRACTOR will not otherwise be reimbursed or compensated for such tax payments. The CONTRACTOR is urged to ascertain at his own risk his actual tax liability in connection with the execution or performance of his Contract.

12. LAWS AND REGULATIONS

The bidder's attention is directed to the fact that all applicable state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over

construction of the Project shall apply to the Contract throughout, and they will be deemed to be included in the contract, the same as though herein written out in full.

13. PREVAILING WAGE LAW AND MINIMUM HOURLY RATES

Federal or state wage rates and regulations, if required for this Project, will be as described in the Special Conditions.

14. AFFIRMATIVE ACTION PLAN

Bidders who frequently bid on Urban County Government projects may file a copy of their firm's Affirmative Action Plan with the Urban County Government. If an Affirmative Action Plan is filed with the Urban-County Government, additional submissions will not be required unless said plan is revised.

A Work Force Analysis Form shall be submitted for each Contract. Failure to submit these items as required herein may result in disqualification of the Bidder from award of the Contract.

All submissions should be directed to:

Director, Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street, Room 338
Lexington, KY 40507

15. CONTRACT TIME

The number of calendar days within which the Work is to be completed and ready for final payment (the Contract Time) is set forth in the Form of Proposal and the Agreement.

16. SUBSTITUTE OR "OR-EQUAL" ITEMS

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or-equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by the CONTRACTOR if acceptable to the ENGINEER, application for such acceptance will not be considered by the ENGINEER until after the effective date of the Agreement. The procedure for submission of any such application by the CONTRACTOR and consideration by the ENGINEER is set forth in the General Conditions.

17. ALTERNATE BIDS

Bidders shall submit alternate proposals only if and when such alternate proposals have been specifically requested in an Invitation for Bids. If alternate proposals are requested in an Invitation for Bids, the form of submission of such alternate proposals and the conditions under which such alternate proposals will be considered for award of a contract will be established in the Invitation.

Any Bidder who submits a bid incorporating an alternate proposal when alternate proposals have not been requested in the Invitation for Bids shall have his/her bid rejected as non-responsive.

Any Bidder who submits a bid incorporating two (2) or more prices for an item or group of items (unless such method of pricing is requested in the Invitation for Bids), or which imposes conditions for acceptance other than those established in the Invitation for Bids, shall have their bid rejected as non-responsive.

18. SIGNING OF AGREEMENT

When OWNER gives a Notice of Award to the successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within ten days thereafter, CONTRACTOR shall sign and deliver the required number of counterparts of the Agreement and attached documents to OWNER with the required Bonds, Certificate of Insurance, and Power of Attorney. The OWNER will deliver one fully signed counterpart to CONTRACTOR at such time as it has been signed by the Mayor.

19. ASSISTANCE TO BE OFFERED TO DISADVANTAGED BUSINESS ENTERPRISE (DBE) CONTRACTORS

I. Outreach

The Lexington-Fayette Urban County Government (LFUCG) maintains a mailing list of DBE contractors and organizations. When a LFUCG construction project is advertised for bidding, notices are sent to the entire mailing list. The notices describe the project, indicate the deadline for submitting bids, and review the bonding assistance which is available.

If you wish to be added to the LFUCG DBE contractor mailing list, please register at <https://lfucg.economicengine.com>.

II. Subcontractors

The LFUCG will, upon request, assist prime contractors in the procurement of eligible DBE subcontractors in an effort to achieve the 10% minimum DBE goal.

For a list of eligible DBE subcontractors please contact:

Candace Wafford, Buyer Sr.
Division of Central Purchasing
200 East Main Street, Room 338
Lexington, Kentucky 40507
(859) 258-3320

III. Questions

If you have questions or wish to have additional information, please contact:

Todd Slatin, Buyer Sr.
Lexington-Fayette Urban County Government
200 East Main Street, 3rd Floor
Lexington, Kentucky 40507
(859) 258-3320

PART III

FORM OF PROPOSAL

INDEX

1. FORM OF PROPOSAL
2. LEGAL STATUS OF BIDDER
3. BIDDERS AFFIDAVIT
4. BID SCHEDULE
5. STATEMENT OF BIDDER'S QUALIFICATIONS
6. LIST OF PROPOSED SUBCONTRACTORS
7. AUTHENTICATION OF BID AND STATEMENT OF NON-COLLUSION AND NON-CONFLICT OF INTEREST
8. STATEMENT OF EXPERIENCE
9. EQUAL OPPORTUNITY AGREEMENT
10. EQUAL EMPLOYMENT OPPORTUNITY AFFIRMATIVE ACTION POLICY
11. EVIDENCE OF INSURABILITY

NOTE:

CONTRACT MAY NOT BE AWARDED IF A COMPLETED AND SIGNED COPY OF THE "EVIDENCE OF INSURABILITY" FORM (LOCATED AT THE END OF PART III) IS NOT PROVIDED.

PART III

Invitation to Bid No. 94-2011

Project Name
Dunbar Community Center Energy Efficiency Improvements

20__

1. FORM OF PROPOSAL

Place: Lexington, Kentucky

Date: _____

The following Form of Proposal shall be followed exactly in submitting a proposal for this Work.

This Proposal Submitted by _____

(Name and Address of Bidding Contractor)

(Hereinafter called "Bidder"), organized and existing under the laws of the State of _____, doing
business as _____
"a corporation," "a partnership", or an "individual" as applicable

To: Lexington-Fayette Urban County Government
(Hereinafter called "OWNER")
Office of the Director of Central Purchasing
200 East Main Street, Room 338
Lexington, KY 40507

Gentlemen:

The bidder, in compliance with your Invitation for Bids for the _____;
Lexington, Kentucky, having examined the Plans and Specifications with related documents, having
examined the site for proposed Work, and being familiar with all of the conditions surrounding the
construction of the proposed Project, including the availability of materials and labor, hereby proposes to
furnish all labor, materials, and supplies, and to construct the Project in accordance with the Contract
Documents, within the time set forth therein, and at the lump sum and/or unit prices stated hereinafter.
These prices are to cover all expenses incurred in performing the Work required under the Contract
Documents, of which this proposal is a part.

The Bidder hereby agrees to commence Work under this Contract on a date to be specified in a written "Notice to Proceed" of the OWNER and to fully complete the Project within _____() calendar days.

The Bidder hereby acknowledges receipt of the following addenda:

Addendum No. _____ Date _____; Addendum No. _____ Date _____

Addendum No. _____ Date _____; Addendum No. _____ Date _____

Addendum No. _____ Date _____; Addendum No. _____ Date _____

Addendum No. _____ Date _____; Addendum No. _____ Date _____

Insert above the number and the date of any Addendum issued and received. If none has been issued and received, the word "NONE" should be inserted.

2. LEGAL STATUS OF BIDDER

Bidder _____

Date _____

* 1. A corporation duly organized and doing business under the laws of the State of _____, for whom _____, bearing the official title of _____, whose signature is affixed to this Proposal, is duly authorized to execute contracts.

* 2. A Partnership, all of the members of which, with addresses are: (Designate general partners as such)

* 3. An individual, whose signature is affixed to this Proposal. (Print name)

*(The Bidder shall fill out the appropriate form and strike out the other two.)

3. BIDDERS AFFIDAVIT

Comes the Affiant, _____, and after being first duly sworn, states under penalty of perjury as follows:

1. His/her name is _____ and he/she is the individual submitting the bid or is the authorized representative of _____, the entity submitting the bid (hereinafter referred to as "Bidder").
2. Bidder will pay all taxes and fees, which are owed to the Lexington-Fayette Urban County Government at the time the bid is submitted, prior to award of the contract and will maintain a "current" status in regard to those taxes and fees during the life of the contract.
3. Bidder will obtain a Lexington-Fayette Urban County Government business license, if applicable, prior to award of the contract.
4. Bidder has authorized the Division of Central Purchasing to verify the above-mentioned information with the Division of Revenue and to disclose to the Urban County Council that taxes and/or fees are delinquent or that a business license has not been obtained.
5. Bidder has not knowingly violated any provision of the campaign finance laws of the Commonwealth of Kentucky within the past five (5) years and the award of a contract to the Bidder will not violate any provision of the campaign finance laws of the Commonwealth.
6. Bidder has not knowingly violated any provision of Chapter 25 of the Lexington-Fayette Urban County Government Code of Ordinances, known as the "Ethics Act."
7. Bidder acknowledges that "knowingly" for purposes of this Affidavit means, with respect to conduct or to circumstances described by a statute or ordinance defining an offense, that a person is aware or should have been aware that his conduct is of that nature or that the circumstance exists.

Further, Affiant sayeth naught.

COMMONWEALTH OF KENTUCKY

COUNTY OF FAYETTE

The foregoing instrument was subscribed, sworn to and acknowledged before me by

_____ on this the _____ day of _____, 20__.

My Commission expires: _____

NOTARY PUBLIC, STATE AT LARGE, KY

4. BID SCHEDULE

The Bidder agrees to perform all the Work described in the Specifications and shown on the Plans for the following lump sum and/or unit prices which shall include the furnishing of all labor, materials, supplies, services, all items of cost, overhead, taxes (federal, state, local), and profit for the Contractor and any Subcontractor involved. The Bidder must make the extensions and additions showing the total amount of bid.

Bidding Schedule	
Bid Advertisement	September 1, 2011
PreBid Conference	At 10:00 AM on September 20, 2011
Final Submission of Questions	September 29, 2011
Bid Submission	By 2:00 PM on October 6, 2011
Bid Opening	At 2:00 PM on October 6, 2011

**FORM OF PROPOSAL
FOR BLACK & WILLIAMS COMMUNITY CENTER
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
LEXINGTON, KY**

BID: PROVIDE ENERGY EFFICIENCY RETROFITS TO BLACK & WILLIAMS COMMUNITY CENTER AS DESCRIBED IN REQUEST FOR BIDS #94-2011.

_____ DOLLARS
(USE WORDS)

_____ CENTS. (\$ _____)
(USE WORDS) (USE FIGURES)

COMPLETE BID COST TABLE. GRAND TOTAL MUST MATCH BID ABOVE.

LIST OF MATERIALS AND/OR EQUIPMENT

MATERIAL AND/OR EQUIPMENT MANUFACTURER AND BRAND NAME

1. VRV Heat Pump System _____

LIST OF PROPOSED SUBCONTRACTORS

BRANCH OF WORK

NAME AND ADDRESS OF SUBCONTRACTOR

(If none, please state.)

1. Mechanical _____
2. Insulation _____
3. Electrical _____
4. Controls (By Alternate) _____

5. General Trades _____

LIST OF UNIT PRICES (PROVIDE INSTALLED COST)

<u>DESCRIPTION OF WORK</u>	<u>UNIT PRICE</u>	<u>QUANTITY</u>
1. 3/4" Trade Size EMT Plus Five (5) Elbows	_____	\$/100 L.F.
2. #12 AWG Wire, Installed in Conduit	_____	\$/100 L.F.

ALTERNATE #1: PROVIDE BACNET COMMUNICATION GATEWAY WITH CENTRALIZED CONTROLLER. INTEGRATE ALL CONTROL POINTS INTO AUTOMATED LOGIC MANAGEMENT SYSTEM AND TIE INTO EXISTING LFUCG AUTOMATED LOGIC NETWORK. REFERENCE DRAWINGS AND SPECIFICATIONS FOR REQUIREMENTS.

_____ DOLLARS
(USE WORDS)

_____ CENTS. (\$ _____)
(USE WORDS) (USE FIGURES)

ALTERNATE #2: PROVIDE INDEPENDENT COMMISSIONING (CX) OF ENERGY RETROFIT INSTALLATION.

_____ DOLLARS
(USE WORDS)

_____ CENTS. (\$ _____)
(USE WORDS) (USE FIGURES)

ALTERNATE #3: PROVIDE PRICE PER WEEK TO SUPPLY TEMPORARY HEAT TO AFFECTED AREAS (NOT INCLUDING GYM) UPON REQUEST FROM OWNER.

_____ DOLLARS
(USE WORDS)

_____ CENTS. (\$ _____) PER WEEK
(USE WORDS) (USE FIGURES)

ALTERNATE #4: PROVIDE PER UNIT PRICE FOR REPLACEMENT OF PLEXIGLASS WINDOW PANES IN BLACK & WILLIAMS FIRST FLOOR COMMUNITY ROOM. REFER TO BLACK & WILLIAMS SHEET D1.1 FOR FURTHER DETAIL.

_____ DOLLARS
(USE WORDS)

_____ CENTS. (\$ _____) PER PANE
(USE WORDS) (USE FIGURES)

BLACK & WILLIAMS: BID COST TABLE

Item	Qty	Unit Cost	Unit	Total
Mechanical				
Demo	1		Lump sum	
VRV System (Installed w/o electrical)	50		Ton	
Electric Cabinet Heaters	10		Ea	
Refrigerant Pipe Enclosure	150		LF	
Sheet Metal	500		Sq Ft	
Duct Specialties (diffusers, grilles)	1		Lump sum	
Misc (ceiling work, patching, repairing)	1		Lump sum	
TAB / Startup	1		Lump sum	
Controls (includes heat recovery)	1		Lump sum	
Mechanical Subtotal				
Electrical				
Demo	1		Lump sum	
VRV System Electrical	1		Lump sum	
ECH Electrical	10		Ea	
Misc electrical devices	1		Ea	
Electrical Panel & sub breaker	1		Ea	
Panel Install	1		Ea	
Electrical Subtotal				
GRANT TOTAL				

Respectfully Submitted,

BY: _____
(NAME OF FIRM)

DATE: _____

BY: _____

FAILURE TO SIGN WILL BE CAUSE FOR REJECTION OF BID. MUST BE ORIGINAL SIGNATURE – NO PHOTOCOPIES.

TITLE: _____

EMAIL: _____

OFFICIAL ADDRESS AND PHONE:

_____ (Seal if Bid is by Corporation)

by signing this form you agree to all of the terms and associated forms.

5. STATEMENT OF BIDDER'S QUALIFICATIONS

The following statement of the bidder's qualifications is required to be filled in, executed, and submitted with the Proposal:

- 1. Name of Bidder: _____
- 2. Permanent Place of Business: _____
- 3. When Organized: _____
- 4. Where Incorporated: _____
- 5. Construction Plant and Equipment Available for this Project:

(Attach Separate Sheet If Necessary)

- 6. Financial Condition:

If specifically requested by the OWNER, the apparent low Bidder is required to submit its latest three (3) years audited financial statements to the OWNER'S Division of Central Purchasing within seven (7) calendar days following the bid opening.

- 7. In the event the Contract is awarded to the undersigned, surety bonds will be furnished by:

_____ (Surety)

Signed: _____ (Representative of Surety)

- 8. The following is a list of similar projects performed by the bidder: (Attach separate sheet if necessary).

NAME

LOCATION

CONTRACT SUM

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

9. The bidder has now under contract and bonded the following projects:

NAME

LOCATION

CONTRACT SUM

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

10. List Key bidder Personnel who will work on this Project.

NAME

POSITION DESCRIPTION

**NO. OF YEARS
WITH BIDDER**

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

11. DBE Participation on current bonded projects under contract:

<u>SUBCONTRACTORS</u> <u>(LIST)</u>	<u>PROJECT</u> <u>(SPECIFIC TYPE)</u>	<u>DBE</u>	<u>MAJORITY</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

(USE ADDITIONAL SHEETS IF NECESSARY)

12. We acknowledge that, if we are the apparent low bidder, we will submit to the Owner within 7 calendar days following the Bid Opening, a sworn statement on the Owner’s form regarding all current work on hand and under contract, and a statement on the Owner’s form of the experience of our officers, office management and field management personnel. Additionally, if requested by the Owner, we will within 7 days following the request submit audited financial statements and loss history for insurance claims for the 3 most recent years (or a lesser period stipulated by the Owner)—all in accordance with the Bid Documents.

Respectfully submitted:

(Name of Contracting Firm)

BY: _____

TITLE: _____

DATE _____, 20__

6. LIST OF PROPOSED SUBCONTRACTORS

The following list of proposed subcontractors is required by the OWNER to be executed, completed and submitted with the BIDDER'S FORM OF PROPOSAL. All subcontractors are subject to approval of the Lexington-Fayette Urban County Government. Failure to submit this list completely filled out may be cause for rejection of Bid.

BRANCH OF WORK

- LIST EACH MAJOR ITEM

Such as: Grading, bituminous paving, concrete, seeding and protection, construction staking, etc.

SUBCONTRACTOR

DBE
yes/no

- | | | |
|----------|----------------|-------|
| 1. _____ | Name: _____ | _____ |
| | Address: _____ | |
| 2. _____ | Name: _____ | _____ |
| | Address: _____ | |
| 3. _____ | Name: _____ | _____ |
| | Address: _____ | |
| 4. _____ | Name: _____ | _____ |
| | Address: _____ | |
| 5. _____ | Name: _____ | _____ |
| | Address: _____ | |
| 6. _____ | Name: _____ | _____ |
| | Address: _____ | |
| 7. _____ | Name: _____ | _____ |
| | Address: _____ | |

7. AUTHENTICATION OF BID AND STATEMENT OF
NON-COLLUSION AND NON-CONFLICT OF INTEREST

I hereby swear (or affirm) under the penalty for false swearing:

1. That I am the Bidder (if the Bidder is an individual), a partner of the Bidder (if the Bidder is a partnership), or an officer or employee of the bidding corporation having authority to sign on its behalf (if the Bidder is a corporation);
2. That the attached bid has been arrived at by the Bidder independently, and has been submitted without collusion with, and without any agreement, understanding or planned common course of action, with any other contractor, vendor of materials, supplies, equipment or services described in the Invitation to Bid, designed to limit independent bidding or competition;
3. That the contents of the bid or bids have not been communicated by the Bidder or its employees or agents to any person not an employee or agent of the Bidder or its surety on any bond furnished, with the bid or bids, and will not be communicated to any such person, prior to the official opening of the bid or bids;
4. That the Bidder is legally entitled to enter into the contracts with the Lexington-Fayette Urban County Government, and is not in violation of any prohibited conflict of interest;
5. (Applicable to corporation only) That as a foreign corporation, we are registered with the Secretary of State, Commonwealth of Kentucky, and authorized to do business in the State _ or, that as a domestic corporation, we are in good standing with the Secretary of State, Commonwealth of Kentucky _. Check the statement applicable.
6. This offer is for 60 calendar days from the date this bid is opened. In submitting the above, it is expressly agreed that, upon proper acceptance by the Lexington-Fayette Urban County Government of any or all items bid above, a contract shall thereby be created with respect to the items accepted.
7. That I have fully informed myself regarding the accuracy of the statements made in this statement.

AUTHENTICATION OF BID AND STATEMENT OF
NON-COLLUSION AND NON-CONFLICT OF INTEREST (continued)

Firm: _____

Address: _____

Telephone: _____

Date: _____

8. STATEMENT OF EXPERIENCE

NAME OF INDIVIDUAL: _____

POSITION/TITLE: _____

STATEMENT OF EXPERIENCE: _____

NAME OF INDIVIDUAL: _____

POSITION/TITLE: _____

STATEMENT OF EXPERIENCE: _____

NAME OF INDIVIDUAL: _____

POSITION/TITLE: _____

STATEMENT OF EXPERIENCE: _____

NAME OF INDIVIDUAL: _____

POSITION/TITLE: _____

STATEMENT OF EXPERIENCE: _____

NAME OF INDIVIDUAL: _____

POSITION/TITLE: _____

STATEMENT OF EXPERIENCE: _____

BY: _____
Name of Firm

DATE: _____

BY: _____

TITLE: _____

* Include all officers, office management's, Affirmative Action officials, and field management personnel. Attach separate sheets if necessary.

9. EQUAL OPPORTUNITY AGREEMENT

The Law

- * Title VII of the Civil Rights Act of 1964 (amended 1972) states that it is unlawful for an employer to discriminate in employment because of race, color, religion, sex, age (40-70 years) or national origin.
- * Executive Order No. 11246 on Nondiscrimination under Federal contract prohibits employment discrimination by contractor and subcontractor doing business with the Federal Government or recipients of Federal funds. This order was later amended by Executive Order No. 11375 to prohibit discrimination on the basis of sex.
- * Section 503 of the Rehabilitation Act of 1973 States:

The Contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap.

- * Section 2012 of the Vietnam Era Veterans Readjustment Act of 1973 requires Affirmative Action on behalf of disabled veterans and veterans of the Vietnam Era by contractors having Federal Contracts.
- * Section 206 (A) of Executive Order 12086, Consolidation of Contract Compliance Functions for Equal Employment Opportunity, states:

The Secretary of Labor may investigate the employment practices of any Government contractor or sub-contractor to determine whether or not the contractual provisions specified in Section 202 of this order have been violated.

The Lexington-Fayette Urban County Government practices Equal Opportunity in recruiting, hiring and promoting. It is the Government's intent to affirmatively provide employment opportunities for those individuals who have previously not been allowed to enter into the mainstream of society. Because of its importance to the local Government, this policy carries the full endorsement of the Mayor, Commissioners, Directors, and all supervisory personnel. In following this commitment to Equal Employment Opportunity and because the Government is the benefactor of the Federal funds, it is both against the Urban County Government policy and illegal for the Government to let contracts to companies which knowingly or unknowingly practice discrimination in their employment practices. Violation of the above mentioned ordinances may cause a contract to be canceled and the contractor may be declared ineligible for future consideration.

Please sign this statement in the appropriate space acknowledging that you have read and understand the provisions contained herein. Return this document as part of your application packet.

Bidders

I/We agree to comply with the Civil Rights Laws listed above that govern employment rights of minorities, women, Vietnam veterans, handicapped, and aged persons.

Signature

Name of Business

The Entity (regardless of whether construction contractor, non-construction contractor or supplier) agrees to provide equal opportunity in employment for all qualified persons, to prohibit discrimination in employment because of race, color, creed, national origin, sex or age, and to promote equal employment through a positive, continuing program from itself and each of its sub-contracting agents. This program of equal employment opportunity shall apply to every aspect of its employment policies and practices.

The Kentucky Equal Employment Opportunity Act of 1978 (KRS 45.560-45.640) requires that any county, city, town, school district, water district, hospital district, or other political subdivision of the state shall include in directly or indirectly publicly funded contracts for supplies, materials, services, or equipment hereinafter entered into the following provisions:

During the performance of this contract, the contractor agrees as follows:

- (1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age or national origin;*
- (2) The contractor will state in all solicitations or advertisements for employees placed by or on behalf of the contractors that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, age or national origin;*
- (3) The contractor will post notices in conspicuous places, available to employees and applicants for employment, setting forth the provisions of the non-discrimination clauses required by this section; and*
- (4) The contractor will send a notice to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding advising the labor union or workers' representative of the contractor's commitments under the nondiscrimination clauses.*

The Act further provides:

KRS 45.610. Hiring minorities - Information required

- (1) For the length of the contract, each contractor shall hire minorities from other sources within the drawing area, should the union with which he has collective bargaining agreements be unwilling to supply sufficient minorities to satisfy the agreed upon goals and timetable.*
- (2) Each contractor shall, for the length of the contract, furnish such information as required by KRS 45.560 to KRS 45.640 and by such rules, regulations and orders issued pursuant thereto and will permit access to all books and records pertaining to his employment practices and work sites by the contracting agency and the department for purposes of investigation to ascertain compliance with KRS 45.560 to 45.640 and such rules, regulations and orders issued pursuant thereto.*

KRS 45.620. Action against contractor - Hiring of minority contractor or subcontractor

- (1) If any contractor is found by the department to have engaged in an unlawful practice under this chapter during the course of performing under a contract or subcontract covered under KRS 45.560 to 45.640, the*

department shall so certify to the contracting agency and such certification shall be binding upon the contracting agency unless it is reversed in the course of judicial review.

- (2) If the contractor is found to have committed an unlawful practice under KRS 45.560 to 45.640, the contracting agency may cancel or terminate the contract, conditioned upon a program for future compliance approved by the contracting agency and the department. The contracting agency may declare such a contractor ineligible to bid on further contracts with that agency until such time as the contractor complies in full with the requirements of KRS 45.560 to 45.640.*
- (3) The equal employment provisions of KRS 45.560 to 45.640 may be met in part by a contractor by subcontracting to a minority contractor or subcontractor. For the provisions of KRS 45.560 to 45.640, a minority contractor or subcontractor shall mean a business that is owned and controlled by one or more persons disadvantaged by racial or ethnic circumstances.*

KRS 45.630 Termination of existing employee not required, when

Any provision of KRS 45.560 to 45.640 notwithstanding, no contractor shall be required to terminate an existing employee upon proof that that employee was employed prior to the date of the contract.

KRS 45.640 Minimum skills

Nothing in KRS 45.560 to 45.640 shall require a contractor to hire anyone who fails to demonstrate the minimum skills required to perform a particular job.

It is recommended that all of the provisions above quoted to be included as special conditions in each contract. In the case of a contract exceeding \$250,000, the contractor is required to furnish evidence that his work-force in Kentucky is representative of the available work-force in the area from which he draws employees, or to supply an Affirmative Action plan which will achieve such representation during the life of the contract.

Any project over \$50,000 will require a Performance & Payment Bond in an amount equal to 100% of the contract.

10. EQUAL EMPLOYMENT OPPORTUNITY AFFIRMATIVE ACTION POLICY

It is the policy of _____
to assure that all applicants for employment and all employees are treated on a fair and equitable basis without regard to their race, religion, sex, color, handicap, natural origin or age.

Such action shall include employment, promotion, demotion, recruitment or recruitment advertising, layoff or termination, rates of pay and other forms of compensation, and selection for training, whether apprenticeship and/or on-the-job-training.

Furthermore, this company agrees to make special recruitment efforts to hire the protected class whenever feasible. This company also agrees to adhere to all applicable federal, state, and local laws relating to Equal Employment Opportunity for all individuals.

_____ has been appointed Equal Employment Compliance (EEOC) Officer and shall be available for counseling, answering of questions in regards to this company policy, and to hear any complaints of discrimination. The EEOC Officer may be reached by calling _____.

Signature: _____
(Bidding Contractor)

Title: _____

Date: _____

WORKFORCE ANALYSIS FORM

Name of Organization: _____

Date: ____ / ____ / ____

Categories	Total	<u>White</u>		<u>Black</u>		<u>Other</u>		<u>Total</u>	
		M	F	M	F	M	F	M	F
Administrators									
Professionals									
Superintendents									
Supervisors									
Foremen									
Technicians									
Protective Service									
Para-Professionals									
Office/Clerical									
Skilled Craft									
Service/Maintenance									
Total:									

Prepared By: _____

11. EVIDENCE OF INSURABILITY

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT CONSTRUCTION PROJECT

(Use separate form for each Agency or Brokerage agreeing to provide coverage)

Names Insured: _____

Employee ID: _____

Address: _____

Phone: _____

Project to be insured: _____

In lieu of obtaining certificates of insurance at this time, the undersigned agrees to provide the above Named Insured with the minimum coverage listed below. These are outlined in the Insurance and Risk Management of Part V (Special Conditions), including all requirements, and conditions:

Section Items	Coverage	Minimum Limits and Policy Requirements	Limits Provided To Insured	Name of Insurer	A.M. Best's	
					Code	Rating
(X)SC 4.1	CGL	\$1,000,000/per occ. \$2,000,000/aggregate	\$			
(X)	AUTO	\$1,000,000/per occ.	\$			
(X)	WC	Statutory	\$			
	Employer's Liability	\$1,000,000	\$			

Section 2 includes required provisions, statements regarding insurance requirements, and the undersigned agrees to abide by all provisions for the coverage's checked above unless stated otherwise when submitting.

Agency or Brokerage

Name of Authorized Representative

Street Address

Title

City State Zip

Authorized Signature

Telephone Number

Date

NOTE: Authorized signatures may be the agent's if agent has placed insurance through an agency agreement with the insurer. If insurance is brokered, authorized signature must be that of authorized representative of insurer.

IMPORTANT: CONTRACT MAY NOT BE AWARDED IF A COMPLETED AND SIGNED COPY OF THIS FORM FOR ALL COVERAGE'S LISTED ABOVE IS NOT PROVIDED.

**Lexington-Fayette Urban County Government
MBE/WBE Participation Goals**

PART 1 - GENERAL

- 1.1 The LFUCG request all potential contractors to make a concerted effort to include Minority-Owned (MBE) and Woman-Owned (WBE) Business Enterprises as subcontractors or suppliers in their bids.
- 1.2 Toward that end, the LFUCG has established 10% of total procurement costs as a Goal for participation of Minority-Owned and Woman-Owned Businesses on this contract.
- 1.3 **It is therefore a request of each Bidder to include in its bid, the same goal (10%) or for MBE/WBE participation and other requirements as outlined in this section.**

PART 2 - PROCEDURES

- 2.1 The successful bidder will be required to report to the LFUCG, the dollar amounts of all purchase orders submitted to Minority-Owned or Woman-Owned subcontractors and suppliers for work done or materials purchased for this contract.
- 2.2 Replacement of a Minority-Owned or Woman-Owned subcontractor or supplier listed in the original submittal must be requested in writing and must be accompanied by documentation of Good Faith Efforts to replace the subcontractor / supplier with another MBE/WBE Firm; this is subject to approval by the LFUCG.
- 2.3 For assistance in identifying qualified, certified businesses to solicit for potential contracting opportunities, bidders may contact:
 - A. The Lexington-Fayette Urban County Government, Division of Central Purchasing (859-258-3320)
 - B. The Kentuckiana Minority Supplier Development Council in Louisville, KY (502-625-0135)
 - C. The Kentucky Cabinet for Economic Development, Small & Minority Business Division in Frankfort, KY (502-564-2064)
 - D. The Office of Equal Employment Opportunity, Contract Compliance Division in Frankfort, KY (502-564-2874)
- 2.4 The LFUCG will make every effort to notify interested MBE/WBE subcontractors and suppliers of each Bid Package, including information on the scope of work, the pre-bid meeting time and location, the bid date, and all other pertinent information regarding the project.

PART 3 - DEFINITIONS

- 3.1 A Minority-Owned Business Enterprise (MBE) is defined as a business which is certified as being at least 51% owned and operated by persons of African American, Hispanic, Asian, Pacific Islander, American Indian or Alaskan Native Heritage.
- 3.2 A Woman-Owned Business Enterprise (WBE) is defined as a business which is certified as being at least 51% owned and operated by one or more Non-Minority Females.

PART 4 - OBLIGATION OF BIDDER

- 4.1 **The bidder shall make a Good Faith Effort to achieve the Participation Goal for MBE/WBE subcontractors/suppliers. The failure to meet the goal shall not necessarily be cause for disqualification of the bidder; however, bidders not meeting the goal are required to furnish with their bids written documentation of their Good Faith Efforts to do so.**
- 4.2 Award of Contract shall be conditioned upon satisfaction of the requirements set forth herein.
- 4.3 The Form of Proposal includes a section entitled "MBE/WBE Participation Form". The applicable information must be completed and submitted as outlined below.
- 4.4 **Failure to submit this information as requested may be cause for rejection of bid.**

PART 5 - DOCUMENTATION REQUIRED

- 5.1 Bidders reaching the Goal are required to submit only the "MBE/WBE Participation Form." The form must be fully completed including names and telephone number of participating MBE/WBE firm(s); type of work to be performed; estimated value of the contract and value expressed as a percentage of the total Lump Sum Bid Price. The form must be signed and dated, and is to be submitted with the bid.
- 5.2 Bidders not reaching the Goal must submit both the "MBE/WBE Participation Form" and a written statement documenting their Good Faith Effort to do so (If bid includes no MBE/WBE participation, bidder shall enter "None" on the subcontractor / supplier form). In addition, the bidder may submit the following as proof of Good Faith Efforts to meet the Participation Goal:
 - A. Advertisement by the bidder of MBE/WBE Contracting opportunities associated with this bid in at least two (2) of the following:
 1. A periodical in general circulation throughout the region
 2. A Minority-Focused periodical in general circulation throughout the region
 3. A Trade periodical aimed at the MBE/WBE community in general circulation throughout the region
 4. Bidder shall include copies of dated advertisement with his submittal
 - B. Evidence of written notice of contracting opportunities to at least five (5) MBE/WBE firms serving the construction industry at least seven (7) days prior to the bid opening date.

- C. Copies of quotations submitted by MBE/WBE firms which were not used due to uncompetitive pricing or other factors and/or copies of responses from firms that were contacted indicating that they would not be submitting a bid.
- D. Documentation of Bidder's utilization of the agencies identified to help locate potential MBE/WBE firms for inclusion on the contract including responses from agencies.
- E. Failure to submit any of the documentation requested in this section may be cause for rejection of bid. Bidders may include any other documentation deemed relevant to this requirement. "Record of MBE/WBE Solicitation" and other required documentation of Good Faith Efforts are to be submitted with the bid, if participation Goal is not met.

**Lexington-Fayette Urban County Government
MBE/WBE Participation Good Faith Efforts Checklist**

- Attend LFUCG Economic Inclusion Outreach Event
- Attend or sponsor economic inclusion events to participate and/or provide networking opportunities
- Request list of MBE/WBE subcontractors and/or suppliers from LFUCG
- Advertise need for MBE/WBE subcontractors and/or suppliers in at least two of the following publications:
 - Local and/or regional newspaper(s)
 - Minority focused periodical in general circulation throughout the region
 - Trade periodical aimed at the MBE/WBE community in general circulation throughout the region
- Evidence of written notice of contracting and/or supplier opportunities to at least give MBE/WBE firms or suppliers serving this at least seven days prior to the bid opening date
- Utilize one or more of the following agencies identified to help locate MBE/WBE firms for inclusion on the contract including responses from the agencies
 - LFUCG
 - Kentucky Transportation Cabinet – Office for Civil Rights and Small Business Development
 - Tri-State Minority Development Council
 - Commerce Lexington
- Provide copies of quotations submitted by MBE/WBE firms which were not used due to uncompetitive pricing or other factors and/or copies of responses from firms that were contacted indicating they would not be submitting a quotation
- Provide copies of phone logs, faxes, and/or emails documenting efforts to contact MBE/WBE firms

**Lexington-Fayette Urban County Government
MBE/WBE Participation Form**

1) Identification of Participating MBE/WBEs

MBE/WBE Name, Address & Phone	Work to be Performed	Dollar Value of Work	% Value of Total Contract
1.		\$	%
2.		\$	%
3.		\$	%
4.		\$	%

The undersigned submits the above list of MBE/WBE firms to be used in accomplishing the work contained in this Bid.

Company: _____ By: _____

Date: _____ Title: _____

PART IV
GENERAL CONDITIONS
TABLE OF CONTENTS

Article Number	Title	Page
1	DEFINITIONS	GC-6
2	PRELIMINARY MATTERS.....	GC-10
3	CONTRACT DOCUMENTS: INTENT, CONFLICTS, AMENDING AND REUSE	GC-12
4	AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS	GC-13
5	CONTRACTOR'S RESPONSIBILITIES	GC-16
6	OTHER WORK	GC-26
7	OWNER'S RESPONSIBILITIES	GC-27
8	ENGINEER'S STATUS DURING CONSTRUCTION	GC-28
9	CHANGES IN THE WORK	GC-31
10	CHANGE OF CONTRACT PRICE.....	GC-32
11	CHANGE OF CONTRACT TIME	GC-38
12	WARRANTY AND GUARANTEE; TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK.....	GC-39
13	PAYMENTS TO CONTRACTOR AND COMPLETION.....	GC-43
14	SUSPENSION OF WORK AND TERMINATION.....	GC-47
15	MISCELLANEOUS.....	GC-49

DETAILED TABLE OF CONTENTS OF GENERAL CONDITIONS

1. Definitions
2. Preliminary Matters
 - 2.1 Delivery of Bonds
 - 2.2 Copies of Documents
 - 2.3 Commencement of Contract Time; Notice to Proceed
 - 2.4 Starting the Project
 - 2.5 Before Starting Construction
 - 2.6 Submittal of Schedules
 - 2.7 Preconstruction Conference
 - 2.8 Finalizing Schedules
3. Contract Documents, Intent, Conflicts, Amending, and Reuse
 - 3.1 General
 - 3.2 Intent
 - 3.3 Conflicts
 - 3.4 Amending and Supplementing Contract Documents
 - 3.5 Reuse of Documents
4. Availability of Lands, Physical Conditions, Reference Points
 - 4.1 Availability of Lands
 - 4.2 Physical Conditions
 - 4.3 Physical Conditions - Underground Facilities
 - 4.4 Reference Points
5. CONTRACTOR'S Responsibilities
 - 5.1 Supervision
 - 5.2 Superintendence
 - 5.3 Labor
 - 5.4 Start-Up and Completion of Work
 - 5.5 Materials and Equipment
 - 5.6 Adjusting Progress Schedule
 - 5.7 Substitutes or "Or-Equal" Items
 - 5.8 Subcontractors, Suppliers and Others
 - 5.9 Patent Fees and Royalties
 - 5.10 Permits
 - 5.11 Laws and Regulations
 - 5.12 Taxes

- 5.13 Use of Premises
- 5.14 Record Drawings
- 5.15 Shop Drawings and Samples
- 5.16 Continuing the Work

- 6. Other Work
 - 6.1 Related Work at Site
 - 6.2 Other Contractors or Utility Owners
 - 6.3 Delays Caused By Others
 - 6.4 Coordination

- 7. OWNER'S Responsibilities
 - 7.1 Communications
 - 7.2 Data and Payments
 - 7.3 Lands, Easements, and Surveys
 - 7.4 Change Orders
 - 7.5 Inspections, Tests, and Approvals
 - 7.6 Stop or Suspend Work

- 8. ENGINEER'S Status During Construction
 - 8.1 OWNER'S Representative
 - 8.2 Visits to Site
 - 8.3 Project Representation
 - 8.4 Clarification and Interpretations
 - 8.5 Authorized Variations in Work
 - 8.6 Rejecting Defective Work
 - 8.7 Shop Drawings
 - 8.8 Change Orders
 - 8.9 Payments
 - 8.10 Determinations for Unit Prices
 - 8.11 Decisions on Disputes
 - 8.12 Limitations on ENGINEER'S Responsibilities

- 9. Changes in the Work
 - 9.1 OWNER May Order Changes
 - 9.2 Claims
 - 9.3 Work Not in Contract Documents
 - 9.4 Change Orders
 - 9.5 Notice of Change

10. Change of Contract Price
 - 10.1 Total Compensation
 - 10.2 Claim for Increase or Decrease in Price
 - 10.3 Value of Work
 - 10.4 Cost of the Work
 - 10.5 Not to Be Included in Cost of the Work
 - 10.6 CONTRACTOR'S Fee
 - 10.7 Itemized Cost Breakdown
 - 10.8 Cash Allowance
 - 10.9 Unit Price Work

11. Change of Contract Time
 - 11.1 Change Order
 - 11.2 Justification for Time Extension
 - 11.3 Time Limits

12. Warranty and Guarantee; Tests and Inspections; Correction, Removal or Acceptance of Defective Work
 - 12.1 Warranty and Guarantee
 - 12.2 Access to Work
 - 12.3 Tests and Inspections
 - 12.4 OWNER May Stop Work
 - 12.5 Correction or Removal of Defective Work
 - 12.6 One Year Correction Period
 - 12.7 Acceptance of Defective work
 - 12.8 Owner May Correct Defective Work

13. Payments to CONTRACTOR and Completion
 - 13.1 Schedule of Values
 - 13.2 Application for Progress Payments
 - 13.3 CONTRACTOR'S Warranty of Title
 - 13.4 Review of Application for Progress Payments
 - 13.5 Partial Utilization
 - 13.6 Final Inspection
 - 13.7 Final Application for Payment
 - 13.8 Final Payment and Acceptance
 - 13.9 CONTRACTOR'S Continuing Obligation
 - 13.10 Waiver of Claims

14. Suspension of Work and Termination

- 14.1 OWNER May Suspend Work
- 14.2 OWNER May Terminate
- 14.3 CONTRACTOR'S Services Terminated
- 14.4 Payment After Termination
- 14.5 CONTRACTOR May Stop or Terminate

15. Miscellaneous

- 15.1 Claims for Injury or Damage
- 15.2 Non-Discrimination in Employment
- 15.3 Temporary Street Closing or Blockage
- 15.4 Percentage of Work Performed by Prime CONTRACTOR
- 15.5 Clean-up
- 15.6 General
- 15.7 Debris Disposal

PART IV

GENERAL CONDITIONS

1. DEFINITIONS

Wherever used in these General Conditions or the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof.

1.1 Addenda

Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bid Documents or the Contract Documents.

1.2 Agreement

The written agreement between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

1.3 Application for Payment

The form accepted by ENGINEER which is to be used by CONTRACTOR in requesting progress or final payments and which is to include such supporting documentation as is required by the Contract Documents.

1.4 Bid

The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

1.5 Bidder

An individual, partnership, or corporation, who submit a Bid for a prime contract with the OWNER, for the Work described in the proposed Contract Documents.

1.6 Bonds

Bid, performance and payment bonds and other instruments of security.

1.7 Calendar Day

A calendar day of twenty-four hours measured from midnight to the next midnight shall constitute a day.

1.8 Change Order

A document recommended by ENGINEER, which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Time, issued on or after the Effective Date of the Agreement.

1.9 Contract Documents

The Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR'S Bid (including documentation accompanying the Bid and any post-bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Bonds, these General Conditions, the Special Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all amendments, modifications and supplements.

1.10 Contract Price

The monies payable by OWNER to CONTRACTOR under the Contract Documents as stated in the Agreement.

1.11 Contract Time

The number of consecutive calendar days between the date of issuance of the Notice to Proceed and the contract completion date.

1.12 CONTRACTOR

The person, firm or corporation with whom OWNER has entered into the Agreement.

1.13 Defective

An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER'S recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER).

1.14 Drawings

The drawings which show the character and scope of the Work to be performed and which have been prepared or approved by ENGINEER and are referred to in the Contract Documents.

1.15 Effective Date of the Agreement

The date indicated in the Agreement on which it becomes effective.

1.16 ENGINEER

The Lexington-Fayette Urban County Government Division of Water Quality or its authorized representative.

1.17 Field Order

A documented order issued by ENGINEER which orders minor changes in the Work, but which does not involve a change in the Contract Price or the Contract Time.

1.18 Giving Notice

Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

1.19 Laws and Regulations

Laws, rules, regulations, ordinances, codes and/or orders.

1.20 Notice of Award

The written notice by OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions enumerated therein, within the time specified, OWNER will sign and deliver the Agreement.

1.21 Notice to Proceed

A written notice given by OWNER to CONTRACTOR fixing the date on which the Contract Time will commence to run and on which CONTRACTOR shall start to perform CONTRACTOR'S obligations under the Contract Documents.

1.22 OWNER

The Lexington-Fayette Urban County Government.

1.23 Partial Utilization

Placing a portion of the Work in service for the purpose for which it is intended (or related purpose) before reaching Completion for all the Work.

1.24 Project

The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

1.25 Inspector

The authorized representative of the ENGINEER who is assigned to the site or any part thereof.

1.26 Shop Drawings

All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for CONTRACTOR to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by CONTRACTOR to illustrate material or equipment for some portion of the Work.

1.27 Specifications

Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

1.28 Standard Specifications

The "Standard Specifications for Road and Bridge Construction", Transportation Cabinet, Department of Highways, Commonwealth of Kentucky, current edition. MUTCD shall refer to the "Manual of Uniform Traffic Control Devices.

1.29 Subcontractor

An individual, firm or corporation having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the site.

1.30 Special Conditions

The part of the Contract Documents which amends or supplements these General Conditions.

1.31 Supplier

A manufacturer, fabricator, supplier, distributor, materialman or vendor.

1.32 Underground Facilities

All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

1.33 Unit Price Work

Not Applicable

1.34 Work

The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

1.35 Time Period

When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

2. PRELIMINARY MATTERS

2.1 Delivery of Bonds

When the CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER, such Bonds, Insurance Certificate, and Power of Attorney as CONTRACTOR may be required to furnish.

2.2 Copies of Documents

Owner shall furnish to CONTRACTOR up to three copies (unless otherwise specified in the Special Conditions) of the Contract Documents as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

2.3 Commencement of Contract Time; Notice to Proceed

The Contract Time will commence to run on the day specified in the Notice to Proceed.

2.4 Starting the Project

CONTRACTOR shall start to perform the Work on the date when the Contract Time commences to run, but no Work shall be done at the site prior to the date on which the Contract Time commences to run.

2.5 Before Starting Construction

Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected

thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error or discrepancy in the Contract Documents, unless CONTRACTOR had actual knowledge thereof or should reasonably have known thereof.

2.6 Submittal of Schedules

Within ten days after the effective date of the Agreement (unless otherwise specified) CONTRACTOR shall submit to ENGINEER for review:

2.6.1 an estimated progress schedule indicating the starting and completion dates of the various stages of the Work;

2.6.2 a preliminary schedule of Shop Drawing submissions; and

2.6.3 a preliminary schedule of values for all of the Work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work which will be confirmed in writing by CONTRACTOR at the time of submission.

2.7 Preconstruction Conference

Before CONTRACTOR starts the Work at the proposed site, a conference attended by CONTRACTOR, ENGINEER, EEO-Affirmative Action Officer, and other appropriate parties will be held to discuss the following issues: (1) The scheduling of the Work to be completed; (2) The procedures for handling shop drawings and other submittals; (3) The processing of applications for payment; (4) The establishment of an understanding among the involved parties in regard to the proposed project; and (5) The establishment of procedures for effectively implementing the LFUCG's 10% minimum DBE goals.

2.8 Finalizing Schedules

At least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to finalize the schedules submitted in accordance with paragraph 2.6.

The finalized progress schedule will be acceptable to ENGINEER as providing orderly progression of the Work to completion within the Contract Time, but such acceptance will neither impose on ENGINEER responsibility for the progress or scheduling of the Work nor relieve CONTRACTOR from full responsibility therefor. The finalized schedule of Shop Drawing submissions will be acceptable to ENGINEER as providing a workable arrangement for processing the submissions. The finalized schedule of values will be acceptable to ENGINEER as to form and substance.

3. CONTRACT DOCUMENTS: INTENT, CONFLICTS, AMENDING AND REUSE

3.1 General

The Contract Documents comprise the entire agreement between OWNER and CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the place of the Project.

3.2 Intent

It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result will be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe Work, materials or equipment such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or laws or regulations in effect at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR or ENGINEER, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to ENGINEER, or any of ENGINEER'S consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 8.12.3 or 8.12.4. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in paragraph 8.4.

3.3 Conflicts

If, during the performance of the Work, CONTRACTOR finds a conflict, error or discrepancy in the Contract Documents, CONTRACTOR shall so report to ENGINEER in writing at once and before proceeding with the Work affected thereby shall obtain a written interpretation or clarification from ENGINEER; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error or discrepancy in the Contract Documents unless CONTRACTOR had actual knowledge thereof or should reasonably have known thereof.

In resolving such conflicts, errors and discrepancies, the documents shall be given precedence in the following order:

1. Agreement
2. Field and Change Orders
3. Addenda
4. Special Conditions
5. Instruction to Bidders
6. General Conditions
7. Specifications and Drawings

Figure dimension on drawings shall govern over scale dimensions and detailed Drawings shall govern over general Drawings.

3.4 Amending and Supplementing Contract Documents

The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof by means of a Change Order or a Field Order. Contract Price and Contract Time may only be changed by a Change Order.

3.5 Reuse of Documents

Neither CONTRACTOR nor any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with OWNER shall have or acquire any title to or ownership rights in any of the Drawings, Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER; and they shall not reuse any of them on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaptation by ENGINEER.

4. AVAILABILITY OF LANDS; PHYSICAL CONDITIONS, REFERENCE POINTS

4.1 Availability of Lands

OWNER shall furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by OWNER, unless otherwise provided in the Contract Documents. If CONTRACTOR believes that any delay in OWNER'S furnishing these lands, rights-of-way or easements entitles CONTRACTOR to an extension of the Contract Time, CONTRACTOR may make a claim therefor as provided in Article 11. ENGINEER shall determine if the claim is legitimate or not. CONTRACTOR shall provide for all additional

lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.2 Physical Conditions

4.2.1 Explorations and Reports

Reference is made to the Special Conditions for identification of those reports of explorations and tests of subsurface conditions at the site that have been utilized by ENGINEER in preparation of the Contract Documents. CONTRACTOR may rely upon the accuracy of the technical data contained in such reports, but not upon non-technical data, interpretations or opinions contained therein or for the completeness thereof for CONTRACTOR'S purposes. Except as indicated in the immediately preceding sentence and in paragraph 4.2.6, CONTRACTOR shall have full responsibility with respect to subsurface conditions at the site.

4.2.2 Existing Structures

Reference is made to the Special Conditions for identification of those drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities referred to in paragraph 4.3) which are at or contiguous to the site that have been utilized by ENGINEER in preparation of the Contract Documents. CONTRACTOR may rely upon the accuracy of the technical data contained in such drawings, but not for the completeness thereof for CONTRACTOR'S purposes. Except as indicated in the immediately preceding sentence and in paragraph 4.2.6, CONTRACTOR shall have full responsibility with respect to physical conditions in or relating to such structures.

4.2.3 Report of Differing Conditions

If CONTRACTOR believes that:

4.2.3.1 any technical data on which CONTRACTOR is entitled to rely as provided in paragraphs 4.2.1 and 4.2.2 is inaccurate, or

4.2.3.2 any physical conditions uncovered or revealed at the site differ materially from that indicated, reflected or referred to in the Contract Documents,

CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work in connection therewith (except in an emergency) notify OWNER and ENGINEER in writing about the inaccuracy or difference.

4.2.4 ENGINEER'S Review

Engineer will promptly review the pertinent conditions, determine the necessity of obtaining additional explorations or tests with respect thereto and advise CONTRACTOR of ENGINEER'S findings and conclusions.

4.2.5 Possible Document Change

If ENGINEER concludes that there is a material error in the Contract Documents or that because of newly discovered conditions a change in the Contract Documents is required, a Change Order will be issued as provided in Article 10 to reflect and document the consequences of the inaccuracy or difference.

4.2.6 Possible Price and Time Adjustments

In each such case, an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, or any combination thereof, will be allowable to the extent that they are attributable to any such inaccuracy or difference.

4.3 Physical Conditions-Underground Facilities

4.3.1 Shown or Indicated

The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based on information and data furnished to OWNER or ENGINEER by the owners of such underground facilities or by others. Unless it is otherwise expressly provided in the Special Conditions:

4.3.1.1 OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and,

4.3.1.2 CONTRACTOR shall have full responsibility for reviewing and checking all such information and data; for locating all underground facilities shown or indicated in the Contract Documents; for coordination of the Work with the owners of such underground facilities during construction; and for the safety and protection thereof and repairing any damage thereto resulting from the Work, the cost of all of which will be considered as having been included in the Contract Price.

4.3.2 Not Shown or Indicated

If an underground facility is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents and which CONTRACTOR could not reasonably have been expected to be

aware of, CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work affected thereby (except in an emergency), identify the owner of such Underground Facility and give written notice thereof to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the underground facility to determine the extent to which the Contract Documents should be modified to reflect and document the consequences of the existence of the Underground Facility, and the Contract Documents will be amended or supplemented to the extent necessary. During such time, CONTRACTOR shall be responsible for the safety and protection of such underground facility. CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, to the extent that they are attributable to the existence of any underground facility that was not shown or indicated in the Contract Documents and which CONTRACTOR could not reasonably have been expected to be aware of.

4.4 Reference Points

OWNER shall provide engineering surveys to establish reference points for construction which in ENGINEER'S judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work (unless otherwise specified), shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by a Registered Land Surveyor.

5. CONTRACTOR'S RESPONSIBILITIES

5.1 Supervision

CONTRACTOR shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall assure that all CONTRACTOR personnel (including subcontractors, etc.) conduct themselves in a courteous and respectful manner toward the ENGINEER and the general public. Failure to comply with this condition of the Contract will result in immediate suspension of the Work. Following a review by the Commissioner of Environmental Quality the Contract may be terminated (see GC section 14). CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of others in the design or selection of a specific means, method, technique, sequence

or procedure of construction which is indicated in and required by the Contract Documents. CONTRACTOR shall be responsible to see that the finished Work complies accurately with the Contract Documents.

5.2 Superintendence

CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR'S representative at the site and shall have authority to act on behalf of CONTRACTOR. All communications given to the superintendent shall be as binding as if given to CONTRACTOR.

5.3 Labor

CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the Work or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during regular working hours, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without OWNER'S written consent given after prior written notice to ENGINEER.

5.4 Start-Up and Completion of Work

Unless otherwise specified, CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

5.5 Materials and Equipment

All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable supplier except as otherwise provided in the Contract Documents; but no provision of any such instructions will be effective to assign to ENGINEER, or any of ENGINEER'S consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or

authority to undertake responsibility contrary to the provisions of paragraph 8.12.3 or 8.12.4.

5.5.1 Not Clearly Specified or Indicated

In all instances where materials specified are obtainable in different sizes, weights, trade grades, qualities or finishes, etc., whose weights, trade grades, qualities or finishes, etc., are not clearly specified or indicated on the Drawings, the CONTRACTOR shall notify the ENGINEER of all such instances at least five (5) days in advance of receiving the proposals.

The Engineer will then determine which size, weight, trade grade, quality, finish, etc., is required.

5.5.2 Coordination of Work

The CONTRACTOR shall see that for his own Work and for the work of each subcontractor, proper templates and patterns necessary for the coordination of the various parts of the Work are prepared. The CONTRACTOR shall furnish or require the Subcontractor to furnish such duplicates as will enable the Subcontractors to fit together and execute fully their respective portions of the Work.

5.6 Adjusting Progress Schedule

CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.8) adjustments in the progress schedule to reflect the impact thereon of new developments; these will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the Contract Documents applicable thereto.

5.7 Substitutes or "Or-Equal" Items

5.7.1 General

Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier, the naming of the item is intended to establish the type, function, and quality required. Unless the name is followed by words indicating that no substitution is permitted, materials or equipment of other Suppliers may be accepted by OWNER/ENGINEER if sufficient information is submitted by CONTRACTOR to allow OWNER/ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named. The procedure for review by OWNER/ENGINEER will include the following. Requests for review of substitute items of material and equipment will not be accepted by OWNER/ENGINEER from anyone, other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall make written application to

OWNER/ENGINEER for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application will state that the evaluation and acceptance of the proposed substitute will not prejudice CONTRACTOR'S achievement of completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by OWNER/ENGINEER in evaluating the proposed substitute. OWNER/ENGINEER may require CONTRACTOR to furnish at CONTRACTOR'S expense additional data about the proposed substitute.

5.7.2 Substitutes

If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to OWNER/ENGINEER, if CONTRACTOR submits sufficient information to allow OWNER/ENGINEER to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents. The procedure for review by OWNER/ENGINEER will be similar to that provided in paragraph 5.7.1 as applied by OWNER/ENGINEER.

5.7.3 OWNER/ENGINEER'S Approval

OWNER/ENGINEER will be allowed a reasonable time within which to evaluate each proposed substitute. OWNER/ENGINEER will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without OWNER/ENGINEER'S prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. OWNER may require CONTRACTOR to furnish at CONTRACTOR'S expense a special performance guarantee or other surety with respect to any substitute. OWNER/ENGINEER will record

time required by OWNER/ENGINEER and OWNER/ENGINEER'S consultants in evaluating substitutions proposed by CONTRACTOR and in making changes in the Contract Documents occasioned thereby. Whether or not OWNER/ENGINEER accepts a proposed substitute, CONTRACTOR shall reimburse OWNER for the charges of OWNER/ENGINEER and OWNER/ENGINEER'S consultants for evaluating each proposed substitute.

5.8 Subcontractors, Suppliers, and Others

5.8.1 Acceptable to ENGINEER

CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those acceptable to OWNER and ENGINEER as indicated in paragraph 5.8.2), whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

5.8.2 Objection After Due Investigation

If the Contract Documents require the identity of certain Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials and equipment) to be submitted to OWNER in advance of the specified date prior to the Effective Date of the Agreement for acceptance by OWNER and ENGINEER and if CONTRACTOR has submitted a list thereof, OWNER'S or ENGINEER'S acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the bidding documents or the Contract Documents) of any such Subcontractor, Supplier or other person or organization so identified may be revoked on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable substitute. No acceptance by OWNER or ENGINEER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

5.8.3 Contractor Responsible for Acts of Subcontractors

The CONTRACTOR shall perform on the site, and with its own organization, work equivalent to at least fifty (50) percent of the total amount of Work to be performed under the Contract. This percentage may be reduced by a supplemental agreement to this Contract if, during performing the Work, the CONTRACTOR requests a reduction and the Urban County Engineer determines that the reduction would be to the advantage of the Urban County Government.

The CONTRACTOR shall, at the time he submits his proposal for the Contract, notify the OWNER in writing of the names of Subcontractors proposed for the Work. He shall not employ any Subcontractor without the prior written approval of the OWNER.

CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR'S own acts and omissions. Nothing in the Contract Documents shall create any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Laws and Regulations.

5.8.4 Division of Specifications

The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

5.8.5 Agreement Between Contractor and Subcontractors

All Work performed for CONTRACTOR by a Subcontractor will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor which specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER.

5.8.6 Statements and Comments by CONTRACTOR

Neither the CONTRACTOR, his employees, nor his subcontractors shall at any time make any statement or comment as to the project scope, nature, intention, design, or construction method to any third party or parties without the explicit written consent of the OWNER.

Any third party requesting such information shall be referred to the OWNER or his representative.

Should there be any change from the original intent of the project as a result of any statement or comment by the contractor, his employees or subcontractors, contractor shall be held liable for any change in the scope, nature, design, or construction method and shall bear the full cost for the previously mentioned changes.

5.9 Patent Fees and Royalties

CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others.

5.10 Permits

Unless otherwise provided in the Special conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or if there are no Bids on the Effective Date of the Agreement. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto such as plant investment fees.

5.11 Laws and Regulations

5.11.1 CONTRACTOR to Comply

CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to furnishing and performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR'S compliance with any Laws and Regulations.

5.11.2 Specifications and Drawings at Variance

If CONTRACTOR observes that the Specifications or Drawings are at variance with any Laws or Regulations, CONTRACTOR shall give ENGINEER prompt written notice thereof, and any necessary changes will be authorized by one of the methods indicated in paragraph 3.4. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to such Laws, or Regulations, and without such notice to ENGINEER, CONTRACTOR shall bear all costs arising therefrom; however, it shall not be CONTRACTOR'S primary responsibility to make certain that the Specifications and Drawings are in accordance with such Laws and Regulations.

Any party, firm or individual submitting a proposal pursuant to invitation must have paid all taxes owed to the Lexington-Fayette Urban County Government at the time the proposal is submitted, and must maintain a "current" status in regard to those taxes throughout the Contract. If applicable, business must be licensed in Fayette County.

5.12 Taxes

CONTRACTOR shall pay all sales, consumer, use and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work. Any party, firm or individual submitting a proposal pursuant to invitation must have paid all taxes owed to the Lexington-Fayette Urban County Government at the time the proposal is submitted, and must maintain a "current" status in regard to those taxes throughout the Contract. If applicable, business must be licensed in Fayette County.

5.13 Use of Premises

5.13.1 Project Site

CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Project site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by Laws and Regulations, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the Work. Should any claim be made against OWNER or ENGINEER by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly attempt to settle with such other party by agreement or otherwise resolve the claim by arbitration or at law.

CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold OWNER and ENGINEER harmless from and against all claims, damages, losses and expenses (including, but not limited to, fees of engineers, architects, attorneys and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any such other party against OWNER or ENGINEER to the extent based on a claim arising out of CONTRACTOR'S performance of the Work.

5.13.2 Clean Up

During the progress of the Work, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work, CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery, and surplus materials, and shall leave the site clean and ready for occupancy by OWNER. CONTRACTOR shall restore to original condition all property not designated for alteration by the Contract Documents.

5.13.3 Loading of Structures

CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

5.14 Record Drawings

CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Change Orders, Field Orders and written interpretations and clarifications (issued pursuant to paragraph 9.4) in good order and annotated to show all changes made during construction. These record documents together with all approved samples and a counterpart of all approved Shop Drawings will be available to ENGINEER for reference. Upon completion of the Work, these record documents, samples and Shop Drawings will be delivered to ENGINEER for OWNER.

5.15 Shop Drawings and Samples

5.15.1 Shop Drawing Submittals

After checking and verifying all field measurements and after complying with applicable procedures specified, CONTRACTOR shall submit to ENGINEER for review and approval in accordance with the accepted schedule of Shop Drawing submissions (see paragraph 2.8), or for other appropriate action if so indicated in the Special Conditions, five copies

(unless otherwise specified) of all Shop Drawings, which will bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR'S responsibilities under the Contract Documents with respect to the review of the submission. All submissions will be identified as ENGINEER may require. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable ENGINEER to review the information as required.

5.15.2 Sample Submittals

CONTRACTOR shall also submit to ENGINEER for review and approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and accompanied by a specific written indication that CONTRACTOR has satisfied CONTRACTOR'S responsibilities under the Contract Documents with respect to the review of the submission and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended.

5.15.3 Review by CONTRACTOR

Before submission of each Shop Drawing or sample CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each Shop Drawing or sample with other Shop Drawings and samples and with the requirements of the Work and the Contract Documents.

5.15.4 Notice of Variation

At the time of each submission, CONTRACTOR shall give ENGINEER specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each Shop Drawing submitted to ENGINEER for review and approval of each such variation.

5.15.5 ENGINEER'S Approval

ENGINEER will review and approve with reasonable promptness Shop Drawings and samples, but ENGINEER'S review and approval will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the

Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. CONTRACTOR shall make corrections required by ENGINEER, and shall return the required number of corrected copies of Shop Drawings and submit, as required, new samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

5.15.6 Responsibility for Errors and Omissions

ENGINEER'S review and approval of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER'S attention to each such variation at the time of submission as required by paragraph 5.15.4 and ENGINEER has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing or sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the provisions of paragraph 5.15.3.

5.15.7 Cost of Related Work

Where a Shop Drawing or sample is required by the Specifications, any related Work performed prior to ENGINEER'S review and approval of the pertinent submission will be the sole expense and responsibility of CONTRACTOR.

5.16 Continuing the Work

CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolutions of any disputes or disagreements, except as permitted by paragraph 14.5 or as CONTRACTOR and OWNER may otherwise agree in writing.

6. OTHER WORK

6.1 Related Work at Site

OWNER may perform other work related to the Project at the site by OWNER'S own forces, have other work performed by utility owners or let other direct contracts therefor which shall contain General Conditions similar to these. If the fact that such other work is to be performed was not noted in the Contract

Documents, written notice thereof will be given to CONTRACTOR prior to starting any such other work; and, if such performance will involve additional expense to CONTRACTOR or requires additional time, a Change Order to the Contract will be negotiated.

6.2 Other Contractors or Utility Owners

CONTRACTOR shall afford each utility owner and other contractor who is a party to such a direct contract (or OWNER, if OWNER is performing the additional work with OWNER'S employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work, and shall properly connect and coordinate the Work with theirs. CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between OWNER and such utility owners and other contractors.

6.3 Delays Caused by Others

If any part of CONTRACTOR'S Work depends for proper execution or results upon the work of any such other contractor or utility owner (or OWNER), CONTRACTOR shall inspect and promptly report to ENGINEER in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution and results. CONTRACTOR'S failure so to report will constitute an acceptance of the other work as fit and proper for integration with CONTRACTOR'S Work except for latent or nonapparent defects and deficiencies in the other work.

6.4 Coordination

If OWNER contracts with others for the performance of other work on the Project at the site, the person or organization who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified in the Special Conditions, and the specific matters to be covered by such authority and responsibility will be itemized, and the extent of such authority and responsibilities will be provided, in the Special Conditions.

7. OWNER'S RESPONSIBILITIES

7.1 Communications

OWNER shall issue all communications to CONTRACTOR through ENGINEER.

7.2 Data and Payments

OWNER shall furnish the data required of OWNER under the Contract Documents promptly after they are due.

7.3 Lands, Easements, and Surveys

OWNER'S duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.1 and 4.4. Paragraph 4.2 refers to OWNER'S identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions at the site and in existing structures which have been utilized by ENGINEER in preparing the Drawings and Specifications.

7.4 Change Orders

OWNER is obligated to execute Change Orders as indicated in paragraph 9.4.

7.5 Inspections, Tests and Approvals

OWNER'S responsibility in respect to certain inspections, tests and approvals is set forth in paragraph 13.3.

7.6 Stop or Suspend Work

In connection with OWNER'S right to stop Work or suspend Work, see paragraph 12.4 and 14.1 Paragraph 14.2 deals with OWNER'S rights to terminate services of CONTRACTOR under certain circumstances.

8. ENGINEER'S STATUS DURING CONSTRUCTION

8.1 OWNER'S Representative

ENGINEER will be OWNER'S representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER'S representative during construction are set forth in the Contract Documents and shall not be extended without written consent of OWNER and ENGINEER.

8.2 Visits to Site

ENGINEER will make visits to the site at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or

continuous on-site inspections to check the quality or quantity of the Work. ENGINEER'S efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform to the Contract Documents. On the basis of such visits and on-site observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defects and deficiencies in the Work.

8.3 Project Representation

ENGINEER will provide an Inspector to assist ENGINEER in observing the performance of the Work. If OWNER designates another agent to represent OWNER at the site who is not ENGINEER'S agent or employee, the duties, responsibilities and limitations of authority of such other person will be as provided in the Special Conditions.

8.4 Clarifications and Interpretations

ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as ENGINEER may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

8.5 Authorized Variations in Work

ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Time and are consistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order.

8.6 Rejecting Defective Work

ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be defective, and will also have authority to require special inspection or testing of the Work as provided in paragraph 12.3, whether or not the Work is fabricated, installed or completed.

8.7 Shop Drawings

In connection with ENGINEER'S responsibility for Shop Drawings and samples, see paragraphs 5.15.1 through 5.16 inclusive.

8.8 Change Orders

In connection with ENGINEER'S responsibilities as to Change Orders, see Articles 10, 11 and 12.

8.9 Payments

In connection with ENGINEER'S responsibilities with respect to Applications for Payment, etc., see Article 13.

8.10 Determinations for Unit Prices

ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR.

ENGINEER will review with CONTRACTOR ENGINEER'S preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise).

8.11 Decision on Disputes

ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work and claims under Articles 10 and 11 in respect of changes in the Contract Price or Contract Time will be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph, which ENGINEER will render in writing within a reasonable time. Written notice of each such claim, dispute and other matter will be delivered to ENGINEER promptly (but in no event later than thirty days) after the occurrence of the event giving rise thereto, and written supporting data will be submitted to ENGINEER within sixty days after such occurrence unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim.

8.12 Limitations on Engineer's Responsibilities

8.12.1 CONTRACTOR, Supplier, or Surety

Neither ENGINEER'S authority to act under this Article 8 or elsewhere in the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization performing any of the Work, or to any surety for any of them.

8.12.2 To Evaluate the Work

Whenever in the Contract Documents the terms "as ordered", "as directed", "as required", "as allowed", "as approved" or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper", or "satisfactory" or adjectives or like "effect" or "import" are used to describe a requirement, direction, review or judgment of ENGINEER as to the Work, it is intended that such

requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 8.12.3 or 8.12.4.

8.12.3 CONTRACTOR'S Means, Methods, Etc.

ENGINEER will not be responsible for CONTRACTOR'S means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and ENGINEER will not be responsible for CONTRACTOR'S failure to perform or furnish the Work in accordance with the Contract Documents.

8.12.4 Acts of Omissions of CONTRACTOR

ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

9. CHANGES IN THE WORK

9.1 OWNER May Order Change

Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work; these will be authorized by a Change Order. Upon receipt of such notice, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

9.2 Claims

Claims for an increase or decrease in the Contract Price or an extension or shortening of the Contract Time that should be allowed as a result of a Change Order will be settled as provided for in Article 10 or Article 11.

9.3 Work Not in Contract Documents

CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in paragraph 3.4, except in the case of an emergency and except in the case of uncovering Work as provided in paragraph 12.3.4.

9.4 Change Orders

OWNER and CONTRACTOR shall execute appropriate Change Orders covering:

9.4.1 changes in the Work which are ordered by OWNER pursuant to paragraph 9.1, are required because of acceptance of defective Work under paragraph 12.7 or corrective defective Work under paragraph 12.8, or are agreed to by the parties;

9.4.2 changes in the Contract Price or Contract Time which are agreed to by the parties; and

9.4.3 changes in the Contract Price or Contract Time which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 8.11; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and REGULATIONS, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 5.16.

9.5 Notice of Change

If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Time) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR'S responsibility, and the amount of each applicable Bond will be adjusted accordingly.

10. CHANGE OF CONTRACT PRICE

10.1 Total Compensation

The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at his expense without change in the Contract Price.

10.2 Claim for Increase or Decrease in Price

The Contract Price may only be changed by a Change Order. Any claim for an increase or decrease in the Contract Price shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than thirty days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within sixty days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by CONTRACTOR'S written statement that the amount claimed covers all known amounts (direct, indirect, and consequential) to which the CONTRACTOR is entitled as a result of the occurrence of said event.

10.3 Value of Work

The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:

10.3.1 Unit Prices

Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved (subject to the provisions of paragraphs 10.9.1. through 10.9.3, inclusive).

10.3.2 Lump Sum

By mutual acceptance of a lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 10.6.2.1).

10.3.3 Cost Plus Fee

On the basis of the Cost of the Work (determined as provided in paragraphs 10.4 and 10.5) plus a CONTRACTOR'S fee for overhead and profit (determined as provided in paragraphs 10.6 and 10.7).

10.4 Cost of the Work

The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project; shall include only the following items; and shall not include any of the costs itemized in paragraph 10.5:

10.4.1 Payroll Costs

Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications

agreed upon by OWNER and CONTRACTOR. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' or workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Such employees shall include superintendents and foremen at the site. The expenses of performing Work after regular working hours, on Saturday, Sunday or legal holidays, shall be included in the above to the extent authorized by OWNER.

10.4.2 Materials and Equipment Costs

Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and all returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

10.4.3 Subcontractor Costs

Payments made by CONTRACTOR to the Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from Subcontractors acceptable to CONTRACTOR and shall deliver such bids to OWNER who will then determine, with the advice of ENGINEER, which bids will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a Fee, the Subcontractor's Cost of the Work shall be determined in the same manner as CONTRACTOR'S Cost of the Work. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

10.4.4 Special Consultant Costs

Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys and accountants) employed for services specifically related to the Work.

10.4.5 Supplemental Costs

- 10.4.5.1 The proportion of necessary transportation, travel and subsistence expenses of CONTRACTOR'S employees incurred in discharge of duties connected with the Work.
- 10.4.5.2 Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of CONTRACTOR.
- 10.4.5.3 Rentals of all construction equipment and machinery and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, installation, dismantling and removal shall be in accordance with terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.
- 10.4.5.4 Sales, consumer, use or similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.
- 10.4.5.5 Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- 10.4.5.6 Losses and damages (and related expenses), not compensated by insurance or otherwise, to the Work or otherwise sustained by CONTRACTOR in connection with the performance and furnishing of the Work (except losses and damages within the deductible amounts of property insurance established by OWNER), provided they have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include

settlements made with the written consent and approval of OWNER. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR'S fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid a fee proportionate to that stated in paragraph 10.6.2 for services.

10.4.5.7 The cost of utilities, fuel and sanitary facilities at the site.

10.4.5.8 Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

10.4.5.9 Cost of premiums for additional Bonds and insurance required because of changes in the Work and premiums for property insurance coverage within the limits of the deductible amounts established by OWNER.

10.5 Not to Be Included in Cost of the Work

The term Cost of the Work shall not include any of the following:

10.5.1 Costs of Officers and Executives

Payroll costs and other compensation of CONTRACTOR'S officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the site or in CONTRACTOR'S principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 10.4.1 or specifically covered by paragraph 10.4.4 - all of which are to be considered administrative costs covered by the CONTRACTOR'S fee.

10.5.2 Principal Office

Expenses of CONTRACTOR'S principal and branch offices other than CONTRACTOR'S office at the site.

10.5.3 Capital Expense

Any part of CONTRACTOR'S capital expenses, including interest on CONTRACTOR'S capital employed for the Work and charges against CONTRACTOR for delinquent payments.

10.5.4 Bonds and Insurance

Cost of premiums for all Bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by subparagraph 10.4.5.9 above).

10.5.5 Costs Due to Negligence

Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

10.5.6 Other Costs

Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 10.4.

10.6 Contractor's Fee

The CONTRACTOR'S Fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

10.6.1 a mutually acceptable fixed fee; or if none can be agreed upon,

10.6.2 a fee based on the following percentages of the various portions of the Cost of the Work:

10.6.2.1 for costs incurred under paragraphs 10.4.1 and 10.4.2, the CONTRACTOR'S fee shall be fifteen percent;

10.6.2.2 for costs incurred under paragraph 10.4.3, the CONTRACTOR'S fee shall be five percent; and if a subcontract is on the basis of Cost of the Work Plus a fee, the maximum allowable to CONTRACTOR on account of overhead and profit of all Subcontractors shall be fifteen percent;

10.6.2.3 no fee shall be payable on the basis of costs itemized under paragraphs 10.4.4, 10.4.5 and 10.5;

10.6.2.4 the amount of credit to be allowed by CONTRACTOR to OWNER for any such change which results in a net decrease in cost will be the amount of the actual net decrease plus a deduction in CONTRACTOR'S Fee by an amount equal to ten percent of the net decrease; and

10.6.2.5 when both additions and credits are involved in any one change, the adjustment in CONTRACTOR'S fee shall be computed on the basis of the net change in accordance with paragraphs 10.6.2.1 through 10.6.2.4, inclusive.

10.7 Itemized Cost Breakdown

Whenever the cost of any Work is to be determined pursuant to paragraph 10.4 or 10.5, CONTRACTOR will submit in form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

10.8 Cash Allowances

It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be done by such Subcontractors or Suppliers and for such sums within the limit of the allowances as may be acceptable to ENGINEER, CONTRACTOR agrees that:

10.8.1 Materials and Equipment

The allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the site, and all applicable taxes; and

10.8.2 Other Costs

CONTRACTOR'S costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances. No demand for additional payment on account of any thereof will be valid.

10.8.3 Change Order

Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

10.9 Unit Price Work

10.9.1 General

Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit prices for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The

estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER in accordance with Paragraph 8.10.

10.9.2 Overhead and Profit

Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR'S overhead and profit for each separately identified item.

10.9.3 Claim for Increase in Unit Price

Where the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement and there is no corresponding adjustment with respect to any other item of Work and if CONTRACTOR believes that CONTRACTOR has incurred additional expense as a result thereof, CONTRACTOR may make a claim for an increase in the Contract Price in accordance with Article 10.

11. CHANGE OF CONTRACT TIME

11.1 Change Order

The Contract Time may only be changed by a Change Order. Any claim for an extension or shortening of the Contract Time shall be based on written notice delivered to ENGINEER promptly (but in no event later than thirty days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within sixty days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Time shall be determined by ENGINEER in accordance with paragraph 8.11. No claim for an adjustment in the Contract Time will be valid if not submitted in accordance with the requirements of this paragraph 11.1.

11.2 Justification for Time Extensions

The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of CONTRACTOR if a claim is made therefor as provided in paragraph 11.1. Such delays shall include, but not be limited to, acts or neglect by OWNER or others performing additional work as contemplated by Article 6, or to fires, floods, labor disputes, epidemics, abnormal weather conditions or acts of God.

11.3 Time Limits

All time limits stated in the Contract Documents are of the essence of the Agreement. The provisions of this Article 11 shall not exclude recovery for damages (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court costs) for delay by either party.

12. WARRANTY AND GUARANTEE; TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

12.1 Warranty and Guarantee

CONTRACTOR warrants and guarantees to OWNER and ENGINEER that all Work will be in accordance with the Contract Documents and will not be defective. All defective Work, whether or not in place, may be rejected, corrected or accepted as provided in this Article 12.

12.2 Access to Work

ENGINEER and ENGINEER'S representatives, other representatives of OWNER, testing agencies and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide proper and safe conditions for such access.

12.3 Tests and Inspections

12.3.1 Timely Notice

CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests or approvals.

12.3.2 Requirements and Responsibilities

The ENGINEER may require such inspection and testing during the course of the Work as he/she deems necessary to ascertain and assure the integrity and acceptable quality of the materials incorporated and the work performed. Inspection presence may be either full-time or intermittent, and neither the presence nor absence at any time of the ENGINEER or the INSPECTOR shall relieve the CONTRACTOR of sole responsibility for the acceptability and integrity of the Work or any part thereof.

The costs of sampling, testing, and inspection on-site to ascertain acceptability of the Work and materials will be borne by the OWNER except as otherwise provided. The OWNER will select a testing laboratory to perform such sampling and testing. Sampling and/or testing

required by the CONTRACTOR or necessitated by failure of Work or materials to meet the above acceptability test shall be at the expense of the CONTRACTOR.

Inspection services may be performed by the employees of the OWNER or by others selected or designated by the OWNER or the ENGINEER.

Sampling and/or testing required for manufacturing quality and/or process control, for certification that raw mineral materials or manufactured products are the quality specified in the contract, or to assure the acceptability for incorporation into the Work shall be borne by the CONTRACTOR or the material supplier.

Cost for inspection, sampling, testing, and approvals required by the laws or regulations of any public body having competent jurisdiction shall be borne by the CONTRACTOR or the material supplier.

Sampling and testing will be in accord with pertinent codes and regulations and with appropriate standards of the American Society of Testing Materials or other specified standards.

12.3.3 On-site Construction Test and Other Testing

All inspections, tests or approvals other than those required by Laws or Regulations of any public body having jurisdiction shall be performed by organizations acceptable to OWNER and CONTRACTOR (or by ENGINEER if so specified).

12.3.4 Covered Work

If any Work (including the work of others) that is to be inspected, tested or approved is covered without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation. Such uncovering shall be at CONTRACTOR'S expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR'S intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

12.3.5 CONTRACTOR'S Obligation

Neither observations by ENGINEER nor inspections, tests or approvals by others shall relieve CONTRACTOR from CONTRACTOR'S obligations to perform the Work in accordance with the Contract Documents.

12.4 OWNER May Stop the Work

If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any other party.

12.5 Correction or Removal of Defective Work

If required by ENGINEER, CONTRACTOR shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by ENGINEER, remove it from the site and replace it with non-defective Work. CONTRACTOR shall bear all direct, indirect and consequential costs of such correction or removal (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) made necessary thereby.

12.6 One Year Correction Period

If within one year after the date of Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER'S written instructions, either correct such defective Work, or, if it has been rejected by OWNER, remove it from the site and replace it with non-defective Work. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or the rejected Work removed and replaced, and all direct, indirect and consequential costs of such removal and replacement (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) will be paid by CONTRACTOR. In special circumstances where a particular item of equipment is placed in continuous service before Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Change Order.

12.7 Acceptance of Defective Work

If, instead of requiring correction or removal and replacement of defective Work, OWNER prefers to accept it, OWNER may do so. CONTRACTOR shall bear all direct, indirect and consequential costs attributable to OWNER'S evaluation of and determination to accept such defective Work (such costs to be approved

by ENGINEER as to reasonableness and to include but not be limited to fees and charges of engineers, architects, attorneys and other professionals).

12.8 OWNER May Correct Defective Work

If CONTRACTOR fails within a reasonable time after written notice of ENGINEER to proceed to correct and to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 12.5, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days' written notice to CONTRACTOR, correct and remedy any such deficiency. In exercising the rights and remedies under this paragraph OWNER shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend CONTRACTOR'S services related thereto, take possession of CONTRACTOR'S tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER'S representatives, agents and employees such access to the site as may be necessary to enable OWNER to exercise the rights and remedies under this paragraph. All direct, indirect and consequential costs of OWNER in exercising such rights and remedies will be charged against CONTRACTOR in an amount approved as to reasonableness by ENGINEER, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price. Such direct, indirect and consequential costs will include but not be limited to fees and charges of engineers, architects, attorneys and other professionals, all court costs and all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of CONTRACTOR'S defective Work. CONTRACTOR shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by OWNER of OWNER'S rights and remedies hereunder.

13. PAYMENTS TO CONTRACTOR AND COMPLETION

13.1 Schedule of Values

The schedule of values established as provided in paragraph 2.8 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

13.2 Application for Progress Payment

At least ten days before each progress payment is scheduled (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that OWNER has received the materials and equipment free and clear of all liens, charges, security interests and encumbrances (which are hereinafter in these General Conditions referred to as "Liens") and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect OWNER'S interest therein, all of which will be satisfactory to OWNER. OWNER shall, within thirty (30) calendar days of presentation to him of an approved Application for Payment, pay CONTRACTOR the amount approved by ENGINEER.

13.2 Retainage

Monthly progress payments shall be ninety (90) percent of the sum obtained by applying the respective bid unit prices to the approved estimated quantities of work completed by the Contractor during the preceding month. The remaining ten (10) percent will be held by the Owner, as retainage until 51% of the project has been completed. Thereafter, if the work is fully in compliance with the requirements of the contract, the OWNER shall retain five (5) percent of the total contract amount until substantial completion and acceptance of all work covered by the contract as collateral security to ensure successful completion of the work. If substantial completion of the project is achieved and the Engineer deems appropriate, based on the quality of work performed, progress of cleanup, and other pertinent factors, the rate of retainage, or the total amount retained, may be reduced. All remaining retainage held will be included in the final payment to the Contractor.

13.3 CONTRACTOR'S Warranty of Title

CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

13.4 Review of Applications for Progress Payment

13.4.1 Submission of Application for Payment

ENGINEER will, after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER, or return the Application to CONTRACTOR indicating in writing ENGINEER'S reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application.

13.4.2 ENGINEER'S Recommendation

ENGINEER may refuse to recommend the whole or any part of any payment, if, in ENGINEER'S opinion, it would be incorrect to make such representations to OWNER. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in ENGINEER'S opinion to protect OWNER from loss because:

- 13.4.2.1 the Work is defective, or completed Work has been damaged requiring correction or replacement;
- 13.4.2.2 the Contract Price has been reduced by Written Amendment or Change Order;
- 13.4.2.3 OWNER has been required to correct defective Work or complete Work in accordance with paragraph 12.8; or
- 13.4.2.4 of ENGINEER'S actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.2.1 through 14.2.9 inclusive.

13.5 Partial Utilization

OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and has been completed. If CONTRACTOR agrees, CONTRACTOR will certify to OWNER that said part of the Work is complete and request that a Certificate of Completion be issued for that part of the Work.

13.6 Final Inspection

Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, ENGINEER will make a final inspection with CONTRACTOR and will notify CONTRACTOR in writing of all particulars in

which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to remedy such deficiencies.

13.7 Final Application for Payment

After CONTRACTOR has completed all such corrections to the satisfaction of ENGINEER and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked-up record documents (as provided in paragraph 5.14) and other documents - all as required by the Contract Documents, and after ENGINEER has indicated that the Work is acceptable (subject to the provisions of paragraph 13.10), CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to OWNER) of all Liens arising out of or filed in connection with the Work. In lieu thereof and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full; an affidavit of CONTRACTOR that the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and that all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or OWNER'S property might in any way be responsible, have been paid or otherwise satisfied; and consent of the surety, if any, to final payment. If any Subcontractor or Supplier fails to furnish a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

13.8 Final Payment and Acceptance

13.8.1 ENGINEER'S Approval

If, on the basis of ENGINEER'S observation of the Work during construction and final inspection, and ENGINEER'S review of the final Application for Payment and accompanying documentation - all as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR'S other obligations under the Contract Documents have been fulfilled, ENGINEER will, after receipt of the final Application for Payment, indicate in writing ENGINEER'S recommendation of payment and present the Application to OWNER for payment. Thereupon ENGINEER will give written notice to OWNER and CONTRACTOR that the Work is acceptable, subject to the provisions of paragraph 13.10. Otherwise, ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application.

13.8.2 Delay in Completion of Work

If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, OWNER shall, upon receipt of CONTRACTOR'S final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 10 of Part II, Information for Bidders, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

13.9 CONTRACTOR'S Continuing Obligation

CONTRACTOR'S obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by ENGINEER, nor the issuance of a certificate of Completion, nor any payment by OWNER to CONTRACTOR under the Contract Documents, nor any use or occupancy of the Work or any part thereof by OWNER, nor any act of acceptance by OWNER nor any failure to do so, nor any review and approval of a Shop Drawing or sample submission, nor any correction of defective Work by OWNER will constitute an acceptance of Work not in accordance with the Contract Documents or a release of CONTRACTOR'S obligation to perform the Work in accordance with the Contract Documents (except as provided in paragraph 13.10).

13.10 Waiver of Claims

The making and acceptance of final payment will constitute:

13.10.1 a waiver of all claims by OWNER against CONTRACTOR, except claims arising from unsettled Liens, from defective Work appearing after final inspection or from failure to comply with the Contract Documents or the terms of any special guarantees specified therein; however, it will not constitute a waiver by OWNER of any rights in respect of CONTRACTOR'S continuing obligations under the Contract Documents; and

13.10.2 a waiver of all claims by CONTRACTOR against OWNER other than those previously made in writing and still unsettled.

14. SUSPENSION OF WORK AND TERMINATION

14.1 OWNER May Suspend Work

OWNER may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety days by notice in writing to CONTRACTOR and ENGINEER which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if CONTRACTOR makes an approved claim therefor as provided in Articles 10 and 11.

14.2 OWNER May Terminate

The OWNER may terminate the Work upon the occurrence of any one or more of the following events:

14.2.1 if CONTRACTOR commences a voluntary case under any chapter of the Bankruptcy Code (Title 11, United States Code), as now or hereafter in effect, or if CONTRACTOR takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time relating to the bankruptcy or insolvency;

14.2.2 if a petition is filed against CONTRACTOR under any chapter of the Bankruptcy Code as now or hereafter in effect at the time of filing, or if a petition is filed seeking any such equivalent or similar relief against CONTRACTOR under any other federal or state law in effect at the time relating to bankruptcy or insolvency;

14.2.3 if CONTRACTOR makes a general assignment for the benefit of creditors;

14.2.4 if a trustee, receiver, custodian or agent of CONTRACTOR is appointed under applicable law or under contract, whose appointment or authority to take charge of property of CONTRACTOR is for the purpose of enforcing a Lien against such property or for the purpose of general administration of such property for the benefit of CONTRACTOR'S creditors;

14.2.5 if CONTRACTOR admits in writing an inability to pay its debts generally as they become due;

14.2.6 if CONTRACTOR persistently fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or

failure to adhere to the progress schedule established under paragraph 2.8 as revised from time to time);

- 14.2.7 if CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;
- 14.2.8 if CONTRACTOR disregards the authority of ENGINEER, or
- 14.2.9 if CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents;

OWNER may, after giving CONTRACTOR (and the surety) seven days' written notice and to the extent permitted by Laws and Regulations, terminate the services of CONTRACTOR, exclude CONTRACTOR from the site and take possession of the Work and of all CONTRACTOR'S tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the direct, indirect and consequential costs of completing the Work (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs) such excess will be paid to CONTRACTOR. If such costs exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such costs incurred by OWNER will be approved as to reasonableness by ENGINEER and incorporated in a Change Order, but when exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

14.3 CONTRACTOR'S Services Terminated

Where CONTRACTOR'S services have been so terminated by OWNER, the termination will not affect any rights or remedies of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

14.4 Payment After Termination

Upon seven days' written notice to CONTRACTOR, OWNER may, without cause and without prejudice to any other right or remedy, elect to abandon the

Work and terminate the Agreement. In such case, CONTRACTOR shall be paid for all Work executed and any expense sustained plus reasonable termination expenses, which will include, but not be limited to, direct, indirect and consequential costs (including, but not limited to, fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs).

14.5 CONTRACTOR May Stop Work or Terminate

If, through no act or fault of CONTRACTOR, the Work is suspended for a period of more than ninety days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within sixty days after it is submitted, or OWNER fails for sixty days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days' written notice to OWNER and ENGINEER, terminate the Agreement and recover from OWNER payment for all Work executed and any expense sustained plus reasonable termination expenses. In addition and in lieu of terminating the Agreement, if ENGINEER has failed to act on an Application for Payment or OWNER has failed to make any payment as aforesaid, CONTRACTOR may upon seven days' written notice to OWNER and ENGINEER stop the Work until payment of all amounts then due. The provisions of this paragraph shall not relieve CONTRACTOR of the obligations under paragraph 5.16 to carry on the Work in accordance with the progress schedule and without delay during disputes and disagreements with OWNER.

15. MISCELLANEOUS

15.1 Claims for Injury or Damage

Should OWNER or CONTRACTOR suffer injury or damage to person or property because of any error, omission or act of the other party or of any of the other party's employees or agents or others for whose acts the other party is legally liable, claim will be made in writing to the other party within a reasonable time of the first observance of such injury or damage. The provisions of this paragraph 15.1 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose.

15.2 Non-Discrimination in Employment

The CONTRACTOR shall comply with the following requirements prohibiting discrimination:

15.2.1 That no person (as defined in KRS 344.010) shall bid on Lexington-Fayette Urban County Government construction projects, or bid to furnish materials or supplies to the Lexington-Fayette Urban County Government, if, within six months prior to the time of opening of bids, said person shall have been found, by declaratory judgment action in Fayette Circuit Court, to be presently engaging in an unlawful practice, as

hereinafter defined. Such declamatory judgment action may be brought by an aggrieved individual or upon an allegation that an effort at conciliation pursuant to KRS 344.200 has been attempted and failed, by the Lexington-Fayette County Human Rights Commission.

15.2.2 That it is an unlawful practice for an employer:

15.2.2.1 to fail or refuse to hire, or to discharge any individual or otherwise to discriminate against an individual, with respect to his compensation, terms, conditions, or privileges of employment, because of such individual's race, color, religion, sex, age, or national origin; or

15.2.2.2 to limit, segregate or classify his employees in any way which would deprive or tend to deprive an individual of employment opportunities or otherwise adversely affect his status as an employee because of such individual's sex, race, color, religion, age, or national origin.

15.2.3 That it is an unlawful practice for an employer, labor organization, or joint-labor management committee controlling apprenticeship or other training or retraining, including on-the-job training programs to discriminate against an individual because of his race, color, religion, sex, age, or national origin in admission to, or employment in, any program established to provide apprenticeship or other training.

15.2.4 That a copy of this Ordinance shall be furnished all suppliers and made a part of all bid specifications.

15.2.5 This Ordinance shall take effect after it is signed, published and recorded, as required by law.

15.3 Temporary Street Closing or Blockage

The CONTRACTOR will notify the ENGINEER at least 72 hours prior to making any temporary street closing or blockage. This will permit orderly notification to all concerned public agencies. Specific details and restrictions on street closure or blockage are contained in the Special Conditions.

15.4 Percentage of Work Performed by prime CONTRACTOR

The CONTRACTOR shall perform on site, and with its own organization, Work equivalent to at least fifty (50%) percent of the total amount of Work to be performed under the Contract. This percentage may be reduced by a supplemental agreement to this Contract if, during performing the Work, the

CONTRACTOR requests a reduction and the ENGINEER determines that the reduction would be to the advantage of the OWNER.

15.5 Clean-up

Cleanup shall progress, to the greatest degree practicable, throughout the course of the Work. The Work will not be considered as completed, and final payment will not be made, until the right-of-way and all ground occupied or affected by the Contractor in connection with the Work has been cleared of all rubbish, equipment, excess materials, temporary structures, and weeds. Rubbish and all waste materials of whatever nature shall be disposed of, off of the project site, in an acceptable manner. All property, both public and private, which has been damaged in the prosecution of the Work, shall be restored in an acceptable manner. All areas shall be draining, and all drainage ways shall be left unobstructed, and in such a condition that drift will not collect or scour be induced.

15.6 General

The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon CONTRACTOR by paragraphs 12.1, 12.3.5, 13.3, and 15.2 and all of the rights and remedies available to OWNER and ENGINEER thereunder, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply. All representations, warranties and guarantees made in the Contract Documents will survive final payment and termination or completion of the Agreement.

15.7 Debris Disposal

For all LFUCG projects any fill, trash, construction demolition debris, yard waste, dirt or debris of any kind that is removed from the project site must be disposed of in accordance with local, state, and federal regulations. The disposal site or facility must be approved in advance by the LFUCG and disposal documentation is required. The Contractor will be responsible for payment of any fines associated with improper disposal of material removed from the project site.

PART V

SPECIAL CONDITIONS

INDEX

1	GENERAL
2	COMPLETION SCHEDULE
3	SUPPLEMENTAL
4	REQUIRED RISK MANAGEMENT PROVISIONS
5	BLASTING
6	WASTE MANAGEMENT PLAN
7	BUY AMERICAN PROVISION
8	STATE and/or FEDERAL WAGE SCALE
9	SPECIAL TERMS AND CONDITIONS, U.S. DEPARTMENT OF ENERGY (ADDENDUM NO.1)
10	CONFINED SPACE PROGRAM

1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General, and Supplementary Conditions, apply to work of this section.

1.2 PROJECT / WORK IDENTIFICATION

- A. Conduits, piping, troughs, ducts, etc., carrying, containing or generating water or any other fluid subject to freezing shall not be installed in any location where danger of freezing may exist, nor shall existing similar elements be exposed to freezing conditions. All damages resulting from broken, leaking, or otherwise damaged, lines shall be replaced or repaired at the Contractor's expense.
- B. Equipment, devices, etc. shall operate under all conditions of load without objectionable sound or vibration.
- C. Equipment, devices, etc., subject to undue vibration and, or oscillation shall be mounted on vibration supports suitable for the purpose of minimizing noise and vibration transmission, and shall be isolated by means of flexible connectors, vibration absorbers, or other approved means. Unitary equipment, such as small room heating units, small exhaust fans, etc., shall be rigidly braced and mounted to wall, floor or ceiling as required and tightly gasketed and sealed to mounting surfaces to prevent air leakage and to obtain quiet operation. Flush and surface mounted equipment such as diffusers, grilles, etc., shall be gasketed and affixed tightly to their mounting surfaces.
- D. The Contractor shall provide access panels for concealed valves, control dampers, pullboxes, junction boxes, fire dampers, smoke dampers, and any other such devices requiring access and, or service.
- E. The Contractor shall, at his expense restore to their original condition all paving, curbing, surfaces, drainage ditches, structures, fences, shrubs, existing or new building surfaces and appurtenances, and any other items damaged or removed by his operations. Replacement and repairs shall be by workers competent in the respective replacement, repairs, restoration, etc. All such work shall be in accordance with good practice and shall reasonably match materials employed in the original construction of the item and shall be warranted. Roofing shall be warranted to the current life of its warranty. **The Contractor shall provide the Owner with video or photographic documentation of the pre-existing conditions of the facility prior to beginning any demolition activities.**
- F. The Contractor shall repair; fire and smoke stop all openings in fire rated walls, ceilings, floors, etc., in accord with the KBC. Patch all openings around ductwork and piping with appropriate type material to stop smoke at smoke walls and provide commensurate fire rating at fire walls, floors, ceilings, roofs, etc. This provision includes all openings either pre-existing or created during demolition or construction.

- G. The Contractor shall locate and provide sleeves and inserts required for the work. Penetrations to the exterior shall be made watertight.
- H. Escutcheon plates shall be provided for all exposed pipes and conduit passing through walls, floors and ceilings. Plates shall be nickel plated, of the split ring type and of size to match the pipe or conduit.
- I. The Contractor shall furnish and install all (1) temperature control wiring, (2) equipment control wiring and (3) interlock wiring. The Contractor shall also provide all power wiring complete from the power source to motor equipment, device, etc., junction box, including power wiring through starters, and shall install all required starters not factory-mounted on equipment. All electrical work shall be in strict accord with the currently applicable copy of the National Electrical Code (NEC). All electrical work shall be by fully trained, competent electricians, licensed where required.
- J. The NEC has specific required clearances above, in front, and around electrical gear, panels, etc. The Contractor shall not install any piping, ductwork, etc., in the required clearance. If any appurtenance is located in the NEC required clearance, it shall be relocated at no additional cost.
- K. The Owner will **NOT** permit the Contractor to use the building's restroom facilities, during the construction period. The Contractor is to provide bathroom facilities adequate to meet all applicable regulations for temporary bathroom facilities. Location of said facilities to be approved by the Owner before placement.
- L. The Owner will permit the Contractor to wisely use the building's power for operating construction lighting, power tools, etc. The use of the building's power for temporary heat, cooling or other substantial use or using the power in a wasteful or abusive manner is not permitted. Coordination of this power availability with the demolition and retrofit of the electrical portions of this contract is strictly the responsibility of the Contractor.
- M. The Owner will **NOT** remove from the building; furniture, equipment, bookcases or cabinetry. The Contractor shall cover and protect these fixtures during the work. Any damage shall be repaired or replaced.
- N. Staging and storage space will not be available to the Contractor within the building. The Contractor's needs and details will be addressed during the Pre- Construction meeting. The Contractor should make provisions in his bid to provide temporary storage for his materials on the job site but outside the building.
- O. The Owner will be occupying parts of the building during the construction period. The contractor will include in his Construction Schedule a sequence of work to accommodate the Owner's access. The contractor will send a representative authorized to make decisions on the contractor's behalf to a biweekly site meeting to coordinate schedule and access requirements. A minimum of 48 hours notice shall be given prior to mobilizing in an occupied area to start work. No adjustment to project completion schedule will be granted based on Owner's occupancy requirements during construction. A minimum of 48 hours notice shall be given to the Owner prior to operating any cranes or rigging/hoisting equipment on site.

2 COMPLETION SCHEDULE

2.1 COMPLETION SCHEDULE

	SUBSTANTIAL COMPLETION	FINAL COMPLETION
Base Bid and all Alternates	145 Days	14 days

3 SUPPLEMENTAL

A. Related documents.

1. Drawings and general provisions of the contract, including General, and Special Conditions, apply to this section.

B. Definitions of terms.

1. Add the following to the General Conditions:

- a. **Furnish:** Except as otherwise defined in greater detail, the term "furnish" is used to mean, supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.
- b. **Install:** Except as otherwise defined in greater detail, the term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.
- c. **Provide:** Except as otherwise defined in greater detail, the term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

2. Abbreviations.

- a. Where any of the following abbreviations are used in the Contract Documents, they shall have the meaning set forth opposite each.

- (1) ANSI American National Standard Institute
- (2) ASHRAE American Society of Heating, Air Conditioning and Refrigeration Engineers
- (3) ASTM American Society for Testing and Materials
- (4) CGA Compressed Gas Association
- (5) CSA Canadian Standard Association
- (6) Fed. Spec. Federal Specifications issued by the Federal Supply Service of the General Service Administration, Washington, DC
- (7) IECC International Energy Conservation Code
- (8) KBC Kentucky Building Code; latest edition
- (9) NEC National Electrical Code; latest edition
- (10) NEMA National Electrical Manufacturers Association
- (11) NFPA National Fire Protection Association
- (11) NIOSH National Institute for Occupational Safety and Health
- (12) MSHA Mine Safety and Health Administration
- (13) OSHA Occupational Safety and Health Administration
- (14) SMACNA Sheet Metal and Air Conditioning Contractors' National Association
- (15) USEPA United States Environmental Protection Agency

C. Intent and Interpretation.

1. Add the following to the General Conditions:

- a. Each Proposer shall inform himself of all of the conditions under which the work is to be performed, the site of the work, obstacles that may be encountered, availability and location of necessary facilities and any other relevant matters concerning the work. Each Proposer shall also fully acquaint himself with all existing conditions as to ingress and egress, distance of haul from supply points, routes for transportation of materials, facilities.

2. Add the following to the General Conditions:

- a. Details not shown or specified, but are necessary as required for the proper installation and operation of the systems, equipment, materials, devices, etc., shall be included in the work, the same as if specified or indicated.

D. Supervision and Construction Procedures.

1. Add the following to the General Conditions:

- a. The Contractor shall be responsible for the conduct of all workers whom he engages either directly or indirectly on the Project. Misconduct on the part of any worker to the extent of creating a safety hazard, or endangering the lives, well being, and, or property of others is strictly prohibited. The consumption of alcoholic beverages or other intoxicants, narcotics, barbiturates, hallucinogens or other debilitating drugs on the job site is strictly forbidden.

2. Add the following to the General Conditions:

- a. The Contractors Superintendent shall carry a cell phone at all times. The superintendent's name and cell phone number shall be filed with the Engineer.

E. Labor, Materials.

1. Add the following to the General Conditions:

- a. Deliver to the Owner all manufacturers' warranties prior to completion of the project.

2. Add the following to the General Conditions:

- a. By making a request for substitution, the Contractor:

- (1) represents that he has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
 - (2) represents that he will provide the same warranty for the substitution as the original product specified;
 - (3) certifies that the cost data presented is complete and includes all related costs under the Contract Documents, and waives all claims for additional costs related to the substitution which subsequently become apparent;
 - (4) will coordinate the installation of the accepted substitute, making all such changes and additions as may be required for the Work to be complete in all respects.
- b. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not necessarily be construed as limiting competition. Secure approval of Engineers prior to ordering.
3. Add the following to the General Conditions:
- a. The Contractor shall be responsible for all material and equipment furnished by him in connection with his work and special care shall be taken to properly protect all parts thereof from damage and/or theft during the construction period. All open piping, ductwork, conduit, sanitary lines, electrical wiring, etc. shall be properly plugged or capped during construction. Equipment damaged stolen or vandalized while on site, either before or after installation, shall be repaired or replaced by the Contractor at his own expense.
 - b. All work shall be accomplished by qualified workers competent in the area of work for which they are responsible. Untrained and incompetent workers shall be relieved of their responsibilities in areas of incompetence. Workers shall have all legally and standard required licenses registrations and to present them upon request.
 - c. The Contractor shall furnish all scaffolding, rigging, hoisting and any other services necessary for erection and delivery onto the premises of any equipment, devices, materials, apparatus, etc., furnished. All such temporary appurtenances shall be of the required type and shall be set up in strict accord with OSHA Guidelines Standards and Requirements and any other applicable safety standards. Remove from premises when no longer required.
 - d. After completion, but before final acceptance of the work, the Contractor shall thoroughly clean all equipment and materials and shall remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of piping, equipment, fixtures and all other associated or adjacent fabrication, except as may be required for instructional purposes or for the safe and, or proper operation of the equipment, device, etc.
 - e. The Contractor shall locate and install all equipment so that it may be serviced, and maintained as recommended by the manufacturer.
 - f. The Contractor shall provide cutting and patching as required to install the work. Patching shall match and be finished the same as adjacent surfaces. Matching may in some cases require painting of other walls or spaces, replacement of entire ceilings where satisfactory molding cannot be attained.

- g. Where any work pierces waterproofing including waterproof concrete, the Contractor shall furnish all necessary sleeves, caulking, flashing, etc., required to make openings permanently water-tight.
- h. Upon completion of all work, the Contractor shall instruct the Owner or his representative(s) fully in the operations, adjustment and maintenance of all equipment, devices, systems, etc., and turn over all special wrenches, keys, devices, etc., to the Owner.
- i. The Contractor shall furnish three (3) complete sets of instructions for operating and maintaining all systems and equipment included in this project. The Contractor shall furnish detailed record drawings in accordance with the General Conditions upon completion of the project.
- j. The Contractor shall finally connect to electrical and mechanical services (water, gas, air, etc.) terminal equipment, appliances, etc. Whether furnished by him or not, such connections shall be made in strict accord with current codes, safety regulations and the equipment manufacturer's recommendations.

F. Protection of Work, Property, Employees, and Public.

1. Add the following to the General Conditions:

- a. Each item of equipment, apparatus, device, piping, conduit, ductwork, wiring, etc. shall be provided with safe, suitable and rigid support. Exercise care that structural members of building are not overloaded. Do not cut, bore, bend or otherwise weaken any new or existing structural members.

G. Indemnification.

1. Add the following to the General Conditions:

- a. The Contractor shall hold harmless and indemnify the owner, the Architect / Engineer (Paladin, Inc.), their respective employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and, or liability resulting from, brought for, or on account of any personal injury, property damage, or loss or production received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed under or related to this Project.

H. Miscellaneous Provisions Regarding Contractor's Work

1. Add the following to the General Conditions:

- a. Contractor will be supplied with one (1) set of prints of his Contract Drawings. These prints shall be kept and maintained in good condition at the site of the project and a qualified representative of the Contractor shall enter upon these prints the actual record of progress. Electrical and Mechanical utilities and equipment, including HVAC terminal equipment, shall be accurately located and referenced to permanent surface markers. Each HVAC terminal power circuit identification number shall be recorded on the record drawings. Each lighting circuit number shall be identified on the record drawings. Entries and notations

shall be made in a neat and legible manner and these prints shall be delivered to the Engineer upon completion of his work, as "record" documentation.

4 REQUIRED RISK MANAGEMENT PROVISIONS INSURANCE AND INDEMNIFICATION

4.1 DEFINITIONS.

The CONTRACTOR understands and agrees that the Risk Management Provisions of this Contract define the responsibilities of the CONTRACTOR to the OWNER.

As used in these Risk Management Provisions, the terms "CONTRACTOR" and "OWNER" shall be defined as follows:

- a. "CONTRACTOR" means the contractor and its employees, agents, servants, owners, principals, licensees, assigns and subcontractors of any tier.
- b. "OWNER" means the Lexington-Fayette Urban County Government and its elected and appointed officials, employees, agents, boards, consultants, assigns, volunteers and successors in interest.

4.2 INDEMNIFICATION AND HOLD HARMLESS PROVISION

CONTRACTOR shall defend, indemnify, and hold harmless OWNER from and against all liability, claims, losses, actions, costs, expenses, obligations, fines, and assessments of whatever kind, including defense costs and attorney's fees, that are in any way incidental to or connected with, or that arise or are alleged to have arisen, directly or indirectly, in whole or in part, from or by: (a) CONTRACTOR's negligent acts or intentional misconduct, or errors or omissions, in connection with the performance of this contract, (b) CONTRACTOR's performance or breach of the contract provided the claim or loss is attributable to death, illness, personal injury, or property loss or damage or loss of use, and not caused by OWNER, or (c) the condition of any premises, equipment or other property being used or operated by the CONTRACTOR in connection with the performance of this contract. In the event OWNER is alleged to be liable based upon the actions or inactions of CONTRACTOR, CONTRACTOR shall defend such allegations and shall bear all costs, fees and expenses of such defense, including but not limited to, all attorneys' fees and expenses, court costs, and expert witness fees and expenses, using attorneys approved in writing by OWNER, which approval shall not be unreasonably withheld. This Indemnification and Hold Harmless Provision shall in no way be limited by any financial responsibility or insurance requirements, and shall survive the termination of this contract.

4.3 FINANCIAL RESPONSIBILITY

The CONTRACTOR understands and agrees that it shall, prior to final acceptance of its bid and the commencement of any work, demonstrate the ability to assure compliance with the Indemnity Agreement and other provisions of this Contract.

4.4 INSURANCE REQUIREMENTS

BIDDERS' ATTENTION IS DIRECTED TO THE INSURANCE REQUIREMENTS BELOW, AS BIDDERS MUST CONFER WITH THEIR RESPECTIVE INSURANCE AGENTS, BROKERS, OR CARRIERS TO DETERMINE IN ADVANCE OF BID SUBMISSION THE AVAILABILITY OF THE INSURANCE COVERAGES AND ENDORSEMENTS REQUIRED HEREIN. IF AN APPARENT LOW BIDDER FAILS TO COMPLY STRICTLY WITH THE INSURANCE REQUIREMENTS BELOW, THAT BIDDER MAY BE DISQUALIFIED FROM AWARD OF THE CONTRACT.

4.4.1 Required Insurance Coverage

CONTRACTOR shall procure and maintain for the duration of this contract the following or equivalent insurance policies at no less than the limits shown below and cause its subcontractors to maintain similar insurance with limits acceptable to OWNER in order to protect OWNER against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by CONTRACTOR. The cost of such insurance shall be included in any bid:

<u>Coverage</u>	<u>Limits</u>
General Liability aggregate (Insurance Services Office Form CG 00 01)	\$1 million per occurrence, \$2 million or \$2 million combined single limit
Commercial Automobile Liability occurrence (Insurance Services Office Form CA 0001)	combined single, \$1 million per occurrence
Worker's Compensation	Statutory
Employer's Liability	\$500,000.00

The policies above shall contain the following conditions:

- a. OWNER shall be named as an additional insured in the General Liability Policy and Commercial Automobile Liability Policy.
- b. The General Liability Policy shall be primary to any insurance or self-insurance retained by OWNER.
- c. The General Liability Policy shall include a Products and Completed Operations endorsement or Premises and Operations Liability endorsement unless it is deemed not to apply by OWNER.
- d. The General Liability Policy shall include a Products Liability endorsement unless it is deemed not to apply by OWNER.
- e. OWNER shall be provided at least 30 days advance written notice via certified mail, return receipt requested, in the event any of the required policies are canceled or non-renewed.

- f. Said coverage shall be written by insurers acceptable to OWNER and shall be in a form acceptable to OWNER. Insurance placed with insurers with a rating classification of no less than Excellent (A or A-) and a financial size category of no less than VIII, as defined by the most current Best's Key Rating Guide shall be deemed automatically acceptable.

4.4.2 Additional insurance coverage and amounts required, if any, are stated below:

NONE

4.4.3 Renewals

After insurance has been approved by OWNER, evidence of renewal of an expiring policy must be submitted to OWNER, and may be submitted on a manually signed renewal endorsement form. If the policy or carrier has changed, however, new evidence of coverage must be submitted in accordance with these Insurance Requirements.

4.4.4 Deductibles and Self-Insured Programs

IF CONTRACTOR INTENDS TO SUBMIT SELF-INSURANCE PLAN FOR BID, THIS MUST BE FORWARDED TO LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DIVISION OF RISK MANAGEMENT, 200 EAST MAIN STREET, LEXINGTON, KENTUCKY 40507 NO LATER THAN A MINIMUM OF FIVE (5) WORKING DAYS PRIOR TO BID OPENING DATE. Self-insurance programs, deductibles, and self-insured retentions in insurance policies are subject to separate approval by Lexington-Fayette Urban County Government's Division of Risk Management, upon review of evidence of CONTRACTOR'S financial capacity to respond to claims. Any such programs or retentions must provide OWNER with at least the same protection from liability and defense of suits as would be afforded by first-dollar insurance coverage. If CONTRACTOR satisfies any portion of the insurance requirements through deductibles, self-insurance programs, or self-insured retentions, CONTRACTOR agrees to provide Lexington-Fayette Urban County Government, Division of Risk Management, the following data prior to the final acceptance of bid and the commencement of any work:

- a. CONTRACTOR'S latest audited financial statement, including auditor's notes.
- b. Any records of any self-insured trust fund plan or policy and related accounting statements.
- c. Actuarial funding reports or retained losses.
- d. CONTRACTOR'S Risk Management Manual or a description of CONTRACTOR'S self-insurance and risk management program.
- e. A claim loss run summary for the previous five (5) years.

f. Self-Insured Associations will be considered.

4.4.5 Verification of Coverage

Prior to award of bid, CONTRACTOR agrees to furnish OWNER with all applicable Certificates of Insurance signed by a person authorized by the insurer to bind coverage on its behalf. If requested due to a claim, CONTRACTOR shall provide OWNER copies of all insurance policies, including all endorsements.

4.4.6 Right to Review, Audit and Inspect

CONTRACTOR understands and agrees that OWNER may review, audit and inspect any and all of CONTRACTOR'S records and operations to insure compliance with these Insurance Requirements.

4.5 **SAFETY AND LOSS CONTROL**

4.5.1 CONTRACTOR agrees to adhere to and comply with William-Steiger Act, enacted December 1970, and all other federal, state and local safety and environmental laws, regulations and ordinances. The CONTRACTOR shall provide all safeguards, safety devices and protective equipment, and take any other action necessary to protect the life, health and safety and property of all persons on the job site, the public and the owner.

4.5.2 The current Kentucky Occupational Safety and Health Standards of the Construction Industry 29 CFR Part 1926 adopted by 803 KAR 2:030 and the Kentucky Occupational Safety and Health Standard for General Industry 29 CFR Part 1910 as adopted by KAR 2:010, and as promulgated by the Kentucky Occupational Safety and Health Standards Board and as amended or modified, are hereby incorporated into and made an integral part of the Contract with full compliance the responsibility solely of the CONTRACTOR.

4.5.3 The CONTRACTOR understands and agrees that the OWNER shall be permitted, but not obligated, to inspect the work place, operations, machinery and equipment involved in this Contract and review and audit any and all CONTRACTOR'S records and documents as deemed necessary by the OWNER to assure compliance with any and all of the provisions of this Contract and maximize the protection of the OWNER. Safety on the job, however, remains solely the responsibility of the CONTRACTOR.

4.6 **DEFINITION OF DEFAULT**

CONTRACTOR understands and agrees that the failure to comply with any of these insurance, safety, or loss control provisions shall constitute default under this Contract. CONTRACTOR also agrees that OWNER may elect at its option any single remedy or penalty or any combination of remedies and penalties, as available, including but not limited to purchasing insurance and charging CONTRACTOR for any such insurance premiums purchased, or suspending or terminating this Contract.

5 BLASTING

Blasting is allowed on this project by a licensed blaster in compliance with the State of Kentucky Laws, KRS Section 351.310 – 351.340 and applicable rules and regulations issued by the Department of Mines and Minerals.

CONTRACTOR shall notify each property owner and public utility company having structures or facilities in proximity to the site of the work of the intent to use explosives. Give such notice sufficiently in advance to enable those being notified to take the necessary steps to protect their property from injury. CONTRACTOR will be liable for any and all damages and claims made as a result of his blasting operations.

CONTRACTOR shall preserve the original bearing value of rock located under proposed structure foundations from damage by blasting, by concussion from the blasting or by excessive breakage. The CONTRACTOR shall bear any increase in structure costs caused by blasting damage to rock under proposed foundations.

6 WASTE MANAGEMENT PLAN

Where practical, items will be reused. Items that cannot be reused will be recycled if possible. Items that cannot be recycled will be disposed of in accordance with all applicable environmental regulations, usually in a permitted construction demolition and debris (CD&D) landfill or in a permitted contained landfill.

Specific details for managing materials likely to be generated are presented below.

Lamps

Any lamps removed during energy improvements at government buildings (retrofits) will be managed as Universal Waste in accordance with Kentucky regulation 401 KAR 43:050 and corresponding federal regulations. The LFUCG has had an internal Universal Waste Program in place for a number of years and is experienced in this area. These materials will be collected and shipped off site to a Universal Waste vendor, where they will be recycled to the extent possible (to include mercury from fluorescent bulbs which will be retorted for resale).

Batteries

Any batteries removed (from emergency lighting, etc) during energy improvements at government buildings (retrofits) will be managed as Universal Waste in accordance with Kentucky regulation 401 KAR 43:050 and corresponding federal regulations. The LFUCG has had an internal Universal Waste Program in place for a number of years and is experienced in this area. These materials will be collected and shipped to an off site vendor where they will be recycled to the extent possible.

Mercury Containing Equipment

Any mercury thermostats, thermometers, temperature gauges, manometers, barometers, switches and similar items removed during energy improvements at government buildings (retrofits) will be collected and shipped off site to either a Universal Waste vendor or, in the case of thermostats, to the nonprofit Thermostat Recycling Corporation where they will be recycled to the extent possible (to include mercury which will be retorted for resale).

Fluorescent Lamp Ballasts

The LFUCG has had an internal program in place to collect and manage both electronic and magnetic fluorescent light ballasts for a number of years and is experienced in this area.

Electronic light ballasts will be collected and shipped off site to a vendor where they will be recycled to the extent possible (as “escrap”).

Electromagnetic ballasts manufactured prior to July 1, 1979 shall be considered to contain PCBs unless they are marked "Contains No PCBs." Electromagnetic ballasts manufactured between July 1, 1979 and 1991 shall be considered to contain di (2- ethylhexyl) phthalate or DEHP. Removed magnetic fluorescent light ballasts which contain DEHP or PCBs will be collected and shipped off-site for either recycling or incineration. Should short-term storage of these items be necessary, the LFUCG has filed the required one-time EPA PCB Notification that allows us to store PCB items for a limited time and will store these PCB and DEHP magnetic ballasts in a secondarily contained concrete storage area to minimize the chance of spills.

Radioactive Wastes

Smoke detectors can contain a small amount of Americium 241, a radioactive material. Self-luminous EXIT signs can also contain radioactive material such as tritium gas, a radioactive isotope. Items such as smoke detectors and self-luminous EXIT signs that are removed during building energy improvements and contain low level radioactive materials will be collected and shipped to a Nuclear Regulatory Authority (NRC) licensed vendor for proper off-site management in accordance with NRC requirements. Typically, these will be returned to the manufacturer for proper disposal.

Asbestos

Asbestos containing items (ACM) which are removed from LFUCG buildings will be managed in accordance with applicable EPA and OSHA requirements. The LFUCG has an asbestos abatement team trained to identify and remove asbestos (if needed). The LFUCG also has a written internal asbestos management policy (Policy # 26) which will be followed to help ensure asbestos is not unknowingly disturbed and that in cases where asbestos must be disturbed, it is removed and managed properly to protect workers and the environment. Removed ACM will be disposed of in a landfill permitted to accept ACM.

Lead

The LFUCG has a Lead Compliance Program in place as well as a lead abatement team housed within our Division of Facilities and Fleet Management trained to identify and remove lead (if needed) at LFUCG facilities. This team is tasked with helping ensure lead is not unknowingly disturbed and that in cases where lead must be disturbed, it is managed properly to protect workers and the environment. Lead containing items which are removed from LFUCG buildings will be managed in accordance with applicable EPA requirements. Removed lead will be disposed of in a landfill permitted to accept this type of waste.

Electronics

The LFUCG has had an electronics recycling program in place for a number of years. Any electronics such as controllers, computers, etc, generated during EECBG improvements will be collected and shipped to an off site vendor for recycling.

7 BUY AMERICAN PROVISION

Funding for the projects is being provided by the American Recovery and Reinvestment Act, Energy Efficiency and Conservation Block Grant. The CONTRACTOR shall work with the OWNER and upon request from the U.S. Department of Energy (DOE) to insure compliance with the provisions of the grant. The requirements, known as the "Flowdown Provisions" are provided in Addendum No.1.

Compliance with all Flowdown Provisions is required, however, the Buy American deserves special attention:

Buy American Provision

http://www1.eere.energy.gov/recovery/buy_american_provision.html

All iron, steel and manufactured goods to be used in the building retrofits must be produced in the United States. The CONTRACTOR must document the domestic availability of equipment and/or building components. Note: the De Minimis Public Interest Waiver permits incidental items up to a limit of no more than 5 percent of the total cost of the iron, steel, and manufactured goods used in and incorporated into a project.

Acceptable Buy American documentation shall identify, for each item:

1. The product name;
2. The product identification number;
3. The product cost; and
4. The domestic place of manufacture/assembly.

Buy American documentation shall be signed by the vendor providing the product(s). The CONTRACTOR is to retain the original documentation and provide the OWNER with a copy prior to installation.

8 COMPLIANCE, STATE and/or FEDERAL WAGE SCALE

a. WORKERS INTERVIEWS

The LFUCG labor compliance reviewer will visit the job site and interview workers concerning their wages, hours, benefits, classifications, payroll deductions, and other related subjects. The CONTRACTOR shall notify the LFUCG labor compliance reviewer each day the contractor or subcontractors are working on site. The CONTRACTOR is required by law to provide access to their workers for the purpose of interviewing at the job site by the designated labor compliance reviewer. Every effort will be made to ensure that the interviews cause as little disruption as possible in performance of the work on the job site. Contractor and subcontractor cooperation with this task is essential and any questions pertaining to the process should be addressed to compliance reviewer or DOE.

b. FEDERAL WAGE SCALE

General Decision Number: KY100162 06/03/2011 KY162

State: Kentucky

Construction Type: Building

County: Fayette County in Kentucky.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Modification Number	Publication Date
0	09/24/2010
1	10/15/2010
2	11/19/2010
3	12/03/2010
4	02/18/2011
5	04/08/2011
6	04/29/2011
7	06/03/2011

ASBE0051-001 02/01/2011

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR (Including Duct (Cold/Hot)).....	\$ 24.37	10.85

BRKY0017-008 01/01/2010

	Rates	Fringes
TILE FINISHER.....	\$ 15.42	5.37
TILE SETTER.....	\$ 22.64	6.05

ELEC0369-020 05/26/2010

	Rates	Fringes
ELECTRICIAN.....	\$ 29.27	13.08

 * ENGI0181-061 06/01/2011

	Rates	Fringes
Operating Engineer:		
GROUP 1.....	\$ 25.55	13.00
GROUP 2.....	\$ 26.55	13.00
GROUP 3.....	\$ 22.81	13.00
GROUP 4.....	\$ 22.04	13.00

OPERATING ENGINEER CLASSIFICATIONS

GROUP 1 - Bituminous Paver; Elevating Grader; Extendable Boom Forklift; Forklift (Regardless of Lift Height); Backhoe Track; Trackhoe; Motor Scrapper; Bulldozer; Mechanic; Power Blade; Motor Grader; Roller (Bituminous); Core Drill; Concrete Paver; Hoist; Rotary Drill
 GROUP 2 - Crane (Including Overhead, Truck, Tower, & Hydraulic); Hoist (1 Drum); Hoisting Engine (2 or more Drums)
 GROUP 3 - Form Grader; Roller (Rock); Tractor (50 H.P. & Over); Farm Tractor with attachments (Except Backhoe, Highlift & End Loader); Elevator (when used for hoisting); Hoisting Engine (1 Drum or Buck Hoist);
 GROUP 4 - Roller (Earth); Tractor (Under 50 H.P.); Oiler; Truck Crane Oiler

CRANE WITH BOOM 150 FEET & OVER, INCLUDING JIB SHALL RECEIVE \$.75 ABOVE GROUP 1

ALL CRANES WITH PILING LEADS WILL RECEIVE \$.50 ABOVE GROUP 1 REGARDLESS OF BOOM LENGTH

 * IRON0070-012 06/01/2011

	Rates	Fringes
IRONWORKER, REINFORCING, ORNAMENTAL AND STRUCTURAL.....	\$ 25.77	18.28

 * LABO0189-026 06/01/2011

	Rates	Fringes
LABORER		
Grade Checker, Mason Tender-Cement/Concrete, Mason Tender-Brick (Hod), Pipelayer, and Screw Operator.....	\$ 19.96	9.54
Landscape Laborer.....	\$ 19.56	9.54

 PAIN0238-007 06/01/2010

	Rates	Fringes
PAINTER: Spray Only.....	\$ 22.85	8.10

PLUM0452-003 11/01/2010		
	Rates	Fringes
PLUMBER.....	\$ 28.20	14.80

PLUM0452-018 11/01/2010		
	Rates	Fringes
PIPEFITTER, Including HVAC Pipe and System Installation.....	\$ 28.20	14.80

ROOF0042-009 08/01/2010		
	Rates	Fringes
ROOFER Built Up Roof, Metal Roofing, Modified Bitumen Roof, Rubber Roof, and Single Ply Roof.....	\$ 26.31	11.32

SFKY0669-003 04/01/2011		
	Rates	Fringes
SPRINKLER FITTER (Fire Sprinklers).....	\$ 29.00	16.50

SHEE0110-023 12/01/2010		
	Rates	Fringes
SHEET METAL WORKER (Including HVAC Duct Installation).....	\$ 28.15	15.72

SUKY2010-111 07/30/2010		
	Rates	Fringes
BRICKLAYER.....	\$ 18.00	1.90
CARPENTER (All Other Work).....	\$ 16.13	0.00
CARPENTER (Form Work Only).....	\$ 16.92	7.20
CARPENTER (Soft Floor Layer - Carpet).....	\$ 16.63	6.08
CEMENT MASON/CONCRETE FINISHER...\$	21.40	0.00
DRYWALL FINISHER/TAPER.....\$	14.84	0.00
INSULATOR - PIPE & PIPEWRAPPER...\$	12.00	1.21
LABORER: Carpenter Tender.....\$	14.50	1.02
LABORER: Common or General.....\$	13.61	6.21

LABORER: Mason Tender - Brick...\$ 15.66	0.00
OPERATOR: Backhoe/Excavator.....\$ 19.57	6.41
OPERATOR: Bobcat/Skid Loader....\$ 19.51	5.38
OPERATOR: Compactor.....\$ 24.53	0.00
OPERATOR: Highlift.....\$ 25.00	0.00
PAINTER: Brush and Roller Only.....\$ 13.84	3.50
ROOFER: Shake & Shingle Roof....\$ 12.98	0.00
TRUCK DRIVER: 10 Yard Truck....\$ 16.27	1.50
TRUCK DRIVER: Dump Truck.....\$ 18.63	6.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

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In the listing above, the "SU" designation means that rates listed under the identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

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WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an Interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

9 SPECIAL TERMS AND CONDITIONS, U.S. DEPARTMENT OF ENERGY

REFERENCE PART IX, ADDENDUM NO.1

10 CONFINED SPACE PROGRAM

REFERENCE PART IX, ADDENDUM NO.2

PART VI

CONTRACT AGREEMENT

INDEX

1. SCOPE OF WORK
2. TIME OF COMPLETION
3. ISSUANCE OF WORK ORDERS
4. THE CONTRACT SUM
5. PROGRESS PAYMENTS
6. ACCEPTANCE AND FINAL PAYMENT
7. THE CONTRACT DOCUMENTS
8. EXTRA WORK
9. PLAN DRAWINGS

PART VI

CONTRACT AGREEMENT

THIS AGREEMENT, made on the _____ day of _____, 20____, by and between (1) Lexington-Fayette Urban County Government, acting herein called "OWNER" and

(2) _____ doing business as *(an individual) (a partnership) (a corporation) (limited liability company) located in the City of _____, County of _____, and State of _____, hereinafter called "CONTRACTOR."

WITNESSETH: That the CONTRACTOR and the OWNER in consideration of _____

_____ Dollars

(\$ _____) quoted in the proposal by the CONTRACTOR, dated _____, 20____, hereby agree to commence and complete the construction described as follows:

1. SCOPE OF WORK

The CONTRACTOR shall furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal, the General Conditions, and the Special Conditions of the Contract, the Specifications and Contract Documents therefor as prepared by Paladin, Inc. for the Black & Williams Community Center Energy Efficiency Improvements

2. TIME OF COMPLETION

The time period estimated and authorized by the OWNER for the proper execution of the Work by the Contract, in full, is hereby fixed as **one-hundred fifty nine (159)** calendar days. The time shall begin ten (10) days after the date specified in the Notice to Proceed with the Work.

3. ISSUANCE OF WORK ORDERS

Notice to begin Work will be given in whole or for part of the Work as determined by the OWNER pending the availability of funds or other considerations. The order of construction will be as determined by the Engineer after consultation with the CONTRACTOR and the OWNER.

4. THE CONTRACT SUM

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the Contract, as quoted in the proposal, subject to any additions and deductions, as provided therein.

5. PROGRESS PAYMENTS

The OWNER shall make payments on account of the Contract, as provided in accordance with the General Conditions, as estimated by the Engineer, less the aggregate of previous payments.

6. ACCEPTANCE AND FINAL PAYMENT

Final payment shall be due within ninety (90) days after completion of the Work, provided the Work be then fully completed and the Contract fully accepted.

Before issuance of final certificate, the CONTRACTOR shall submit evidence satisfactory to the Engineer that all payrolls, material bills, and other indebtedness connected with the Work has been paid.

If, after the Work has been substantially completed, full completion thereof is materially delayed through no fault of the CONTRACTOR, and the ENGINEER so certifies, the OWNER shall upon certificate of the ENGINEER, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

7. THE CONTRACT DOCUMENTS

The Advertisement for Bids, Information for Bidders, the General Conditions, Performance and Payment Bonds, Contract Agreement, Special Conditions, Technical Specifications, and Proposal, and Plan Drawings and any related addenda form the Contract, and they are fully a part of the Contract as if hereto attached or herein repeated.

8. EXTRA WORK

The OWNER, without invalidating the Contract, may order extra work or make changes by altering, adding to or deducting from the Work, the Contract Sum being adjusted accordingly. All such Work shall be executed and paid for in accordance with the General Conditions, which is a part of this Contract.

THE FOLLOWING IS AN ENUMERATION OF THE SPECIFICATIONS AND DRAWINGS
(CONTRACT DOCUMENTS)

SPECIFICATIONS

PART NO.	TITLE	PAGES
I	Advertisement for Bids	AB 1 through 7
II	Information for Bidders	IB 1 through 8
III	Form of Proposal	P 1 through 29
IV	General Conditions	GC 1 through 52
V	Special Conditions	SC 1 through 24
VI	Contract Agreement	CA 1 through 5
VII	Performance and Payment Bonds	PB 1 through 7
VIII	Technical Specifications	TS 1 through 137
IX	Addenda	_____
	Addendum No.1. Special Terms and Conditions, U.S. Department of Energy	34 pg
	Addendum No.2. Confined Spaces, LFUCG	17 pg
APPENDIX A	Standard Drawings	9 pg

PLAN DRAWINGS

For Plan Drawings, reference Section VIII. Technical Specifications. Reference Addendum No.1 and No.2

IN WITNESSETH WHEREOF, the parties hereto have executed this Contract as of the date and year above written.

(Seal)

Lexington-Fayette Urban County Government.
Lexington, Kentucky
(Owner)

ATTEST:

Clerk of the Urban County Council

BY: _____
Jim Gray
MAYOR

(Witness)

(Title)

(Seal)

(Contractor)

(Secretary)

BY: _____

(Witness)

(Title)

(Address and Zip Code)

IMPORTANT: *Strike out any inapplicable terms.

Secretary of the Owner should attest. If the CONTRACTOR is corporation,
Secretary should attest. Give proper title of each person-executing Contract.

PART VII

PERFORMANCE AND PAYMENT BONDS

1. PERFORMANCE BOND
2. PAYMENT BOND

PART VII

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that

(Name of CONTRACTOR)

(Address of CONTRACTOR)

a _____, hereinafter
(Corporation, Partnership, or Individual)

called Principal, and _____
(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

(Name of OWNER)

(Address of OWNER)

hereinafter called "OWNER" in the penal sum of _____
Dollars, (\$ _____), for the payment of whereof Principal and Surety bind themselves,
their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these
presents.

WHEREAS, Principal by written agreement is entering into a Contract with OWNER for
_____ in accordance with Drawings and Specifications prepared
by _____ which Contract is by reference made a part hereof, and is
hereinafter referred to as the Contract.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal shall
promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it
shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the OWNER.

Whenever, Principal shall be, and declared by OWNER to be in default under the Contract, the OWNER having performed OWNER'S obligations thereunder, the Surety may promptly remedy the default, or shall promptly:

- (1) Complete the Contract in accordance with its terms and conditions or
- (2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or if the OWNER elects, upon determination by the OWNER and Surety jointly of the lowest responsible bidder, arrange for a Contract between such bidder and OWNER, and make available as Work progresses (even though there may be a default or a succession of defaults under the Contract or Contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the Contract Price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the Contract Price", as used in this paragraph shall mean the total amount payable by OWNER to Principal under the Contract and any amendments thereto, less the amount properly paid by OWNER to Principal.

Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the OWNER named herein or the heirs, executors, administrators or successors of OWNER.

IN WITNESS WHEREOF, this instrument is executed in _____ each one of which
(number)
shall be deemed an original, this the _____ day of _____, 20____.

ATTEST:

(Principal) Secretary

Principal

BY: _____(s)

(Address)

Witness as to Principal

(Address)

ATTEST:

Surety

Attorney-in-Fact

(Surety) Secretary

(Address)

(SEAL)

Witness as to Surety

(Address)

TITLE: _____

Surety

BY: _____

TITLE: _____

NOTE: The number of executed counterparts of the bond shall coincide with the number of executed counterparts of the Contract.

PART VII

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENT: that

_____ (Name of Contractor)

_____ (Address of Contractor)

a _____, hereinafter
(Corporation, Partnership or Individual)

called Principal, and _____ (Name of Surety)

_____ (Address of Surety)

hereinafter called Surety, are held and firmly bound unto

_____ (Name of OWNER)

_____ (Address of OWNER)

Obligee, hereinafter called OWNER, for the use and benefit of claimants as hereinafter defined, in the amount of _____ Dollars (\$_____) the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement is entering into a Contract with OWNER for _____ in accordance with Drawings and Specifications prepared by _____ which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly make payment to all claimants as hereinafter defined for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions.

1. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.
2. The above named Principal and Surety hereby jointly and severally agree with the OWNER that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The OWNER shall not be liable for the payment of any costs or expenses of any such suit.
3. No suit or action shall be commenced hereunder by any claimant:
 - (a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: The Principal, the OWNER, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the Work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the Work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, OWNER, or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.
 - (b) After the expiration of one (1) year following the date on which Principal ceased Work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.
 - (c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.
4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against aid improvement, whether or not claim for the amount of such lien be presented under and against this bond.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of _____ (number)

which shall be deemed an original, this the _____ day of _____, 20____.

ATTEST:

(Principal)

(Principal) Secretary

(SEAL)

BY: _____(s)

(Address)

(Witness to Principal)

(Address)

(Surety)

ATTEST:

BY: _____
(Attorney-in-Fact)

(Surety) Secretary

(SEAL)

Witness as to Surety

(Address)

(Address)

NOTE: The number of executed counterparts of the bond shall coincide with the number of executed counterparts of the Contract.

PART VIII
TECHNICAL SPECIFICATIONS
INDEX

1. BLACK & WILLIAMS TECHNICAL SPECS

Division	Section Title
----------	---------------

DIVISION 1 - GENERAL REQUIREMENTS

017329 CUTTING, PATCHING, PAINTING, AND REPAIRING

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

230500 COMMON WORK RESULTS FOR HVAC
230529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
230553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
230700 HVAC INSULATION
230900 INSTRUMENTATION AND CONTROLS - ALTERNATE ONLY
230993 SEQUENCE OF OPERATIONS FOR HVAC CONTROLS
232300 REFRIGERANT AND CONDENSATE PIPING
233113 METAL DUCTS
233300 AIR DUCT ACCESSORIES
238126 SPLIT SYSTEM HEAT PUMPS
238239 WALL, CEILING, AND UNIT HEATERS

DIVISION 26 - ELECTRICAL

260500 COMMON WORK RESULTS FOR ELECTRICAL
260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260523 CONTROL-VOLTAGE ELECTRICAL POWER CABLES
260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
260533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS
262416 PANELBOARDS
262726 WIRING DEVICES
262816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

END OF SPECIFICATION INDEX

SPECIFICATION INDEX

SECTION 017329 - CUTTING, PATCHING, PAINTING, AND REPAIRING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Cutting and patching.
 - 2. Progress cleaning.
 - 3. Painting

1.3 DEFINITIONS

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

1.4 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Engineer of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that result in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety
 - 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Engineer's opinion, reduce the building's aesthetic qualities.

Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: Match existing. Contact Owner's for existing paint numbers, if available.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- B. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Engineer.
- C. The Contractor shall be entirely responsible for all material and equipment furnished by him in connection with his work and special care shall be taken to properly protect all parts thereof from damage during the construction period. Such protection shall be by a means acceptable to the Engineer. All rough-in soil, waste, vent and storm piping, ductwork, conduit, etc., shall be properly plugged or capped during construction in a manner approved by the Engineer. Equipment damaged stolen or vandalized while stored on site, either before or after installation, shall be repaired or replaced (as determined by the Engineer) by the responsible Contractor at his expense.

3.2 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produces harmful noise levels.
- F. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.3 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching with Owner and Engineer.
- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements

retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 4. Proceed with patching after construction operations requiring cutting are complete.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.4 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80°F (27°C).
 - 2. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Utilize containers intended for holding waste materials of type to be stored.
 - 3. Coordinate progress cleaning for joint-use areas where more than one installer has worked.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- H. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- I. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers prior to painting.

3.6 PAINTING PREPARATION

- A. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce paint systems indicated.

3.7 PAINTING APPLICATION

- A. Apply paints according to manufacturer's written instructions.
- B. Painting Mechanical Work: Paint duct and pipe insulation jackets where insulation was removed and replaced to facilitate new Work. Colors shall match existing color schemes.
- C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.8 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Engineer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 017300

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Dielectric fittings.
 - 3. Mechanical sleeve seals.
 - 4. Sleeves.
 - 5. Escutcheons.
 - 6. Grout.
 - 7. Equipment installation requirements common to equipment sections.
 - 8. Painting and finishing.
 - 9. Concrete bases.
 - 10. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces.

1.8 SUPPORTS

- A. The Contractor shall provide supports for all equipment furnished by him. Supports shall be liberally sized and adequate to carry the load of the equipment and the loads of attached

equipment, piping, etc. All equipment shall be securely fastened to the structure either directly or indirectly through supporting members by means of bolts or equally effective means. Exercise extreme care that such equipment does not overload structural members of building. Provide any required additional bracing, cross members, angles, support, etc., as indicated or required by a Structural Engineer. This, in some instances, will require the Contractor to add an angle to a joist to transfer the load to a panel point. If in doubt, contact Structural Engineer

1.9 SCAFFOLDING, RIGGING, AND HOISTING

- A. The Contractor shall furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

1.10 CLEANING

- A. The Contractor shall, at all times, keep the area of his work presentable to the public and clean of rubbish caused by his operations; and at the completion of the work, shall remove all rubbish, all of his tools, equipment, temporary work and surplus materials, from and about the premises, and shall leave the work clean and ready for use. If the Contractor does not attend to such cleaning immediately upon request, the Engineer may cause cleaning to be done by others and charge the cost of same to the responsible Contractor. Each Contractor shall be responsible for all damage from fire, which originates in, or is propagated by, accumulations of his rubbish or debris.

1.11 PERMITS, FEES, CODES, AND REGULATIONS

- A. The Contractor shall give all necessary notices, obtain and pay for all permits, taxes, sales taxes, fees, and other costs including utility connections or extensions, in connection with his work. As necessary, he shall file all required plans, utility easement requests and drawings, survey information on line locations, load calculations, etc. The Contractor shall prepare all documents and obtain all necessary approvals of all utility and authorities having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Engineer before request for acceptance and final payment for the work.
- B. Ignorance of Codes, Rules, regulations, utility company requirements, laws, etc., shall not diminish or absolve the Contractor's responsibilities to provide and complete all work in compliance with such.
- C. All materials furnished and all work installed shall comply with the current edition of the applicable mechanical and electrical codes, Codes of the National Fire Protection Association, the requirements of local utility companies, and with the requirements of all authorities having jurisdiction.
- D. All material and equipment for the electrical systems shall bear the approval label, or shall be listed by the Underwriters' Laboratories. Listings by other testing agencies may be acceptable with written approval by the Engineer. Each packaged assembly shall be U.L. labeled.

- E. All Heating, Ventilation and Air Conditioning work shall be accomplished in accordance with the applicable state building code and amendments thereto, the latest standards recognized by the American Society of Heating, Refrigerating and Air Conditioning Engineers, SMACNA, and the National Fire Protection Association.
- F. All pressure vessel installations shall comply with the State, and/or Federal Code applicable codes. A Certificate of Final Boiler Inspection shall be required.
- G. The Contractor shall furnish three (3) copies of all Final Inspection Certificates to the Engineer when work is complete. Final payment for work will be contingent upon compliance with this requirement.
- H. Where minimum code requirements are exceeded in the Design, the Design shall govern.
- I. The Contractor shall ensure that his work is accomplished in accord with the OSHA Standards and any other applicable government requirements.
- J. All work in conjunction with a natural gas installation shall, in addition to all other Codes, Rules, Regulations, Standards, etc., comply with the requirements of the local gas supplier and/or standards and recommendations of the American Gas Association.
- K. Discharge of any toxic, odorous or otherwise noxious materials into the atmosphere or any system shall be subject to regulations of the Environmental Protection Agency (EPA) and/or the air pollution control commission. If in doubt, contact the State Division.
- L. Where conflict arises between any code and the plans and/or specifications, the code shall apply except in the instance where the plans and specifications exceed the requirements of the code. Any changes required as a result of these conflicts shall be brought to the attention of the Engineer at least ten (10) working days prior to bid date, otherwise the Contractor shall make the required changes at his own expense.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BA91, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.3 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180°F (82°C).
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 1. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig (1035- or 2070-kPa) minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225°F (107°C).
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225°F (107°C).

2.4 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Stainless steel. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

- A. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated and rough brass.
- D. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.

2.7 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, non-staining, non-corrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction

loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
- M. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- N. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

- O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
- P. Verify final equipment locations for roughing-in.
- Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

- A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 7. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement.

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

3.8 GROUTING

- A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

3.9 QUIET OPERATION, VIBRATION AND OSCILLATION

- A. All work shall operate under all conditions of load without any objectionable sound or vibration. All equipment subject to vibration and/or oscillation shall be mounted on vibration supports, whether indicated or not, suitable for the purpose of minimizing noise and vibration transmission. All equipment shall be isolated from external connections such as piping, ducts, etc. by means of flexible connectors, vibration absorbers, or other approved means. Unitary equipment, such as small room heating units, small exhaust fans, etc., shall be rigidly braced and mounted to wall, floor or ceiling as required and tightly gasketed and sealed to mounting surface to prevent air leakage and to obtain quiet operation. Flush and surface mounted equipment such as diffusers, grilles, etc., shall be gasketed and affixed tightly to their mounting surface.

3.10 PROTECTION OF EQUIPMENT

- A. The Contractor shall be entirely responsible for all material and equipment furnished by him in connection with his work and special care shall be taken to properly protect all parts thereof from damage during the construction period. Such protection shall be by a means acceptable to the Engineer. All rough-in soil, waste, vent and storm piping, ductwork, conduit, etc., shall be properly plugged or capped during construction in a manner approved by the Engineer. Equipment damaged stolen or vandalized while stored on site, either before or after installation, shall be repaired or replaced (as determined by the Engineer) by the responsible Contractor at his expense.

3.11 TEMPORARY USE OF EQUIPMENT

- A. The permanent mechanical and electrical equipment, when installed, may be used for temporary services, subject to an agreement among the Contractors involved, the Owner,

and with the written consent of the Engineer. Should the permanent systems be used for this purpose, each Contractor shall pay for all temporary connections required and any replacements required due to damage without cost, leaving the equipment and installation in "as new" condition. The Contractor will be required to bear utility costs, user fees, cleaning cost, etc.

- B. Permission to use the permanent equipment does not relieve the Contractors from the responsibility for any damages to the building construction and/or equipment, which might result because of its use.

END OF SECTION 230500

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following hangers and supports for HVAC system piping and equipment:
 - 1. Steel pipe hangers and supports.
 - 2. Metal framing systems.
 - 3. Equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.2, "Structural Welding Code--Aluminum."
 - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 - 4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
 - 5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.
- C. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.2 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
- C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.3 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.4 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non-staining, no corrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.
 - 4. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
 - 5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated stationary pipes, NPS 3/4 to NPS 8 (DN 20 to DN 200).
 - 6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 7. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 8. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).
 - 9. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of non-insulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).
 - 10. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).
 - 11. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 12. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120°F to 450°F (49°C to 232°C) piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120°F to 450°F (49°C to 232°C) piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

- K. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- L. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- K. Insulated Piping: Comply with the following:
 - 1. Attach clamps and spacers to piping.

- a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
- b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
- c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

END OF SECTION 230529

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes.
 - 1. Equipment labels.
 - 2. Pipe labels.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment.
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160°F (71°C).
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction in accordance with ASME A13.1.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches ((38 mm) high).

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows.
1. Near each valve and control device.
 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

END OF SECTION 230553

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Insulation Materials:
 - a. Flexible elastomeric.
 - b. Mineral fiber.
 - 2. Adhesives.
 - 3. Factory-applied jackets.
 - 4. Tapes.
 - 5. Securements.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- D. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
- E. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- F. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Type I, 850°F (454°C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 2. Type II, 1200°F (649°C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
- E. PVC Jacket Adhesive: Compatible with PVC jacket.

2.3 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.4 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Width: 3 inches (75 mm).
 - 2. Thickness: 11.5 mils (0.29 mm).
 - 3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 - 1. Width: 3 inches (75 mm).
 - 2. Thickness: 6.5 mils (0.16 mm).
 - 3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
 - 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.5 SECUREMENTS

- A. Bands:
 - 1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) wide with wing or closed seal.
 - 2. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing or closed seal.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- (3.5-mm-) diameter shank, length to suit depth of insulation indicated.
2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- (3.5-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated and securely in position indicated, when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
 - b. Spindle: Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated and securely in position indicated, when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
 - b. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated and securely in position indicated, when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
 - b. Spindle: Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive-backed base with a peel-off protective cover.
6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick, stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
 - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils (0.127 mm) thick and an epoxy finish 5 mils (0.127 mm) thick if operating in a temperature range between 140°F and 300°F (60°C and 149°C). Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32°F and 300°F (0°C and 149°C) with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
 1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Manholes.
 5. Handholes.
 6. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).
- E. Insulation Installation at Floor Penetrations:
 1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper

- sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies.

3.5 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 MINERAL-FIBER INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.

4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 4. Install insulation to flanges as specified for flange insulation application.
- E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
 - b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

- c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over compress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50°F (10°C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches (75 mm).
 5. Overlap un-faced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.7 FINISHES

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:

1. When new ducted units are installed, provide insulation to restore insulation. Insulation and vapor barrier shall be continuous from new work to interface with existing.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Duct insulation shall be the following:

1. Mineral-Fiber Blanket: 1-1/2 inches (38 mm) thick and 1.5-lb/cu. ft. (24-kg/cu. m) nominal density.

3.11 PIPING INSULATION SCHEDULE, GENERAL

- #### A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60°F (16°C):

1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 3/4 inch (19 mm) thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch (13 mm) thick.

B. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 1 inch (25 mm) thick.

3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 1 1/2 inches (50 mm) thick.

END OF SECTION 230700

SECTION 230900 - INSTRUMENTATION AND CONTROLS - ALTERNATE ONLY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes:
 - 1. DDC Control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls
 - 2. Integration with Owner's existing off-site Front-End.
- B. Related Sections include the following:
 - 1. Division 23 Section "Sequence of Operations for HVAC Controls" for requirements that relate to this Section.
 - 2. Division 26 Section "Control - Voltage Electrical Power Cables".

1.3 DEFINITIONS

- A. AAC: Advanced Application Controller.
- B. ARP: Address Resolution Protocol.
- C. ASC: Application Specific Controller.
- D. BACnet.
 - 1. ASHRAE/ANSI Standard 135-2004 BACnet protocol.
- E. BACnet Services.
 - 1. The client-server messages exchanged between BACnet devices.
- F. BC: Building Controller.
- G. CMOS: Complementary metal-oxide semiconductor.
- H. CSMA/CD: Carrier Sense Multiple Access/Collision Detect.
- I. DDC: Direct Digital Control.

- J. DDE: Dynamic Data Exchange.
- K. FTT: Free Topology Transceivers.
- L. GUI: Graphical User Interface.
- M. HVAC: Heating, Ventilation, and Air Conditioning.
- N. I/O: Input/Output.
- O. LAN: Local Area Network.
- P. LCD: Liquid-crystal display.
- Q. LED: Light-emitting diode.
- R. Lon Talk™.
 - 1. E1A Standard 709.1 Lon Talk protocol.
- S. MER: Mechanical Equipment Room.
- T. MOS: Metal-oxide semiconductor.
- U. NDIR: Non-dispersive infrared.
- V. ODBC: Open DataBase Connectivity.
- W. PC: Person Computer.
- X. PES: Portable Engineering Station.
- Y. PID: Proportional, Integral, Derivative.
- Z. PIR: Photoacoustic infrared.
- AA. Power wiring shall be defined as follows:
 - 1. Wiring of power feeds through all disconnect starters and variable speed controllers to electric motors.
 - 2. 120 VAC Emergency power feeds to all critical control panels.
 - 3. 120 VAC wiring to DDC terminal units without fan motors or heaters as scheduled. Required voltage to DDC boxes with fan motors and/or heaters shown on Electrical Plans.
 - 4. Wiring of any remote start/stop switches and manual or automatic motor speed control devices not furnished by the BAS Supplier.
- BB. SA: Smart Actuators.
- CC. SNVT: Standard Network Variables Types.
- DD. SQL: Structured Query Language.

- EE. SS: Smart Sensors.
- FF. UDP: User Datagram Protocol.
- GG. UNC: Universal Network Controller.
- HH. VAV: Variable Air Volume Box.

1.4 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.
2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.
3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.
5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.
6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.
7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.
8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:

VARIABLE	REPORT RANGE	CONTROL RANGE
Water Temperature	+/- .5°F (0.25°C)	+/- 2°F
Water Flow	+/- 2% of full scale	+/- 5% of full scale
Water Pressure	+/- 1% of full scale	+/- 2% of full scale
Space Temperature	+/- 1°F (0.5°C)	+/- 3°F
Ducted Air Temperature	+/- .5°F (0.25°C)	+/- 1°F - 2°F
Outside Air Temperature	+/- 1°F (.5°C)	N/A
Dew Point Temperature	+/- 1°F (.5°C)	+/- 3°F
Temperature Differential	+/- 0.25°F (0.15°C)	N/A
Relative Humidity	+/- 1%	+/- 3%
Airflow (Pressurized Spaces)	+/- 1% of full scale	+/- 3% of full scale
Airflow (Measuring Stations)	+/- 2% of full scale	+/- 5% of full scale
Airflow (Terminal)	+/- 2% of full scale	+/- 10% of full scale
Air Pressure (Space)	+/- 0.01" wg (2.5 Pa)	+/- 0.05" wg

Air Pressure (Supply Duct)	+/- 0.1" wg (25 Pa)	+/- 0.2" wg
Air Pressure (Return Duct)	+/- 0.01" wg (2.5 Pa)	+/- 0.05" wg
Electrical Power	+/- 1% of reading	N/A

1.5 SYSTEM DESCRIPTION

- A. Provide DDC controls for buildings and systems indicated in the Contract Documents.
 - 1. Provide full integration of DDC Controls with Owner's existing off-site front-end server.
 - 2. Integration of new DDC controls to existing front-end shall be performed by manufacturer's authorized technician.
 - 3. Coordinate exact requirements with existing system architecture.
 - 4. Graphical interface shall match existing in functionality and appearance.
- B. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers and a web-based operator interface. Depict each mechanical system and building floor plan by a point-and-click graphic. A web server with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.
- C. The system shall directly control HVAC equipment as specified in Section 230993 - Sequence of Operations for HVAC Controls. Each zone controller shall provide occupied and unoccupied modes of operation by individual zone. Furnish energy conservation features such as optimal start and stop, night setback, request-based logic, and demand level adjustment of setpoints as specified in the sequence.
- D. Provide for future system expansion to include monitoring of occupant card access, fire alarm, and lighting control systems.
- E. System shall use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules. I/O points, schedules, setpoints, trends, and alarms specified in Section 230993 - "Sequence of Operations for HVAC Controls" shall be BACnet objects.
- F. The control system communications shall be transparent, meaning that the user or control programmer does not need to know the details of system architecture and operation.
- G. Furnish all labor, materials, equipment programming, and service necessary for a complete and operating temperature control system, utilizing a high speed peer to peer network of interoperable Direct Digital Controls (DDC), Graphical User Interface (GUI) with color graphic displays available on at least 64 client computers, electronic interfaces and actuation devices, and as described in the contract documents. The number of user licenses shall be the same for Server Base, Client Base or Web Browser based software installations. Thus providing a seamless installation and interface for the Owner. No system shall be installed that is not capable of expansion by having to change out GUI, UNC or Controllers. System shall be required to have minimum of 10% extra points available for future buildings needs without having to add expansion blocks. No systems that require a yearly licensing renewal fee to operate shall be permitted.

Note: Selected supplier shall work with Owner's IT department to secure open ports and IP addresses.

- H. The Local Area Network (LAN) shall be A 100 Mbps Ethernet furnished by the Owner and supporting Lonworks/LonMark/LonTalk Standards, Java, XML, HTTP, and CORBA IIOP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Universal Network Controllers (UNCs), operator workstations and the Control System Server.
- I. The Enterprise Ethernet (IEEE 802.3) LAN shall utilize Carrier Sense Multiple/Access/Collision Detect (CSMA/CD), Address Resolution Protocol (ARP) and User Datagram Protocol (UDP) operating at 10 or 100 Mbps.
- J. The control system shall consist of an open architecture that utilizes ASHRAE™ Standard 135-2004, BACnet functionality to assure interoperability between all system components and HVAC equipment that may be BACnet proprietary.
- K. Where necessary or desired, packets may be encapsulated into TCP/IP messages to take advantage of existing infrastructure or to increase network bandwidth.
- L. The Products used in constructing the control system shall be BACnet compliant, except in those instances in which devices are not available. The controls system supplier shall provide BACnet devices with application source code, device resource files, and external interface definitions.
- M. Provide software programming and service tech tools including cables and connectors required to network manage ANSI / ASHRAE™ Standard 135-2004, BACnet protocol. Full BACnet compliance means programming, monitoring and control functions at user level; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet/Ethernet IP, if any equipment requires a BACnet connection.
- N. All work described in this section shall be installed, circuit tested, and calibrated by factory certified technicians qualified for this work and in the regular employment of the Control System Supplier. Supervision, calibration and checkout of the system shall be by the employees of the Control System Supplier. Supplier shall have an in place support facility with technical staff, spare parts inventory and all necessary test and diagnostic equipment.
- O. Drawings are diagrammatic only. Equipment and labor not specifically referred to herein or on the plans, that is required to meet the functional intent, shall be provided without additional cost to the Owner.

1.6 SUBMITTALS

- A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
 - 1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for control system server, interface equipment, controllers, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.

2. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data.
 3. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications. Include proposed alarms and diagnostic messages.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
 2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and all other control devices.
 3. Wiring Diagrams: Power, signal, and control wiring, with wire number identification.
 4. Details of control panel faces, including controls, instruments, and labeling.
 5. Written description of sequence of operation, and either 1) programming ladder logic diagrams or 2) control logic block diagrams, fully populated with initial setpoint and control values.
 6. Schedule of dampers including size, leakage, and flow characteristics.
 7. Schedule of valves including flow characteristics.
 8. DDC System Hardware:
 - a. Wiring diagrams for control units with termination numbers.
 - b. Schematic diagrams and floor plans for field sensors and control hardware.
 - c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
 9. Controlled Systems:
 - a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
 - b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
 - c. Written description of sequence of operation including schematic diagram, and either 1) programming ladder logic diagrams or 2) control logic block diagrams, fully populated with initial setpoint and control values.
 - d. Points list.
 10. Control System Software:
 - a. List of color graphics indicating a monitored system, data (connected and calculated) point addresses, output schedule, and operator notations.
 - b. Hard color copy of each graphic screen proposed.
- C. Software and Firmware Operational Documentation: Include the following:
1. Software operating and upgrade manuals.
 2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
 3. Device address list.
 4. Printout of software application and graphic screens.

5. Software license required by and installed for DDC workstations and control systems, with a licensed copy left with the Owner.
- D. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.
- E. Qualification Data: For Installer and manufacturer.
- F. Operation and Maintenance Data: For instrumentation and control system components to include in emergency, operation, and maintenance manuals. Include the following:
 1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
 2. Interconnection wiring diagrams with identified and numbered system components and devices.
 3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
 4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
 5. Calibration records and list of set points.
- H. Field quality-control test reports.
- I. Project Schedule: Provide project schedule, coordinated with Division 23 and Division 26 Contractor detailing controls installation process and anticipated completion dates.

1.7 QUALITY ASSURANCE

- A. Supplier Qualifications: Control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project. The Technician, Installer, or Graphics installer that starts the job is required to be the person that completes the job with no changes in personnel during the BMS installation. The manufacturer is to be ultimately responsible for the installation quality and warranty.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Bids by wholesalers and non-franchised contractors shall not be acceptable.
- D. The system manufacturer shall, as a minimum, manufacture and supply the Custom Application Controller, Application Specific Controller (field installed terminal and unitary equipment), and Universal Network Controllers.
- E. All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians qualified for this work and in the direct employment of the control system supplier.
- F. The Control Systems Supplier shall have a full service facility that is staffed with engineers trained in Integrating Interoperable Systems and technicians fully capable of providing instructions and routine emergency maintenance service on all system components.

- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- H. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems".
- I. Comply with National Electric Code, UL-916 Energy Management Systems, LonMark™, ULC, FCC Part 15, subpart J, Class B Computing Devices.
- J. Comply with EIA Standard 709.1 LonTalk™ protocol for DDC system control components.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.
- B. System Software: Update to latest version of software at Project completion.

1.9 COORDINATION

- A. Coordination Meeting Requirements:
 - 1. Submittal Review Meeting: At the discretion of the Engineer, the Control System Supplier's Programmer and Project Supervisor shall meet at the Engineer's office to review and/or adjust the programming or other portions of the submittal prior to approving or returning the Control system Supplier's submittals.
 - a. The intent is to reconcile any un-certainties such that the control submitted might be approved as a complete set instead of in incremental approval steps.
 - 2. Warranty Phase Walk through Meeting: This meeting will consist of a complete walk through of the building with demonstration that all systems are full operable and spot checks by the Engineer of calibration.
- B. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.
- C. Coordinate with the Owner's IT department on locations for UNC's, Ethernet communication cabling and TCP/IP addresses.

1.10 WARRANTY AND MAINTENANCE

- A. All components, system software, and parts furnished and installed by the Control Systems Supplier shall be guaranteed against defects in materials and workmanship for one (1) year of substantial completion unless extended warranty by owner or manufacturer is greater than one (1) year. Labor to repair, re-program, or replace these components shall be furnished by the Control Systems Supplier at no charge during normal working hours during the warranty period. Materials furnished but not installed by the Control Systems Supplier shall be covered

to the extent of the product only. Installation labor shall be the responsibility of the trade contractor performing the installation. All corrective software modifications made during warranty periods shall be updated on all user documentation and on user and manufacturer archived software disks. The Control Systems Supplier shall respond to the owner's request for warranty service within forty-eight (48) hours standard working hours. Emergency service shall be available within twenty-four (24) hours. Any changes made to the control system, including setpoints, programming, schedules, or calibrations shall be documented on the Owners work order to clarify the adjustments made in addition to updating user documentation.

1.11 OWNERSHIP OF PROPRIETARY MATERIAL

- A. The Owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition of this contract. All software licensing shall be made to the Owner, not the Contractor or vender, or installer with all tools in, all tools out functionality and such license shall grant use of all programs and application software to owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software. All software shall be capable of adding other manufacturer licensed vendors if of the same firmware. All project developed software, control software and documentation shall become the property of the owner. These include, but are not limited to project graphic images, record drawings, project database, project specific application programming code, and all other associated documentation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified, or approved equal.
- B. Universal software framework: The listed control system suppliers shall extend the existing DDC control system architecture using devices by same manufacturer and fully integrated into existing system.

2.2 CONTROL SYSTEM

- A. Control system suppliers:
 - 1. Automated Logic Corporation.

2.3 CONTROL SYSTEM HARDWARE AND SOFTWARE

- A. Server Graphical User Interface (GUI) application software: Include the following:

1. The supplied system shall incorporate the ability to access all data using non specific version of Java enabled browsers without requiring proprietary operator interface and configuration programs.
2. An Open DataBase Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage.
 - a. This data shall reside on the control system server for all database access.
 - b. Systems requiring proprietary database and user interface programs shall not be acceptable.
 - c. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network.
 - d. Systems employing a "flat" single tiered architecture shall not be acceptable.
3. The operator shall be able to monitor and access all points by means of clear concise English names without having to understand or reference hardware point locations or controller programs.
 - a. Operating System: The GUI shall run on Microsoft Windows NT Server Pro.
 - b. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.
 - c. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:
 - 1) Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.
 - 2) Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.
 - 3) Graphics shall support layering and each graphic object shall be configurable for assignment to one layer. A minimum of six layers shall be supported.
 - 4) Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.
 - a) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
 - b) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

- d. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
- e. Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No entry of text shall be required.
- f. System configuration. At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:
 - 1) Create, delete or modify control strategies.
 - 2) Add/delete objects to the system.
 - 3) Tune control loops through the adjustment of control loop parameters.
 - 4) Enable or disable control strategies.
 - 5) Generate hard copy records or control strategies on a printer.
 - 6) Select points to be alarm-able and define the alarm state.
 - 7) Select points to be trended over a period of time and initiate the recording of values automatically.
 - 8) Set and control schedules.
- g. On-Line help. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.
- h. Security. Each operator shall be required to log on to that system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format. Operator log-on and log-off times shall be recorded in a log record archive.
- i. System diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.
- j. Alarm console.
 - 1) The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.
 - 2) When the Alarm Console is enabled, a separate alarm notification window will supersede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

- k. Provide embedded "Workbench Pro" software with GUI.
4. Web browser client's support.
 - a. The control system, server, and server GUI application software shall be capable of supporting 64 clients using a standard Web browser such as Internet Explorer™ or Netscape Navigator™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, are only acceptable if 64 licensed copies of the client machine software are provided, installed, and tested.
 - b. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the control system, shall only be acceptable if 64 workstations or workstation hardware upgrades are provided.
 - c. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.
 - d. The Web browser client shall support at a minimum, the following functions:
 - 1) User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
 - 2) Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
 - 3) HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
 - 4) Storage of the graphical screens shall be in the Building Control Units (BC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
 - 5) Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.
 - 6) Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
 - a) Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
 - b) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
 - c) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
 - d) Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
 - e) View logs and charts
 - f) View and acknowledge alarms

- 7) The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
- 8) Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

- B. Workstation communication shall adhere to the industry standard format IEEE 802.3 or EIA 709.1.

2.4 CONTROLLERS

- A. General. Provide Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified in Section 230900 00. Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.

B. BACnet.

1. Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.
3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
4. Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.
5. Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.
6. BACnet Communication.
 - a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
 - b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
 - c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 - d. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

- e. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
- f. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

C. Communication.

- 1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.
- 2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
- 3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.
- 4. Stand-Alone Operation. Each piece of equipment specified in Section 23 09 93 shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

D. Environment. Controller hardware shall be suitable for anticipated ambient conditions.

- 1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).
- 2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

E. Keypad. Provide a local keypad and display for each BC and AAC. Operator shall be able to use keypad to view and edit data. Keypad and display shall require password to prevent unauthorized use. If the manufacturer does not normally provide a keypad and display for each BC and AAC, provide the software and any interface cabling needed to use a laptop computer as a Portable Operator's Terminal for the system.

F. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.

G. Serviceability.

- 1. Controllers shall have diagnostic LEDs for power, communication, and processor.
- 2. Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.
- 3. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

H. Memory.

- 1. Controller memory shall support operating system, database, and programming requirements.
- 2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.

3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.

- I. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
- J. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.5 INPUT AND OUTPUT INTERFACE

- A. General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.
- B. Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.
- C. Binary Inputs. Binary inputs shall monitor the on and off signal from a remote device. Binary inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.
- D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall accumulate up to 10 pulses per second.
- E. Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.
- F. Binary Outputs. Binary outputs shall send an on-or-off signal for on and off control. Building Controller binary outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.
- G. Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.
- H. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.
- I. Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

2.6 POWER SUPPLIES AND LINE FILTERING

- A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
 - 1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.
 - a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.
 - b. Line voltage units shall be UL recognized and CSA listed.
- B. Power Line Filtering.
 - 1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:
 - a. Dielectric strength of 1000 V minimum
 - b. Response time of 10 nanoseconds or less
 - c. Transverse mode noise attenuation of 65 dB or greater
 - d. Common mode noise attenuation of 150 dB or greater at 40-100 Hz

2.7 ELECTRONIC SENSORS

- A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.
- B. Thermistor temperature sensors and transmitters.
 - 1. Manufacturers:
 - a. BEC Controls Corporation.
 - b. Ebtron, Inc.
 - c. I.T.M. Instruments Inc.
 - d. Kele.
 - e. MAMAC Systems, Inc.
 - f. RDF Corporation.
 - g. "Control System Supplier" reference section 2.2.A.
 - 2. Accuracy: Plus or minus 0.5 F (0.3 C) at calibration point.
 - 3. Wire: Twisted, shielded-pair cable.
 - 4. Insertion Elements in Ducts: Single point, 8 inches (200 mm) long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft. (0.84 sq. m).
 - 5. Averaging Elements in Ducts: 72 inches (1830 mm) long, flexible; use where prone to temperature stratification or where ducts are larger than 10 sq. ft. (1 sq. m).

6. Insertion elements with stainless emersion wells in pipes: single point, of length equal to 75% of pipe diameter for perpendicular instrumentation or 6" minimum where installed in piping elbow.
7. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

C. Room sensor cover construction: Manufacturer's standard locking covers.

2.8 STATUS SENSORS

- A. Status inputs for fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0 to 5 inch wg (0 to 1240 Pa).
- B. Status inputs for electric motors: Comply with ISA 50.00.01, current-sensing fixed or split core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.
- C. Current switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.
- D. Electronic valve/damper position indicator: Visual scale indicating percent of travel and 2 to 10 V dc, feedback signal.

2.9 CONTROL CABLE

- A. Electronic and fiber-optic cables for control wiring are specified in Division 26 Section "Control-Voltage Electrical Power Cables".
- B. Where network cabling is not specifically referenced otherwise, utilize twisted shielded pairs.

2.10 CONTROL PANELS

- A. Local Control Panels: Unitized NEMA 1 cabinet with suitable brackets for wall or floor mounting, located adjacent to each system under automatic control. Provide common keying for all panels

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that power supply is available to control units and operator workstation.

3.2 INSTALLATION

- A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

- B. Connect and configure equipment and software to achieve sequence of operation specified.
- C. Verify location of thermostats, humidistats, other exposed control sensors, and control units with Drawings and room details before installation. Install devices in accordance with KBC 3311.5, 3311.6, and ADA.
 - 1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
- D. Install automatic dampers in ductwork and seal air tight.
- E. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
- F. Provide clear and thorough Owners Manuals with extensive diagrams and examples. Also provide documentation such as installation drawings and software documentation.
- G. Provide operational information on the system. This will include file drawings and framed schematics and operation sequences posted in the area.
- H. Provide operational information on the system. This will include file drawings and framed schematics and operation sequences posted in the area.
- I. Comply with ASHRAE 15 NFPA 69.

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. The Control System Supplier shall verify all terminations and performance of the installed wiring and cabling.
- B. The Control System Supplier shall provide all built-up control panels and control component enclosures, with all fusing, transformers, and termination points required to land the field cabling. The mounting and installation of control devices, controllers, and enclosures shall be the responsibility of the Control system Supplier.
- C. The control system schematics and P & ID's are provided for use in estimating the control wiring and cabling.
 - 1. The Control System Supplier shall review the P & ID's sequence of operations and wiring schematics and advise the Engineer, no less than two (2) weeks prior to bid date if notable wiring variations are required for the Supplier's system.
 - 2. Failure to notify of such variation within the stated time period obligates the proposers to make provisions for any necessary adjustments between the various divisions prior to bidding the project.
- D. Install building wire and cable according to Division 26 Specifications.
- E. Install signal and communication cable according to the following:
 - 1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
 - 2. Install exposed cable in raceway.

3. Install concealed cable in raceway.
 4. Bundle and harness multi-conductor instrument cable in place of single cables where several cables follow a common path.
 5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
 6. Number-code conductors for future identification and service of control system, except local individual room control cables may be color coded.
 7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.
- F. Connections, switches, LED's, major components, etc. inside the enclosures are to be labeled in the unit.
- G. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- H. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 ADJUSTING

- A. Calibrating and adjusting.
1. Calibrate instruments.
 2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
 3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
 4. Control system inputs and outputs:
 - a. Check analog inputs at 0, 50, and 100 percent of span.
 - b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
 - c. Check digital inputs using jumper wire.
 - d. Check digital outputs using ohmmeter to test for contact making or breaking.
 - e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.
 5. Flow.
 - a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
 - b. Manually operate flow switches to verify that they make or break contact.
 6. Pressure.
 - a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
 - b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

7. Temperature.
 - a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
 - b. Calibrate temperature switches to make or break contacts.
 8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
 9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
 10. Provide diagnostic and test instruments for calibration and adjustment of system.
- B. Adjust initial temperature and humidity set points.

3.6 DEMONSTRATION & TRAINING

- A. Engage factory-authorized service representative train Owner's maintenance personnel to adjust, operate, and maintain control systems and components. The training objectives shall include:
1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
 2. Provide operator training on data display, alarm and status descriptors, requesting data, executing commands, calibrating and adjusting devices, resetting default values, and requesting logs. Include a minimum of 8 hours dedicated instructor time on-site.
 3. Review data in maintenance manuals.
 4. Review data in maintenance manuals "Operation and Maintenance Data".

3.7 ON-SITE ASSISTANCE

- A. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three project site visits, when requested by Owner, to adjust and calibrate components and to assist Owner's personnel in making program changes and in adjusting sensors and controls to suit actual conditions.

END OF SECTION 230900

SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Sequences of Operations for all new equipment and systems.
- B. Related Sections include the following:
 - 1. Division 23 Section "Instrumentation and Control for HVAC" for control equipment and devices and for submittal requirements.

1.3 DESCRIPTION OF WORK

- A. Sequences of Operations shall be implemented in base bid by factory controls and control devices, including VRV system centralized controller.
- B. By Alternate, the sequences shall be implemented via DDC controls system specified in Section 230900 and on the Drawings. All points indicated below shall be integrated into the Owner's existing front-end server.

1.4 ELECTRIC CABINET UNIT HEATERS

- A. Run Conditions - Enable/Disable.
 - 1. When enabled, the unit shall run subject to its internal controls and safeties.
 - 2. Enable/Disable shall be accomplished through the VRV Centralized controller auxiliary contacts. The heating shall be enabled whenever:
 - a. Outside air temperature is less than 55°F (adj.).

	Hardware Points				Software Points					
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Heating Enable				x				x		x

1.5 VRV HEAT PUMP SYSTEM

- A. The following sequences are typical for each VRV heat pump zone and shall be implemented by the VRV heat pump system controls as provided by the manufacturer. A centralized controller shall be provided to communicate with all systems and, as alternate, network gateway shall be provided to interface with the building controller, reference the control interface requirements section.
- B. Run Conditions - Scheduled.
 - 1. The unit shall run according to a user definable time schedule in the following modes:
 - a. Occupied Mode: The unit shall maintain.
 - 1) A 75°F (adj.) cooling setpoint.
 - 2) A 68°F (adj.) heating setpoint.
 - b. Unoccupied Mode (night setback): The unit shall maintain.
 - 1) A 95°F (adj.) cooling setpoint.
 - 2) A 55°F (adj.) heating setpoint.
- C. Alarms shall be provided as follows.
 - 1. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
 - 2. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
- D. Zone Setpoint Adjust.
 - 1. The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.
- E. Fan.
 - 1. The fan shall run according to occupancy schedule and be adjustable at the zone sensor, unless shutdown on safeties.
 - a. Occupied Mode: The fan shall run continuously
 - b. Unoccupied Mode (night setback): The fan shall run as commanded.
- F. Heating and Cooling.
 - 1. The controller shall measure the zone temperature and cycle the compressor to maintain its setpoint. To prevent short cycling, the stage shall have a user definable (adj.)

minimum runtime. The compressor shall run subject to its own internal safeties and controls.

2. On mode change, the compressor shall be disabled and remain off until after the reversing valve has changed position.

1.8 VRV HEAT PUMP SYSTEM CONTROL INTERFACE

A. Each VRV Heat Pump system (Ground Level System, First Level System, and IT Room System) shall interface with one centralized controller. This controller shall communicate with the building controller through a BACnet interface. The control and monitoring functions of the building controller are detailed below:

B. BACnet Interface.

1. The current operating conditions shall be monitored through the device's communications interface port. The interface shall monitor and trend the points as shown on the Points List.
2. The interface shall be capable of writing to the points shown on the Points List including, but not limited to, individual zone setpoints, and individual zone schedules.
3. The building controller interface shall graphically display the building floor plan, each zone and the current zone conditions and setpoints as communicated through the BACnet interface port.
4. The building controller interface shall be capable of enabling/disabling whole system operation.
5. Alarms shall be provided as follows:
 - a. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
 - b. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
 - c. Error Code Report: If any components fails and issues an error code.
6. Each VRV System (OU-1, OU-2, etc), shall communicate the following points:

Point Name	Hardware Points				Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	
Error Code Report	x							x	x	x
Error Status Report			x					x	x	x
Operating Mode				x				x		x
Operating Mode Status			x					x		x
ON/OFF Command				x			x	x		x
ON/OFF Status			x					x		x

7. Each Zone within each system shall communicate the following points:

Point Name	Hardware Points				Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	
Zone Temp	x						x	x		x
Zone Setpoint Adjust		x						x		x
Fan Speed Setpoint		x						x		x
Fan Speed Status	x							x		x
Error Code Report	x							x	x	x
Error Status Report			x					x	x	x
Operating Mode				x				x		x
Operating Mode Status			x					x		x
ON/OFF Command				x			x	x		x
ON/OFF Status			x					x		x
Zone Temp High									x	
Zone Temp Low									x	

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230993

SECTION 232300 - REFRIGERANT AND CONDENSATE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes refrigerant piping and condensate drain piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A.
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
 - 2. Suction Lines for Heat-Pump Applications: 535 psig (3689 kPa).
 - 3. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).

1.4 SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Pipe, Tube and Materials.
 - 2. Valves.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications".
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems".
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components".

1.6 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 280, Type ACR.
- B. Drawn-Temper Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B) ASTM B 88, Type M (ASTM B 88M, Type C).
- C. Wrought-Copper Fittings: ASME B16.22.
- D. Wrought-Copper Unions: ASME B16.22.
- E. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- F. Brazing Filler Metals: AWS A5.8.

2.2 VALVES AND SPECIALTIES

- A. Service Valves.
 - 1. Body: Forged brass with brass cap including key end to remove core.
 - 2. Core: Removable ball-type check valve with stainless-steel spring.
 - 3. Seat: Polytetrafluoroethylene.
 - 4. End Connections: Copper spring.
 - 5. Working Pressure Rating: 500 psig (3450 kPa).
 - 6. Port: Full-port
- B. Branch Fittings: All branch fittings shall be engineered fittings furnished with the heat pump equipment for the specific size and application. Any other branch piping fittings or take-offs will not be permitted.

2.3 REFRIGERANTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
 - 1. Atofina Chemicals, Inc.
 - 2. DuPont Company; Fluorochemicals Div.
 - 3. Honeywell, Inc.; Genetron Refrigerants.
 - 4. INEOS Fluor Americas LLC.

- B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
- B. Condensate-Drain Piping: Type M (C), drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.

- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install refrigerant piping in protective conduit where installed belowground.
- M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- N. Slope refrigerant piping as follows.
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- Q. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment".

3.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube".
 - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
- E. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment".
- B. Install the following pipe attachments.
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.
 - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6 m) or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes.
 - 1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 - 2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 - 3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).
 - 4. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
 - 5. NPS 1-1/2 (DN 40): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
 - 6. NPS 2 (DN 50): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes.
 - 1. NPS 2 (DN 50): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (9.5 mm).
 - 2. NPS 2-1/2 (DN 65): Maximum span, 11 feet (3.4 m); minimum rod size, 3/8 inch (9.5 mm).
- E. Support multi-floor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections.
 - 1. Comply with ASME B31.5, Chapter VI.
 - 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.

3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

- A. Charge system using the following procedures.
 1. Install core in filter dryers after leak test but before evacuation.
 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
 4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

- A. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- B. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- C. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions.
 1. Open shutoff valves in condenser water circuit.
 2. Verify that compressor oil level is correct.
 3. Open compressor suction and discharge valves.
 4. Open refrigerant valves except bypass valves that are used for other purposes.
 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- D. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes.

- 1. Single-wall rectangular ducts and fittings.
- 2. Single-wall round ducts and fittings.
- 3. Sheet metal materials.
- 4. Sealants and gaskets.
- 5. Hangers and supports.

- B. Related Sections.

- 1. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated.

- 1. Static-Pressure Classes.

- a. Supply and Make-up Ducts: 1-inch wg (250 Pa).
- b. Return Ducts (Negative Pressure): 3-inch wg (250 Pa).
- c. General Exhaust Ducts (Negative Pressure): 1-inch wg (250 Pa).

- 2. Leakage Class.

- a. Round Supply and Make-Up-Air Duct: 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa).
- b. Rectangular Supply and Make-Up-Air Duct: 6 cfm/100 sq. ft. at 1-inch wg (0.29 L/s per sq. m at 250 Pa).
- c. Flexible Supply and Make-Up-Air Duct: 6 cfm/100 sq. ft. at 1-inch wg (0.29 L/s per sq. m at 250 Pa).
- d. Outside Air Duct: 6 cfm/100 sq. ft. at 1-inch wg (0.29 L/s per sq. m at 250 Pa).

- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Figure 1-4, "Transverse (Girth) Joints", for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Figure 1-5, "Longitudinal Seams - Rectangular Ducts", for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Chapter 2, "Fittings and Other Construction", for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Chapter 3, "Round, Oval, and Flexible Duct", based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Figure 3-2, "Transverse Joints - Round Duct", for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Figure 3-1, "Seams - Round Duct and Fittings", for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Figure 3-4, "90 Degree Tees and Laterals", and Figure 3-5,

"Conical Tees", for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60 (Z180).
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant.
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - 4. Class: 25.
 - 5. Use: O.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Non-corrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct".
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round and flat-oval ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines".

3.2 SEAM AND JOINT SEALING

- A. Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Table 1-2, "Standard Duct Sealing Requirements", unless otherwise indicated.
 - a. For static-pressure classes 1- and 1/2-inch wg (250 and 125 Pa), comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Seal Class C.

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Chapter 4, "Hangers and Supports".
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size", and Table 4-2, "Minimum Hanger Sizes for Round Duct", for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories".
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Painting requirements are specified in Division 09 Section "Interior Painting".

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Duct system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.7 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel.
- B. Intermediate Reinforcement.
 - 1. Galvanized-Steel Ducts: Galvanized steel.
- C. Elbow Configuration.
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Figure 2-2, "Rectangular Elbows".
 - a. Velocity 1000 fpm (5 m/s) or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s).
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Figure 2-3, "Vanes and Vane Runners", and Figure 2-4, "Vane Support in Elbows".

- c. Velocity 1500 fpm (7.6 m/s) or Higher.
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Figure 2-3, "Vanes and Vane Runners", and Figure 2-4, "Vane Support in Elbows".
2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows".
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Table 3-1, "Mitered Elbows". Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Welded.
- D. Branch Configuration.
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Figure 2-6, "Branch Connections".
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", Figure 3-4, "90 Degree Tees and Laterals", and Figure 3-5, "Conical Tees". Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
 - c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral or eccentric conical tap.
- E. Velocity Classification for the following systems.
 1. Supply and Make-up air > 1500 fpm.
 2. Return Air System > 1000 to 1500 fpm.
 3. Toilet Exhaust Systems. > 1000 to 1500 fpm.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes.
 - 1. Flexible connectors.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems", and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems".

PART 2 - PRODUCTS

2.1 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. Ventfabrics, Inc.
 - 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
 - 2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
 - 3. Service Temperature: Minus 40 to plus 200°F (Minus 40 to plus 93°C).

- E. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
 - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 - 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 - 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch (6-mm) movement at start and stop.

2.2 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
 - 1. Flexmaster U.S.A., Inc.
 - 2. McGill AirFlow LLC.
 - 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
 - 1. Pressure Rating: 4-inch wg (1000 Pa) positive and 0.5-inch wg (125 Pa) negative.
 - 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 - 3. Temperature Range: Minus 20 to plus 175°F (Minus 29 to plus 79°C).
 - 4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1-2004.
- C. Flexible Duct Connectors.
 - 1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action or Nylon strap in sizes 3 through 18 inches (75 through 460 mm), to suit duct size.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install fire dampers according to UL listing.

- C. Install flexible connectors to connect ducts to equipment.
- D. Connect diffusers or light troffer boots to ducts with maximum 60-inch (1500-mm) lengths of flexible duct clamped or strapped in place.
- E. Connect flexible ducts to metal ducts with draw bands and sheet metal screws.

END OF SECTION 233300

SECTION 238126 - SPLIT SYSTEM HEAT PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.
 - 1. VRV Heat-recovery Heat Pump Systems.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Field quality-control reports.
- D. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.
- E. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE Compliance:
 - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems".

2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-Up".

- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.

1.5 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete".
- B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period.

- a. For Compressor: Five year(s) from date of Substantial Completion.
- b. For Parts: One year(s) from date of Substantial Completion.
- c. For Labor: One year(s) from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Filters: Three set(s) for each air-handling unit.

PART 2 - PRODUCTS

2.1 VRV HEAT-RECOVERY HEAT PUMP MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
 1. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
 2. SANYO North America Corporation; SANYO Fisher Company.
 3. Daikin, Industries LTD.

2.2 VRV INDOOR UNITS 5 TONS (18 kW) OR LESS

A. Concealed Ducted Evaporator-Fan Components.

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: foil Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins. Comply with ARI 210/240.
4. Control: Electronic Expansion Valve.
5. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
6. Fan Motors.
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment".
 - b. Multi-tapped, multi-speed with internal thermal protection and permanent lubrication.
 - c. Wiring Terminations: Connect motor to chassis wiring with plug connection.
7. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
8. Filters: Provide filter chamber kit where specified on Drawings.
9. Sound Pressure Level: 48 dBA max when measured at 5ft below the ducted unit.

B. Wall-Mounted, Evaporator-Fan Components:

1. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and electronic-expansion valve. Comply with ARI 210/240.
2. Fan: Direct drive, centrifugal.
3. Fan Motors:
 - a. Multi-tapped, multi-speed with internal thermal protection and permanent lubrication.
 - b. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
 - c. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
5. Condensate Drain Pans:
 - a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection. Retain one of first two subparagraphs below.
 - b. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on both ends of pan.

C. Floor-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect.
 - a. Discharge Grille: Steel with surface-mounted frame.
 - b. Insulation: Faced, glass-fiber duct liner.
 - c. Drain Pans: Galvanized steel, with connection for drain; insulated.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:
 - a. Multi-speed with internal thermal protection and permanent lubrication.
5. Air Filtration Section:
 - a. General Requirements for Air Filtration Section:
 - 1) Comply with NFPA 90A.
 - 2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
 - 3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

2.3 VRV OUTDOOR UNITS

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Manufacturer's standard finish with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - a. Compressor Type: Scroll.
 - b. Variable-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
 - c. Refrigerant Charge: R-410A.
 - d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 210/240. Provide PE coating to prevent corrosion.
3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Control: Electronic expansion valve.
5. Fan: Propeller type, directly connected to motor.
6. Motor: Variable Speed, permanently lubricated, with integral thermal-overload protection.

7. Cooling Operating Range: 23°F to 110°F dry bulb.
8. Heating Operating Range: 0°F to 64°F dry bulb, -5°F to 60°F wet bulb.
9. Simultaneous operations of heating and cooling
10. Continuous heating during defrost operation
11. VFD controlled outdoor fan motor.
12. Provide manifold kit as required.

2.4 VRV BRANCH-SELECTOR UNITS FOR HEAT-RECOVERY VRV

- A. Maximum connectible cooling capacity: 36,000 btuh
- B. Max number of indoor units connectible: 5
- C. 208-230V, single phase, 60 Hz.
- D. 15 MOCP, max 5W input heating and cooling.
- E. Sound absorbing thermal insulation material
- F. Steel construction
- G. Outdoor unit brazing connections:
 1. Liquid
 2. Suction gas
 3. Discharge gas
- H. Indoor unit brazing connections:
 1. Liquid
 2. Gas

2.5 VRV SYSTEM CONTROLS

- A. Control Network:
 1. Provide complete control network for VRV heat pumps including all indoor units and outdoor units.
 2. System shall be complete with zone controllers, centralized controller, all sensor devices and wiring for fully functional system.
 3. All control wiring shall be completed in accordance with requirements of Division 23 specification "HVAC Instrumentation and Controls."
- B. Centralized Controller:
 1. Provide intelligent centralized controller to interface with all indoor and outdoor units.
 2. Centralized controller shall have the following capabilities.
 - a. Scheduling.
 - b. Setpoint Adjust.

- c. System trouble monitoring.
 - d. Operating Mode adjust.
 - e. Fan speed Adjust.
 3. The unit shall be capable of controlling 64 groups (128 indoor units)
 4. Unit shall be wall mounted with graphical interface and touch screen display.
 5. Controller shall include web-based functionality, including:
 - a. Communications by IP address over standard 10BASE-T Ethernet network.
 - b. Centralized monitoring and control via standard PC Web Browser.
- C. Network Communications Gateway - **ALTERNATE ONLY**.
 1. Provide network communications gateway to integrate VRV heat pump system controls with building automation system (BAS) specified in Division 23 Section "HVAC Instrumentation and Controls."
 2. Gateway shall be BACnet compatible and communicate via BACnet protocol over twisted-pair wire.
 3. Gateway shall communicate all points indicated on Points List in 230993.
 4. Gateway and all communicating points shall have read/write capability between the control networks.
- D. Individual Zone Controls.
 1. Provide wired zone controllers for all zones.
 2. Each indoor unit shall be provided with its own zone controller.
 3. All individual zone controllers shall communicate with the centralized controller.
 4. Functions shall include the following.
 - a. Setpoint adjust.
 - b. Fan speed Adjust.
 - c. Operating Mode.
 5. The controller shall monitor and display the following.
 - a. Zone temperature and humidity.
 - b. Operating Status.
 - c. Trouble Alarms.
 6. All zone controllers shall be installed and wired in accordance with Division 23 Section "HVAC Instrumentation and Controls."
 7. Wireless zone controllers shall not be permitted.
- E. Control System Licensing.
 1. All licensing shall be made to the Owner, not the Contractor or vender, or installer with all tools in, all tools out functionality and such license shall grant use of all programs and application software to owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software. All software shall be capable of adding other manufacturer licensed vendors if of the same firmware. All project developed software, control software, network management tools hardware, software and documentation shall become the property of the owner. These include, but are not

limited to project graphic images, record drawings, project database, project specific application programming code, and all other associated documentation. All licensing terms shall be for the lifetime of the product.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install and connect refrigerant tubing. Install tubing to allow access to unit.
- D. Install centralized and individual zone controllers.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.
- C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts" Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors.

3.3 FIELD QUALITY CONTROL

- A. VRV System Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections.
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service for VRV Systems.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

SECTION 238239 - WALL, CEILING, AND UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Wall heaters with propeller fans and electric-resistance heating coils.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.
- B. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 WALL HEATERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. Berko Electric Heating; a division of Marley Engineered Products.
 - 2. Chromalox, Inc.; a division of Emerson Electric Company.

3. Indeeco.
 4. Markel Products; a division of TPI Corporation.
 5. Marley Electric Heating; a division of Marley Engineered Products.
 6. Ouellet Canada Inc.
 7. QMark Electric Heating; a division of Marley Engineered Products.
 8. Trane.
- B. Description: An assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.
- C. Cabinet:
1. Front Panel: Extruded-aluminum bar grille, with removable panels fastened with tamperproof fasteners.
 2. Finish: Baked enamel over baked-on primer with manufacturer's custom color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
 3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
- D. Surface-Mounting Cabinet Enclosure: Steel with finish to match cabinet.
- E. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high temperature protection. Provide integral circuit breaker for overcurrent protection.
- F. Fan: Aluminum propeller directly connected to motor.
1. Motor: Permanently lubricated, multi-speed.
- G. Controls: Unit-mounted thermostat. Low-voltage relay with transformer kit, remote BAS relay.
- H. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.
- I. Capacities and Characteristics
1. Refer to drawings and schedules.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

- B. Examine roughing-in for electrical connections to verify actual locations before unit heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 238239

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Electrical equipment coordination and installation.
 - 2. Common electrical installation requirements.

1.3 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

1.6 PERMITS, FEES, CODES, AND REGULATIONS

- A. The Contractor shall give all necessary notices, obtain and pay for all permits, taxes, sales taxes, fees, and other costs including utility connections or extensions, in connection with his work. As necessary, he shall file all required plans, utility easement requests and drawings, survey information on line locations, load calculations, etc. The Contractor shall prepare all documents and obtain all necessary approvals of all utility and authorities having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Engineer before request for acceptance and final payment for the work.
- B. Ignorance of Codes, Rules, regulations, utility company requirements, laws, etc., shall not diminish or absolve the Contractor's responsibilities to provide and complete all work in compliance with such.
- C. All materials furnished and all work installed shall comply with the current edition of the applicable mechanical and electrical codes, Codes of the National Fire Protection Association, the requirements of local utility companies, and with the requirements of all authorities having jurisdiction.

- D. All material and equipment for the electrical systems shall bear the approval label, or shall be listed by the Underwriters' Laboratories. Listings by other testing agencies may be acceptable with written approval by the Engineer. Each packaged assembly shall be U.L. labeled.
- E. The Contractor shall furnish three (3) copies of all Final Inspection Certificates to the Engineer when work is complete. Final payment for work will be contingent upon compliance with this requirement.
- F. Where minimum code requirements are exceeded in the Design, the Design shall govern.
- G. The Contractor shall ensure that his work is accomplished in accord with the OSHA Standards, the latest edition of the National Electrical Code and any other applicable government requirements.
- H. Where conflict arises between any code and the plans and/or specifications, the code shall apply except in the instance where the plans and specifications exceed the requirements of the code. Any changes required as a result of these conflicts shall be brought to the attention of the Engineer at least ten (10) working days prior to bid date, otherwise the Contractor shall make the required changes at his own expense.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

- B. Smoke and Fire proofing materials and methods of application shall be approved by the local authority having jurisdiction. Submit shop drawings to Engineer for approval on materials to be used and method of installation.
- C. Provide firestopping systems that are produced and installed to resist the spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction assembly.
- D. Provide firestopping systems with F-ratings, and T-ratings, indicated, as determined per ASTM E814, but not less than that equaling or exceeding fire-resistance ratings of the construction assembly.

3.3 QUIET OPERATION, VIBRATION AND OSCILLATION

- A. All work shall operate under all conditions of load without any objectionable sound or vibration. All equipment subject to vibration and/or oscillation shall be mounted on vibration supports, whether indicated or not, suitable for the purpose of minimizing noise and vibration transmission. All equipment shall be isolated from external connections such as piping, ducts, etc. by means of flexible connectors, vibration absorbers, or other approved means. Unitary equipment, such as small room heating units, small exhaust fans, etc., shall be rigidly braced and mounted to wall, floor or ceiling as required and tightly gasketed and sealed to mounting surface to prevent air leakage and to obtain quiet operation. Flush and surface mounted equipment such as diffusers, grilles, etc., shall be gasketed and affixed tightly to their mounting surface.

3.4 PROTECTION OF EQUIPMENT

- A. The Contractor shall be entirely responsible for all material and equipment furnished by him in connection with his work and special care shall be taken to properly protect all parts thereof from damage during the construction period. Such protection shall be by a means acceptable to the Engineer. All rough-in soil, waste, vent and storm piping, ductwork, conduit, etc., shall be properly plugged or capped during construction in a manner approved by the Engineer. Equipment damaged stolen or vandalized while stored on site, either before or after installation, shall be repaired or replaced (as determined by the Engineer) by the responsible Contractor at his expense.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. American Insulated Wire Corp.; a Leviton Company.
 - 3. General Cable Corporation.
 - 4. Senator Wire & Cable Company.
 - 5. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THW THHN-THWN XHHW UF USE and SO.
- D. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC Type SO with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Hubbell Power Systems, Inc.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M; Electrical Products Division.
 - 5. Tyco Electronics Corp.
- C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- E. Feeders Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway. Manufactured wiring systems.
- F. Feeders in Cable Tray: Type THHN-THWN, single conductors in raceway.
- G. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- H. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- I. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- J. Branch Circuits Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway. Manufactured wiring systems.
- K. Branch Circuits in Cable Tray: Type THHN-THWN, single conductors in raceway.
- L. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- M. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- N. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, which will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems".
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping".

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Low-voltage control cabling.
 - 2. Control-circuit conductors.
 - 3. Identification products.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- C. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control reports.
- C. Maintenance Data: For wire and cable to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test each pair of UTP cable for open and short circuits.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install UTP and optical fiber cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PATHWAYS

- A. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."
 - 1. All cabling, concealed and exposed shall be in raceway.
 - 2. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

2.2 BACKBOARDS

- A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm).

2.3 LOW-VOLTAGE CONTROL CABLE

- A. Low-voltage control cabling must be in conformance with control system requirements and recommendations. Requirements below shall not supercede the manufacturer's cabling requirements. Coordinate with Control System Supplier.
- B. Paired Cable: NFPA 70, Type CMG.
 - 1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
 - 2. PVC insulation.
 - 3. Unshielded.
 - 4. PVC jacket.
 - 5. Flame Resistance: Comply with UL 1581.
- C. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
 - 1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.

2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

D. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

E. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Plastic jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.4 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN], in raceway, complying with UL 83.
- B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway power-limited cable, concealed in building finishes, complying with UL 83.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or Type TF, complying with UL 83.

2.5 IDENTIFICATION PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Brady Corporation.
 2. HellermannTyton.
 3. Kroy LLC.
 4. Panduit Corp.
- B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

- A. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.
- D. Pathway Installation in Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed or in the corner of room if multiple sheets of plywood are installed around perimeter walls of room.
 - 2. Install cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard if entering room from overhead.
 - 4. Extend conduits 3 inches (75 mm) above finished floor.
 - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- E. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Terminate all conductors; no cable shall contain un-terminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 - 2. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 3. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
 - 4. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - 5. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 - 6. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Division 26 Section "Raceway and Boxes for Electrical Systems."

D. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (305 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (305 mm).
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.3 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables.

3.4 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits, No 12 AWG.

3.5 FIRESTOPPING

- A. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

- A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling according to TIA/EIA-606-A.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Receptacle circuits.
 - 2. Single-phase motor and appliance branch circuits.
 - 3. Three-phase motor and appliance branch circuits.
 - 4. Flexible raceway runs.
 - 5. Armored and metal-clad cable runs.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from

panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

- E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- F. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- C. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
- B. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
 - 2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.

3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
- C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.

2. Non-metallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 1. Trapeze hangers. Include Product Data for components.
 2. Steel slotted channel systems. Include Product Data for components.
 3. Nonmetallic slotted channel systems. Include Product Data for components.
 4. Equipment supports.
 - C. Welding certificates.
- 1.6 QUALITY ASSURANCE
- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 4. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
 1. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 2. Fitting and Accessory Materials: Same as channels and angles.
 3. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 - 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
 2. Alflex Inc.
 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
 5. Electri-Flex Co.
 6. Manhattan/CDT/Cole-Flex.
 7. Maverick Tube Corporation.
 8. O-Z Gedney; a unit of General Signal.
 9. Wheatland Tube Company.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. EMT: ANSI C80.3.
- D. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
- E. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 2. EGS/Appleton Electric.
 3. Erickson Electrical Equipment Company.
 4. Hoffman.
 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 6. O-Z/Gedney; a unit of General Signal.
 7. RACO; a Hubbell Company.
 8. Robroy Industries, Inc.; Enclosure Division.
 9. Scott Fetzer Co.; Adalet Division.
 10. Spring City Electrical Manufacturing Company.
 11. Thomas & Betts Corporation.
 12. Walker Systems, Inc.; Wiremold Company (The).
 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- F. Cabinets:
 - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

2.3 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Coordinate sleeve selection and application with selection and application of firestopping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Comply with the following indoor applications, unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Classified rooms with hazardous atmospheres.
 - e. Exposed exterior damp or wet locations
 - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.

5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 6. Damp or Wet Locations: Rigid steel conduit.
 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, nonmetallic in damp or wet locations.
- B. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 2. Set-screw fittings shall not be used. No exceptions.
- D. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- E. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- K. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box

with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where otherwise required by NFPA 70.
- L. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- M. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- N. Raceways in Classified Areas: Raceway fittings shall be provided in explosion-proof configurations rated for the atmosphere. Place conduit seal off fittings at each device in accord with applicable codes. Seal off fittings shall be packed with wadding, and poured with an approved non-shrink sealing compound.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping.
- B. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- C. Cut sleeves to length for mounting flush with both surfaces of walls.
- D. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- E. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway unless sleeve seal is to be installed.
- F. Seal space outside of sleeves with grout for penetrations of concrete and masonry.
- G. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- H. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials.

3.4 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.5 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Equipment identification labels.

1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

- C. Coordinate installation of identifying devices with location of access panels and doors.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.5 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with black letters on a white background. Minimum letter height shall be 3/8 inch (10 mm).
- B. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. Black letters on a white background. Minimum letter height shall be 3/8 inch (10 mm).

2.6 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73°F (23°C), According to ASTM D 638: 12,000 psi (82.7 MPa).
 - 3. Temperature Range: Minus 40°F to plus 185°F (Minus 40°C to plus 85°C).
 - 4. Color: Black except where used for color-coding.
- B. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73°F (23°C), According to ASTM D 638: 7000 psi (48.2 MPa).
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50°F to plus 284°F (Minus 46°C to plus 140°C).
 - 5. Color: Black.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 30-foot (10-m) maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.

2. Power.
 3. UPS.
- C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- D. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.
- E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- F. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include mechanical/HVAC, power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label or a mechanically fastened engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
 - b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 2. Equipment to Be Labeled:
 - a. Enclosures and electrical cabinets.
 - b. Access doors and panels for concealed electrical items.
 - c. Enclosed controllers.
 - d. Variable-speed controllers.
 - e. Monitoring and control equipment.
 - f. Mechanical/HVAC equipment.

END OF SECTION 260553

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.
 - 3. Load centers.
 - 4. Electronic-grade panelboards.

1.3 SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Field Quality-Control Reports:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- C. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals.
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Engineer no fewer than two days in advance of proposed interruption of electric service.
 - 2. Do not proceed with interruption of electric service without Engineer's written permission.

1.6 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Keys: Two spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: surface-mounted cabinets.

1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
6. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
7. Directory Card: Inside panelboard door, mounted in transparent card holder.

B. Incoming Mains Location: Top and bottom.

C. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Compression type.
3. Ground Lugs and Bus-Configured Terminators: Compression type.
4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Gutter-Tap Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

E. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 2. Siemens Energy & Automation, Inc.
 - 3. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - 1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
- D. Mains: Circuit breaker or Lugs only as specified on Plans.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 2. Siemens Energy & Automation, Inc.
 - 3. Square D; a brand of Schneider Electric.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 - 3. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 - 4. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
 - 5. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
 - c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- B. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- B. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- C. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- D. Install filler plates in unused spaces.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.
- B. Tests and Inspections:
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Panelboards will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 3. Leviton Mfg. Company Inc. (Leviton).
 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5351 (single), 5352 (duplex).
 - b. Hubbell; HBL5351 (single), CR5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5381 (single), 5352 (duplex).

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; GF20.
 - b. Pass & Seymour; 2084.

2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).

- c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
- d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Off-white.
 - 3. Material for Unfinished Spaces: Galvanized steel.

2.6 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - 1. Wiring Devices Connected to Normal Power System: Gray unless otherwise indicated or required by NFPA 70 or device listing.
 - 2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until approved in writing by Architect.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 - 1. Test Instruments: Use instruments that comply with UL 1436.
 - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

- B. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Molded-case circuit breakers (MCCBs).

1.3 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Include evidence of NRTL listing for series rating of installed devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- B. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - 1. Ambient Temperature: Not less than minus 22°F (minus 30°C) and not exceeding 104°F (40°C).
 - 2. Altitude: Not exceeding 6600 feet (2010 m).
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Owner no fewer than 14 days in advance of proposed interruption of electric service.
 - 2. Indicate method of providing temporary electric service.
 - 3. Do not proceed with interruption of electric service without Owner's written permission.
 - 4. Comply with NFPA 70E.

1.6 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
2. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.2 NONFUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
2. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
2. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

D. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination Study".

END OF SECTION 262816

PART IX**ADDENDA**

<u>Addendum Number</u>	<u>Title</u>	<u>Date</u>
1.	Special Terms and Conditions, U.S. Department of Energy	9/1/11
2.	Confined Space Program, LFUCG	9/1/11
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____

SPECIAL TERMS AND CONDITIONS

Table of Contents

<u>Number</u>	<u>Subject</u>	<u>Page</u>
1.	RESOLUTION OF CONFLICTING CONDITIONS.....	2
2.	AWARD AGREEMENT TERMS AND CONDITIONS.....	2
3.	ELECTRONIC AUTHORIZATION OF AWARD DOCUMENTS.....	2
4.	PAYMENT PROCEDURES - ADVANCES THROUGH THE AUTOMATED STANDARD APPLICATION FOR PAYMENTS (ASAP) SYSTEM.....	2
5.	CEILING ON ADMINISTRATIVE COSTS.....	3
6.	LIMITATIONS ON USE OF FUNDS.....	3
7.	REIMBURSABLE FRINGE BENEFIT COSTS.....	4
8.	INDIRECT COSTS ARE NOT REIMBURSABLE.....	4
9.	USE OF PROGRAM INCOME.....	4
10.	STATEMENT OF FEDERAL STEWARDSHIP.....	4
11.	SITE VISITS.....	4
12.	REPORTING REQUIREMENTS.....	5
13.	PUBLICATIONS.....	5
14.	FEDERAL, STATE, AND MUNICIPAL REQUIREMENTS.....	6
15.	LOBBYING RESTRICTIONS.....	6
16.	NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) REQUIREMENTS.....	6
17.	HISTORIC PRESERVATION.....	7
18.	WASTE STREAM.....	8
19.	DECONTAMINATION AND/OR DECOMMISSIONING (D&D) COSTS.....	8
20.	SUBGRANTS AND LOANS.....	8
21.	JUSTIFICATION OF BUDGET COSTS.....	9
22.	ADVANCE UNDERSTANDING CONCERNING PUBLICLY FINANCED ENERGY IMPROVEMENT PROGRAMS.....	10
23.	SPECIAL PROVISIONS RELATING TO WORK FUNDED UNDER AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009 (May 2009).....	10
24.	REPORTING AND REGISTRATION REQUIREMENTS UNDER SECTION 1512 OF THE RECOVERY ACT.....	15
25.	NOTICE REGARDING THE PURCHASE OF AMERICAN-MADE EQUIPMENT AND PRODUCTS -- SENSE OF CONGRESS.....	15
26.	REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009.....	16
27.	REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS (COVERED UNDER INTERNATIONAL AGREEMENTS) – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009.....	19
28.	WAGE RATE REQUIREMENTS UNDER SECTION 1606 OF THE RECOVERY ACT.....	23
29.	RECOVERY ACT TRANSACTIONS LISTED IN SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS AND RECIPIENT RESPONSIBILITIES FOR INFORMING SUBRECIPIENTS.....	23
30.	DAVIS-BACON ACT AND CONTRACT WORKHOURS AND SAFETY STANDARD ACT.....	24

1. RESOLUTION OF CONFLICTING CONDITIONS

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

2. AWARD AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of the Assistance Agreement, plus the following:

- a. Special Terms and Conditions.
- b. Attachments:

Attachment Number	Title
1.	Statement of Project Objectives
2.	Federal Assistance Reporting Checklist and Instructions
3.	Budget Pages (SF 424A)
- c. DOE Assistance Regulations, 10 CFR Part 600 at <http://ecfr.gpoaccess.gov>.
- d. Application/proposal as approved by DOE.
- e. National Policy Assurances to Be Incorporated as Award Terms in effect on date of award at http://management.energy.gov/business_doe/1374.htm.

3. ELECTRONIC AUTHORIZATION OF AWARD DOCUMENTS

Acknowledgement of award documents by the Recipient's authorized representative through electronic systems used by the Department of Energy, specifically FedConnect, constitutes the Recipient's acceptance of the terms and conditions of the award. Acknowledgement via FedConnect by the Recipient's authorized representative constitutes the Recipient's electronic signature.

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

- a. Method of Payment. Payment will be made by advances through the Department of Treasury's ASAP system.
- b. Requesting Advances. Requests for advances must be made through the ASAP system. You may submit requests as frequently as required to meet your needs to disburse funds for the Federal share of project costs. If feasible, you should time each request so that you receive payment on the same day that you disperse funds for direct project costs and the proportionate share of any allowable indirect costs. If same-day transfers are not feasible, advance payments must be as close to actual disbursements as administratively feasible.
- c. Adjusting payment requests for available cash. You must disburse any funds that are available from repayments to and interest earned on a revolving fund, program income,

rebates, refunds, contract settlements, audit recoveries, credits, discounts, and interest earned on any of those funds before requesting additional cash payments from DOE.

- d. Payments. All payments are made by electronic funds transfer to the bank account identified on the ASAP Bank Information Form that you filed with the U.S. Department of Treasury.
- e. Agency approval of payments. Based on review of your current A-133 Audit Report results, DOE may require Agency pre-approval of payments. If the Agency approval requirement is in effect for your award, the ASAP system will indicate that Agency approval is required when you submit a request for advance payment. The DOE payment authorizing official may request additional information to justify the payment request, as deemed necessary.

5. CEILING ON ADMINISTRATIVE COSTS

- a. Local government and Indian Tribe Recipients may not use more than 10 percent of amounts provided under this program, or \$75,000, whichever is greater (EISA Sec 545 (b)(3)(A)), for administrative expenses, excluding the costs of meeting the reporting requirements under Title V, Subtitle E of EISA. These costs should be captured and summarized for each activity under the Projected Costs Within Budget: Administration.
- b. Recipients are expected to manage their administrative costs. DOE will not amend an award solely to provide additional funds for changes in administrative costs. The Recipient shall not be reimbursed on this project for any final administrative costs that are in excess of the designated 10 percent administrative cost ceiling. In addition, the Recipient shall neither count costs in excess of the administrative cost ceiling as cost share, nor allocate such costs to other federally sponsored project, unless approved by the Contracting Officer.

6. LIMITATIONS ON USE OF FUNDS

- a. By accepting funds under this award, you agree that none of the funds obligated on the award shall be expended, directly or indirectly, for gambling establishments, aquariums, zoos, golf courses or swimming pools.
- b. Recipients may not use more than 50 percent of the amounts provided for the establishment of a loan loss reserve.
- c. Local government and Indian tribe Recipients may not use more than 20 percent of the amounts provided or \$250,000, whichever is greater (EISA Sec 545 (b)(3)(B)), for the establishment of revolving loan funds.
- d. Local government and Indian tribe Recipients may not use more than 20 percent of the amounts provided or \$250,000, whichever is greater (EISA Sec 545 (b)(3)(C)), for subgrants to nongovernmental organizations for the purpose of assisting in the

implementation of the energy efficiency and conservation strategy of the eligible unit of local government or Indian tribe.

7. REIMBURSABLE FRINGE BENEFIT COSTS

- a. The Recipient is expected to manage their final negotiated project budgets, including their fringe benefit costs. DOE will not amend an award solely to provide additional funds for changes in the fringe benefit costs or for changes in rates used for calculating these costs. DOE recognizes that the inability to obtain full reimbursement for fringe benefit costs means the Recipient must absorb the underrecovery. Such underrecovery may be allocated as part of the Recipient's cost share.
- b. If actual allowable fringe benefit costs are less than those budgeted and funded under the award, the Recipient may use the difference to pay additional allowable direct costs during the project period. If at the completion of the award the Government's share of total allowable costs (i.e., direct and indirect), is less than the total costs reimbursed, the Recipient must refund the difference.

8. INDIRECT COSTS ARE NOT REIMBURSABLE

The budget for this award does not include indirect costs. Therefore, these expenses shall not be charged to nor reimbursement requested for this project nor shall the indirect costs from this project be allocated to any other federally sponsored project. In addition, indirect costs shall not be counted as cost share unless approved by the Contracting Officer. This restriction does not apply to subawardees' indirect costs.

9. USE OF PROGRAM INCOME

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

10. STATEMENT OF FEDERAL STEWARDSHIP

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

11. SITE VISITS

DOE's authorized representatives have the right to make site visits at reasonable times to review project accomplishments and management control systems and to provide technical

assistance, if required. You must provide, and must require your subawardees to provide, reasonable access to facilities, office space, resources, and assistance for the safety and convenience of the government representatives in the performance of their duties. All site visits and evaluations must be performed in a manner that does not unduly interfere with or delay the work.

12. REPORTING REQUIREMENTS

- a. Requirements. The reporting requirements for this award are identified on the Federal Assistance Reporting Checklist, DOE F 4600.2, attached to this award. Failure to comply with these reporting requirements is considered a material noncompliance with the terms of the award. Noncompliance may result in withholding of future payments, suspension or termination of the current award, and withholding of future awards. A willful failure to perform, a history of failure to perform, or unsatisfactory performance of this and/or other financial assistance awards, may also result in a debarment action to preclude future awards by Federal agencies.
- b. Additional Recovery Act Reporting Requirements are found in the Provision below labeled: "REPORTING AND REGISTRATION REQUIREMENTS UNDER SECTION 1512 OF THE RECOVERY ACT."

13. PUBLICATIONS

- a. You are encouraged to publish or otherwise make publicly available the results of the work conducted under the award.
- b. An acknowledgment of DOE support and a disclaimer must appear in the publication of any material, whether copyrighted or not, based on or developed under this project, as follows:

Acknowledgment: "This material is based upon work supported by the Department of Energy [National Nuclear Security Administration] [add name(s) of other agencies, if applicable] under Award Number(s) [enter the award number(s)]."

Disclaimer: "This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof."

14. FEDERAL, STATE, AND MUNICIPAL REQUIREMENTS

You must obtain any required permits, ensure the safety and structural integrity of any repair, replacement, construction and/or alteration, and comply with applicable federal, state, and municipal laws, codes, and regulations for work performed under this award.

15. LOBBYING RESTRICTIONS

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

16. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) REQUIREMENTS

You are restricted from taking any action using Federal funds, which would have an adverse effect on the environment or limit the choice of reasonable alternatives prior to DOE providing either a NEPA clearance or a final NEPA decision regarding this project.

If you move forward with activities that are not authorized for Federal funding by the DOE Contracting Officer in advance of the final NEPA decision, you are doing so at risk of not receiving Federal funding and such costs may not be recognized as allowable cost share.

You are prohibited from implementing energy efficiency improvements and renewable energy generation opportunities, including demolition, repair, replacement, installation, construction, disposal, or alteration activities until such time that you comply with the Waste Stream and Historic Preservation clauses.

If this award includes construction activities, you must submit an environmental evaluation report/evaluation notification form addressing NEPA issues prior to DOE initiating the NEPA process.

If you intend to make changes to the scope or objective of your project you are required to contact the DOE Project Officer identified in Block 15 of the Assistance Agreement before proceeding. You must receive notification of approval from the DOE Contracting Officer prior to commencing with work beyond that currently approved.

Activity #1 – Energy Management Technology

DOE has made a final NEPA Determination for this activity, which is categorically excluded from further NEPA review.

Activity #2 – Government Energy Retrofits

This activity is bounded in compliance with the signed Statement of Work. DOE has made a final NEPA Determination for this activity, which is categorically excluded from further NEPA review.

Activity #3 – Community Energy Awareness

DOE has made a final NEPA Determination for this activity, which is categorically excluded from further NEPA review.

Activity # 4– Community Energy Retrofits (Nonprofit Art Buildings)

This activity is bounded in compliance with the signed Statement of Work. DOE has made a final NEPA Determination for this activity, which is categorically excluded from further NEPA review.

Activity #5 – Intelligent Transportation System (Software Upgrade)

DOE has made a final NEPA Determination for this activity, which is categorically excluded from further NEPA review.

Activity #6 – Community Bike Program

This activity falls outside the bounds of the signed Statement of Work, but is categorically excluded from further NEPA review as described. Prior to the expenditure of Federal funds to implement this activity, the Recipient has the affirmative responsibility to ensure compliance with Sec. 106 of the National Historic Preservation Act (NHPA). DOE has made a final NEPA Determination for this activity, which is categorically excluded from further NEPA review.

Activity #7 – Green Roof Education Program

DOE has made a final NEPA Determination for this activity, which is categorically excluded from further NEPA review.

Activity #8 – Recycling Efficiency Program

This activity falls outside the bounds of the signed Statement of Work, but is categorically excluded from further NEPA review as described. Under this determination, the Recipient must comply with submitted assurances establishing a process to address visual impacts resulting from the placement of recycling compactors. DOE has made a final NEPA Determination for this activity, which is categorically excluded from further NEPA review.

17. HISTORIC PRESERVATION

Prior to the expenditure of Project funds to alter any historic structure or site, the Recipient or subrecipient shall ensure that it is compliant with Section 106 of the National Historic Preservation Act (NHPA), consistent with DOE's 2009 letter of delegation of authority regarding the NHPA. Section 106 applies to historic properties that are listed in or eligible for listing in the National Register of Historic Places. If applicable, the Recipient or subrecipient must contact the State Historic Preservation Officer (SHPO), and the Tribal Historic Preservation Officer (THPO) to coordinate the Section 106 review outlined in 36 CFR Part 800. In the event that a State, State SHPO and DOE enter into a Programmatic Agreement, the terms of that Programmatic Agreement shall apply to all recipient and subrecipient activities within that State. SHPO contact information is available at the following link: <http://www.ncshpo.org/find/index.htm>. THPO contact information is

available at the following link: <http://www.nathpo.org/map.html>. Section 110(k) of the NHPA applies to DOE funded activities.

The Recipient or subrecipient certifies that it will retain sufficient documentation to demonstrate that the Recipient or subrecipient has received required approval(s) from the SHPO or THPO for the Project. Recipients or subrecipients shall avoid taking any action that results in an adverse effect to historic properties pending compliance with Section 106. The Recipient or subrecipient shall deem compliance with Section 106 of the NHPA complete only after it has received this documentation. The Recipient or subrecipient shall make this documentation available to DOE on DOE's request (for example, during a post-award audit). Recipient will be required to report annually on September 1 the disposition of all historic preservation consultations by category.

18. WASTE STREAM

The Recipient assures that it will create or obtain a waste management plan addressing waste generated by a proposed Project prior to the Project generating waste. This waste management plan will describe the Recipient's or subrecipient's plan to dispose of any sanitary or hazardous waste (e.g., construction and demolition debris, old light bulbs, lead ballasts, piping, roofing material, discarded equipment, debris, and asbestos) generated as a result of the proposed Project. The Recipient shall ensure that the Project is in compliance with all Federal, state and local regulations for waste disposal. The Recipient shall make the waste management plan and related documentation available to DOE on DOE's request (for example, during a post-award audit).

19. DECONTAMINATION AND/OR DECOMMISSIONING (D&D) COSTS

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

20. SUBGRANTS AND LOANS

- a. The Recipient hereby warrants that it will ensure that all activities by sub-grantee(s) and loan recipients to accomplish the approved Project Description or Statement of Project Objectives are eligible activities under 42 U.S.C. 171534(1)-(13). State recipients hereby warrant that they will ensure that all activities by sub-grantee(s) and loan recipients pursuant to 42 U.S.C. 17155(c)(1)(A) to accomplish the approved Project Description or Statement of Project objects are eligible activities under 42 U.S.C. 171534(3)-(13).
- b. Upon the Recipient's selection of the sub-grantee(s) and loan recipients, the Recipient shall notify (i.e. approval not required) the DOE Contracting Officer with the following information for each, regardless of dollar amount:

- Name of Sub-Grantee
- DUNS Number
- Award Amount
- Statement of work including applicable activities

State recipients shall notify the DOE Contracting Officer with the above information within 180 days of the award date in Block 27 of the Assistance Agreement Cover Page.

- c. In addition to the information in paragraph b. above, for each sub-grant and loan that has an estimated cost greater than \$10,000,000, the recipient must submit for approval by the Contracting Officer, a SF424A Budget Information – Nonconstruction Programs, and PMC 123.1 Cost Reasonableness Determination for Financial Assistance (available at <http://www.eere-pmc.energy.gov/forms.aspx>).

21. JUSTIFICATION OF BUDGET COSTS

- a. In the original application, the recipient did not provide sufficient information to justify the approval or release of funds for the proposed activities. In order to receive reimbursement for the costs associated with the activities listed in the approved Statement of Project Objectives (SOPO), a justification for all proposed costs must be submitted to the DOE Contracting Officer.
- b. The Recipient must provide justification for the following costs:

Equipment Costs:

The Recipient must submit cost justification for the equipment costs for Activity #2 – Government Energy Retrofits for approval by the Contracting Officer. For equipment costs of \$50,000 or more, the Recipient must submit vendor quotes for approval by the Contracting Officer.

Contractual Costs:

1. The recipient shall provide the following information for each individual or company that will receive EECBG funding, regardless of dollar amount:

- Name
- DUNS Number
- Award Amount
- Statement of work including applicable activities
- NEPA documentation, as applicable

2. In addition to the information in paragraph 1 above, for each individual or company that has an estimated cost greater than \$10,000,000, the Recipient must submit a separate SF424A Budget Information – Nonconstruction Programs, and Budget Justification. The DOE Contracting Officer may require additional information concerning these individuals or companies prior to providing written approval.

- c. Upon written notification and/or approval by the Contracting Officer, the Recipient may then receive payment for the activities listed in the approved SOPO for allowable costs incurred in accordance with the payment provisions contained in the Special Terms and Conditions of this agreement. These written notifications and/or approvals will be incorporated into the award by formal modification at a future date.

22. ADVANCE UNDERSTANDING CONCERNING PUBLICLY FINANCED ENERGY IMPROVEMENT PROGRAMS

The parties recognize that the Recipient may use funds under this award for Property-Assessed Clean Energy (PACE) loans, Sustainable Energy Municipal Financing, Clean Energy Assessment Districts, Energy Loan Tax Assessment Programs (ELTAPS), or any other form or derivation of Special Taxing District whereby taxing entities collect payments through increased tax assessments for energy efficiency and renewable energy building improvements made by their constituents. The Department of Energy intends to publish "Best Practices" or other guidelines pertaining to the use of funds made available to the Recipient under this award pertaining to the programs identified herein. By accepting this award, the Recipient agrees to incorporate, to the maximum extent practicable, those Best Practices and other guidelines into any such program(s) within a reasonable time after notification by DOE that the Best Practices or guidelines have been made available. The Recipient also agrees, by its acceptance of this award, to require its sub-recipients to incorporate to the maximum extent practicable the best practices and other guideline into any such program used by the sub-recipient.

23. SPECIAL PROVISIONS RELATING TO WORK FUNDED UNDER AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009 (May 2009)

Preamble

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

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

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

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

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

Definitions

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

Non-Federal employer means any employer with respect to covered funds -- the contractor, subcontractor, grantee, or recipient, as the case may be, if the contractor, subcontractor, grantee, or recipient is an employer; and any professional membership organization, certification of other professional body, any agent or licensee of the Federal government, or any person acting directly or indirectly in the interest of an employer receiving covered funds; or with respect to covered funds received by a State or local government, the State or local government receiving the funds and any contractor or subcontractor receiving the funds and any contractor or subcontractor of the State or local government; and does not mean any department, agency, or other entity of the federal government.

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

Special Provisions

A. Flow Down Requirement

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

B. Segregation of Costs

Recipients must segregate the obligations and expenditures related to funding under the Recovery Act. Financial and accounting systems should be revised as necessary to

segregate, track and maintain these funds apart and separate from other revenue streams. No part of the funds from the Recovery Act shall be commingled with any other funds or used for a purpose other than that of making payments for costs allowable for Recovery Act projects.

C. Prohibition on Use of Funds

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

D. Access to Records

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

(1) to examine any records of the contractor or grantee, any of its subcontractors or subgrantees, or any State or local agency administering such contract that pertain to, and involve transactions that relate to, the subcontract, subcontract, grant, or subgrant; and

(2) to interview any officer or employee of the contractor, grantee, subgrantee, or agency regarding such transactions.

E. Publication

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

Notice of Restriction on Disclosure and Use of Data

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

Information about this agreement will be published on the Internet and linked to the website www.recovery.gov, maintained by the Accountability and Transparency Board. The Board

may exclude posting contractual or other information on the website on a case-by-case basis when necessary to protect national security or to protect information that is not subject to disclosure under sections 552 and 552a of title 5, United States Code.

F. Protecting State and Local Government and Contractor Whistleblowers.

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

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

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

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

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

Nonenforceability of Certain Provisions Waiving Rights and remedies or Requiring Arbitration: Except as provided in a collective bargaining agreement, the rights and remedies provided to aggrieved employees by this section may not be waived by any agreement,

policy, form, or condition of employment, including any predispute arbitration agreement. No predispute arbitration agreement shall be valid or enforceable if it requires arbitration of a dispute arising out of this section.

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

G. Reserved

H. False Claims Act

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

I. Information in Support of Recovery Act Reporting

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

J. Availability of Funds

Funds obligated to this award are available for reimbursement of costs until 36 months after the award date.

K. Additional Funding Distribution and Assurance of Appropriate Use of Funds

Certification by Governor – For funds provided to any State or agency thereof by the American Reinvestment and Recovery Act of 2009, Pub. L. 111-5, the Governor of the State shall certify that: 1) the state will request and use funds provided by the Act; and 2) the funds will be used to create jobs and promote economic growth.

Acceptance by State Legislature -- If funds provided to any State in any division of the Act are not accepted for use by the Governor, then acceptance by the State legislature, by means of the adoption of a concurrent resolution, shall be sufficient to provide funding to such State.

Distribution -- After adoption of a State legislature's concurrent resolution, funding to the State will be for distribution to local governments, councils of government, public entities, and public-private entities within the State either by formula or at the State's discretion.

L. Certifications

With respect to funds made available to State or local governments for infrastructure investments under the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, the Governor, mayor, or other chief executive, as appropriate, certified by acceptance of this award that the infrastructure investment has received the full review and vetting required by law and that the chief executive accepts responsibility that the infrastructure investment is an appropriate use of taxpayer dollars. Recipient shall provide an additional certification that includes a description of the investment, the estimated total cost, and the amount of covered funds to be used for posting on the Internet. A State or local agency may not receive infrastructure investment funding from funds made available by the Act unless this certification is made and posted.

24. REPORTING AND REGISTRATION REQUIREMENTS UNDER SECTION 1512 OF THE RECOVERY ACT

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

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

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

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

25. NOTICE REGARDING THE PURCHASE OF AMERICAN-MADE EQUIPMENT AND PRODUCTS -- SENSE OF CONGRESS

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

*Special Note: Definitization of the Provisions entitled, "REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS – SECTION 1605 OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009" and "REQUIRED USE OF AMERICAN IRON, STEEL, AND MANUFACTURED GOODS (COVERED UNDER INTERNATIONAL AGREEMENTS) – SECTION 1605 OF THE AMERICAN

RECOVERY AND REINVESTMENT ACT OF 2009” will be done upon definition and review of final activities.

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

If the Recipient determines at any time that any construction, alteration, or repair activity on a public building or public works will be performed during the course of the project, the Recipient shall notify the Contracting Officer prior to commencing such work and the following provisions shall apply.

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

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

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

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

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

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

(b) *Domestic preference.*

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

(2) This requirement does not apply to the material listed by the Federal Government as follows: None.

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

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

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

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

(c) *Request for determination of inapplicability of Section 1605 of the Recovery Act.*

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

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

(B) Unit of measure;

(C) Quantity;

(D) Cost;

(E) Time of delivery or availability;

(F) Location of the project;

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

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

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

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

(iv) Any recipient request for a determination submitted after Recovery Act funds have been obligated for a project for construction, alteration, maintenance, or repair shall explain why the recipient could not reasonably foresee the need for such determination and could not have

requested the determination before the funds were obligated. If the recipient does not submit a satisfactory explanation, the award official need not make a determination.

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

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

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

Foreign and Domestic Items Cost Comparison

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

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

[Include other applicable supporting information.]

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

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

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

Designated country --

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

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

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

(4) An Agreement between Canada and the United States of America on Government Procurement country (Canada).

Designated country iron, steel, and/or manufactured goods –

(1) Is wholly the growth, product, or manufacture of a designated country; or

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

Domestic iron, steel, and/or manufactured good –

(1) Is wholly the growth, product, or manufacture of the United States; or

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

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

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

- (1) Processed into a specific form and shape; or
- (2) Combined with other raw material to create a material that has different properties than the properties of the individual raw materials.

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

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

(b) *Iron, steel, and manufactured goods.*

(1) The award term and condition described in this section implements-

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

(ii) Section 1605(d), which requires application of the Buy American requirement in a manner consistent with U.S. obligations under international agreements. The restrictions of section 1605 of the Recovery Act do not apply to designated country iron, steel, and/or manufactured goods. The Buy American requirement in section 1605 shall not be applied where the iron, steel or manufactured goods used in the project are from a Party to an international agreement that obligates the recipient to treat the goods and services of that Party the same as domestic goods and services. As of January 1, 2010, this obligation shall only apply to projects with an estimated value of \$7,804,000 or more.

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

(3) The requirement in paragraph (b)(2) of this section does not apply to the iron, steel, and

manufactured goods listed by the Federal Government as follows: None.

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

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

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

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

(c) Request for determination of inapplicability of section 1605 of the Recovery Act or the Buy American Act.

(1)(i) Any recipient request to use foreign iron, steel, and/or manufactured goods in accordance with paragraph (b)(4) of this section shall include adequate information for Federal Government evaluation of the request, including--

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

(B) Unit of measure;

(C) Quantity;

(D) Cost;

(E) Time of delivery or availability;

(F) Location of the project;

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

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

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

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

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

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

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

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

Foreign and Domestic Items Cost Comparison

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

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

[Include other applicable supporting information.]

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

28. WAGE RATE REQUIREMENTS UNDER SECTION 1606 OF THE RECOVERY ACT

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

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

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

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

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

(b) For recipients covered by the Single Audit Act Amendments of 1996 and OMB Circular A-133, “Audits of States, Local Governments, and Non-Profit Organizations,” recipients agree to separately identify the expenditures for Federal awards under the Recovery Act on the Schedule of Expenditures of Federal Awards (SEFA) and the Data Collection Form (SF-SAC) required by OMB Circular A-133. OMB Circular A-133 is available at <http://www.whitehouse.gov/omb/circulars/a133/a133.html>. This shall be accomplished by

identifying expenditures for Federal awards made under the Recovery Act separately on the SEFA, and as separate rows under Item 9 of Part III on the SF-SAC by CFDA number, and inclusion of the prefix "ARRA-" in identifying the name of the Federal program on the SEFA and as the first characters in Item 9d of Part III on the SF-SAC.

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

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

30. DAVIS-BACON ACT AND CONTRACT WORKHOURS AND SAFETY STANDARD ACT

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

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

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

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

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

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

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

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

(a) Davis Bacon Act

(1) Minimum wages.

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

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

determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, *provided* that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

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

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

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

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

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

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

or will notify the Contracting Officer within the 30-day period that additional time is necessary.

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

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

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

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

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the

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

(ii) (A) The Contractor shall submit weekly for each week in which any Contract work is performed a copy of all payrolls to the Department of Energy if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit the payrolls to the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner, as the case may be, for transmission to the Department of Energy. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime Contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Department of Energy if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit them to the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner, as the case may be, for transmission to the Department of Energy, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the

sponsoring government agency (or the Recipient or Subrecipient (as applicable), applicant, sponsor, or owner).

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

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

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

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

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

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

(iii) The Contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Department of Energy or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees—

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

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to

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

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

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

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

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

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

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Recipient, Subrecipient, the Contractor (or any of its subcontractors), and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

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

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

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

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

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

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

(3) Withholding for unpaid wages and liquidated damages. The Department of Energy or the Recipient or Subrecipient shall upon its own action or upon written request of an

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

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

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

(c) Recipient Responsibilities for Davis Bacon Act

(1) On behalf of the Department of Energy (DOE), Recipient shall perform the following functions:

- (i) Obtain, maintain, and monitor all Davis Bacon Act (DBA) certified payroll records submitted by the Subrecipients and Contractors at any tier under this Award;
- (ii) Review all DBA certified payroll records for compliance with DBA requirements, including applicable DOL wage determinations;
- (iii) Notify DOE of any non-compliance with DBA requirements by Subrecipients or Contractors at any tier, including any non-compliances identified as the result of reviews performed pursuant to paragraph (ii) above;
- (iv) Address any Subrecipient and any Contractor DBA non-compliance issues; if DBA non-compliance issues cannot be resolved in a timely manner, forward complaints, summary of investigations and all relevant information to DOE;

- (v) Provide DOE with detailed information regarding the resolution of any DBA non-compliance issues;
- (vi) Perform services in support of DOE investigations of complaints filed regarding noncompliance by Subrecipients and Contractors with DBA requirements;
- (vii) Perform audit services as necessary to ensure compliance by Subrecipients and Contractors with DBA requirements and as requested by the Contracting Officer; and
- (viii) Provide copies of all records upon request by DOE or DOL in a timely manner.

(d) Rates of Wages

The prevailing wage rates determined by the Secretary of Labor can be found at <http://www.wdol.gov/>.

CONFINED SPACE PROGRAM

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT

STATEMENT OF POLICY

It is the policy of the Lexington-Fayette Urban County Government to comply with all regulations regarding confined space entry operations codified under 29 CFR 1910.146 and 29 CFR 1926.21 entitled Permit-Required Confined Spaces. Any department, division, LFUCG worker, or contractor involved with confined space operations shall follow all procedures outlined in this program and any other duties necessary to ensure a safe work environment is maintained at all times. Where applicable, all Commissioners, Directors and any affected government employee shall adhere to the program elements of this policy.

PURPOSE

The purpose of this program is to establish procedures, methods, and requirements necessary to comply with regulations regarding confined spaces. This plan shall be implemented and followed by all government divisions when work activities necessitate entry of a confined space. This program describes the requirements that shall be followed during confined space entry procedures in order to control or eliminate the hazards that can potentially result in personal injury, harm to the employee, or death. Elements of the confined space program include:

- Responsibilities
- Definitions
- Hazard Assessment
- Identification of Confined Spaces
- Addressing the Hazards
- Entry Permit and Procedures
- Training and Information
- Contractors
- Recordkeeping

GENERAL RESPONSIBILITIES

Everyone in the Lexington-Fayette Urban County Government has the responsibility for following this plan. Particular people have been given specific duties so that the plan will be effectively implemented.

Directors/Commissioners carry the overall responsibility to ensure their division/department meets compliance with all state and federal regulations regarding confined spaces. This will be accomplished by the following actions:

- Ensure that the affected division/department develop or adapt a written plan to be used for confined space entry
- Appoint a Confined Space Coordinator with the ability and knowledge to fulfill the duties of this position

- Ensure the written plan is unique to their operations and confined space areas
- Ensure all employees follow the written plan, safe work practices are implemented, and the overall requirements of the confined space regulations are fulfilled
- Inform Purchasing whenever proposed work contracted out will involve confined space entry. The Director or Commissioner must ensure that contractors and vendors are qualified to carry out confined space operations prior to signing contracts for work.

The Confined Space Coordinator for the division carries the responsibility to ensure that the division is fulfilling the requirements of this program. Where applicable, each division of the Lexington-Fayette Urban County Government must designate a person as the “Confined Space Coordinator” for their division. The Confined Space Coordinator shall attend to the following responsibilities:

- Shall attend training as necessary to ensure current and up-to-date knowledge of confined spaces such as the Confined Space training offered through Human Resources and Risk Management.
- Identify and document all confined spaces. Assess the hazards of each confined space in order to determine whether or not the area is a permit-required space.
- Investigate and address entry of spaces and areas suspected of being a confined space, but have not yet been identified as such. Serve in an advisory capacity in resolving related issues.
- Maintain a log of all confined spaces (both permit and non-permit required). Update the log as new spaces are identified, and submit all updates to the Division of Risk Management annually. Appendix A is the form to use for the log.
- Develop unique written entry procedures for each confined space determined to be a permit-required space.
- Ensure all contractors are informed of the provisions of this plan and are properly equipped to enter a confined space (see section on Contractors and Vendors)
- Collect and file all entry permits when work is complete. Review permits to ensure they were completed properly and only trained and authorized individuals have signed the permit.
- Take action when deficiencies are found.
- Ensure that Fire and Emergency Services receives a complete list of all confined space areas, the locations, and unique hazards associated with each space. (see Appendix A, Confined Space Log)
- Ensure all qualifying members of the on-site Rescue Team participate in training at least once per year (see Rescue Team section)
- Schedule an annual walk through/evaluation of all confined spaces with the Rescue Team to familiarize them with the confined spaces and confirm they are qualified to conduct rescue from these areas.
- Ensure Material Safety Data Sheets are available for all known hazardous substances located in any of the confined spaces.
- Ensure all entry equipment (such as gas detectors, fall protection, etc.) is maintained, calibrated annually, in good condition and any supplementary supplies (such as calibration gases, body harnesses, respirator cartridges, etc.) are on hand and ready for use.

The Entry Supervisor is charged to ensure that the details of the confined space entry program and related entry activities are adhered to during entry operations and there is no deviation from the program. The Entry Supervisor's responsibilities include the following:

- Know the hazards that may be confronted during entry including the mode, signs or symptoms, and consequences of the exposure.
- Always conduct a pre-entry safety meeting with all affected individuals to review the procedures and safety concerns.
- Verify the entry permit has been filled out completely and all individuals who are participating in the entry are trained.
- Ensure the appropriate atmospheric tests have been made and all equipment and tools are available before signing the permit.
- Post the permit in a conspicuous place outside of the permit-required confined space entry portal.
- Terminate the entry and cancel permits as required by law. (see section on **Entry Procedures**)
- Ensure an on-site Rescue Team is available, the Attendant can summon Fire and Emergency Services if needed, and the means for contacting Fire and Emergency Services is operable (phone, radio, etc.).
- Prevent unauthorized access of individuals who attempt to enter the permit space during entry operations. When unauthorized individuals do enter the space, the Entry Supervisor shall have them exit. If the unauthorized individual does not exit, the Entry Supervisor shall immediately initiate evacuation of the space.
- Determine when rotation of the functional duties or responsibilities for permit space entry operations are to be transferred to another individual and ensure the intervals of rotation are dictated by the hazards and operations performed within the space. Whenever work responsibilities are transferred, ensure the operations and work activities remain consistent with terms of the entry permit and acceptable entry conditions are maintained.
- If the on-site Rescue Team can no longer maintain commitment to provide rescue, the Entry Supervisor must abandon operations and cancel the permit
- If required, ensure that all Entrants have been fit tested, medically evaluated, and trained in the use of respirators

Authorized Entrant is the individual(s) who is qualified to enter a confined space. Duties of the Authorized Entrants include:

- Know all hazards that may be confronted during entry procedures including the mode, signs or symptoms, and consequences of the exposure
- Use all equipment properly as instructed and as trained
- Maintain two-way communication with the Attendant at all times so the Attendant can monitor and assess the status of the Entrant
- The Authorized Entrant must alert the Attendant under the following conditions:
 - When the Entrant recognizes warning signs or symptoms of exposure to a dangerous situation
 - When the Entrant detects a prohibited condition
- Exit from the permit space as quickly as possible whenever:

- An order to evacuate is given by the Attendant or Entry Supervisor
- The Entrant recognizes warning signs or symptoms of exposure to a dangerous situation
- The Entrant detects a prohibited condition
- An evacuation alarm is activated

Attendant carries the overall responsibility to manage the entry portal to the confined space and ensure the following duties are maintained:

- Know all hazards that may be confronted during entry procedures including the mode, signs or symptoms, and consequences of the exposure
- Be aware of the behavioral effects from a hazardous exposure in Authorized Entrant(s)
- Maintain a systematic head count of all Authorized Entrants in a confined space and ensure there is a means to identify each Entrant (e.g., a sign-in/out entry log)
- Remain outside of the confined space until relieved by another Attendant
- Know the location of the nearest phone and the exact location of the confined space
- Communicate with the Authorized Entrant(s) as necessary to monitor the status of each Entrant and as needed to initiate an evacuation
- Monitor the activities inside and outside of the confined space as needed to ensure the safety of the Entrants and as needed to initiate an evacuation. Evacuations are issued under the following conditions:
 - A prohibited condition is detected
 - The Attendant detects the behavioral effects of a hazardous exposure in an Authorized Entrant
 - The Attendant detects an unsafe condition outside or inside of the confined space that could endanger the Entrants
 - The Attendant cannot effectively and safely perform all of the duties above
- Take the following actions when unauthorized persons approach or enter a space while entry is underway:
 - Warn unauthorized persons that they must stay away from the space
 - Advise the unauthorized persons that they must exit immediately if they have already entered the space
 - Inform the Authorized Entrants and Entry Supervisor if unauthorized individuals have entered the space
- Summons the on-site Rescue Team and the Division of Fire and Emergency Services as soon as it is recognized that the Entrant may need assistance escaping from the confined space. The Attendant shall not perform unauthorized rescue or enter the confined space during rescue operations, regardless of training.
- Perform non-entry rescues as specified and qualified by instructions and training
- Perform no duties that might interfere with the Attendant's primary duty to monitor and protect the Authorized Entrants

A Rescue Team must be provided by each division for permit-required, non-hazardous atmosphere entry operations as needed to retrieve Authorized Entrants from the space. The

on-site Rescue Team shall ONLY carry out rescue operations for confined spaces where a non-hazardous atmosphere exists. NO division shall participate in, enter, or agree to provide a Rescue Team for any permit-required confined space that has a *hazardous atmosphere* unless approved by the Division of Risk Management prior to the start of operations.

The Lexington-Fayette Urban County Fire and Emergency Services will ONLY perform “emergency” rescue as would be normally rendered by activating 911. A division cannot name the LFUCG Fire and Emergency Services as their on-site rescue team.

The following activities must be completed by the Rescue Team regarding confined space entry:

- Each member of the Rescue Team must be trained on the duties of the Authorized Entrant, the use of appropriate personal protective equipment, and all rescue equipment
- Each member must participate in annual training to include the removal of a mannequin, dummy or actual person from a representative confined space area (both horizontal and vertical rescue).
- Each member of the Rescue Team must be trained in first aid and CPR.
- Each member of the on-site Rescue Team shall review all the information and hazards of the spaces from the Confined Space Logs submitted by the division’s Confined Space Coordinator. If needed, the Rescue Team shall review the Confined Space Hazard Assessment Form.
- The Rescue Team shall participate in a walk-through inspection of all spaces identified on the Confined Space Log. The Rescue Team must verify the location and hazards of all the areas and confirm that they are capable of making a timely response in the event of an emergency. If after reviewing the space, the Rescue Team does not feel confident or qualified to perform a rescue, or if the hazard description is not clear, the Rescue Team shall contact the individual who completed the Hazard Assessment Form or notify the Division of Risk Management for more information on the space.
- No rescue attempt or rescue entry shall take place until the confined space has been inspected and the hazards are clearly understood so rescue procedures can be addressed in a safe manner.
- If the on-site Rescue Team must leave the site or is unable to provide a timely rescue response for an on-going confined space entry operation, a representative from the Rescue Team must inform the Entry Supervisor, the Attendant, and the workers that they must abort their operation(s). The Rescue Team representative shall document the names of the individuals contacted and the time of day.
- In the event rescue is required, the on-site Rescue Team shall call 911 to summons Fire and Emergency Services - regardless of whether the on-site Rescue Team is capable of performing the retrieval. This is a safety precaution in case advanced medical treatment or advanced rescue is required.

LUFCG Division of Fire and Emergency Services shall be notified in all cases where rescue is required, regardless of whether the on-site Rescue Team is capable of completing the retrieval.

- After the on-site Rescue Team has been notified of the emergency, the Attendant shall immediately contact the Division of Fire and Emergency Services by activating 911 (or 9-911).

- Once the Division of Fire and Emergency Services has arrived on the scene, assessed the situation and secured the area, the Division of Fire and Emergency Services shall assume the role and duties as the Incident Commander in charge of ALL rescue operations or emergency care to be rendered.

Division of Purchasing is responsible to ensure any affected contractors or vendors provide all required safety programs, policies, and documentation required by law in order to engage in permit-required confined space entry operations. Purchasing shall accomplish this by the following actions:

- Request a copy of all vendors'/contractors' overall safety plan as part of the bid process.
- Forward all submitted safety plans to the division awarding the contract.
- Inform the vendor/contractor that a "site-specific" safety plan needs to be maintained at the work site for the duration of the project

The **Risk Manager of Safety & Loss Control (S&LC)** in the Division of Risk Management is responsible for the overall compliance, management, support, and assistance of all LFUCG confined space operations. The following are the required activities:

- Training on Permit-Required Confined Spaces for Coordinators, Supervisors, and Managers
- Assistance to affected division concerning the Confined Space Hazard Assessment process
- Review of the entry procedures of permit spaces
- Review of the divisional entry permit systems
- Review updates and changes made to divisional plan
- Conduct an annual review and update of the LFUCG Confined Space Plan
- Informed all divisions of changes to the LFUCG Confined Space Plan and of the regulations

AVAILABILITY AND REVIEW

Copies of the written program shall be maintained in the LFUCG Comprehensive Safety and Health Manual in each division and on the LFUCG computer network system. The Risk Manager of Safety & Loss Control in Risk Management will ensure this program is reviewed and updated as necessary.

DEFINITIONS

The following definitions explain the terms as used in this program:

- **A confined space** is any area that:
 - Is large enough and so configured that an employee can bodily enter and perform assigned work; and
 - Has limited or restricted means for entry and exit (examples include tanks, vessels, silos, storage bins, hoppers, vaults, pits, etc); and
 - Is not designed for continuous occupancy
- **A permit required confined space** (permit space) means a confined space with one or more of the following characteristics:
 - Contains or has the potential to contain a hazardous atmosphere;

- Contains a material that has the potential for engulfing an entrant;
- Has an internal configuration such that the entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
- Contains any other recognized serious safety or health hazard
- **Oxygen deficient atmosphere** means an atmosphere containing less than 19.5 percent oxygen by volume
- **Oxygen enriched atmosphere** means an atmosphere containing more than 23.5 percent oxygen by volume

Notes: Other definitions apply to the scope and application of confined spaces and permit-required confined spaces. These definitions can be found in the “Definitions” section of the Permit-Required Confined Space Entry Standard, 1910.146 (b).

HAZARD ASSESSMENT

All areas meeting the definition of a confined space must be evaluated and all hazards must be documented. The Confined Space Coordinator must conduct the hazard assessment using the Confined Space Hazard Assessment Form (see Appendix B). Other hazard assessment forms may be substituted, but it is recommended that the Division of Risk Management review all hazard assessment forms prior to implementation. Only those individuals who have completed training on hazard assessment determination can conduct a hazard assessment of an area. The Division of Risk Management shall provide hazard assessment training.

A hazard assessment needs to be conducted for all confined spaces, even when it might seem obvious that there are no particular hazards associated with the space. If there are no apparent hazards, this should be documented on the form. This will verify all areas have been properly inspected and documented.

Once all hazards have been identified, it must be decided whether the hazard(s) warrant classifying the space as “permit-required.” In the event hazards or conditions of a confined space change, a new hazard assessment should be conducted. The Confined Space Hazard Assessment Forms should be kept on file and updated as necessary.

IDENTIFICATION OF CONFINED SPACES

All affected personnel shall be informed of the location of all confined spaces (for which the division is responsible or for which employees will have contact) and their respective hazards. This section specifies the requirements for posting and signage of confined space areas. In addition to posting signs on all confined spaces, all employees shall also be informed of the area’s associated hazards verbally and/or in writing, during safety meetings, training, or by other means.

- All confined spaces meeting the definition of a “permit-required confined space” must be *posted* with danger signs that read, “PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER” (or similar language). All portal openings to each space must be clearly marked.
- All areas meeting the definition of a confined space, but not a permit-required confined space, should be posted with warning/danger signs that read, “DANGER – CONFINED SPACE” (or similar language). All portal openings to each space must be clearly marked.

- All areas meeting the definition of a confined space are to be listed in a Confined Space Log (see Attachment A). The log should list the location, status (permit or non-permit), and other vital information of the confined space.

Each division must keep their Confined Space Log current at all times. A copy of the log is to be forwarded to the Division of Risk Management whenever it is updated, or at least annually.

When work is required in an area that meets the definition of a permit-required confined space, but has not yet been identified as such, the Division Confined Space Coordinator shall be consulted. If this individual is unable to make a determination regarding the status of the space, the Division of Risk Management shall be consulted before any work is begun.

ADDRESSING THE HAZARDS

It is the responsibility of the Division **Director** to ensure written entry procedures are developed which will control or eliminate all hazards associated with permit-required confined spaces. It is MANDATORY that formal entry procedures are written and implemented for each area. Using the Confined Space Hazard Assessment Form, the Confined Space Coordinator should develop “step-by-step” instructions for addressing each hazard associated with the space. These instructions must provide specific details describing the methods and techniques to be implemented by the Entry Supervisor or any third party (such as a contractor) in preparing for entry of a permit space. The hazards must be listed in the order of importance/priority or required sequencing based on severity or level of risk.

ENTRY PERMIT AND PROCEDURES

A key component of the confined space program is the level of formality given to the permitting process. Formal procedures for the procurement of the permit must be in place within each affected division. The Division Director and the Confined Space Coordinator shall coordinate how the permit system should work within their division. This should include where to pick up the permit, individuals authorized to complete the permit, posting of the permit, canceling the permit, who to return it to, and filing requirements.

- The Entry Supervisors are the only individuals who are authorized to request an entry permit.
- When requesting an Entry Permit, the Entry Supervisor must also request a copy of the entry procedures for the confined space to be entered.
- The Entry Supervisor must tell the individual issuing the permit the purpose of the work to be performed and the expected duration of the work. The permit is only valid for the indicated purpose and duration and the entry permit must be issued by an individual who is knowledgeable of the Permit Entry Procedures.
- The individual issuing the permit must verify that the individual requesting the permit is authorized and trained as an Entry Supervisor.
- The person issuing the permit shall fill in the date, site location, the purpose and duration of the work to be performed and provide a copy of the entry procedures to the Entry Supervisor.
- The Entry Supervisor must take the entry procedures and the Entry Permit to the site, and must follow the entry procedures as written and in the order listed. This process shall not be trusted to memory or transposed to notes. The procedures are needed to determine the hazards to be addressed (controlled or eliminated).
- The Entry Supervisor shall follow the procedures and take any other action needed to control or eliminate the hazards as prescribed. This might require atmospheric

testing, the use of mechanical ventilation, lock-out/tag-out of energized equipment, fall protection, personal protective equipment for workers, barricades, protective barriers, lighting, communication devices, ladders for ingress and egress, blanking and blocking valves, depressurizing, etc.

- The Entry Supervisor must personally verify/confirm that each hazard has been properly addressed. This responsibility cannot be transferred to anyone else or confirmed by any other method – the Entry Supervisor must personally confirm the hazards have been controlled or eliminated.
- The on-site Rescue Team must be readily available.
- Once all of the above criteria have been met and the permit has been completely filled out, the Entry Supervisor shall review all procedures and details with the Attendant and Authorized Entrants. Each person shall sign the Entry Permit as needed to authorize entry and begin work. “N/A” should be listed beside any area on the permit not applicable to the entry operations.
- The Permit-Required Confined Space Decision Flow Chart (see Attachment E) should also be referenced when needed to test procedures for entry of a permit-required confined space.

Notes: It is important to note that not all hazards are apparent and are often discovered at a later time. When this happens, entry procedures should be modified immediately and all personnel must be trained on the new entry procedures for that area.

It is important to note that the work to be conducted can often create a hazard. Such is the case when activities which otherwise do not pose a serious safety or atmospheric hazard like welding (hot work), chemical cleaning, painting, sandblasting, etc., are conducted in confined areas. When this type of situation occurs, the nature of the work itself can introduce a hazard and reclassify a non-permit space into a permit-required space. The Entry Supervisor must be alert to this fact! If this occurs, the Entry Supervisor must consult with the Confined Space Coordinator to authorize continuance of the work. When in doubt as to the status of a space, contact the Division of Risk Management.

TRAINING AND INFORMATION

The law requires that all employees involved in any aspect of confined spaces demonstrate proficiency in permit-required confined space operations. Each department and/or division must sign off on the employee’s knowledge and abilities of confined space operations and must further “certify” the employee is qualified to participate. No employee is allowed to participate in confined space entry operations in ANY division of the LFUCG without formal training. This training is to be set-up and provided by each division. The Division of Risk Management can assist with review of training programs and materials upon request.

The training shall include information on the hazards and concepts associated with confined spaces as well as specific details regarding the roles and responsibilities of each participant. The educational element should include a formal presentation, a video review, a proficiency test, and an opportunity for questions and answers.

Each employee shall receive training on all equipment and personal protective equipment (PPE) required by the individual’s role and responsibilities in the confined space program. This training includes, but is not limited to, the use and knowledge of the following:

- Proper calibration and use of air monitoring devices used to assess the quality of the atmosphere in the confined space. Atmospheric testing shall include the percentage of oxygen, combustible and flammable gases and vapors, and toxic gases:

- Oxygen should be between 19.5% - 23.5%
 - Combustibles and flammables should be 0% of the lower explosive level (LEL)
 - Detection of toxic gases is a “red flag” that the confined space has not been properly ventilated
 - Hydrogen sulfide and carbon monoxide should be maintained below 10 ppm and 35 ppm respectively for an eight (8)-hour time weighted average
- Ventilators or other air exchange devices used to eliminate or control a hazardous atmosphere
 - Devices or code systems such as radios, phones, address systems, horns, ropes, or other methods used to communicate. All electronic devices shall be insulated and UL approved as intrinsically safe.
 - Harnesses, wrist-lets, and other retrieval devices to be used during entry
 - Tripods, winches, or other mechanical non-entry rescue devices to be used in conjunction with harnesses or wrist-lets
 - The use of Personal Protective Equipment (PPE) shall be demonstrated. This includes items such as hard hats, safety glasses, ear plugs, respirator, or other gear to be worn by the Entrant during entry operations. Participants shall be properly fitted and tested for all PPE prior to entry and shall be given ample time to ask questions and be reassured of its use and purpose.
 - Proper set-up and installation of barricades, signs, and other assisting devices to be used
 - Any other applicable procedures or regulations, such as lock-out/tag-out or “hot work” permits
 - The Entrants shall be trained on the proper use of all other equipment to be used during the work inside the confined space. This would include any mechanical devices such as power tools, hand tools, hydraulic equipment, etc.

The training shall include a “hands-on” demonstration of all equipment, instruments, and personal protective equipment. After employees have been instructed how to use the equipment for confined space entry operations, the participants shall don all gear and participate in a simulated entry using a suitable area (does not need to be a confined space for the sake of training).

Notes: Any individual can be trained on any responsibility as long as the following rule is followed. An Attendant can be crossed trained as the Entry Supervisor and can serve as both positions during entry operations. However, an Authorized Entrant can NOT serve as the Entry Supervisor during an entry operation.

CONTRACTORS

Outside contractors are required to follow and comply with Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.146 and 29 CFR 1926.21 and have designated personnel as required by the standard.

Any contractor or vendor involved in permit-required confined space operations shall develop a “site-specific” safety plan which outlines the provisions to be implemented for safe entry of the confined space. The “site-specific” safety plan must be maintained at the work site at all times.

RECORDKEEPING

Divisions shall maintain records of confined space hazard assessments for as long as the assessment remains the current assessment. Entry permits of confined spaces shall be maintained for two (2) years. Records of training given to employees shall be maintained for the duration of the employee's employment. Injuries and illnesses associated with any confined space activities shall be maintained as required under Recordkeeping regulations for a period of five (5) years.

The Safety & Loss Control Manager in Risk Management shall ensure through audit or surveys that accurate records regarding Confined Spaces are being maintained by affected divisions.

All records required by the Confined Space regulations are official government records and shall be provided upon request to employees, former employees, representatives designated by the individual employee, Kentucky Occupational Safety and Health Agency or the federal Assistant Secretary of Occupational Safety and Health following the LFUCG Open Records Policy.

APPENDIX A

CONFINED SPACE LOG

DIVISION: _____

P = permit

N = non-permit

Description of space	Location	Hazard Description	Status	Date	COMMENTS

APPENDIX B

CONFINED SPACE HAZARD ASSESSMENT FORM

Inspector's Name: _____ Date: _____

Department or Division: _____

Street: _____

Bldg.(or landmark): _____

Level (or other identifier): _____

General description of space (or other information): _____

Types of hazards associated with the confined space:

Yes No

- | | | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Atmospheric hazard |
| <input type="checkbox"/> | <input type="checkbox"/> | Oxygen deficient (<19.5%) |
| <input type="checkbox"/> | <input type="checkbox"/> | Oxygen enriched (>23.5%) |
| <input type="checkbox"/> | <input type="checkbox"/> | Combustible and flammable gases and vapors present |
| <input type="checkbox"/> | <input type="checkbox"/> | Toxic gases or vapors |
| <input type="checkbox"/> | <input type="checkbox"/> | Engulfment (grain, salt, sand, gravel, mud, water or other moldable materials) |
| <input type="checkbox"/> | <input type="checkbox"/> | Electrical (such as mechanical rooms or where other electrical equip. exists) |
| <input type="checkbox"/> | <input type="checkbox"/> | Configuration (walls, floors, ceilings that slope or in a maze like arrangement) |
| <input type="checkbox"/> | <input type="checkbox"/> | Thermal (hot or cold temperatures) |
| <input type="checkbox"/> | <input type="checkbox"/> | Chemical (are any chemicals in the confined space or piped through the space?) |
| <input type="checkbox"/> | <input type="checkbox"/> | Biological (wildlife, urine, feces, bodily fluids, or the like) |
| <input type="checkbox"/> | <input type="checkbox"/> | Mechanical (energized equipment or moving parts that require lockout/tagout) |
| <input type="checkbox"/> | <input type="checkbox"/> | Discharge Lines (i.e. sewer connections, water junctions or similar piping unions) |
| <input type="checkbox"/> | <input type="checkbox"/> | Steam Lines |
| <input type="checkbox"/> | <input type="checkbox"/> | Gas Lines |
| <input type="checkbox"/> | <input type="checkbox"/> | Poor Lighting |
| <input type="checkbox"/> | <input type="checkbox"/> | Other |

Please provide a brief description of the hazards indicated above:

Is the only hazard an atmospheric hazard? Yes or No

a) If yes, can a safe atmosphere be maintained using ventilation alone? Yes or No

b) If no, can the other hazards be eliminated without entering the space? Yes or No

Please explain:

PERMIT-REQUIRED CONFINED SPACE? Yes or No

APPENDIX C

OFFICIAL ENTRY PROCEDURES FORM

Location of the confined space:

List the pre-entry checks and hazard controls that must be established prior to entry. The pre-entry checks and controls should be listed in order of importance or priority as necessary to control or eliminate the associated hazards.

1. _____
2. _____
3. _____
4. _____
5. _____

List **ALL** required Personal Protective Equipment:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

List **ALL** safety equipment or other equipment required for entry:

1. _____
2. _____
3. _____
4. _____
5. _____

Notes and comments about the confined space not covered in the above sections:

APPENDIX D

CONFINED SPACE ENTRY PERMIT

Date and Time Issued: _____

Date and Time Expires: _____

Job Site/Space I.D.: _____

Job Supervisor: _____

Equipment to be worked on: _____

Work to be performed: _____

Rescue Team is available? Yes or No

1. Pre-Entry Atmospheric Checks: Oxygen _____ % Tester's Initials: _____
 Explosive _____ % L.E.L.
 Toxic _____ PPM
 Time _____

2. Ventilation: **N/A** **Yes** **No**
 Mechanical
 Natural Ventilation Only

3. Atmospheric check after ventilation: Oxygen _____ % Tester's Initials: _____
 Explosive _____ % L.E.L.
 Toxic _____ PPM
 Time _____

4. Are Authorized Entrants, Attendants, Supervisors trained? Yes or No

5. Communication procedures:

<u>Requirements Completed</u>	<u>Date</u>	<u>Time</u>	<u>N/A</u>
Lock-out/De-energize/Tag-out	_____	_____	<input type="checkbox"/>
Line(s) Broken-Capped-Blanked	_____	_____	<input type="checkbox"/>
Purge-Flush and Vent	_____	_____	<input type="checkbox"/>
Ventilation	_____	_____	<input type="checkbox"/>
Secure Area (post and flag)	_____	_____	<input type="checkbox"/>
Breathing Apparatus	_____	_____	<input type="checkbox"/>
Standby Safety Personnel	_____	_____	<input type="checkbox"/>
Full Body Harness w/"D" Ring	_____	_____	<input type="checkbox"/>
Emergency Escape Retrieval Equipment	_____	_____	<input type="checkbox"/>
Lifelines	_____	_____	<input type="checkbox"/>
Fire Extinguishers	_____	_____	<input type="checkbox"/>
Lighting (explosion proof)	_____	_____	<input type="checkbox"/>
Burning and Welding Permit	_____	_____	<input type="checkbox"/>

Note: Items that do not apply, check N/A

APPENDIX D

6. Periodic Atmospheric Tests:

% Oxygen _____ %
%L.E.L _____ %
Toxic Gas _____ (ppm or mgm³)

Tester's Signature: _____

- Supervisor preparing and validating permit:

- Reviewed by Attendant

- Reviewed by Authorized Entrant(s)

- Reviewed by Confined Space Coordinator

**This permit must be kept at the job site
Return to the Confined Space Coordinator following job completion**

