IOWA DEPARTMENT OF NATURAL RESOURCES

# PROJECT MANUAL

## Desjardins
## Renewable Energy Project
## Monona/Appanoose/Washington/Dubuque County

**"Or Equal" Provision:**

Material specified herein by Brand Names and catalog numbers has been chosen to establish a quality level and it is not implied that only that brand is to be used in the Work of this Contract. The Architect will accept any products or material equal or superior to those specified provided that they meet all other specified requirements, subject to approval during the post bid submittal process. We have no provisions for a pre-bid approval process and, due to lack or personnel to handle such process, we will ignore such requests. Feel free to select and bid material you are certain are equal.

*PREPARED BY*

**IOWA DEPARTMENT OF NATURAL RESOURCES**
**ENGINEERING BUREAU**
**502 E. 9TH STREET, WALLACE STATE OFFICE BUILDING**
**DES MOINES, IOWA 50319-0034**

**PROJECT N0. 11-05-04-13**

Obtain complete sets of contract documents including Drawings, Specification, bid documents, bidders' list…. In electronic format at: http://programs.iowadnr.gov/engreal/

SECTION 00002
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DESJARDINS RENEWABLE PROJECT
PROJECT NO. 11-05-04-13

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DESJARDINS RENEWABLE PROJECT
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# Notice to Bidders - Iowa Department of Natural Resources

Sealed bids will be received by the Iowa Department of Natural Resources, Engineering Bureau, at the Wallace State Office Building, 502 East 9th Street, Des Moines, Iowa 50319-0034 until **11:00 A.M., JUNE 16, 2011** for the public improvement projects listed below, at which time they will be opened publicly. No bids shall be accepted by FAX. After the bid opening, information concerning bid results may be obtained by visiting the Department's website at www.iowadnr.gov or by calling (515) 242-6720.

Project documents, including drawings, specifications, proposal forms and addenda items for the project are available at Beeline and Blue, at 2507 Ingersoll Ave., Des Moines, Iowa 50312. Please visit www.beelineandblue.com or contact (515) 244-1611 for more information. Alternatively, Bid Documents can be viewed or printed online at https://programs.iowadnr.gov/engreal/projectlist.asp

The Department shall comply with all public improvement procurement laws, as outlined in the plans and specifications and including but not limited to: Iowa Code chapter 26 related to public construction bidding; Iowa Code chapter 73 related to preferences; Iowa Code chapter 573 related to labor and materials on public improvements; rules promulgated by the Department of Administrative Services – General Services Enterprise as they may apply; rules promulgated by the Department of Natural Resources and the Natural Resources Commission, as they may apply; and any federal statutes, rules and/or executive orders that may be associated depending on funding sources. Bidders shall comply with these laws to be considered and are encouraged to be familiar with public improvement procurement requirements and the bidding documents before submitting a bid.

Each bidder shall accompany the bid with a bid security as defined in Iowa code section 26.8. The bid security must be in an amount set forth in the bidding documents and made payable to the Iowa Department of Natural Resources. Failure to execute a contract for the proposed work and file an acceptable Performance Bond in an amount equal to 100% of the contract price and a certificate of liability insurance within thirty (30) days of the date of the award of the contract will be just and sufficient cause for the rescinding of the award and the forfeiture of the bid security.

**PROCEDURES FOR IMPLEMATION OF**
**40 CFR 35.3145(d) AND SECTION 129 OF P.L. 100-590**

(Minority / Women's / Small Rural Area Business Enterprise)

The following information must be contained in solicitation documents for construction contracts pursuant to 40 CFR Part 35.3145(d) and Section 129 of P.L. 100-590.

The bidder/offerer must fully comply with the requirements, terms, and conditions of EPA's policy to award a fair share of subagreements to minority, women's, and small rural area businesses. The bidder/offeror commits itself to taking affirmative steps contained herein. Bidders/offerers will take affirmative steps prior to submission of bid/proposals.

Affirmative Steps

1. When feasible, segmenting total work requirements to permit maximum MBE/WBE/SBRA participation.

2. Assuring that MBEs, WBEs and SBRAs are solicited whenever they are potential sources of goods or services. This step may include:

    a. Sending letters or making other personal contacts with MBEs and WBEs, (e.g., those whose names appear on lists prepared by EPA or the loan recipient and other MBE/WBEs/SBRAs known to the bidder/offerer). MBEs, WBEs and SBRAs should be contacted when other potential subcontractors are contacted, within reasonable time (fifteen days) prior to bid submission or closing date for receipt of initial offers. Those letters or other contacts should communicate the following:

        i. Specific description of the work to be subcontracted;

        ii. How and where to obtain a copy of the plans and specifications or other detailed information needed to prepare a detailed price quotation;

        iii. Date the quotation is due to the bidder/offerer;

        iv. Name, address, and phone number of the person in the bidder/offerer's firm whom the prospective MBE/WBE/SBRA subcontractor should contact for additional information.

    b. Sending letters or making other personal contacts with local, state, federal and private agencies and MBE/WBE/SBRA associations relevant to the project. Such contacts should provide the same information provided in the direct contacts to MBE, WBE and SBRA firms.

3. Where feasible, establishing delivery schedules which will encourage participation by MBE, WBEs and SBRAs.

Determination of Compliance

It is to be noted that bidders/offerers must demonstrate compliance with MBE/WBE/SBRA requirements in order to be deemed responsible. Demonstration of compliance shall include, but is not limited to, the following information:

1. Names, addresses and phone numbers of MBE/WBE/SBRAs expected to perform the work;

2. Work to be performed by MBEs, WBEs and SBRAs;

3. Aggregate dollar amount of work to be performed by MBEs, WBEs and SBRAs showing aggregate to each separately;

4. Description of contacts to MBE, WBE and SBRA organizations, agencies and associations which serve MBE/WBE/ SBRAs including names of organizations, agencies and associations, and dates of contacts;

5. Description of contacts to MBEs, WBEs and SBRAs, including number of contacts, fields, (i.e., equipment or material supplier, excavators, transport services, electrical subcontractors, plumbers, etc.) and dates of contacts.

   All bidders/offerers must be prepared to document the affrimative streps taken to utilize minority, women's and small rural area businesses. The successful bidder must complete the Minority, Women's and Small Rural Area Business Enterprise Utilization Worksheet and submit it to the loan recipient prior to contract award, with documentation demonstrating compliance with the affirmative steps for MBE/WBE/SBRA participation in order to be deemed responsible if an 8 percent fair share for Minority and Women's Business Enterprises is not proposed.

   (Loan recipients may establish alternative methods of compliance equivalent to or more stringent than the above.)

Revised 8/92

(A:PFI/218/sp)

**MINORITY, WOMEN'S AND SMALL RURAL RURAL BUSINESS ENTERPRISE WORKSHEET**

(This form is to reflect only those qualifying businesses which the bidder proposes to utilize. In addition to this form, the successful bidder must provide documentation of its efforts to utilize MBE/WBE business if an 8 percent fair share for MBE/WBE is not proposed).

Loan Recipient _____ Project No. _____
Contractor _____
Address _____
Contact Person _____ Telephone No. _____
Amount of Contract _____ MBE % _____ WBE %_____ SBRA % _____

1. MBE _____ Subcontractor _____
   WBE _____ Address _____
   SBRA _____ Contact Person _____ Telephone No. _____
   Amount of Subcontract _____
   Scope of Work _____
   _____

2. MBE _____ Subcontractor _____
   WBE _____ Address _____
   SBRA _____ Contact Person _____ Telephone No. _____
   Amount of Subcontract _____
   Scope of Work _____
   _____

3. MBE _____ Subcontractor _____
   WBE _____ Address _____
   SBRA _____ Contact Person _____ Telephone No. _____
   Amount of Subcontract _____
   Scope of Work _____

4. MBE _____ Subcontractor _____
   WBE _____ Address _____
   SBRA _____ Contact Person _____ Telephone No. _____
   Amount of Subcontract _____
   Scope of Work _____
   _____

5. MBE _____ Subcontractor _____
   WBE _____ Address _____
   SBRA _____ Contact Person _____ Telephone No. _____
   Amount of Subcontract _____
   Scope of Work _____
   _____

6. MBE _____ Subcontractor _____
WBE _____ Address _____
SBRA _____ Contact Person _____ Telephone No. _____
Amount of Subcontract _____
Scope of Work _____
_____

7. MBE _____ Subcontractor _____
WBE _____ Address _____
SBRA _____ Contact Person _____ Telephone No. _____
Amount of Subcontract _____
Scope of Work _____
_____

8. MBE _____ Subcontractor _____
WBE _____ Address _____
SBRA _____ Contact Person _____ Telephone No. _____
Amount of Subcontract _____
Scope of Work _____
_____

Comments: _____
_____
_____
_____
_____
_____
_____
_____
_____

_____ _____ _____
Preparer Telephone No. Date

Time and Date of Letting **11:00 AM, June 16, 2011**

# PROPOSAL

Project No. **11-05-04-13**

Project Description and Location

**DESJARDINS RENEWABLE PROJECT**
**MONONA/APPANOOSE/WASHINGTON/DUBUQUE COUNTY, IOWA**

Proposal of: _____
(Name of Bidder)

Located at: _____ ( )
(Address) (Area) (Telephone)

| Amount of Proposal Guarantee | Specified completion date or Number of Working Days | Approx. or Specified Starting Date or Number of Working Days | Liquidated Damages Per Day |
|---|---|---|---|
| $10,000.00 | OCTOBER 31, 2011 | N/A | $300.00 |

The undersigned hereby agrees, if awarded the contract, to execute the proposed contract and to furnish an approved performance bond in a amount not less than 100 percent of the contract award within 30 days after the date of approval of award of the contract, and to provide all labor, materials, and equipment required to complete the project designated above, for the price hereinafter set forth, in strict compliance with the contract documents prepared by the Iowa Department of Natural Resources.

The undersigned agrees, if awarded the contract, to commence the work within a reasonable time after the preconstruction conference or by the specific starting date, if so specified, and to complete the work within the contract period, or to pay liquidated damages in the amount stipulated herein for each calendar day the work remains uncompleted after the expiration of the contract period or any authorized reduction thereof.

A proposal guarantee in the amount stipulated herein is included with this proposal, to be forfeited to the Iowa Department of Natural Resources if the undersigned fails to execute the contract and furnish an approved performance bond, if awarded the contract.

By virtue of statutory authority, preference will be given to products and provisions grown and coal produced within the state of Iowa, and also, a resident bidder shall be allowed a preference against a nonresident bidder from a state or foreign country which gives or requires a preference to bidders from that state or foreign country on projects in which there are no federal funds involved.

By _____

_____ _____
Iowa Contractor Federal I.D. No. (Signed)

_____ _____
Iowa Contractor Registration No. (Title) (Date)

**THE FOLLOWING AFFIDAVIT MUST BE COMPLETED AND NOTORIZED, OR THIS BID WILL BE REJECTED.**

- AFFIDAVIT-

The signatory. being duly sworn, does depose and say that the undersigned is an authorized representative of:

_____
(Name of Firm)

Located at: _____

Hereinafter referred to as “Bidder” and does hereby affirm to have personal knowledge that said bidder has examined the drawings and specifications, carefully prepared the proposal form, and has checked the same in detail before submitting; and that said bidder, or the agents, officers, or employees thereof, have not either directly or indirectly, entered into any agreement, participated in any collusion or fraud, or otherwise taken any action in restraint of free competitive bidding in connection with this bid.

_____
(Signed)

_____ Day of _____ , 20 _____

_____
(Signed Notary)

My Commission Expires _____ , 20 _____

## SCHEDULE OF PRICES

Project Description and Location
**DESJARDINS RENEWABLE PROJECT**
**MONONA/APPANOOSE/WASHINGTON/DUBUQUE COUNTY, IOWA**
Name of Bidder

| Item No. | Description | Estimated Quantity | Unit Price | Amount |
|---|---|---|---|---|
| | **BASE BID – WIND & SOLAR** | | | |
| 1 | 2.76kw PV ARRAY & ASSOC.EQUIP.@ EB LYONS | LUMP SUM | | |
| 2 | 2.76KW PV ARRAY & ASSOC.EQUIP.@ L.DARLING | LUMP SUM | | |
| 3 | 5.52KW PV ARRAY & ASSOC.EQUIP.@LEWIS&CLARK | LUMP SUM | | |
| 4 | 10KW HOR.WIND TURBINE & 80FT SELF-SUPPORT. TOWER AND ASSOC.EQUIP.@LEWIS&CLARK | LUMP SUM | | |
| 5 | ENERGY MEASUREMENT SYSTEM W/TOUCH SCREEN @LEWIS&CLARK | LUMP SUM | | |
| 6 | 10KW HOR.WIND TURBINE & 80FT SELF-SUPPORT. TOWER AND ASSOC.EQUIP.@ HONEY CREEK RESORT | LUMP SUM | | |
| 7 | FIVE (5) 1.38KW PV ARRAY & ASSOC.EQUIP. @ HONEY CREEK RESORT | LUMP SUM | | |
| 8 | ENERGY MEASUREMENT SYSTEM W/TOUCH SCREEN @ HONEY CREEK RESORT | LUMP SUM | | |
| | **ALTERNATES** | | | |
| 9 | ALTERNATE – ADDITIONAL 2.76KW PV ARRAY @ EB LYONS | LUMP SUM | | |
| 10 | ALTERNATE – ADDITIONAL 12KW VERTICAL TURBINE @ HONEY CREEK RESORT | LUMP SUM | | |
| 11 | ALTERNATE – ADDITIONAL 2.76KW PV ARRAY @ LEWIS & CLARK | LUMP SUM | | |
| | | TOTAL | | |

Bidder Acknowledges Receipt of Any Issued Addenda Below (Number and Date)

_____

_____

_____

**NOTE:**
**CONTRACTORS MUST RETURN EPA FORM 5700-49 WITH THEIR PROPOSAL.**

Project Description and Location
**DESJARDINS RENEWABLE PROJECT**
**MONONA/APPANOOSE/WASHINGTON/DUBUQUE COUNTY, IOWA**

Name of Bidder

| Item No. | Description | Estimated Quantity | Unit Price | Amount |
|---|---|---|---|---|
| | **BASE BID – SOLAR THERMAL** | | | |
| 1 | SOLAR THERMAL COLLECTION SYSTEM CONNECTED TO DOMESTIC HOT WATER HEATING SYSTEM<br><br>-22 ROOF MOUNTED COLLECTORS<br><br>-5 STORAGE TANKS<br><br>-HEAT EXCHANGER<br><br>-EXTERIOR DRY COOLER<br><br>-ASSOCIATED PUMPS, PIPING AND CONTROLS | LUMP SUM | | |
| | | | | |
| | | | | |
| | | | | |
| | | TOTAL | | |

Bidder Acknowledges Receipt of Any Issued Addenda Below (Number and Date)

_____

_____

_____

_____

**NOTE:**
**CONTRACTORS MUST RETURN EPA FORM 5700-49 WITH THEIR PROPOSAL.**

# PROPOSAL GUARANTEE BOND

STATE OF IOWA
DEPARTMENT OF NATURAL RESOURCES

KNOW ALL MEN BY THESE PRESENTS:

That we,_____

of_____as PRINCIPAL,

and_____

of_____as SURETY(S),
are hereby held and firmly bound unto the state of Iowa in the penal sum of:

FIVE THOUSAND AND 00/100 Dollars $10,000.00

for the payment, whereof, the said PRINCIPAL and SURETY(S) bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that whereas the PRINCIPAL is herewith submitting to the state of Iowa, acting by and through the Iowa Department of Natural Resources, hereinafter called the DEPARTMENT, its sealed proposal for a contract for the

DESJARDINS RENEWABLE PROJECT
At LEWIS & CLARK, HONEY CREEK RESORT, LAKE DARLING & EB LYONS
In MONONA/APPANOOSE/WASHINGTON/DUBUQUE County, Iowa.

NOW THEREFORE,
the conditions of this obligation are such that, if said proposal is rejected by the DEPARTMENT, or if said proposal is accepted by the DEPARTMENT and the PRINCIPAL shall enter into a contract in the form specified by the DEPARTMENT in accordance with the terms of the proposal and shall furnish a bond for the faithful performance of said contract in the form specified by the DEPARTMENT, this obligation shall be null and void. Otherwise it shall remain in full force and effect.

In the event that the said proposal is accepted by the DEPARTMENT and the PRINCIPAL shall fail to enter into the contract as defined herein or shall fail to furnish the performance bond as noted above within thirty (30) days of the approval of the award, the PRINCIPAL and SURETY(S) agree to forfeit to the DEPARTMENT the penal sum herein mentioned, it being understood that the liability of the SURETY(S) shall in no event exceed the penal sum of this obligation.

IN WITNESS WHEREOF,
the above bounden parties have executed this instrument under their several seals this _____ day of _____, 20_____, the name and corporate seal of each party being hereto affixed and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

PRINCIPAL: SURETY::

By_____ By _____

_____ _____

_____ _____

_____ _____

If a partnership all partners must sign.

**NONDISCRIMINATION IN EMPLOYMENT**
(Instructions for Bidders)

By the submission of its bid, each bidder acknowledges that he understands and agrees to be bound by the equal opportunity requirements of EPA regulations (40 CFR Part 8, particularly Section 8.4(b)), which shall be applicable throughout the performance of work under any contract awarded pursuant to this solicitation. Each bidder agrees that if awarded a contract, it will similarly bind contractually each subcontractor. In implementation of the foregoing policies, each bidder further understands and agrees that if awarded a contract, it must engage in affirmative action directed at promoting and ensuring equal employment opportunity in the workforce used under the contract (and that it must require contractually the same effort of all subcontractors whose subcontracts exceed $ 10,000). The bidder understands and agrees that "affirmative action" as used herein Shall constitute a good faith effort to achieve and maintain that amount of minority employment in the on-site workforce used on the project which corresponds, for each trade used, to the minority population in the serving labor market area from which workers are reasonably available for hire for the project.

(7/75)

**U.S. ENVIRONMENTAL PROTECTION AGENCY**
**CERTIFICATION OF NONSEGREGATED FACILITIES**

(Applicable to contracts, subcontracts, and agreements with the applicants who are themselves performing Federally assisted construction contracts, exceeding $10,000, which are not exempt from the provisions of the Equal Opportunity Clause.)

By the submission of this bid, the bidder, offerer, applicant, or subcontractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. He certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The bidder, offerer, applicant, or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. He further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause; that he will retain such certifications in his files; and that he will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATION OF NONSEGREGATED FACILITIES**

A Certification of Non-segregated Facilities, as required by the May 9, 1967 order (33 F.R. 7808, May 28, 1968) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding $10,000, which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

Signature Date

Name and Title of Signer (Please Type)

NOTE:
The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001

EPA-7 5720-4.2 (6/2/77)

STATE OF IOWA
DEPARTMENT OF NATURAL RESOURCES

# CONTRACT
(CAPITAL IMPROVEMENT)

**DESJARDINS RENEWABLE PROJECT** **PROJ. NO. 11-05-04-13**
**MONONA/APPANOOSE/WASHINGTON/DUBUQUE COUNTY, IOWA**

**THIS AGREEMENT**, made this _____ day of, _____20_____by and between the state of Iowa acting through the Department of Natural Resources hereinafter called the **DEPARTMENT** and:

located at

hereinafter called the **CONTRACTOR**

**WITNESSETH**: That the **DEPARTMENT** agrees to pay the **CONTRACTOR** the contract price provided herein for the fulfillment of the work and the performance of the covenants set forth herein, and the **CONTRACTOR** agrees with the **DEPARTMENT** to commence and complete the project described as follows:

This project is more than just a renewable energy pilot. It will give the public hands-on witness to the power of renewable energy. The average state park visitor will get an opportunity to spend a period of time *living* in a space powered with renewables plus the means for personal exploration about how to make renewables work well. At the same time, measurable energy and cost savings accrue at an important, innovative state facility.

Base Bid Completion Date: OCTOBER 31, 2011

For the Sum of: **Dollars ($)**
and all extra work in connection therewith, all in accordance with the terms and conditions herein contained: and to furnish at the **CONTRACTOR'S** own proper cost and expense, all material, equipment, labor, insurance, and other accessories and services necessary to construct and complete, in a workmanlike manner, ready for continuous operation, the above mentioned project. The work shall be performed in accordance with the requirements and provisions of the following documents, all of which are made a part hereof and collectively evidence and constitute the contract:

1. Notice to Bidders.
2. Instructions to bidders.
3. IDNR Standard Specifications and Current Supplemental Specifications
4. Project Specifications Including Addenda Number Through
5. Drawings, Sheet Number E-1.1 Through S-1.0 Inclusive
6. Contractor's Proposal.
7. Proposal Guarantee Bond.
8. Performance Bond.
9. This Instrument.
10. Modifications or Change Orders pursuant to IDNR Standard Specifications
11. Resident Bidder Preference Certification on Non-Federal-Aid Projects

The parties to this contract understand that time of completion of the work under this contract is the essence to the contract. The **CONTRACTOR** hereby agrees to commence work under this contract in accordance with Section 1108 of the IDNR Standard Specifications and to complete all the work by OCTOBER 31, 2011

The **CONTRACTOR** hereby agrees that liquidated damages in the amount of Two hundred Dollars $ 200.00 shall be retained or assessed against the CONTRACTOR for each day and every day the completion of the work is delayed beyond the time specified herein, not as a penalty, but as a mutually agreed to, predetermined amount to reimburse the **DEPARTMENT** for salaries of engineers and reviewers, clerk hire, interest charged during the period for delays and loss of use.

It is understood that the **CONTRACTOR** consents to the jurisdiction of the courts of Iowa, to hear, determine and render judgment as to any controversy arising hereunder, and that this contract shall be governed by, and construed according to, the laws of the state of Iowa.

**IN WITNESS WHEREOF**, the parties hereto have executed this Agreement, in the day and year first above mentioned.

**FOR THE DEPARTMENT:**

Deputy Director

This contract was approved by the **NATURAL RESOURCES COMMISSION** at its meeting held on

(Date)

**FOR THE CONTRACTOR:**

(Signature and Title)

(Firm)

(Address and Zip Code)

Seal if by a Corporation:

Identification Number

Soc. Sec. No.

Or Fed. I. D. No.

# PERFORMANCE BOND

STATE OF IOWA
DEPARTMENT OF NATURAL RESOURCES

KNOW ALL MEN BY THESE PRESENTS:

That we,_____

of_____as PRINCIPAL,

and_____

of_____as SURETY(S),
are hereby held and firmly bound unto the state of Iowa in the penal sum of:

TEN THOUSAND AND 00/100 Dollars $10,000.00

for the payment, whereof, the said PRINCIPAL and SURETY(S) bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that whereas the PRINCIPAL entered a certain contract, hereto attached, and made part, hereof to the state of Iowa, acting by and through the Iowa Department of Natural Resources, hereinafter called the DEPARTMENT, dated _____

for the DESJARDINS RENEWABLE PROJECT
At LEWIS & CLARK, HONEY CREEK RESORT, LAKE DARLING, EB LYONS
In MONONA/APPANOOSE/WASHINGTON/DUBUQUE County, Iowa.

NOW THEREFORE,
the conditions of this obligation are such that, if the DEPARTMENT, shall faithfully perform the contract in accordance with the plans, specifications and contract documents, and shall fully indemnify and save harmless the state of Iowa from all cost and damage which the state of Iowa may suffer by reason of the PRINCIPAL's default or failure to do so and shall fully reimburse and repay the state of Iowa all outlay and expenses which the state of Iowa may incur in making good any such default, then this obligation shall be null and void, otherwise it shall remain in force and effect.

In the event that the PRINCIPAL is in default under this contract as defined herein, the DEPARTMENT shall by written notice inform the PRINCIPAL that this contract is in default. And may, at its option, without process or action at law:

1. Take over all or any portion of the work and complete it either by day labor or reletting the work. The DEPARTMENT may retain all material, equipment and tools on the work, at a rental which it considers reasonable, until the work has been completed.
2. Allow the surety to take over the work within fifteen (15) days and assume completion of said contract and become entitled to the balance of the contract price.
3. Allow the PRINCIPAL to complete the contract.

As required by Chapter of the Code of Iowa.

1. The PRINCIPAL SURETY(S) on this bond hereby agree to pay all persons, firms or corporations having contracts directly with the PRINCIPAL or with subcontractors, all just claims due them for labor performed or material furnished, in the performance of the contract on account of which this bond is given, when the same are not satisfied out of the portion of the contract price shall have been established as provided by law.

2. Every Surety on this bond shall be deemed and held, any contract to the contrary notwithstanding, to consent without notices:
   a. To any extension of time to the contractor in which to perform the contract.
   b. To any change in the plans, specifications, or contract, when such changes does not involve an increase of more than 20 percent of the total contract price, and then only as to such excess increase.
   c. That no provision of this bond or any other contract shall be valid which limits less than one year from the time of the acceptance of the work, the right to sue on this bond for defect in workmanship or material not discovered or known to the DEPARTMENT at the time such work was accepted.

No provision of this bond or any other contract shall be valid which limits to less than five years after the acceptance of the work, the right to sue on this bond for defects in workmanship or material in connection with paving or concrete work.

IN WITNESS WHEREOF,
the above bounden parties have executed this instrument under their several seals this _____ day of _____, 20_____, the name and corporate seal of each party being hereto affixed and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

**PRINCIPAL:**

By_____

_____

_____

_____

_____

**SURETY:**

By_____

_____

_____

_____

_____

If a partnership all partners must sign.

This bond approved by the Iowa Department of Natural Resources this _____ day of _____, 20 _____

By _____
Director

**PAYMENT BOND**

KNOW ALL MEN BY THESE PRESENTS: That

_____
(Name of Contractor)

_____
(Address of Contractor)

_____

a _____ hereinafter Called the Principal
(Corporation, Partnership or Individual)

and _____
(Name of Surety)

_____
(Address of Surety)

and _____
(Name of Surety)

_____
(Address of Surety)

and _____
(Name of Surety)

_____
(Address of Surety)

hereinafter called the Surety or Sureties, are held and firmly bond unto:

_____
(Name of Owner)

_____
(Address of Owner)

hereinafter called the Owner, in the penal sum of _____

_____ Dollars ($ _____),

In the lawful money of the United States, for the payment of which a sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severely, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the PRINCIPAL entered into a certain contract with the Owner, dated the _____ day of _____, 20 _____

_____

NOW, THEREFORE, if the PRINCIPAL shall promptly make payment to all persons, firms, SUBCONTRACTORS, and corporations furnishing materials for or performing

labor in the prosecution of the WORK provided for in such a contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal or coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK whether by SUBCONTRACTOR or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.



PROVIDED, FURTHER, that the said surety or sureties for the value received hereby stipulate(s) and agree(s) that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way effect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the owner and the contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in 3 counterparts, each one of which shall be deemed an original, this _____ day of _____, 20 ____.

Surety Countersigned by:

_____
Signature of the Iowa Resident Commission Agent as Prescribed by Chapter 515.52-57, Iowa Code of 1989. (Required only if Attorney-in-Fact is not also an Iowa Resident)

_____
Name of Iowa Resident Commission Agent

_____
Company Name

_____
Company Address

_____
(Including Zip Code)

_____
Company Telephone Number

_____

PRINCIPAL _____
Contractor

BY _____
Signature

_____
Title

_____
Surety Company

_____
Signature of Attorney-in-Fact

_____
Name of Attorney-in-Fact

_____
Company Name

_____
Company Address

_____
(Including Zip Code)

_____
Company Telephone Number

Note: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the Project is located.

_____
EPA Project Control Number

EPA

United State Environmental Protection Agency
Washington, DC 20460

# Certification Regarding
# Debarment, Suspension, and Other Responsibility Matters
# EPA Form 5700-49 (11-83)

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agencies.

(b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for the commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transaction (Federal, State, or local) terminated for cause or default.

I Understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine up to $10.000 or imprisonment for up to 5 years, or both.

_____
Type Name & Title of Authorized Representative

_____

_____
Signature of Authorized Representative Date

_____

? I am unable to certify to the above statements. My explanation is attached.

## Instructions

Under Executive Order 12549, an individual or organization debarred or excluded from participation in Federal assistance or benefit programs may not receive any assistance award under a Federal program, of a sub agreement thereunder for $25,000 or more.

Accordingly, each prospective recipient of an EPA grant, loan, or cooperative agreement and any contract or sub agreement participant thereunder must complete the attached certification or provide an explanation why they cannot. For further details, see 40 CFR 32.510, Participants' responsibilities, in the attached regulation.

## Where To Submit

The prospective EPA grant. loan, or cooperative agreement recipient must return the signed certification of explanation with its application to the appropriate EPA Headquarters or Regional office, as required in the application instructions.

A prospective prime contractor must submit a completed certification or explanation to the individual or organization awarding the contract.

Each prospective subcontractor must submit a completed certification or explanation to the prime contractor for the project.

## How To Obtain Forms:

EPA includes the certification form, instructions, and a copy of its implementing regulation (40) CFR Part 32) in each application kit. Applicants may reproduce these materials as needed and provide them to their prospective prime contractors, who, in turn may reproduce and provide them to prospective subcontractors.

## Additional copies/assistance may be requested from:

Compliance Branch
Grants Administration Division (PM-216F)
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460
(Telephone: 202/475-8025)

**IOWA DEPARTMENT OF NATURAL RESOURCES**
**GENERAL COVENANTS AND PROVISIONS**
**SECTION NO. 007000**
**JANUARY 1993 (Revised 06/04/10)**

This section consists of the general provisions applying to all types of construction and maintenance as set forth in the following sections


Part 1100. Definitions
Part 1101. Instructions to Bidders
Part 1102. Bidder Qualifications
Part 1103. Award and Execution of Contract
Part 1104. Scope of Work
Part 1105. Control of Work
Part 1106. Control of Materials
Part 1107. Legal Relations and Responsibilities to the Public
Part 1108. Prosecution and Progress
Part 1109. Measurement and Payment


## PART 1100. DEFINITIONS

### 1100.01 GENERAL

A. Whenever in these specifications or in other contract documents, the following definitions, or terms or both, or pronouns in place of them are used, the intent and meaning shall be interpreted as follows:

B. In order to avoid cumbersome and confusing repetition of expressions in these specifications, it is provided that whenever anything is, or is to be done, if, as, or, when, or where "contemplated, required, determined, directed, specified, authorized, ordered, given, designated, indicated, considered necessary, deemed necessary, permitted, reserved, suspended, established, approval, approved, disapproved, acceptable , unacceptable, suitable, accepted, satisfactory , unsatisfactory, sufficient, insufficient, rejected, or condemned," it shall be understood as if the expression were followed by the words "by the Engineer" or "to the Engineer."

C. The titles or headings of the sections and articles herein, or referred to on the plans, are intended for convenience of reference and shall not be considered as having any bearing on their interpretation.

D. Working titles and pronouns used for any person referred to in these specifications may be used with a masculine gender for the sake of brevity and are intended to refer to persons of either sex.

### 1100.02 DEFINITIONS OF ABBREVIATIONS

A. Whenever the following abbreviations are used in these specifications or on the plans, they are to be construed the same as the respective expressions represented.

AAN - American Association of Nurserymen
AAR - Association of American Railroads
AASHTO (or AASHO) - American Association of State Highway and Transportation Officials
ACI - American Concrete Institute
AIA - American Institute of Architects
ANSI - American National Standards Institute
APWA - American Public Works Association
ARA - American Railway Association
AREA - American Railway Engineering Association
ASCE - American Society of Civil Engineers
ASLA - American Society of Landscape Architects
ASTM - American Society of Testing and Materials
AWPA - American Wood Preservers Association
AWS - American Welding Society
AWWA - American Water Works Association

CFR - Code of Federal Regulations
DNR - Iowa Department of Natural Resources
DOT - Iowa Department of Transportation
EEI - Edison Electric Institute
EPA - Environmental Protection Agency
FHWA - Federal Highway Administration
FSS - Federal Specifications and Standards
IEES - Institute of Electrical and Electronics Engineers
IES - Illuminating Engineering Society
ICEA (or IPCEA) - Insulated Cable Engineers Association
MUTCD - Manual on Uniform Traffic Control Devices
NEC - National Electrical Code
NECA - National Electrical Contractors Association
NEMA - National Electrical Manufacturers Association
NFPA - National Fire Protection Association
NRC - Natural Resource Commission
SBC - State Building Code
UBC - Uniform Building Code
UL - Underwriters Laboratories, Incorporated
UMC - Uniform Mechanical Code
UPC - Uniform Plumbing Code
US - United States
USC - United State Code

B. Abbreviations may be used for materials and classes of work:

AC - Asphalt cement
ACC - Asphalt cement concrete
ATB - Asphalt treated base
BSC - Bituminous seal coat
BTA - Bituminous treated aggregate
CTG - Cement treated granular
PCC - Portland cement concrete
SAS - Soil-aggregate subbase
SLS - Soil-lime subbase

**1100.03 DEFINITIONS OF TERMS**

1. Acceptable Work - Work in reasonably close conformance with the contract requirements.

2. Addendum or Addenda - Changes, revisions, or clarifications of the specifications of contract documents which have been issued to prospective bidders, prior to the time of receiving bids.

3. Advertisement - The public announcements, publications, or solicitations as required by the Contracting Authority, inviting bids for work to be performed.

4. Approval of Award - The acceptance by the Contracting Authority of a bid.

5. Approximate Starting Date - A calendar day shown on the proposal on which it is anticipated, at the time of the letting, that conditions will be such as to permit the Contractor to commence work.

6. Assignment of Contract -The written agreement whereby the Contractor sells, assigns, or transfers his rights in the contract to any person, firm, or corporation.

7. Award - The execution of the contract.

8. Bidder - An individual, firm, corporation, or joint venture submitting a bid for the advertised work.

9. Calendar Day - Every day shown on the calendar.

10. Change Order - A written order to the Contractor, signed by the Engineer, ordering a change which has been found necessary in the work from that originally shown by the plans and specifications. Change orders duly signed and executed by the Contractor constitute authorized modifications of the contract.

11. Channel - A natural or artificial water course.

12. Chief Engineer - An engineer appointed by the Iowa Department of Natural Resources as the head of the Construction Service Bureau.

13. Classes of Work - The divisions made for the purpose of measuring and paying for labor to be performed or materials to be furnished according to the methods of construction involved, as indicated by the items for which bids have been received for each specific contract.

14. Commencement of Work - Work will be considered commenced when the Contractor's operations are started on items of work covered by the contract documents and which require inspection, or when the Contractor notifies the Engineer, and the Engineer agrees, that the Contractor's equipment and personnel are available at the site, but his operations are prevented by weather or soil conditions.

15. Commission - The state Natural Resources Commission as constituted under the laws of the state of Iowa (which is the party of the first part in the contract, let in behalf of the State, of which these specifications are a part).

16. Commissioner - A member of the state Natural Resources Commission.

17. Contract (Also Contract Document) - The written agreement between the Contracting Authority and the Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the work, the furnishing of labor and materials, and the basis of payment. The contract includes the notice to bidders, proposal, contract form, and contract bonds specifications, supplemental specifications, special provisions, all items covered on the table of contents, plans, notice to proceed, and any change orders and agreements which are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument.

18. Contract Item (Pay Item) - A specifically described unit of work for which a price is provided in the contract.

19. Contract Period (Also Contract Time) - The number of working days or calendar days allowed for completion of the contract, including authorized time extensions. In case a calendar date of completion is shown in the proposal, in lieu of or in addition to the working days, the contract shall be completed by that date.

20. Contract Sum - The aggregate sum obtained by totaling the amounts arrived at by multiplying the number of units of each class of work, as shown in the contracts by the unit price specified in the contract for that class of work.

21. Contracting Authority - The governmental body, board, commission, or officer having authority to award a contract.

22. Contractor - The individual, firm, corporation, or joint venture contracting with the Contracting Authority for performance of prescribed work.

23. Contractor Registration - The registration number issued by the Division of Labor Service, in accordance with Chapter 91C of the Code of Iowa.

24. Deficient Work - Work not in reasonably close conformance with the contract requirements, or otherwise inferior, but in the opinion of the Engineer, reasonably acceptable for its intended use and allowed to remain in place.

25. Department of Economic Development - As defined in Chapter 15, Code of Iowa.

26. Department of Labor Services - As defined in Chapter 91, Code of Iowa.

27. Department of Natural Resources (Department)- The Department of Natural Resources, as defined in Chapter 455A, Code of Iowa.

28. Department of Revenue and Finance - As defined in Chapter 421, Code of Iowa.

29. Department of Transportation -The Department of Transportation, as defined in Chapter 307, Code of Iowa.

30. Director - The duly appointed executive officer for the Department of Natural Resources.

31. Drainage Ditch -An artificially constructed, open depression, other than a road ditch, which is constructed for the purpose of carrying surface water runoff .

32. Drawings (or Plans) - The approved plans, profiles, typical cross sections, working drawings, and supplemental drawings, or exact reproductions thereof, including modifications, altered plan, revisions, and amendments, which show the locations characters dimensions, and details of the work to be done.

33. Employee - Any person working on the project, mentioned in the contract of which these specifications are a party, and who is under the direction or control, or receives compensation from, the Contractor or subcontractor.

34. Engineer - The Chief Engineer, or other Engineer of the Contracting Authority, acting directly or through a duly authorized representative, such representative acting within the scope of the particular duties assigned, or of the authority given.

35. Equipment - All machinery and equipment, together with the necessary supplies for upkeep and maintenance, and tools and apparatus necessary for the proper construction and acceptable completion of the work.

36. Extra Work - Work not provided for in the contract, as awarded, but deemed essential to the satisfactory completion of the contract within its intended scope and authorized by the Engineer. Extra work shall not include additional materials, equipment, and labor used due to natural variations in the surface and subsurface conditions, except as specifically provided for elsewhere in the contract documents.

37. Extra Work Order - A change order concerning the performance of work or furnishing of materials involving additional work. Such additional work may be performed at agreed prices, or on a force-account basis, as provided elsewhere in these contract documents.

38. Independent Contractor - Any persons firms or corporation who contracts with the Contractor to perform a service for which the basis of payment is in terms of units of service rather than salary or wages.

39. Inspector - An employee of the Contracting Authority and who is the authorized representative of the Engineer, assigned to make detailed inspections of any or all portions of the work, or materials included in the work.

40. Instruction to Bidders - The clauses setting forth in detail the information relative to the proposed work and requirements for the submission of proposals.

41. Invitation for Bids - See Notice to Bidders.

42. Item -See Contract Item.

43. Joint Venture - Two or more individuals, films or corporations combining any equipment, personnel or finances for the purpose of submitting a single bid.

44. Laboratory - The testing laboratory of the Contracting Authority, or any other testing laboratory which may be designated or approved by the Engineer.

45. Lands Acquired for the Work - The land area, reserved or secured by the Contracting Authority, upon which to construct the work, or where to obtain material therefrom.

46. Major Item of Work - Any contract item (Pay item) for which the original contract amount plus authorized additions is more than 10% of the total original contract sum or $50,000 whichever is less.

47. Materials - Any substances specified for use in the construction of the project and its appurtenances.

48. Notice to Bidders - That portion of the contract documents, prepared and furnished by the Contracting Authority for the information of bidders submitting proposals, which notice specifies provisions, requirements, and instructions pertaining to the method, manner, and time of submitting bids.

49. Notice to Proceed - Written notice to the Contractor to proceed with the contract work including, when applicable, the date of beginning of contract time.

50. Official Publications - The official publications are the formal resolutions and notices relative to the proposed improvement that are required by law to be published in a prescribed manner and that have been published in accordance with the statutes relating to them. Official publications area by statutes vested with all of the force and effect of contract obligations.

51. Owner - The state of Iowa, acting through the Iowa Department of Natural Resources as constituted under the laws of the state of Iowa.

52. Performance Bond - The bond executed by the Contractor and its surety in favor of the owner, guaranteeing the faithful performance of the contract and the payment of all debts pertaining to the work.

53. Plans (or Drawings) - The approved plans, profiles, typical cross sections, working drawings, and supplemental drawings, or exact reproductions thereof, including modifications, altered plan, revisions, and amendments, which show the locations characters dimensions, and details of the work to be done.

54. Project - One or more correlated improvements which constitute the complete improvement of a designated park, recreational reserve, state monument, lake, reserve, game area, fish hatchery, parkway, or other area under jurisdiction of the Department of Natural Resources.

55. Project Engineer - The representative of the Department of Natural Resources, regardless of actual title, directly in change of the work.

56. Proposal - The formal offer of a bidders on the prescribed form, to perform the work and to furnish the labor and materials at the prices quoted.

57. Proposal Form - The approved form on which the Contracting Authority requires formal bids to be prepared and submitted for the work.

58. Proposal Guarantee - The security furnished by the bidder with his/her proposal for a projects as guarantee he/she will execute the contract for the work if the proposal is accepted.

59. Reasonably Close Conformity - Reasonably close conformity means compliance with reasonable and customary manufacturing and construction tolerances where working tolerances are not specified. Where working tolerances are specified, reasonably close conformity means compliance with such working tolerances. Without detracting from the complete and absolute discretion of the Engineer to insist upon such working tolerances as establishing reasonably close conformity, the Engineer may accept variations beyond such tolerances, as reasonably close conformity, where they will not materially affect value or utility of the work and the interest of the State.

60. Right-of-Way - The land area, the right to possession of which is secured or reserved by the Contracting Authority for road purposes.

61. Road - A general term denoting a public way for vehicular travel, including the entire area within the right-of-way.

62. Shop drawings - See "working drawings".

63. Special Provisions - Additions and revisions to the standard and supplemental specifications covering conditions peculiar to an individual project, method and manner.

64. Specifications - The requirements contained herein and in any supplemental specifications, or special provisions applying to the contract, and pertaining to the method and manner of performing the work, or to the quantity and quality of the materials to be furnished under the contract.

65. Specified Completion Date - The date specified in the proposal for completion of the work. After work has commenced or if the completion date is not specified, the last day of the contract period shall be the completion date.

66. Specified Starting Date - A calendar day shown on the proposal on which date commencement of the work is expected.

67. State - The State of Iowa acting through its authorized representative.

68. Station - One hundred lineal feet.

69. Subcontractor - Any individual, firm, or corporation to whom the Contractor, with the written consent of the Contracting Authority, sublets any part of the contract.

70. Superintendent - The Contractor's authorized representative in responsible charge of the work.

71. Supplemental Agreement - Written agreement between the Contractor and the Contracting Authority, modifying the original contract.

72. Surety - The corporation, partnership, or individual, other than the Contractor, executing a bond furnished by the Contractor.

73. Targeted Small Business - Any enterprise, located in the state of Iowa, which is operated for profits under a single management, and which is 51 percent owned, operated, and actively managed by one or more women or minority persons, and has been certified by the Iowa Department of Economic Development.

74. Unacceptable Work - Work not in reasonably close conformance with the contract requirements and ordered to be removed and replaced.

75. Unauthorized Work - Work neither contemplated by the contract documents nor authorized by the Engineer, and work done contrary to the instructions of the Engineer.

76. Work - Work shall mean the furnishing of all labor, materials, equipment, and other incidentals, as detailed in the plans, specifications, and by the Engineer, necessary or convenient to the successful completion of the project and the carrying out of all the duties and obligations imposed by the contract.

77. Work Order - A written order, signed by the Engineer, of contractual status, requiring performance by the Contractor without negotiation of any sort, and which may involve starting, resuming, or the suspension of work. (Not to be confused with extra work order. )

78. Working Day - Prior to commencement of work, beginning on the date designated in the notice to proceeds or beginning on the specified starting date, or as soon thereafter as provided in the specifications, a day other than Saturday, Sunday, or another recognized legal holiday. Any weekdays exclusive of Saturdays, Sundays, or a recognized legal holidays on which weather or other conditions not under control of the Contractor, will permit construction operations to proceed for not less than 3/4 of a normal workday in the performance of a controlling item of work. If such conditions permit operations to proceed for at least 1/2 but less than 3/4 of the normal working hours, 1/2 of a working day will be counted. The days counted will exclude Saturdays, Sundays, and recognized legal holidays the Contractor does not work, but will include Saturdays, Sundays, and recognized legal holidays the Contractor does work. Nonproductive work that does not require inspection may be done on Saturdays with no time charged. Working days will not be charged for the day before or after a holiday when the contract documents specifically prohibit work and the Contractor does not work. Working days will not be counted during periods of suspension of work ordered by the Engineer, except when the suspension is a result of a violation of terms of the contract.

79. Working Drawings - Stress sheets, shop drawings, erection plans, falsework plans, framework plans, cofferdam plans, bending diagrams for reinforcing steel, or any other supplementary plans or similar data which the Contractor is required to submit to the Engineer for approval. Also referred to as "shop drawings". After approval by the Engineer the working drawings became a part of the plans.

## PART 1101. INSTRUCTIONS TO BIDDERS

### 1101.01 GENERAL

A. These instructions are intended to serve as a guide to the requirements with which the bidder must comply prior to and in submitting a proposal, including various "conditions" affecting the award of the contract. They do not in themselves inform the bidder of all the requirements that must be complied with under the contract.

B. The time for bid openings shall be the prevailing Central Standard or Daylight Savings time in force at Des Moines, Iowa on the date set forth in the Notice to Bidders.

C. Before submitting a bid, the bidder shall examine all the drawings and specifications enumerated in the table of contents of this project manual. The successful bidder will be required to do all the work that is shown on the drawings, mentioned in the specifications, or reasonably implied as necessary to complete this contract.

D. The bidder shall visit and examine the site to become acquainted with the adjacent areas, means of approach to the site, conditions of the actual job site, and the facilities for delivering, storing, placing, and handling of materials and equipment.

E. Failure to visit the site or failure to examine any and all contract documents will not relieve the successful bidder from the necessity of furnishing any materials or equipment, or performing any work that may be required to complete the work, in accordance with the drawings and specifications. Neglect of the above requirements will not be accepted as reason for delay in the work or additional compensation.

### 1101.02 DRAWINGS AND SPECIFICATIONS

A. The drawing and specifications, which are part of this contract, are enumerated in the table of contents of this project manual.

B. It is the responsibility of the bidder to examine the plans, proposal form, specifications, supplemental specifications, special provisions, the site of the works and the state of the work of other contractors on the project to assure that all requirements of the contract and the plans are fully understood. It is the bidder's responsibility to satisfy herself/himself as to the nature of the work and all reasonably ascertainable conditions that may affect his/her performance under the contract.

### 1101.03 INTERPRETATION

A. Nonverbal explanation or instructions will be given in regard to the meaning of the drawings or specifications during the bid period. Bidders shall bring all inadequacies, omissions, or conflicts to the Engineer's attention, at least ten days before the date set for the bidding. Prompt clarification will be supplied to all bidders of record by addendum.

B. Neither the Department of Natural Resources nor the Engineer will be responsible for verbal instructions.

C. Failure to request clarification or interpretation of the drawings and specifications will not relieve the successful bidder of responsibility. Signing of the contract will be considered as an implicit indication that the Contractor has thorough understanding of the scope of the work and comprehension of the contract documents.

### 1101.04 CONTENTS OF PROPOSAL FORMS

A. Bidders will be furnished with proposal forms stating the location and description of the proposed work, the approximate quantities of work to be performed or materials to be furnished, the form and amount of the required proposal guarantee, and the contract period.

B. The statement, "By virtue of statutory authority, preference will be given to products, provisions grown and coal produced within the state of Iowa where applicable," which is on the face of the proposal form shall not be applicable to contracts involving Federal-aid participation in construction.

C. The following bidding and letting regulations shall apply to all construction projects for which the Department receives bids.

1. Contracts will be recommended for approval for award on the basis of the greatest total savings in the public interest. The determination of which projects are to be awarded will be based on the approval by the appropriate Commission or other contracting agency.

2. Contractors shall not be permitted to tie projects or to designate on the bidding proposal the limit of the amount they will accept.

**1101.05 PREPARATION OF PROPOSALS**

A. Only signed proposals, submitted on forms furnished by the Contracting Authority, will be considered, and the bidder will be assumed to have familiarized himself with the requirements of all applicable contract documents. To insure consideration, the bidder shall specify a unit price in figures for each pay item for which a quantity is given and shall also show the products for the respective unit prices and quantities, written in figures in the column provided for the purposes and the total amount of the proposal obtained by adding the amounts of the several items. All the unit price figures shall be in ink or typed. If there is a discrepancy between unit bid prices, extensions, or total amounts of bid, the unit bid prices shall govern.

B. If the proposal is made by a partnership or corporations the name of the partnership or corporations its agents and its principal place of business shall be shown. The proposal shall be signed by an authorized agent of the partnership of corporation.

C. If the proposal is made on the basis of a joint bid, the proposal shall be signed by each of the joint bidders, or in the case of a firms partnerships or corporations by an authorized agent for such firms partnerships or corporations and the principal place of business for each shall be shown.

D. For work let by the DNR, the sworn affidavit on the proposal shall be executed by the bidder of an agent thereof, on behalf of each person, firm, association, partnership, or corporation submitting a proposals certifying that such person, firm, association, partnership, or corporation has not, either directly or indirectly, entered into any agreements participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such contracts and is not under debarment currently by the Federal government for a criminal violation which is reasonably related to bidding and contracting procedures.

E. The attention of the bidders for the work covered by a proposal and referred to as this work, is directed to the fact that contracts for work other than the work covered in this proposal may have been awarded, are being advertised for letting on the same date as this work, or may be awarded in the future.

F. Completion of work covered by this proposal may be contingent upon certain work covered by other contracts being performed on the project in advance of this work, likewise, completion of work covered by other contracts may be dependent upon completion of work covered by this proposal.

G. The contract documents will list types of work involving other contracts anticipated to be let on the same letting date or same time within the contract period anticipated for this work. The contract documents will also list other governmental agencies, railroads, utilities, or other parties who will have work with which it is known that this work must be coordinated.

H. The bidder is expected to be familiar with work already in progress or previously let on this project, the contract periods, the progress being made, and any other conditions regarding that work which may affect his/her bid or his/her performance under this contract.

I. Cooperation and coordination of all contractors and other agencies authorized to do work on the project will be required.

J. The bidder for this work acknowledges these facts and agrees that it is in the public interest to have the work of certain contracts and agencies performed concurrently rather than consecutively. The bidder further agrees to cooperate and coordinate his work with that of other contractors or agencies to the mutual interest of all parties doing work on the project, whether by contract with the State, County, or City or necessary work being done by governmental agency or utility force.

K. By the submission of a bid on this works the bidder acknowledges and agrees that an investigation and inquiry has been made regarding the contracts for work with which this work must be coordinated.

L. In the event disputes arise between contractors or other agencies, or both, doing work on the project as to their mutual rights or obligations, the Contracting Authority or its authorized representative will, when requested to do so or upon his own motion, act as referee and define the rights of all interested parties with regard to the conduct of the work, which decision shall be final as provided in 1105.01.

M. If a prospective bidder, for a project for which the Department is the Contracting Authority, is in doubt as to the true meaning of any part of the contract documents, he may submit to the Contracting Authority a request for additional information, explanations, or interpretations. Interpretations may be in the form of an addendum to the proposal. The Contracting Authority will not be responsible for any information, explanation, or interpretation from any other source.

**1101.06 IRREGULAR PROPOSALS**

A. Proposals will be considered irregular and may be rejected for any unauthorized changes in the proposal form or for any of the following reasons:

1. If on a form other than that furnished by the Contracting Authority, or if the form is altered or any part thereof is detached.

2. If there are unauthorized additions, conditional or alternate bids, or irregularities of any kind which may tend to make the proposal incomplete, indefinite, or ambiguous as to its meaning.

3. If the bidder adds any provisions reserving the right to accept or reject an award because he is low bidder on another project in the same letting,

4. If the bidder adds any provisions reserving the right to accept or reject an award or to enter into contract pursuant to an award.

5. If a bid on one project is tied to a bid on any other project, except as specifically authorized on the proposal form by the Contracting Authority,

6. If the proposal does not contain a unit price for each pay item listed, except in the case of authorized alternate pay items.

**1101.07 ESTIMATE OF QUANTITIES**

A. For all work let on a unit price basis, the Engineer's estimate of quantities, as shown in the notice to bidders and the proposals is understood to be approximate only, and will be used only for comparing bids except as otherwise provided in the basis of payment for the various classes of work.

**1101.08 SUBMISSION OF PROPOSALS**

A. All proposals shall be submitted on the standard proposal form prepared specifically for this projects an example of which is bound in this specification volume. One separate, unbound copy of the standard proposal forms which has been specifically prepared for this projects is supplied by the Department of Natural Resources with the contract documents. Only proposals which are submitted on this form will be considered.

B. One copy of the proposal shall be submitted.

C. No proposa1 for any subdivision or any subclassification of the work , except as indicated, will be accepted. Any conditional bid, amendment to the proposal form, or the inclusion of any correspondence, written or printed matter, or details of any essential provision of the contract documents, or required consideration of unsolicited material or data in determining the award of the contracts will disqualify the proposal.

D. The bid amounts shall be inserted in the spaces provided on the proposal form, setting forth clearly and concisely, all designations and prices. Erasures or other changes on the proposal form must be explained or noted over the signature of the bidder.

E. Addenda issued during the time of bidding shall become part of the contract documents. Bidders shall acknowledge receipt of each addendum in the appropriate space provided on the proposal form. If no addenda are issued, the word "none" is to be entered in the space provided.

F. When samples are required, they must be submitted by the bidder so as to arrive at the designated office prior to the hour set for opening the proposals. Samples shall be furnished free of expense to the Department of Natural Resources, properly marked by identifications and accompanied by a list when there is more than one sample. The Department of Natural Resources reserves the right to mutilate or destroy any samples submitted whenever it may be considered necessary to do so for the purpose of testing. Samples not so mutilated or destroyed, when no longer required to be retained in connection with the award or delivery of supplies, will be returned at the bidder's expense, if such return is requested in the proposal.

G. All proposals must have the affidavit portion of the proposal completed and notarized affirming that the bidder is not guilty of collusion or fraud in connection with his proposal.

H. All proposals must state the full business address of the bidder and be signed with the bidders usual signature. Proposals by partnerships must state the full names of all partners and must state the name of the partnership followed by the signature and designation of one of the members of the partnership or an authorized representative. Proposals by corporations must state the legal name of the corporation and the name of the state of incorporation followed by the signature and designation of the president, secretary, or other person authorized to bind the corporation to the proposal. Contractors are required to include the Iowa Contractors registration number assigned to them by the Iowa Division of Labor Services. The name of each person signing the proposal shall be typed or printed below the signature.

    1. A proposal by a person who affixes to their signature the word "president", "secretary", "agent", or any other designation without disclosing their principals may be held to be the proposal of the individual whose name is signed thereon. When requested by the Department of Natural Resources, satisfactory evidence of the authority of the officers signing in behalf of the corporation shall be furnished.

I. The proposal, with the proposal guarantee, must be securely sealed in the special envelope furnished by the Department of Natural Resources with the contract documents, and plainly marked as to its contents on the outside of the envelope. The bidder shall be responsible for the sealed envelope being delivered to the place designated for the bid opening on or before the date and time specified in the notice to bidders. The officer whose duty it is to open the proposal will decide when the specified time has arrived. Proposals received thereafter will not be considered and will be returned unopened.

J. No bidder shall submit more than one proposal for identical work for the same project.

**1101.09 WITHDRAWAL OF PROPOSALS**

A. Proposals may be withdrawn by written or telegraphic request received from the bidder or authorized representative prior to the time fixed for opening of bids, without prejudice to the right of the bidder to file a new proposal. No proposals may be withdrawn by telephone request. Withdrawn proposals will be returned unopened. Negligence on the part of the bidder in preparing the proposal confers no right for withdrawal of the proposal after it has been opened.

**1101.10 TAXES**

A. The bidder shall include in the proposal all applicable federal and state taxes required by law. See Sales Tax Exemption below.

B. For the purposes of retail sales tax and use tax, general construction contractors, special construction contractors, and construction subcontractors are regarded as consumers or users of all tangible personal property which they purchaser acquire, or manufacture for use in complying their respective construction contracts.

C. Iowa retailers making sales, within the state of Iowa, of tangible personal property to a construction contractor for such use, are making sales at retail, the receipts of which are subject to retail sales tax. This means that a construction contractor should pay retail sales tax to his Iowa suppliers when purchases of tangible property are made within the state of Iowa. If a Contractor uses tangible personal property in completing the constructions which the Contractor has manufactured or fabricated, the tax will be 5% of the cost of manufacture.

D. This likewise means that any construction contractor purchasing, acquiring, or manufacturing tangible personal property outside the state of Iowa, for such use in Iowa, owes use tax on such out-of-state purchases, measured at the rate of 5% of the purchase prices or in the case of a product manufactured by the Contractor, the Contractor owes 5% of the cost of manufacture.

E. The use tax is to be paid by the Contractor directly to the Iowa Department of Revenue and Finance, using the retailers sales and use tax return, unless the out-of-state vendor from whom purchased is registered with the Use Tax Section of the Iowa Department of Revenue and does bill and collect the Iowa Use Tax for the state.

F. In accordance with Iowa Code Section 442.42 (15) & (16) and 422.47 (5), the DEPARTMENT will issue a Sales Tax Examption Certificate to CONTRACTOR and each approved contractor which will permit the material suppliers to sell material which will becomes an integral part of the structure exempt from Iowa sales tax and some applicable local option taxes and school infrastructure local option sales taxes.

**G.** The CONTRACTOR is responsible for keeping records identifying the materials and supplies purchase and verifying they were used as an integral part of the structure governed by this Contract. Any material purchased tax free and not used on this project are subject to taxes payable within the same quarter as the project completion date.

**H.** The Sales Tax Exemption Certificate must not be used to claim exemption for tax items not used on this project or thst do not qualify for exemption under the provisions of the Iowa Code Sections listed above. Such misuse will result in civil or criminal penalties.

I. Bidders should enticipate that the sale and use tax couild increase the cost of non-exempted services and material by at least 5% andmake the necessary llowance before submitting a bid.

J. The Department will reclaim sales taxes, after receiving a Contractor’s Statement of Sales Tax for those projects for which a Tax Exemption Certificate was not issued.

**1101.11 WORK BY THE DEPARTMENT OF NATURAL RESOURCES**

A. Unless specifically provided in the contracts the Department of Natural Resources will not furnish any labor, materials, or supplies necessary to complete the work under this contract.

**1101.12 PREFERENCE FOR LABOR AND MATERIALS**

A. The Contractor shall observe all of the laws of the state of Iowa with regard to preference for labor and materials, except that preference for Iowa labor and materials shall not apply when federal funding is to pay for any part of the project. When a project is federally funded it is indicated in the notice to bidders.

**1101.13 PROPOSAL GUARANTEE**

A. All proposals submitted by bidders must be accompanied by a proposal guarantee in the form of a certified check, cashier's check, or a proposal guarantee bond prepared on the standard proposal guarantee bond form furnished to the bidder by the Department of Natural Resources, an example of which is bound in this specification volume.

1. The proposal guarantee shall be made payable to the Department of Natural Resources in the amount specified in the notice to bidders and on the proposal form.

2. If the bond form is utilized in lieu of certified check or cashier's checks it must be executed by a surety company authorized by the Commissioner of Insurance for the state of Iowa to do business in Iowa and which has filed its certificate of authority with the Clerk of Court. One copy of the proposal guarantee bond form is furnished by the Department of Natural Resources with the contract documents. Only one executed copy must be submitted with the bid proposal.

B. Any bid which is not accompanied by a proposal guarantee will be considered no bid and will not be read at the bid opening.

C. All proposal guarantees submitted by unsuccessful bidders will be returned as stated in Section 1103.03 of the General Covenants and Provisions.

**1101.14 AWARD OF THE CONTRACT**

A. Award of this contract will be at the place and at the time of the first regularly scheduled meeting of the appropriate commission of the Department of Natural Resources following the opening of the proposals, except for reasonable delays as provided in Section 1103.02 of the General Covenants and Provisions.

B. The Department of Natural Resources reserves the right to reject all bids or any proposal or to waive informalities in any proposal or to accept any proposal which will best serve the interests of the state of Iowa.

C. If, at the time this contract is to be awarded, the lowest proposal submitted by a qualified responsible bidder is in the best interest of the state of Iowa, the contract will be awarded, and the bidder to whom the award is made will be promptly notified after the Department of Natural Resources meeting.

**1101.15 EXECUTION OF THE CONTRACT**

A. The successful bidder shall, within thirty calendar days after the date of the award of the contract, enter into a written contract with the Department of Natural Resources on the forms furnished by the Department for the performance of the awarded work.

**1101.16 PERFORMANCE GUARANTEE BOND**

A. Simultaneously with delivery of the signed contracts, the Contractor shall furnish a performance guarantee bond prepared on the standard performance guarantee bond form furnished to the Contractor by the Department of Natural Resources, an example of which is bound in the specification volume.

1. The bond must be executed by a surety company authorized by the Commissioner of Insurance of the State of Iowa to do business in Iowa and which has filed its Certificate of Authority with the Clerk of Court.

2. A copy of the performance guarantee bond form will be attached to a copy of the contract furnished by the Department of Natural Resources to the Contractor after award of the contract. One executed copy of the bond must be returned to the Department of Natural Resources with the signed contract, one copy of the bond may be retained by the surety company for its own records.

### 1101.17 CERTIFICATE OF INSURANCE

A. On or before execution of the contracts the Contractor shall furnish to the Department of Natural Resources a certificate of liability and property damage insurance.

1. The bidder is directed to examine the insurance coverage limits section of this specification volume to determine the coverage limits which apply to this project. Insurance certificates furnished to the Department of Natural Resources showing inadequate limits of coverage will be rejected, thus delaying final execution of the contract. See Sections 1103.04, 1107.02, and 1107.03 of the General Covenants and Provisions.

### 1101.18 COMMENCEMENT AND COMPLETION

A. The Contractor shall not commence work before the preconstruction meeting to be held after execution of the contract by all parties. The Contractor will be responsible for contacting the project Inspector to set up a time for the preconstruction meeting at the project site.

B. The Contractor must agree to complete the work by the date specified, or within the number of working days indicated if so specified in the contract. Should it be found impossible to complete the work on or before the time specified for completion, a written request may be submitted for a time extension, setting forth the reasons believed to justify the granting of such requests.

## PART 1102. BIDDER QUALIFICATIONS

### 1102.01 COMPETENCY AND OF BIDDERS

A. Bidders submitting proposals must be recognized contractors, engaged in the class of work provided for in the plans and specifications, and must possess sufficient resources to complete the work. Before the contract is awarded, the bidder may be required to furnish evidence to the satisfaction of the Contracting Authority of the ability to perform and complete the contract.

### 1102.02 QUALIFICATIONS OF THE BIDDER

A. Before award of the contract can be approved, the Department of Natural Resources shall be satisfied that the bidder involved:

1. Maintains a permanent place of business.
2. Has adequate equipment to do the work properly and expeditiously.
3. Has suitable financial status to meet the obligations incident to the work.
4. Has appropriate technical experience.
5. Has satisfactorily completed past projects.
6. Is not ineligible due to discrimination in employment.

B. The Engineer will make such investigations as deemed necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Engineer all such information and data for this purpose as the Engineer may request.

1. The Department of Natural Resources reserves the right to reject a bid if the evidence submitted by, or an investigation of, such bidder fails to satisfy the Department of Natural Resources that the bidder is responsible and qualified to carry out the obligations of the contract and to complete the work contemplated therein.

C. Targeted small business set-aside projects.

1. All contractors submitting proposals for set-aside projects shall meet the "Targeted Small Business" definitions and be capable of being certified by the Department of Economic Development within thirty (30) days after the bid letting date. Failure of the low bidder to become certified within this time will be just and sufficient cause for the denial of the award.

2. Contractors eligible for "Targeted Small Business" designation but not currently certified as such by the Department of Inspections and Appeals, should do so immediately by contacting the Targeted Small Business Officer, Lucas State Office Building, Des Moines, Iowa 50319 -0083.

**1102.03 REDUCTIONS IN BIDDER QUALIFICATIONS RESTRICTIONS**

A. The requirements and conditions for bidder qualifications may be reduced by the Contracting Authority either for contractors who have well established performance records in other fields or for contractors having adequate financial responsibility and experienced supervisory personnel available for the work that is under consideration or for both the above reasons.

B. Likewise, the requirements may be modified by the Contracting Authority for newly formed or reorganized firms or corporations whose basic organization is composed of individuals who are veterans of the construction industry, with proven records of satisfactory performance in the field in which they have elected to bid, provided, however, that they have adequate financial responsibility, equipment, and available experienced supervisory personnel.

**1102.04 IMPOSITION OF INCREASE IN BIDDER QUALIFICATION REQUIREMENTS, SUSPENSIONS AND DISQUALIFICATION**

A. The requirements and conditions for bidder qualification in 1102.01 may be imposed or re-imposed or increased, or a contractor may be suspended or disqualified.

B. The requirements and conditions for qualifications of a contractor may be imposed or re-imposed or increased if or when:

1. The Contractor seriously delays commencement or completion of any work within the contract period or any extension thereof under circumstances that would normally give rise to a right of the Contracting Authority for liquidated damages or declaration of defaults or;

2. The Contractor does any act or omits doing or performing any act which, in the judgment of the Contracting Authority, evidences a material change in the contractor's financial responsibility or work capability where, in the judgment of the Contracting Authority, the same will materially prejudice the contractor's ability to successfully prosecute such public improvement contracts, or he knowingly submits false information concerning prequalification, or;

3. The Contractor takes or fails to take any action which the Contracting Authority deems to warrant an imposition of increase in bidder qualification requirements.

C. A contractor may be suspended from bidder qualification if or when:

1. The Contractor continually fails or refuses to remove and replace materials or work found by the Engineer not to be in reasonably close conformity with the contract documents or to correct such material or work so as to cause such materials or finished product to be reasonably acceptable work, or;

2. The Contractor continually and, in the judgment of the Engineer, without good cause therefor, fails to carry on the work in an acceptable manner, or refuses to comply with a written order of the Engineer within a reasonable time, or;

3. The Contractor fails to perform with his own organization the work as required in 1108.01, or otherwise assigns or disposes of work or the contract or any part thereof without approval of the Contracting Authority, or;

4. The Contractor forfeits a proposal guaranty and fails to enter into the contract upon an offer of award by the guarantee Contracting Authority in response to a prior advertisement for bids for the same project for which award is currently being considered, or;

5. The Contractor fails to comply with nondiscrimination requirements of the Standard Specifications or special provisions, or;

6. The Contracting Authority deems a suspension is appropriate for reasons stated in Paragraph A, above.

7. The Contractor is debarred from doing work for the federal government.

8. The Contractor knowingly submitted false or misleading information concerning qualifications.

D. A suspension is intended to be for an indefinite period of time or, in the case of Paragraph C4, for a specific project. A suspension shall continue until the contractor resolves, to the satisfaction of the Contracting Authority the problem for which the suspension was made.

E. A contractor may be disqualified from bidder qualification if or when:

1. Currently debarred by some other state or Federal agency, or;

2. Subcontracts, employs, or otherwise uses services, for work of the Contracting Authority, of one who is debarred by the Contracting Authority or disqualified according to Paragraph 1, except to fulfill agreements for work on existing contracts, or;

3. Is convicted of or pleads guilty or nolo contendere to a charge of engaging in any conspiracy, combination, or other unlawful act in restraint of trade or of similar charges in any Federal court or a court of this or any other state, or;

4. Has offered or given gifts or gratuities to employees of the Contracting Authority in violation of State law or has had as his employee a person who was at that time also an employee of the Contracting Authority, or

5. The Contracting Authority deems a disqualification is appropriate for reasons stated in Paragraph C. above.

F. A disqualification is intended to be for a specified time. A disqualification shall not exceed 36 months. The Contracting Authority will issue a written notice of any intent to disqualify or suspend a contractors except when suspended for a specific project according to Paragraph C4.

G. Should the Contractor believe that the increase in bidder qualification requirements, intended suspensions or intended disqualification is based on false, biased, or incomplete information or that the increase or intended action is severe or unwarranted, the Contractor may make a written request to the Contracting Authority for an opportunity to be heard in a contested case pursuant to Chapter 17A, Code of Iowa.

1. If notice is given, the written request for a hearing must be filed with the Contracting Authority within 10 days of receipt of the notice of intended agency action.

2. If the basis of the intended disqualification is a criminal violation which is reasonably related to bidding and contracting procedures, the intended disqualification may be applied to the organization, including a person, firm, association, partnership, or corporation, to an affiliated officer, representative, or employee thereof, and to any other such organization in which the organization or affiliate or the officer, representative, or employee has an interest as either officer or owner.

H. When a notice is given or when any action is contested, the Contracting Authority will issue a notice of the final action taken.

**1102.05 FOREIGN CORPORATIONS**

A. Before entering into a contract involving construction or maintenance work, corporations organized under the laws of any other state shall file with the Contracting Authority a certificate from the Secretary of State of the State of Iowa showing that they have complied with all of the provisions of Chapter 404 Code of Iowa, governing foreign corporations. For contracts involving only the furnishing of materials, the foregoing requirement does not apply.

B. When a contract not involving federal-aid participation for a public improvement is to be awarded to the lowest responsible bidder, a resident bidder shall be allowed a preference over a nonresident bidder from a state or foreign country which gives or requires a preference to bidders from that state or foreign county. The preference is equal to the preference given or required by the state or foreign country in which the nonresident bidder is a resident.

C. If another state or foreign country has a more stringent definition of a resident bidder, the more stringent definition is applicable to bidders from that state or foreign county.

D. Any joint venture that includes a nonresident bidder will be considered nonresident, and the preference rule will be used.

**1102.06 INCOME TAX DEDUCTION ON NON-RESIDENT CONTRACTORS**

A. Each nonresident person or firm doing business as an individual and each nonresident co-partnership will be required, as precedent to receiving an award, to file a certificate issued by the State Tax Commissions as provided in Section 422.17, Code of Iowa, releasing the Contracting Authority from withholding any and all sums required by the provisions of Section 422.17, Code of Iowa.

## PART 1103. APPROVAL FOR AWARD AND AWARD OF THE CONTRACT

**1103.01 CONSIDERATION OF BIDS**

A. The Contracting Authority reserves the right to waive technicalities and to reject any or all proposals. Bidders may be denied a contract award for any one of the following reasons:

1. For failure to meet the Contracting Authority's requirements for qualification of bidders, as set forth in Section 1102.02 and in the special provisions for the project.

2. For failure to maintain satisfactory progress on work already under contract.

3. For failure to meet promptly financial obligations undertaken in connection with other work under contract.

4. For filing more than one proposal at any letting for the same work under the same or different names.

5. For an unsatisfactory record of performance and cooperation on previous contracts.

6. For submitting an obviously unbalanced bid.

7. For having sublet or otherwise assigned work without the approval of the Contracting Authority.

8. For forfeiture of a proposal guarantee and failure to enter into contract upon an offer of an award by the Contracting Authority in response to a prior advertisement for bids for the same project or any combination of projects involving the project for which award is currently being considered.

9. For failure to file and maintain with the Contracting Authority a current Certificate of Insurance meeting the requirements of 1107.02.

10. For failure to provide a current Iowa contractor's registration number according to the provisions of Chapter 91C of the Code of Iowa.

**1103.02 APPROVAL FOR AWARD**

A. In the approval for award of contracts consideration will be given not only to prices bid but also to the mechanical and other equipment available to the bidders the financial responsibility of the bidders and his ability and experience in performance of like or similar contracts.

B. Approvals for award will be made as promptly as practical after bids have been opened and read. The Contracting Authority reserves the right to delay the approval for award for such time as is needed for

consideration of bids and for receipt of concurrence in recommended approvals for award from other governmental agencies whose concurrence may be required.

**1103.03 RETURN OF PROPOSAL GUARANTEE**

A. Proposal guaranties will be returned to the unsuccessful bidder by mail promptly after the approval for award has been made. Return to the successful bidder will be made promptly after the filing of the contract documents.

**1103.04 CERTIFICATE OF INSURANCE**

A. The Contractor's certificate of liability and property damage insurance described in 1107.02 shall be filed with the Contracting Authority on or before the execution of the contract and shall be maintained throughout the prosecution of the work and until final acceptance and completion of the contract. A separate verification shall be required for contracts awarded on the basis of joint bids.

**1103.05 REQUIREMENT OF CONTRACT BOND**

B. In compliance with Section 573 of the Code of Iowa, the Contractor shall, at the request of the Contracting Authority, on all contracts amounting to five thousand ($5,000.00) dollars or more, file an acceptable bond in an amount not less than 100 percent of the contract sum with the Contracting Authority.

1. The bond shall be executed in quadruplicate on the standard form of the Contracting Authority. This bond shall be held to cover all work included in the contracts whether performed by the Contractor or under a subcontract or assignment. The bond shall be executed by the Contractor and by a surety company authorized to do business in the state of Iowa.

2. The Contractor shall not begin work on any contract before he is notified, in writing, that the required bond has been approved and accepted, or until the signed contract is returned to him.

C. Prime contractors that are certified through Iowa Department of Economic Development as a targeted small business may request a performance bond waiver.

1. The waiver shall be applied only to a prime contract where the project does not exceed $50,000.00, not withstanding Section 573.2 of the Iowa Code.

2. The waiver shall only apply to those contractors which are able to demonstrate the inability of securing a bond because of a lack of experience.

3. A waiver shall not apply to business with a record of repeated failure of substantial performance or material breach of contract in prior circumstances. The granting of a waiver shall in no way relieve the business from its contractual obligations and shall not preclude the Contracting Authority from pursuing any remedies under the law upon default or breach of contract.

**1103.06 EXECUTION OF CONTRACT**

A. The bidder to whom a contract is being awarded shall execute and file four copies of such contract with the Contracting Authority.

**1103.07 FAILURE TO EXECUTE CONTRACT**

A. Unless the time limit is modified by special provisions failure to execute a contract and file an acceptable bond within 30 days of the date of the approval for awards herein provided, will be just and sufficient cause for annulment of the approval for award and for forfeiture of the proposal guarantee to the Contracting Authority.

**1103.08 SUBCONTRACTORS**

A. The bidder to whom a contract is being awarded shall file a list of subcontractors and a copy of each subcontract with the Contracting Authority within 30 days of the date of the approval for award. All subcontracts must comply with the provisions of 1106.01.

**1103.09 MATERIAL SUBSTITUTION**

A. The bidder to whom a contract is being awarded shall file all requests for materials substitutions within 30 days of the approval of award of the contract.

## PART 1104. SCOPE OF WORK

**1104.1 INTENT OF PLANS AND SPECIFICATIONS**

A. The intent of the plans and specifications is to provide for the construction and completion of every detail of the work described therein. It shall be understood that the Contractor shall furnish all labor, material, tools, transportation, and supplies required for all or any part of the work to make each item complete in accordance with the spirit of the contract. It is understood that the apparent silence of the specifications as to any detail or the apparent omission of a detailed description concerning any point shall be regarded as meaning that only the best general practice is to prevail and that only materials and workmanship of the first quality are to be used.

B. For the purpose of design and the preparation of the Engineer's estimate, the Contracting Authority or its representatives may perform a reasonable amount of exploratory work to gain information relative to surface and subsurface conditions relating to types of soils moisture content, and types and extent of rock strata.

1. This information, when shown on the plans, represents a summary of conditions as of the date the survey was made, it is only an approximate estimation of the site conditions made merely to be suggestive to the Contracting Authority of construction conditions and quantities and classes of work. This information may be used as the bidder sees fit. The appearance of this information on the plans or specifications will not constitute a guarantee that conditions other than those indicated will not be encountered at the time of construction.

2. The bidder is advised that all information concerning the project, compiled by the Contracting Authority preceding the design, is available for examination at the Contracting Authority's headquarters. The prospective bidder shall conduct an examination as provided in 1102.06 to satisfy himself as to the character of the work to be done, the probable construction conditions, and any other reasonably ascertainable conditions and the potential effect these could have on the performance of work under the contracts which shall be the basis for the bid to be prepared.

C. Any bidder interested in the work is authorized to make whatever additional investigation he consider advisable. In making such additional investigation, the bidder is directed to the Engineer for information relating to available right-of-way. If there are, at that time, any parcels of land over which the Contracting Authority does not have jurisdiction, right of entry must be secured by the prospective bidder from those authorized to grant such permission.

1. All such additional investigation work shall be performed without costing or obligating the Contracting Authority in any way.

**1104.02 SPECIAL WORK**

A. Any conditions not covered by these standard specifications are stated in the special provisions.

**1104.03 INCREASED OR DECREASED QUANTITIES**

A. The Contracting Authority reserves the right to make such increase or decrease in the quantities of the work shown on the plans as may be considered necessary to complete fully and satisfactorily the construction included in the contract. The compensation to the Contractor for such changes will be as provided in 1109.04.

B. Except as provided in 1109.05, no significant change in quantities, as defined in 1109.17, shall be made by increasing or decreasing the project area to be improved as shown on the plans and described in the proposal forms unless the Contractor gives written consent to such increase or decrease. However, such consent will not be required for maintenance or restoration work ordered by the Engineer.

1. For the purpose of this article a material change shall be defined as an increase or decrease of more than 20 percent in the measured quantity of any item in the contract.

**1104.04 EXTRA WORK**

A. The Contracting Authority reserves the right to order, in writing, the performance of work of a class not contemplated in the proposal but which may be considered necessary to complete satisfactorily the work included in the contract. Such extra work will be paid for as provided in 1109.04B.

**1104.05 MAINTENANCE OF DETOURS**

A. Unless so required by the plans or the special provisions, the Contractor will not be required to assume any responsibility in connection with the maintenance or marking of suitable detours.

**1104.06 REMOVAL AND DISPOSAL OF STRUCTURES AND OBSTRUCTIONS**

A. The contractor for bridge and culvert work shall remove any existing structure, or part of structure, that in any way interferes with the new construction. If specific payment for such work has not been provided in the contract, it will be paid for as extra work.

B. The contractor for road work shall remove any materials or structures found on the right-of-way which are not designated to remain in place or which have not been designated for use in the new construction.

1. The removal and disposal of pipe culverts will not be paid for directly but shall be considered as incidental works and the cost of such removal and disposal shall be considered to be included in the contract price for other items. Pipe culverts designated for salvage shall be removed by methods that will cause a minimum of damage to the pipe culverts.

2. The removal and disposal of bridges or other masonry or monolithic concrete construction will be paid for. If the contract does not contain an item for such work, it will be paid for as extra work.

**1104.07 RIGHTS IN AND USE OF MATERIALS FOUND ON THE RIGHT-OF-WAY**

A. Unless stated to the contrary in the contract documents, all materials, such as stone, gravel, sand, timber, and structures or parts of structures, found on the right-of-way or on land acquired for the work, are the property of the Contracting Authority or the owner of the fee title to the land.

1. If such materials are to be removed but use or salvage is not designated on the plans, they shall become the property of the Contractor, and shall be disposed of by the Contractor.

2. When the Contractor is permitted to use materials found on the right-of-way, any excavations that are made below the grade elevations shall be backfilled with other suitable materials so that the finished road conforms to the grade shown on the plans. No extra compensation will be allowed for such backfilling.

**1104.08 FINAL CLEANING UP**

A. Before final acceptance of the work, the Contractor shall remove all unused material and rubbish from the site of the work, remedy any objectionable conditions the Contractor may have created on private property, and leave the project site in a neat and presentable condition. The Contractor shall make no agreement which allows salvaged or unused material to remain on private property within view of the project except when consistent with previous land use.

B. All ground occupied by the Contractor in connection with the work, which is within view of or adjacent to a road, shall be restored. Restoration shall include appropriate smoothing to its original condition and may include making the area suitable for cultivation and, where vegetation has been disturbed, seeding of the area.

1. Unless otherwise provided for, the Contractor shall be responsible for securing waste privileges on private property. The general Contractor shall be responsible for cleanup of subcontractors at the completion of all work.

C. This article is not intended to restrict burning in accord with applicable regulations.

D. Final clean up shall be subject to approval of the Engineer.

**1104.09 RIGHT-OF-WAYS OR LANDS ACQUIRED FOR THE WORK**

A. Access to the construction site will be over designated routes of travel, on land owned or made available by the Contracting Authority for the specific use of the Contractor.

B. Right-of-way or lands will be provided without cost to the Contractor, and it is contemplated that all of the needed right-of-way or lands will have been acquired for the work placed under contract.

1. Whenever it is necessary to secure additional right-of-way or land, performance of the work affected thereby is contingent upon the securing of such right-of-way or land. No claims will be allowed for loss or damage occasioned by delays in securing right-of-way or lands.

**1104.10 PERMITS AND ARRANGEMENTS WITH OTHER GOVERNMENTAL AGENCIES**

A. Whenever the work involves construction with which federal, state, or local governmental agencies are concerned, the performance of the work is contingent on arrangements and/or permits with those concerned agencies.

1. The Contracting Authority shall secure all necessary permits, certificates, and licenses required to prosecute the work, except specifically designated permits, local building permits, and any cost for inspections required by local authorities, which shall be paid for and secured by the Contractor.

2. No additional compensation will be allowed for any delays, inconvenience, or damages sustained by the Contractor due to actions of those concerned agencies with respect to any arrangements or permits they may require.

**1104.11 RAILROAD CROSSINGS**

A. Whenever the work involves construction with which railroad companies are concerned, the performance of the work is contingent upon arrangements with the railroad companies for the proposed construction.

1. The performance of the work shall be in accord with arrangements established by the Contracting Authority. The Contractor may make additional arrangements.

2. No claim will be allowed for loss or damage caused by failure of the railroad to comply with provisions of the agreement with the Contracting Authority. Upon notice given, the Contracting Authority will institute necessary legal action to enforce the conditions of its agreement with the railroad company.

**1104.12 PUBLIC UTILITIES**

A. The Contracting Authority will notify all utility companies, all pipeline owners, or other parties affected, and will endeavor to have all necessary adjustments of the public or private utility fixtures, pipelines, and other appurtenances within or adjacent to the limits of construction made as soon as practicable.

B. The Contractor shall be responsible for notification concerning work near pipelines, required by Section 479.47, Code of Iowa, and for conducting his work as required therein.

C. Waterlines, gaslines, wirelines, service connections, water and gas meter boxes, water and gas valve boxes, light standards, cableways, signals, and all other utility appurtenances within the limits of the proposed construction which are to be relocated or adjusted are to be moved by the owners at their expense, except as otherwise provided for in the special provisions or as noted on the plans.

D. It is understood and agreed that the Contractor has considered in the bid all of the permanent and temporary utility appurtenances in their present or relocated positions as shown on the plans and that no additional compensation will be allowed for any delays, inconvenience, or damage sustained by him/her due to any interference from the utility appurtenances or their operation or relocation.

**1104.13 DRAWINGS AND SPECIFICATIONS**

A. Unless otherwise provided in the contract documents the Contracting Authority shall furnish to the Contractor, awarded the contract, free of charge, all copies of drawings and specifications reasonably necessary for the execution of the work.

**1104.14 THE CONTRACTING AUTHORITY'S RIGHT TO OCCUPY**

A. The Contracting Authority shall have the right to enter the building or work site and store or attach such fixtures or furniture as it may elect, or to do such other work providing that such storage or work will not interfere with the completion of the Contractor's work. Such occupancy by the Contracting Authority shall in no way imply final acceptance of any portion of the Contractor's work.

**1104.15 CONTRACTOR'S UNDERSTANDING**

A. It is understood and agreed that the Contractor has, by careful examination, satisfied him/herself as to the nature, character and location of the work, conformation of the ground, character, quality and quantity of the materials to be encountered, character of the equipment and facilities needed, preliminary to and during the prosecution of the work, general and local conditions and all other matters which can in any way affect the work under this contract. No verbal agreement or conversation with any officer, agency, or employee of the Contracting Authority, either before or after the execution of the contracts shall affect or modify any of the terms or obligations herein contained.

**1104.16 HISTORICAL AND ARCHEOLOGICAL**

A. If during the course of construction evidence of deposits of historical or archeological interest is found, the Contractor shall cease operations affecting the find and shall notify the Iowa Department of Natural Resources and the state Historic Preservation Officer. No further disturbance of the deposits shall occur until the contractor has been notified by the agency that he/she may proceed. The agency will issue a notice to proceed only after the state official has surveyed the find and made a determination to the Iowa Department of Natural Resources.

B. Compensation to the contractor, if any, for lost time or changes in construction to avoid the finds shall be determined in accordance with changed conditions or change order provisions of the specifications.

## PART 1105. CONTROL OF WORK

**1105.01 AUTHORITY OF ENGINEER**

A. The Engineer will decide all questions which may arise as to the quality and acceptability of materials furnished and work performed and as to the rate of progress of the work, all disputed and mutual rights

between contractors, all plans and specifications, and all questions as to the acceptable fulfillment of the contract on the part of the Contractor. Except as provided in Section 1109, the Engineer's decisions will be final.

B. For authority to temporarily suspend work see 1105.08 and 1108.06.

**1105.02 PLANS**

A. The official plans, profiles, and cross sections, on file in the office of the Contracting Authority, show the location, typical construction details, and dimensions of the work contemplated. The work shall be performed in conformity therewith, except in case of error or unforeseen contingency.

B. The plans are made from careful surveys and represent the foreseen construction requirements. Any appreciable deviation from the plans made necessary to expedite construction, or because of errors shall be called to the attention of the other party, in writing, by the party discovering such conditions. If necessary, revised plans will be provided.

**1105.03 WORKING DRAWINGS**

A. The plans will be supplemented by such working drawings as are necessary to adequately control the work. Working drawings shall be furnished by the Contractor, as required by the specifications or the plans.

1. When certification by a professional structural or civil engineer registered in Iowa is required, it will be so designated on the plans or in other contract documents.

2. Working drawings may include shop drawings of fabricated materials, erection plans, falsework plans, cofferdam plans, or other supplemental plans or data. Contractor submitted shop drawings for steel structures shall show fully detailed dimensions and sizes of all component parts of the structure, descriptions of drains, etc.

    a. Prior to review of working drawings, any work done or material ordered shall be at the Contractor's risk.

3. The Contractor shall expressly understand that the Contracting Authority's review of working drawings submitted by the Contractor covers only requirements for strength and arrangement of component parts.

4. The Contracting Authority assumes no responsibility for errors in dimensions and assumes the Contractor will use material complying with requirements of the contract documents, or, where not specified, those of sound and reasonable quality, and will erect the subjects of such working drawings in accord with recognized standards of first-quality workmanship or, when specified, in accordance with standards of the contract documents.

5. If unanticipated and either unusual or complex construction procedures or site conditions occur, the Engineer may require the Contractor to submit such working drawings as, in the judgment of the Engineer, are necessary to satisfactorily complete the proposed construction.

**1105.04 ALTERATION OF PLANS OR CHARACTER OF WORK**

A. The Engineer will have the right to make alterations in plans or character of work as may be considered necessary or desirable during the progress of the work to satisfactorily complete the proposed construction. Such alteration will neither waive any conditions of the contract nor invalidate any of the provisions thereof.

**1105.05 CONFORMITY WITH AND COORDINATION OF SPECIFICATIONS, PLANS AND SPECIAL PROVISIONS**

A. Discrepancies within contract documents:

1. In case of any discrepancy between the drawings on the plans and the figures written thereon, the figures, unless obviously incorrect, are to govern.

2. In case of any discrepancy between the plans, including plan notes, and the general or supplemental specifications, the plans are to govern.

3. In case of a discrepancy between the general specifications and supplemental specifications, the supplemental specifications are to govern.

4. In case of any discrepancy between the general or supplemental specifications and the special provisions or between the plans and the special provisions, the special provisions shall govern.

B. The Contractor shall not take advantage of any apparent error or omission in the plans, specifications, or of any discrepancy between the plans or specifications. The Engineer shall be permitted to make such correction in interpretation as may be deemed necessary for the fulfillment of the intent of the plans and specifications, subject to compensation as provided in 1109.03, 1109.05, and 1109.06.

C. The plans shall not be so changed as to materially affect the cost or the difficulty of performing any item or work for which the contract amount is more than 20 percent of the total contract sum, except with the consent of the Contractor.

D. All work performed and all materials furnished shall be in reasonably close conformity with the lines, grades, cross sections, dimensions, and material requirements, including tolerances, shown on the plans or indicated in the specifications.

E. If the Engineer finds the material, or the finished product in which the material, is used is not within reasonably close conformity with the plans and specifications, but that reasonably acceptable work has been produced, the Engineer shall determine, based on engineering judgment, if the work shall be accepted and remain in place.

1. In this events the Engineer will document the basis of acceptance and supplement it by contract modification which will provide for an appropriate adjustment in the contract price for such work or materials as deemed necessary to conform to the Engineer's determination.

F. If the Engineer finds the material, the finished product in which the material is used, or the work performed is not in reasonably close conformity with the plans and specifications and has resulted in an inferior or unsatisfactory product, the work or material shall be considered unacceptable and shall be removed and replaced, or otherwise corrected, as acceptable to the Engineer, by and at the expense of the Contractor.

**1105.06 SUPERVISION BY CONTRACTOR**

A. The Contractor, when absent from the construction site, shall have on site at all times, as its agent, a competent superintendent, capable of reading and thoroughly understanding the plans, specifications, and other contract documents and who shall be thoroughly experienced in the type of work being performed.

1. The superintendent shall supervise, direct, and control the Contractor's operations, personnel, work, and subcontractor's operations. The superintendent shall have full authority to execute orders or directions of the Engineer, without delays, and to promptly supply such materials, equipment, tools, labor, and incidentals as may be required.

2. The Contractor shall give the Engineer written notification of the name of the superintendent. The superintendent shall not be replaced, except with the consent of the Engineer, unless the superintendent proves to be unsatisfactory to the Contractor and ceases to be in the Contractors employ.

**1105.07 CONSTRUCTION STAKES AND BENCH MARKS**

A. If there is no provision in the Contract documents for a Construction Survey Bid Item, the Engineer will set the necessary centerline, slopes and grade stakes promptly upon notification by the Contractor that stakes are needed, unless otherwise noted on the Plans.

B. For all structures, unless otherwise noted on the Plans, the Engineer will set stakes for centerline and such other stakes as are necessary to establish definitely, the location, elevations, and alignment of the structure. Every reasonable precaution will be taken by the Engineer and his technical assistants to insure that the construction stakes and/or computations are true and accurate, but the Contractor shall ensure that no gross

error exists before beginning operations. Should such mistakes or errors be allowed to exist, and work completed on erroneous data, the Contractor will be held responsible to remedy the work to conform to the correct lines, grades, or standards without expense to the Contracting Authority or the Engineer.

C. The Contracting Authority shall not be responsible for delays due to lack of grade or line stakes, unless the Contractor has given the Engineer 48-hour written notice that such stakes will be needed, and the Contractor's work is being conducted in a satisfactory manner and at the specified rate of progress.

D. The Contractor shall be held responsible for the preservation of stakes and marks. If, in the opinion of the Engineer, any of the survey stakes or marks have been carelessly or willfully destroyed or disturbed by the Contractor, the cost of replacing them shall be charged against the Contractor.

E. The Contractor shall provide and keep constantly upon the work site, first-class instruments for use in establishing the various lines, levels and grades for the construction and shall have a superintendent on the work who is thoroughly familiar with their use. The Contractor shall provide and maintain a permanent bench mark at the construction site for the use of mechanics and other subcontractors.

**1105.08 AUTHORITY AND DUTIES OF INSPECTOR**

A. The Contracting Authority may appoint inspectors to represent the Engineer in the inspection of all materials used in and all work done under the Contract. Such inspection may extend to any part of the work and to preparation or manufacture of materials to be used.

1. The inspector will not be permitted to modify in any way the provisions of the contract documents or to delay the work by failing to inspect materials and work with reasonable promptness. An inspector is placed on the work to keep the Engineer informed as to its progress and the manner in which it is being performed. The inspector will not be authorized to approve or accept any portion of the work.

2. Results of inspection tests and examinations will be available to the Contractor on an informational basis. Absence or presence of representative test data does not alter the Contractor's responsibility for plan and specification compliance in accordance with 1104.01.

3. The inspector will not act as foreman or perform other duties for the Contractors nor improperly interfere with management of the work.

4. In case of dispute between the Contractor and inspector as to quality of materials or manner of performing the works the inspector will have authority to reject materials or suspend the work until the question at issue can be decided by the Engineer. Written notice of suspension of work will be given to the Engineer and Contractor by the inspector.

**1105.09 INSPECTION OF WORK**

A. The Contractor shall furnish the Engineer with every reasonable facility for ascertaining whether the work is being performed in conformance with the contract documents. At any time before acceptance of the works upon request of the Engineer, the Contractor shall remove or uncover such portions of finished work as the Engineer may direct. After examination has been made, the Contractor shall restore such portions of the work to the standard required by the contract documents.

1. If work thus exposed or examined proves acceptable, the uncovering or removing and replacing of coverings or the restoring of parts removed, shall be paid for as extra work, except that no payment will be made for work involved in checking smoothness of concrete surfaces.

2. If work thus exposed and examined proves unacceptable, the Contractor shall replace the defective work in accordance with the specifications.

3. If work thus exposed and examined proves either unacceptable or deficient, the Contractor will be paid only for work as finally accepted.

4. Work done without the Engineer having been afforded ample opportunity to provide suitable inspection, or unauthorized work, may be ordered removed and replaced at the Contractor's expenses or may be excluded from the quantities measured for payment.

B. If the specifications, Engineer's instructions, laws, ordinances, or any public authority require any work and/or materials to be specially tested or approved, the Contractor shall give the Engineer timely notice of readiness for review. If the review is to be made by authority other than the Engineer, the Contractor shall notify the Engineer of the date fixed for review. Reviews by the Engineer will be promptly made and, where practicable, at the source of supply.

**1105.10 REMOVAL OF DEFECTIVE WORK**

A. Any defective work shall be removed and replaced at the Contractor's expense.

B. Should the Contractor fail or refuse to remove defective work when so ordered by the Engineer, the Engineer shall have authority to order the Contractor to suspend further operations, and may withhold payment on estimates until such defective work has been removed and replaced in accordance with the plans and specifications.

1. Continued failure or refusal on the part of the Contractor to correct defective work promptly shall be sufficient cause for the Contracting Authority to declare the contract in default and to complete the work in accordance with 1108.11.

**1105.11 UNAUTHORIZED WORK**

A. Unauthorized work and work done in excess of that provided by the lines and grades shown on the plans or as given by the Engineer, or any work done without the authority of the Engineers will be considered as unauthorized and will not be paid for.

1. Unauthorized work may be ordered removed and replaced at the Contractors expense.

**1105.12 OTHER CONTRACTS**

A. The Contracting Authority reserves the right to do, or to contract for other work adjacent to, or in the vicinity of, the work herein described.

B. The Contractor agrees to permit such other work to progress and to arrange for joint occupation of the site under such provision as the Engineer determines necessary. If in the judgment of the Engineer, such joint occupation of the site impedes progress on the work herein described, the Contracting Authority will proportionally extend the time for completion of the work.

1. The Contractor hereby waives any claim for damages or extra compensation by reason of such interference with his work.

**1105.13 FINAL INSPECTION**

A. Upon notification, by the Contractor or his authorized representative, that the work is completed, the Engineer shall make prompt final inspection of each item of work included in the contract. If the work is found not to be in accordance with the contract documents, the Contractor will be advised as to the particular defects to be remedied before final acceptance can be made.

**1105.14 RESTRICTIONS ON MOVING AND USE OF HEAVY EQUIPMENT**

A. The following restrictions shall apply to the moving and use of heavy equipment:

1. Movement of equipment to and from the project shall be in compliance with the laws governing the operation of vehicles on the highways of Iowa. Movement and operation of equipment over completed portions of pavements, bituminous surfaces, base courses, and structures which are a part of the project shall be with legal axle loads, except as modified in this article.

2. In the case of earthwork and shouldering to be done in connection with either rigid or flexible pavement, or pavement widening and resurfacing, no tractor-drawn, earth-moving equipment shall be operated, or driven on or across the pavements, except at designated crossovers, as authorized by the Engineer.

a. When crossovers are specifically permitted, the Contractor will designate, before use, the location and number of crossovers to be used. The Engineer will not approve crossovers in areas of limited sight distance, near structures, railroad crossings, or at any other location which will place safety of the traveling public in jeopardy. At these crossovers, equipment having axle loads greater than the maximum permitted by law may be used.

b. Crossovers shall be 30 feet in length measured along the centerline and shall not be closer than 300 feet to each other.

c. For each crossover used, the Contractor shall, at the Engineer's option, either replace the pavement or pay the Contracting Authority at the rate of five thousand ($5,000.00) dollars on the basis of a two-lane pavement.

d. In lieu of the surface crossover, approved hauling bridges may be used. The hauling bridge shall accommodate two lanes of public traffic, and it shall be removed from the roadway at the close of each day's operations. When a hauling bridge is used, no payment will be required.

e. The provisions of the Supplemental Specification for Traffic Controls in effect on the contract letting date, shall apply.

3. No dragline, cranes or power shovel shall be operated with any part of the machine resting upon a pavement, bituminous surface, base course, or structure except with approval of the Engineer and in accord with restrictions in that approval.

4. Under no conditions shall machines equipped with metal lugs or similar projections on the treads be operated on the surface of a pavement, bituminous surface or base course.

5. For building shoulders, on completed pavements of any type, the maximum axle load used for equipment operating on pavement shall not exceed the legal axle load, as defined herein.

6. Crawler-type tractors shall not be moved on or off a pavement or base course except at places where the compacted earth adjacent to slab is at least 2 inches higher than the surface of the pavement or base course. Whenever heavy, crawler-type equipment, such as a crane or mixers is moved on or off the edge of a pavement or base course, a substantial timber approach shall be built, at the edge of slab, to prevent overloading or otherwise injuring the edge of the slab.

7. Compacting equipment having axle loads greater than 20,000 pounds may be used on the work under the following provisions:

   a. The equipment shall be transported to and from the work and across the bridges on the work in compliance with laws of the State of Iowa.

   b. For compaction of subbase, the weight of equipment used shall not be greater than that of compaction equipment used in correction of the roadbed for grade and cross section.

   c. For compaction of base course, the weight of equipment used shall not be greater than the weight of equipment used in compaction of the subbase on which the base is placed.

   d. For compaction of surface courses, the weight of equipment shall not be greater than that of equipment used in compaction of the base on which the surface course is placed.

8. For grading or any other type of work, no rollers or other equipment, having an axle load greater than 50,000 pounds or a total weight in excess of 60,000 pounds shall be operated over a culvert, except as may be authorized by the Engineer, and then, in strict compliance with prescribed precautionary measures.

**1105.15 PLACEMENT OF FILL MATERIAL IN STREAMS AND WATERBODIES**

A. The placement of fill material in streams is regulated by Federal law. The intent of this specification is to require contractor operations in streams and other waterbodies and adjacent swamps, marshes, bogs, or similar areas, to be in compliance with Federal regulations.

B. Fill material shall mean; any material used for the primary purpose of replacing an aquatic area with dry land, or of changing the bottom elevation of a waterbody.

C. Fill material shall consist of clean, suitable, naturally occurring material, free from toxic pollutants in other than trace quantities.

D. Temporary stream crossings shall be bridged or culverted so as not to restrict expected high flows or disrupt the movement of aquatic life native to the stream or waterbodies. Expected high flows are those flows, which the Contractor expects to experience during the period of time that the crossing is in place.

1. Temporary stream crossings shall:

a. Not extend over 100 feet into any swampy, bogy, marshy, or similar area that is adjacent to the stream or waterbody.

b. Be maintained to prevent unnecessary erosion and other nonpoint sources of pollution.

c. Be removed after they are no longer needed.

**1105.16 COST REDUCTION INCENTIVE**

A. The Contractor may submit to the Engineer, in writing, proposals for modifying the plans, specifications, or other contract requirements for the sole purpose of reducing the total cost of construction.

1. The proposals shall not impair, in any manner, essential functions or characteristics of the projects, including but not limited to, service life, economy of operation, ease of maintenance, desired appearance, or design and safety standards.

B. Proposals shall contain the following changes:

1. Existing requirements and proposed changes,

2. Contract requirements that must be changed if the proposal is adopted,

3. A detailed cost estimate of performing the work as stipulated and as proposed,

4. The time within which the Engineer must make a decision thereon,

5. The items of work affected by the proposed changes, including any quantity variation attributable thereto.

C. The provisions of this article shall not be construed to require the Engineer to consider any cost reduction proposal which may be submitted hereunder.

1. Proposed changes in basic design of a bridge or pavement type will not be considered an acceptable proposal.

2. The Contracting Authority will not be liable to the Contractor for failure to accept, or act upon, any proposal submitted pursuant to this article, or for any delays to the work attributable to any such proposal.

3. If a proposal is similar to a change in plans or specifications under consideration by the Contracting Authority for the project at the time said proposal is submitted, or if such a proposal is based on, or similar to, standard specifications, special provisions, or plans adopted by the Contracting Authority after the advertisement for the contract, the Engineer will not accept such proposals and the Contracting Authority reserves the right to make such changes without compensation to the Contractor under provisions of this article.

D. The Contractor shall continue to perform the work in accordance with contract requirements until a change order, incorporating the cost reduction proposal, has been issued. If a change order has not been issued by the date on which the Contractor's cost reduction proposal specifies that a decision thereon should be made,

or such other date as the Contractor may subsequently have specified in writing, such proposal shall be deemed rejected.

E. The Engineer shall be the sole judge of the acceptability of a cost reduction proposal and of the estimated net savings in construction costs from adopting all, or any part of, such proposal. In determining the estimated net savings, the right is reserved to disregard the contract bid prices if, in the judgment of the Engineer, such prices do not represent a fair measure of the value of work to be performed or to be deleted.

F. The Contracting Authority reserves the right, where it deems such action appropriate, to require the Contractor to share in the Contracting Authority's costs of investigating a cost reduction proposal. Where such a condition is imposed, the Contractor shall indicate his acceptance thereof in writing, and such acceptance shall constitute full authority to deduct amounts, payable to the Contracting Authority from any money due, or that may become due, to the Contractor under the contract.

G. If the Contractor's cost reduction proposal is accepted in whole or in part, such acceptance will be by change order, which shall specifically state that it is executed pursuant to this article. Such a change order shall incorporate the changes in the plans and specifications which are necessary to permit the proposal, or such part of it as has been accepted, to be put into effects and shall include any conditions upon which the Contracting Authority's approval is based, if the approval is conditional.

    1. The change order shall also set forth the estimated net savings in the cost of performing the work attributable to the proposal effectuated by the change order, and shall further provide that the Contractor be paid 50 percent of said estimated net savings amount.

H. Acceptance of the cost reduction proposal and performance of the work thereunder shall not extend the time of completion of the contract, unless specifically provided for in the change order authorizing use of the proposal.

I. The amount specified to be paid to the Contractor in the change order which effectuates a cost reduction proposal shall constitute full compensation to the Contractor for the proposal and performance of the work thereof pursuant to the said change order.

J. The Contracting Authority expressly reserves the right to adopt a cost reduction proposal, for general use on contracts administered by the Contracting Authority, when it determines that said proposal is suitable for application to other contracts.

    1. When an accepted proposal is adopted for general use, only the contractor who first submitted such proposal will be eligible for compensation pursuant to this article, and in that case, only to those contracts awarded to him/her prior to submission of the accepted proposal and as to which such proposal is also submitted and accepted.

    2. Cost reduction proposals identical or similar to previously submitted proposals will be eligible for consideration and compensation under provisions of this article, if the identical or similar previously submitted proposals were not adopted for general application to other contracts administered by the Contracting Authority.

    3. Subject to the provisions contained herein, the State or any other public agency shall have the right to use all, or any part of any submitted cost reduction proposal without obligation or compensation of any kind to the Contractor.

## PART 1106. CONTROL OF MATERIAL

### 1106.01 QUALITY OF MATERIALS

A. It is the intent of the specifications that first-class materials shall be used throughout the work, and that these first-class materials shall be incorporated in such a manner as to produce completed construction which is acceptable in every detail. Only materials conforming to the requirements of these specifications, approved by the Contracting Authority, shall be incorporated into the work

B. When more than one kind of manufacture of a material is specified, the option will be with the Contractor, but the choice shall be confined to the materials mentioned.

C. Whenever in any of the contract documents, an item of material or equipment is defined by describing a proprietary product or by using the name of a manufacturer or vendor, the terms "or equivalent", or "or equal", if not inserted, shall be implied. This specific item of material or equipment mentioned shall be understood as establishing a standard of type, function, efficiency, minimum basis of design, and quality desired. Other manufacturer's products of comparable quality, design and efficiency, and suitable for the service intended will be considered, but no change will be made without written approval of the Contracting Authority.

D. Requests for materials substitutions must be submitted in duplicate, or in the quantities required elsewhere in the specifications, and meet the requirements of 1103.09

E. **1106.02 SOURCE OF MATERIALS**

A. At the option of the Engineer, the source of supply of each material shall be approved by the Contracting Authority before the delivery is stated.

1. If requested by the Contracting Authority, representative preliminary samples, of prescribed character and quality, tested in accordance with the methods referred to under samples and tests, shall be submitted by the contractor or producer for examination.

2. All materials proposed to be used may be inspected or tested at anytime during their preparation and use.

3. If, after trial, it is found that sources of supply which have been approved do not furnish a uniform product or if products from any source do not meet the specifications, at any time, the Contractor shall furnish approved material from other approved sources. No material which, after approval has in any way become unfit for use, shall be used in the work.

### 1106.03 SAMPLES AND TESTS

A. Each consignment of materials required by the Engineer, shall be tested or inspected before being incorporated into the work and approved by the same Engineer before it is used.

1. The contractor shall afford facilities for collecting and forwarding samples as the Engineer may require.

2. Unless otherwise designated in the standard, supplemental specifications, or instructional memorandums, the inspection, sampling, testing, and basis of acceptance of materials shall be in accordance with the current AASHTO "Standard Specifications for Sampling and Testing of Transportation Materials" including published interim standards.

### 1106.04 STORAGE OF MATERIALS

A. The Contractor shall be responsible for care and storage of materials delivered for the work or purchased for use thereon. Material which has been delivered and has become damaged before actual incorporation in the work may be rejected by the Engineer even though it may have been previously acceptable. Stored materials shall be located to facilitate thorough inspections.

**1106.05 UNACCEPTABLE MATERIALS**

A. All materials not conforming to requirements of the specifications at the time they are to be used shall be considered unacceptable, and all such materials will be rejected and shall be removed immediately from the work site, unless otherwise instructed by the Engineer. No rejected materials the defects of which have been corrected shall be used until approval has been received.

## PART 1107. LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

**1107.01 LAWS TO BE OBSERVED**

A. The Contractor is presumed to be familiar with all laws, ordinances, and regulations that may, in any manner, affect those engaged or employed by the Contractor, the materials or equipment used, or which may in any way, affect the conduct of the Contractor's work. The Contractor shall conduct his work to avoid conflict with any such laws, ordinances, or regulations, and shall save harmless the Contracting Authority and its representatives against any claim arising from violation thereof.

B. The Contractor shall give preference to Iowa domestic labor, in accordance with the provisions of Chapter 73 of the Code of Iowa, and this provision is hereby specifically made a part of any contract of which these contract documents are a part. A person shall be deemed a domestic laborer of this state if he/she is a citizen and has resided in this state for more than six months.

C. The provisions of Chapter 73 of the Code of Iowa concerning preferences for Iowa products and labor shall not apply to contracts involving work financed wholly, or in part, by the federal government.

D. The Contractor and all subcontractors shall have on file with the Contracting Authority, a valid state of Iowa contractors registration number, issued by the Iowa Department of Labor Services, in accordance with Chapter 91C of the Code of Iowa.

**1107.02 LIABILITY INSURANCE**

A. It shall be the Contractor's responsibility to have liability insurance covering all of the construction operations incident to completion of this contract. The Contractor must have on file, with the Contracting Authority, a current "Certificate of Insurance" prior to award of contract. The certificate shall identify the following: insurance company firm name and address, contractor firm names policy period, type of policy, limits of coverage, and scope of work covered, (single project or statewide).

1. This requirement shall apply with equal forces whether the work is performed by -- (1) persons employed directly by the Contractors (2) by a subcontractor or his employees, or (3) by an independent contractor.

B. In addition to the above, the Contracting Authority shall be included as an insured party, or a separate owner's protective policy shall be filed showing the Contracting Authority as an insured party.

C. The liability insurance shall be written by an insurance company (or companies) qualified to do business in Iowa. For independent contractors engaged solely in the transportation of materials, the minimum coverage provided by such insurance shall not be less than required by Chapter 327, Code of Iowa, for truck operators or contract carriers as defined therein. For all other contractors, subcontractors, and independent contractors, the minimum coverage by such insurance shall be as follows:

Public Liability Insurance
Per person - $100,000.00
Each occurrence - $300,000.00
Property Damage Insurance
Each occurrence - $50,000.00

D. Failure on the part of the Contractor to comply with the requirements of this article will be considered sufficient cause to suspend the work, withhold estimates, and to deny the Contractor from receiving further contract awards, as provided in 1103.01.

**1107.03 PATENTS AND ROYALTIES**

A. The Contractor shall be responsible for all claims for infringement of patents, or for royalties on tools, machinery, appliances, devices, or materials used in construction and completion of the work, except as are specifically required by the contract documents.

1. The Contractor agrees that the Department may retain out of the money that is or may become due the Contractor an amount to cover all such claims and to retain the same, until all such claims are paid or adjusted.

B. The Contracting Authority assumes responsibility for payment of claims for damages from patent or copyright infringement or for royalties on material processes, specifications, or types of construction that are required by the contract documents.

**1107.04 RESTORATION OF CONSTRUCTION WORK OPENED BY PERMIT**

A. Prior to final acceptance, if any repairs to the work constructed hereunder are made necessary by construction or repair of drains or sewers, laying or repairing of pipes or conduits for telegraphy, telephone or electric wires, or from any other disturbance of said work under permission issued by the Contracting Authority, the Contractor shall, upon notification by the Engineer, immediately make necessary repairs in conformity with the specifications.

1. Such repairs shall be paid for as extra work, however, no compensation will be allowed when such repairs are made necessary by the Contractor's negligence or carelessness.

B. The Contractor shall not authorize any person or persons to make alterations or additions to the construction work unless a permit duly authorized by the Contracting Authority is presented.

**1107.05 FEDERAL PARTICIPATION**

A. The attention of the Contractor is called to the provisions of the Acts of Congress known as the "Land and Water Conservation Fund Act", the "Federal Aid in Wildlife Restoration Act", the "Federal Aid in Fish Restoration Act", the "Boating Safety Act", the "Superfund Amendments and Reauthorization Act ", the " Clean Water Act" and amendments thereto, and any other acts of congress providing for fish and wildlife of conservation improvements.

1. When the United States Government is to pay for all or any portion of the cost of an improvement or project, the construction work, although it is under the direct supervision of the Contracting Authority and subject to the laws of the State of Iowa, is also subject to the above mentioned Acts of Congress and all rules, regulations, and reimbursements that may be imposed by the federal authority thereunder. Such construction work will, therefore, be subject to inspection by the duly authorized agents of the federal government, but such inspections will not make the federal government a party to the contract.

B. On all contracts involving Federal aid, all steel products incorporated into the work must have been manufactured in the United States. The Engineer may allow minimal amounts of these materials from foreign sources, provided the cost does not exceed 0.1 percent of the contract sum or $2,500 whichever is greater.

**1107.06 SAFETY, HEALTH, POLLUTION AND SANITATION**

A. In the performance of his contract, the Contractor shall comply with all applicable laws, rules, regulations, and ordinances governing safety, health, pollution, sanitation, noise control, and disposal of waste materials, and shall make available such additional safeguards, safety devices, protective equipment, and take such actions as are reasonably necessary to protect life and health of employees and the public.

1. The Engineer will not act as an enforcement agent for compliance of rules and regulations governing industrial safety. However, violations of properly promulgated laws, rules, regulations, and ordinances reported to the Engineer by responsible agencies may result in the issuance of a suspension order until such time as the violation is corrected.

B. The Contractor shall make adequate provisions satisfactory to the Engineer for safety of inspectors, particularly at sampling locations. Provisions shall include guards for moving belts, pulleys, and wheels near the sampling point and a stable platform to be used when sampling is to be done from an elevated location.

C. There shall be suitable retention dams, in areas where approved liquid asphaltic material, or asphalt cement are stored and used, to minimize pollution of nearby areas from effect of normal rains. The Contractor shall take other necessary precautions to prevent pollution of streams, lakes, ponds, reservoirs, and other areas with fuels, oily bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

D. The disposal by open burning of landscape waste originating on the construction site shall be permitted unless prohibited by local ordinances or regulations. However, the burning of landscape waste produced in clearing, grubbing, and construction operations shall be limited to areas located at least one-fourth mile from any inhabited buildings. Rubber tires will not be used to ignite landscape waste.

E. The Contractor shall be specifically responsible for adhering to all local burning ordinances or regulations, and to ascertain what the local burning restrictions consist of in addition to the regulation stated above and to see that all subcontractors comply with those restrictions.

F. All internal combustion engines, used for any purpose on the job, or related to the job, should be equipped with a muffler of the type recommended by the manufacturer. No internal combustion engine will be operated without a muffler. Faulty or damaged mufflers must be replaced. Machinery must be properly maintained at all times in order to limit engine noise, as well as other extraneous noise.

G. When directed by the Engineer, the Contractor shall apply moisture to the construction area and haul routes, as necessary, to prevent the spread of dust, at no expense to the Contracting Authority.

**1107.07 PUBLIC CONVENIENCE AND SAFETY**

A. The Contractor shall conduct the work as to assure the least possible obstruction to access by the residents along the project. The Contractor should schedule and conduct the work in such a way as to provide for their safety and convenience.

1. Work and materials required by the Engineer for public convenience and safety in excess of that provided for in the contract, shall be considered as provided for in 1109.03.

**1107.08 BARRICADES AND WARNING SIGNS**

A. The Contractor shall take every reasonable precaution to prevent the public from interfering with the work, and to prevent the work from interfering with the public, for providing for safety of the general public traveling to, through, within, along, and across the project, and shall take such precautions, measures, or acts as are required herein and as specifically required by the contract documents or by the Engineer. In additions the Contractor shall provide such additional safeguards as deemed necessary to protect equipment, the work, and the public at the Contractors own expense.

B. The Contractor shall erect and maintain suitable barriers, and at night, such lights, as will prevent accidents to persons or property in and around the area of work.

C. The Contractor shall provides at his own expense, such security guards as are necessary to protect equipment and to maintain proper lighting. Security guards that may be necessary for the protection of the public shall be provided by the contractor on written order from the Engineer.

D. Whenever the work is under the Contractor's control, the Contractor shall be held responsible for any damage to the newly completed portions of the work resulting from public misuse.

**1107.09 USE OF EXPLOSIVES**

A. When the use of explosives is necessary for the prosecution of the work, the Contractor shall exercise the utmost care not to endanger life or property. The Contractor shall be responsible for all damage resulting from use of explosives.

B. All explosives shall be stored in a secure manner in compliance with all laws and ordinances and in quantities maintained at a practical minimum. Storage places shall be clearly marked. Where no local laws or ordinances apply, storage shall be provided, satisfactory to the Engineer and, in general, not closer than 1,000 feet from the road or from any building, camping area , or place of human occupancy.

C. The Contractor shall notify each public utility company, having structures in proximity to the site of the work, of the intent to use explosives. Such notice shall be given sufficiently in advance to enable the companies to take such steps as they may deem necessary to protect their property from injury.

**1107.10 PROTECTION AND RESTORATION OF PROPERTY**

A. The Contractor shall replace or renew fences, sidewalks, or other property damage by reason of the work or the negligence of the Contractors employees. The Contractor shall take suitable precautions to prevent damage to telephone, telegraphy, and electric transmission lines along the highway and to pipes, conduits, and other underground structures. The Contractor shall carefully protect from disturbance all land monuments and property marks until an authorized agent has witnessed or otherwise referenced their locations and shall not remove them until so directed.

1. The Contractor shall be responsible for damage or injury to property resulting from the prosecution of his work, however, responsibility shall not extend to damage to fences, telephones, telegraph, or electric lines occupying the right-of-way unlawfully, provided due caution has been used in removing them. The Contractor's responsibility shall not be released until the work under the contract is completed and accepted.

**1107.12 RESPONSIBILITY FOR DAMAGE CLAIMS**

A. The Contractor shall indemnify and save harmless the state of Iowa, the Contracting Authority and other agencies which have concurred in the award of contract, their officers and employees, from all suits, actions, or claims of any character brought because of any injuries or damage received or sustained by any person, persons, or property because of any act, omissions or neglect in safeguarding or performing the work, or through use of unacceptable materials in constructing the work, and so much of the money due the said Contractor, under and by virtue of the contract, as may be considered reasonable and necessary by the Contracting Authority for such purpose, may be retained for the use of the State, or in case no money is due, the surety may be held until such suit or suits, action or actions, claim or claims for injuries or damages, as aforesaid, shall have been settled and suitable evidence to that effect furnished to the Contracting Authority, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence of adequate protection by public liability and property damage insurance.

1. Notwithstanding the above, it is specifically agreed between the parties executing this contract that it is not intended by any of the provisions of any part of the contract documents to create in the public or member thereof a third party beneficiary hereunder, or to authorize anyone not a party to this contract to maintain a suit for personal injuries or property damage pursuant to the terms of provisions of this contract.

2. The duties, obligations, and responsibilities of the parties to this contract with respect to third parties shall remain as imposed by law. It being the intention of the parties that indemnity herein provided shall not extend to acts of omission, of negligence for which the Contracting Authority is solely responsible. But indemnity shall extend to all claims in which the Contractor and the Contracting Authority are found to be either jointly or concurrently negligent.

B. Responsibility of the Contractor for providing warning devices, required by 1107.08 to avoid damages or injuries on any portion of the work covered by the contract, shall not cease until the work on such portion has been released by the Engineer.

1. A release shall be construed to mean a written statement by the Engineer to the effect that the Contractor may cease to maintain barriers and lights, that the work may be opened to the publics and that the Contractor is relieved of further maintenance of that portion of the work. Such release shall not constitute an acceptance of the work.

C. The Contractor's responsibility for maintenance of lights on any individual structure shall cease upon final acceptance of such structure, or when specifically released in writing by the Engineer.

**1107.13 OPENING OF SECTION OF CONSTRUCTED WORK TO THE PUBLIC**

A. When any substantial portion, part, or feature of a contract is completed to the extent that its stability and integrity is not dependent upon completion of the other item, or work required in the contract, that portion, part, or feature may be released by the Engineers after conferring with the Contractor, and opened to traffic or received for public usage prior to final approval and acceptance of all work involved in the contract.

1. The Contractor will not be responsible for damages due to the elements or the ordinary use of the public to those portions, parts, or features of the work which have been released by the Engineer.

2. The Contractor will be responsible for any damages which may be caused by defective work or failure to comply with the contract documents.

B. The above provisions relating to a release by the Engineer will be applicable only to those portions, parts, or features of the contract for which the Engineer has furnished to the Contractor a written release.

**1107.14 CONTRACTOR'S RESPONSIBILITY FOR WORK**

A. The Contractor shall be responsible for the care and maintenance of partially completed and furnished work on any portion of the project until released by the Engineer from such responsibility. It will be the Contractor's responsibility to adjust the Contractor's operation or method of operation to prevent any damage of any nature to any portion of the partially completed or completed work. Repair work shall be done promptly upon being so ordered by the Engineer.

**1107.15 CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTY AND SERVICES**

A. At points where the Contractor's operations are adjacent to properties of railway, telegraph, telephone, and power companies, or are adjacent to other property, damage to which might result in considerable expense, loss, or inconvenience. Work shall not be commenced until all arrangements necessary for the protection thereof have been made.

B. The Contractor shall cooperate with owners of underground or overhead utility lines in their removal and rearrangement operations, in order that these operations may progress in a reasonable manner, that duplication of rearrangement work may be reduced to a minimum, and that services rendered by those parties will not be unnecessarily interrupted.

C. In the event of interruption to water or utility services, as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with said authority in restoration of service.

1. If water service is interrupted, repair work shall be continuous until service is restored.

2. No work shall be undertaken around fire hydrants until provision for continued service has been approved by the local fire authority.

**1107.16 PERSONAL LIABILITY OF PUBLIC OFFICIALS**

A. In carrying out any of the provisions of the contract, or in exercising any power or authority granted to any agency or representative of the Contracting Authority thereby, there shall be no liability upon such agent or representatives including the Engineer or authorized agents, either personally or as an official of the Contracting Authority, it being understood that in such matters the agent acts as the agency and representative of the Contracting Authority.

**1107.17 NO WAIVER OF LEGAL RIGHTS**

A. The Contracting Authority shall not be precluded or stopped by any measurement, estimate, or certificate made, either before or after the completion and acceptance of the work and payment therefor, from showing the true amount and character of the work performed and materials furnished by the Contractor, or from showing that any such measurement, estimate, or certificate is untrue or incorrectly made, or that the work or materials do not, in fact, conform to the contract.

B. The Contracting Authority shall not be precluded or stopped, notwithstanding any such measurement, estimate, or certificate, and payment in accordance therewith, from recovering from the Contractor and the Contractor's sureties such damages as it may sustain by reason of the Contractor's failure to comply with the terms of his contract.

C. Neither acceptance by the Contracting Authority, or any representative of the Contracting Authority, nor any payment for or acceptance of the whole or part of the work, nor any extension of time, nor any possession taken by the Contracting Authority, shall operate as a waiver of any portion of the contract, or for any power herein reserved, or any right to damages herein provided. A waiver of any breach of contract shall not be held to be a waiver of any other or subsequent breach.

## PART 1108. PROSECUTION OF PROGRESS

### 1108.01 SUBLETTING OF CONTRACT

A. The Contractor shall perform, with his/her own organization, work amounting to not less than 30% of the total contract cost, however, any items designated in the contract as "specialty items" may be performed by subcontracts and the cost of any such specialty items so performed by subcontract may be deducted from the total cost before computing the amount of work required to be performed by the Contractor with his/her own organization.

B. Any items that have been selected as "specialty items" for the contract are listed as such in the special provisions found elsewhere in the contract documents.

C. At the time specified by the contract documents or when requested by the Engineer, the Contractor shall submit, in writing to the Contracting Authority, for approval the names of the subcontractors proposed for the work. Subcontractors may not be changed except at the request of and with the approval of the Contracting Authority.

1. The Contractor is responsible to the Contracting Authority for the acts and omissions of the subcontractors, and of their direct and indirect employees, to the same extent as the Contractor is responsible for the acts and omissions of its own employees.

2. The contract documents shall not be construed as creating any contractual relation between the subcontractor and the Contracting Authority.

D. The Contractor shall bind every subcontractor and every subcontractor agrees to be bound by the terms of the contract, the contract documents, the plans, the general conditions of the contract, the supplementary general conditions, the special conditions, and the specifications as far as applicable to the subcontractors work.

E. The subcontractor shall be bound to the Contractor by the terms of the contract, the contract documents, the plans, the general conditions, and specifications, and to assume toward the Contractor all the obligations and responsibilities that the Contractor, by those documents, assumes towards the Contracting Authority.

1. The Contractor agrees to be bound to the subcontractor by all the same obligations that the Contracting Authority assumes to the Contractor under the terms of said documents, and by all the provisions thereof affording remedies and redress to the Contractor from the Contracting Authority.

F. The Contractor shall not assign, sublet, or transfer in whole or part any of the work herein specified without the written consent of the Contracting Authority. Any such assignment, subletting, or transfer shall not in any manner relieve the Contractor from any of the responsibilities assumed herein.

G. For convenience of reference and to facilitate the letting of contracts and subcontracts, the specifications are separated into title sections. Such separations shall not, however, operate to make the Engineer an arbitrator to establish limits to the contracts between Contractor and subcontractors.

H. This article shall further be applicable to contracts involving Federal-aid participation in construction insofar as they are consistent with the required provisions for Federal-aid contracts attached to the contracts, and shall be additional specifications insofar as they cover matters not covered by the required provisions for Federal-aid contracts.

**1108.02 PROSECUTION OF WORK**

A. The proposal form may designate the contract period by either completion date, approximate starting date, of specified starting date.

B. Intermediate contract periods may be designated for completion of certain portions of the contract. The contract period for each portion and the liquidated damages, if any, will be listed in the special provisions.

C. The return of the signed and executed contract to the Contractor shall serve as notice to the Contractor that the contract bond is acceptable, that the contract is in force, and that the Contractor may complete arrangements for materials and other work in accordance with the contract documents.

D. Should delay become apparent before or after the work is started, the Engineer will immediately notify the Contractor, in writing, that work on the contract will be delayed and, if possible, the approximate duration of such delay. For delays exceeding 2 weeks, new construction dates may be established by the Engineer after consulting with the Contractor.

1. Specified Starting Date: When a starting date is specified, working days will be charged to the Contractor starting on the specified starting date or 10 days after execution of the contract, whichever is later. Starting work prior to the specified date will be considered upon request, and working days will be charged when work starts.

2. Approximate Starting Date:

    a. Site available immediately, as determined by the Engineer: Anytime after execution of the contract and on or after the approximate starting date, the Contractor may work, weather and specifications permitting. Working days will be charged any time the Contractor is working on/or after the approximate starting date. Starting work prior to the approximate starting date will be considered upon request. If allowed, working days will be charged.

    b. Site Availability Date Unknown, as determined by the Engineer: It is expected the site will be available by the approximate starting date. If it appears the site will not be available by the approximate starting date, the Engineer will inform the Contractor of the delay and if possible the duration of the delay. The Contractor may commence work, weather and specifications permitting, any time after execution of the contract and on or after the approximate starting date provided the site has become available. If work is started under these conditions, working days will be charged. Starting work before the approximate starting date and before the site is available, will be considered only after the Contractor has submitted a signed waiver of any right to claim extra compensation for damages due to delays from any cause related to the early commencement. If approved, working days will not be charged when working prior to the date of site availability. If the Contractor is working on the project when the site becomes available, working days will be first charged on the following day.

3. Specified Completion Date: The Contractor may commence work any time after execution of the contract, weather and specifications permitting.

    a. Working days will begin to be charged whenever the Contractor starts work.

4. Winter Work: The proposal may require winter work on all or portions of the project, and working days will be counted as indicated therein. When not so specified, the Contractor may work, unless advised to the contrary be the Engineers between November 15 and April 1 with no working time charged. If the best interest of the Contracting Authority so dictates, the Engineer may require the Contractor to continue work after November 15.

    a. Working days will not be charged if working time remains on November 15, and working days may be charged for days worked if no working time remains on November 15.

5. Notice to Proceed: A notice to proceed will be issued when, in the opinion of the Engineer, considering the approximate starting date, site availability, and working days allowed, failure of the Contractor to commence work places the timely completion of the project in jeopardy. The starting date in the notice to proceed will not be less than 15 calendar days after the date of the issuance of the notice. Working

days will be charged beginning with the starting date established by the notice or when the Contractor starts work if prior thereto. A notice to proceed will be issued, except:

a. It will be assumed when a specified starting date is used.

b. It will be assumed when a specified completion date is used, the number of working days allowed will be counted back from the specified completion date, exclusive of Saturdays, Sundays, and holidays, to determine the first day working days will be charged.

c. It may be included as an agreed starting date at a preconstruction conference for projects with an approximate starting date.

d. It will be assumed when the Contractor is working at the time for issuance of the notice.

e. It will be assumed, if an early work waiver is approved, as having been issued at the time of site availability, as documented in the project records.

6. Weekly Report of Working Days: Whenever the Contractor is subject to being charged with working days, the Engineer will furnish the Contractor a weekly statement indicating the working days to be charged against the Contractor for that period. Should the Contractor believe the statement to be inaccurate, a statement should be submitted to the Engineer, in writing, stating the objection and reasons, within 10 calendar days after receipt of the statement. If the Contractor fails to submit an objection within that time, the original statement may be considered as accurate and final.

7. Work Progress: The progress of the work shall be at a rate sufficient to complete the contract within the time allowed. If it appears that the rate of progress is such that the contract will not be completed within the time allowed, or if the work is not being executed in a satisfactory and workmanlike manner, the Engineer may order the Contractor to take such steps as necessary to complete the contract within the period of time specified or to prosecute the work in a satisfactory manner.

   a. If the Contractor fails to comply with such order within 2 weeks after receipt of the order, the Contractor may be disqualified from receiving any additional bidding proposals, and the Contracting Authority shall have the right to declare the contract in default and to complete the work in accordance with 1108.11.

   b. Failure of the Contracting Authority to issue such order shall not alter the Contractor's responsibility under the contract.

   c. The Contractor's sequence of operations shall be such as to cause as little inconvenience to the general public as possible.

8. Schedule of Staging: On any project, or part of a project, on an existing road where the work may prohibit or restrict public or private access that has been previously available, the Contractor may be required to submit a schedule of staging for the Engineer's approval before work is started.

   a. Preliminary work may be required in stage construction, even though the work involved in these operations is similar, in order to minimize the inconvenience to the public and those to whom access has been previously available. This requirement will apply equally to work that is subcontracted.

9. Accelerated Work Schedule: An accelerated work schedule may be required by a note on the proposal. When required, the Contractor shall marshal the necessary forces, including but not limited to: extra crews, subcontractors, extra work hours, or other acceptable methods to insure completion of the projects or various stages of the projects within the contract period and in compliance with the specifications.

   a. A work plan shall be submitted to the Engineer for review prior to commencement of work. Work will be permitted on a 24-hour-day basis and on Sundays and holidays when traffic interference exists, though work may be restricted during peak traffic periods. No credit will be allowed for delayed or slow delivery of materials. The special provisions may include other requirements or modifications for the accelerated work schedule.

10. Preconstruction Conference: The Engineer shall schedule and conduct a preconstruction conference. The Contractor and intended subcontractors shall participate in this conference. The Engineer will invite utilities and others having responsibilities or interest in the work.

**1108.03 LIMITATIONS OF OPERATIONS**

A. The Contractor shall conduct the work so as to create a minimum amount of inconvenience to the public. At anytime, when in the judgment of the Engineer, the Contractor has obstructed, closed, or is conducting his/her operations on a greater portion of the project vicinity than is necessary for the proper prosecution of the work, the Engineer may require the Contractor to finish the section on which work is in progress before work is started on any additional sections.

B. Whenever work which is being done by other contractors or subcontractors is contiguous to, or a part of the work included in this contract, the Engineer shall in case of dispute, determine and define the respective rights of the various interests involved, in order to secure the completion of all parts of the work in general harmony and with satisfactory results.

C. Except when an accelerated work schedule is required, no work will be permitted on Sundays or holidays observed by the Department of Natural Resources except with the permission of the Engineer.

1. The Contractor should request a determination of the holidays to be observed at the beginning of each calendar year.

**1108.04 METHODS AND EQUIPMENT**

A. The methods, equipment, and appliances used shall produce a satisfactory quality of work and shall be adequate to maintain the schedule of progress specified. Equipment used on any portion of the project shall be such and its use so regulated that no serious or irreparable damage to the adjacent property, or highways will result from its use. If damage does occur to the highways suitable repairs shall be made.

B. When the methods and equipment to be used by the Contractor in accomplishing the construction are not prescribed in the contract, the Contractor is free do use any methods or equipment that will accomplish the contract work in conformity with the requirements of the contract, as demonstrated to the satisfaction of the Engineer.

C. When the contract specifies that the construction be performed by use of certain methods and equipment, such methods and equipment shall be used, unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than specified in the contract, he/she may request approval from the Engineer to do so.

1. The request shall be in writing and shall include a full description of the methods and equipment proposed to be used and an explanation of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing construction work in conformity with contract requirements.

2. If after trial use of the substituted methods or equipment the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue use of the substitute method or equipment and shall complete the remaining construction with the specified method and equipment.

3. The Contractor shall remove the defective work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the construction items involved or in contract time as a result of authorizing a change in methods or equipment under these provisions.

**1108.05 CHARACTER OF WORKERS**

A. Any employee of the Contractor who is careless, incompetent, or disorderly, or who refuses or neglects to perform work in accordance with the specifications, or who shall commit trespass upon any public or private property in the vicinity of the work, shall be discharged upon the written request of the Engineer and shall not be reemployed on any of the work unless written permission is given by the Engineer.

**1108.06 TEMPORARY SUSPENSION OF WORK**

A. Work shall be suspended, wholly or in part when, in the opinion of the Engineer, weather or other conditions are unfavorable to its satisfactory prosecution.

1. Work shall also be suspended at the direction of the Engineer pending settlement of disputes arising of failure of the Contractor to comply with provisions of the contract. Written notice of suspension of work shall be given by the Engineer.

2. When the conditions causing suspension no longer exists, written notice to resume work will be given to the Contractor by the Engineer. Promptly after such written notices the Contractor shall resume prosecution of the work as provided in 1106.02.

B. The start of work may be delayed or work may be suspended upon request of the Contractor and with approval of the Engineer. The Engineer may require the request to be in writing and also may require the Contractor to include with the request a schedule for satisfactory completion of the work.

**1108.07 EXTENSION OF CONTRACT PERIOD**

A. An extension of the contract period will be granted by the Engineer for additional work requiring additional construction time and may result from a modification of the plans or extra work.

1. If any delay is caused by active interference by the Contracting Authority, the Contracting Authority will grant such an extension of time for completion of the contract as will, in the opinion of the Engineer, compensate for such delay. An extension of the contract period will be granted by the Contracting Authority for:

a. Additional work resulting from a modification of the plans for the project, or

b. Other reasons beyond the control of the Contractor which, in the Contracting Authority's judgment would justify such extension.

A. All claims for extension of the contract period shall be made in writing to the Engineer no more than thirty days after the occurrence of the delays otherwise they shall be waived. In the case of continuing cause of delays only one claim is necessary.

**1108.08 LIQUIDATED DAMAGES**

A. Time is an essential element of the contract and it is important that the work be pressed vigorously to completion.

B. For each calendar day that any work shall remain uncompleted after the end of the contract period, number of working days allowed, or any extension granted under 1108.07, the amount per calendar day specified in the proposal form will be assessed, not as a penalty, but as predetermined and agreed liquidated damages.

1. The Contracting Authority will prepare and forward to the Contractor an invoice for such liquidated damages.

2. The final payment will be withheld until payment shall have been made on this invoice.

C. Assessment of liquidated damages will be based only on the number of working days required to complete the work in excess of the specified working days allowed, plus authorized extensions thereto.

D. This provision for the assessment of liquidated damages for failure to complete work within the contract period does not constitute a waiver of the Contracting Authority's right to collect any additional damages other than time delays which the Contracting Authority may sustain by failure of the Contractor to carry out the terms of the contract.

**1108.09 FAILURE TO COMPLETE WORK WITHIN CONTRACT PERIOD**

A. If the Contractor fails to complete his work within the contract periods or any extension thereof, as provided in 1108.07, upon written notice to the Contractor and surety, said contract shall be in default. The

Contracting Authority may, at its option, permit the Contractor or the Contractor's surety to complete the work included in the contracts or may proceed to complete the work in accordance with 1106.11. In either event, the Contractor or the Contractor's surety shall be responsible for all costs incident to the completion of the work, and also for the liquidated damages stipulated in the proposal form. The Contracting Authority may waive such portion of the liquidated damages as may accrue after the work is in condition for safe and convenient use by the public.

**1108.10 CONTRACTS IN DEFAULT**

A. The Contracting Authority may declare a contract in default for any one of the following reasons:

1. Failure to complete the work within the contract period or any extension thereof,

2. Failure or refusal to comply with an order of the Engineer within a reasonable time,

3. Failure or refusal to remove rejected materials,

4. Failure or refusal to correct any defective or unacceptable work,

5. Bankruptcy or insolvency, or the making of an assignment for the benefit of creditors,

6. Failure to carry on the work in an acceptable manner.

**1108.11 COMPLETION OF CONTRACTS IN DEFAULT**

A. If for any reason a contract is declared in default, the Contracting Authority shall have the right, without process or action at law, to take over all or any portion of the work and complete it, at its option, either by day labor or by reletting the work.

1. Written notice shall be given the Contractor by the Contracting Authority that the contract has been declared in default, and upon receiving such notices the Contractor shall peaceably relinquish possession of the said work or the parts thereof specified in the notice.

B. The Contracting Authority may, at its option and, at a rental which it considers reasonable, retain all material, equipment, and tools on the work until the work has been completed.

C. Neither the Contracting Authority nor any member or employee thereof shall be in any way liable or accountable to the Contractor or the Contractor's surety for the method by which the completion of said work, or any portion thereof, may be accomplished, or for the price paid therefor.

1. Should the cost of completing work be in excess of the original contract prices the Contractor and the Contractor's surety shall be held responsible for such excess cost.

2. Should the cost of such completion, including all proper charges, be less than the original contract price, the amount so saved shall be paid to the Contractor.

3. Neither by taking over the work nor by declaring the contract in default shall the Contracting Authority forfeit the right to recover damages from the Contractor or the Contractor's surety for failure to complete the entire contract.

**1108.12 REMOVAL OF EQUIPMENT**

A. In the case of cancellation of this contract before completion from any cause whatsoever, the Contractor, if notified to do so by the Contracting Authority, shall promptly remove any part or all of his equipment and supplies from the property of the Contracting Authority. In the event of failure of the Contractor to remove such equipment and supplies within thirty days after the issuance of the notification for removal, the Contracting Authority shall have the right to remove such equipment and supplies at the expense of the Contractor.

### 1108.13 ORDER OF COMPLETION AND USE OF COMPLETED PORTIONS OF THE WORK

A. The Contractor shall complete any portion or portions of the work in such order of time as the Engineer may require. The Contracting Authority shall have the right to take possession of, and use any completed or partially completed portion of the work at anytime, but such taking possession and use shall not be deemed as acceptance of the work so taken or used or any part thereof. If such prior use increases the cost or delays the work, the Contractor shall be entitled to such extra compensation or extension of time, or both, as determined by the Engineer.

### 1108.14 METHOD OF SERVING NOTICES

A. Any notice to be given by the Contracting Authority to the Contractor under this contract shall be deemed to be served if delivered to any office used by the Contractor, or foreman, or agent, at or near the work, or deposited in the post office, postpaid, addressed to the Contractor at the last known place of business.

### 1108.15 TERMINATION OF CONTRACTOR'S RESPONSIBILITY

A. The contract shall be considered completed when the work has been accepted in writing by the Contracting Authority.

1. Such acceptance shall release the Contractor from all further obligation with respect thereto, except as to conditions and requirements set forth in the performance bond, and if, within one year after the final acceptance or a longer period of time, as may be prescribed by law or by the terms of any applicable guarantee required by the contract documents, any of the work is found to be defective or not in accordance with the contract documents, the Contractor shall correct it promptly after receipt of a written notice from the Contracting Authority to do so unless the Contracting Authority has previously given the Contractor a written acceptance of such conditions specifically starting the condition that is accepted.

2. The Contracting Authority shall give such notice promptly after discovery of the condition. All such defective or non comforming work shall be removed from the site if necessary, and the work shall be corrected to comply with the contract documents without cost to the Contracting Authority.

B. The Contractor shall bear the cost of making good, all work destroyed or damaged by such removal or correction of separate contractors.

## PART 1109. MEASUREMENT AND PAYMENT

### 1109.01 MEASUREMENT OF QUANTITIES

A. The work completed under the contract shall be measured according to United States standard measures. Payment will be based on the actual quantity of work performed under the various work classifications in the contract, unless otherwise provided below, or by the method of measurement for the various classes of work.

B. By written agreement between the Contractor and the Engineer, final settlement may be made on the basis of contract quantities without final field measurements. Such an agreement may be made before work is started or after work has been completed, if no material deviation from the original plans is involved.

1. Except for those items for which quantities cannot be accurately predetermined, the contract quantities have been accurately and properly estimated, but adjustments will be made for obvious errors or authorized changes.

2. The Engineer shall exercise such controls and make such measurements, as are necessary, to assure that each item of work is done in substantial compliance with the contract documents. The use of this agreement for payment shall not be considered as a change in the contract.

### 1109.02 SCOPE OF PAYMENT

A. The Contractor shall accept the compensation herein provided as full payment for furnishing all materials labor, tools, and equipment for performing all work under the contract or any extension thereof allowed under 1108.07, also, for all costs arising from the action of the elements or other natural causes, agreements, and performance, nonperformance, or delays involving other contractors and third parties, or injunctions or lawsuits resulting therefrom, or from any unforeseen difficulties not otherwise provided for in the specifications and which may be encountered during prosecution of the work and up to the time of acceptance thereof, except damage to the work due to acts of war. Nothing herein shall in itself be construed to prejudice or deny any claim filed under provisions 1109.12.

B. The contract price for any item shall be full compensation for acceptable work and for materials, equipment, tools, and labor for performance of all work necessary to complete the item in accordance with the plans and specifications, except as specifically exempt in the clauses covering the basis of payment for the item.

**1109.03 ADJUSTMENT IN CONTRACT PRICE**

A. When the measured quantity of any item varies by more than 20% from the estimated quantity specified in the contracts an adjustment in price may be made for such item of work, and the adjustment will be made on the full variance from the contract quantity. Such adjustment may be requested by either party to the Contract.

1. If the contract sum for an item is less than five thousand ($5,000.00) dollars, the price of that item will not be subject to adjustment.

B. If the increase or decrease in quantity is due to an alteration in plans, any price adjustment shall be requested and agreed upon before the work is done. If the increase or decrease in quantity is not the result of an alteration in plans, but results from errors in original estimates, or unforeseen conditions, price adjustments may be requested after the work is completed.

C. In making price adjustments, consideration shall be given to the portion of the cost of the work that can be classified as fixed costs, independent of the exact quantity of work performed, such as transportation and installation costs on equipment, overhead costs, etc. Any price adjustment shall be arrived at from the standpoint that neither party to the contract shall be penalized by the increase or decrease in quantities which occasioned the price adjustment.

D. If changes or alterations, as outlined in 1105.04, result in a substantial increase or decrease in cost or difficulty of the work, appropriate modifications will be made in the contract by extra work order, regardless of the quantity.

E. All price adjustments shall be agreed to by the Engineer and the Contractor and shall be subject to the approval of the Contracting Authority.

**1109.04 PAYMENT FOR WORK PERFORMED**

A. All contract price adjustments approved by the Engineer shall be subject to the concurrence of the Contracting Authority.

B. The Contractor will receive and accept payment for work performed under his contract as follows:

1. Items or Work Performed Which Are Covered by Definite Prices Stipulated in the Contract: For all items of acceptable work performed which are covered by definite unit prices or lump-sum amounts specified in the contract, the Contractor shall receive and accept compensation at the rate specified in the contract, except as provided in 1109.03 and for items identified as that of "significant change" as provided in 1109.17.

2. Extra Work: Extra work ordered by the Engineer, of a quality or class not covered by the contract, will be paid for, either at an agreed price or on a force-account basis.

3. Agreed-Price Basis: For extra work ordered by the Engineer and performed on an agreed-price basis, the Engineer and the Contractor shall enter into a written agreement before such work is undertaken. This written agreement shall describe the extra work that is to be done and shall specify the agreed price or prices.

4. Force-Account Basis: Extra work performed on a force-account basis will be paid for in the following manner:

    a. For laborers, timekeepers, foremen, and superintendents, the Contractor shall receive the rate of wage shown on previous payrolls for the time they are actually engaged in the extra work, to which shall be added an amount negotiated up to 15% thereof, plus the amount of social security tax imposed by law upon the Contractor because of such force-account work, plus the cost of worker's compensation, public liability insurance, and employment security contributions. The percentage shall cover compensation for furnishing of necessary small tools for the work together with all other overhead expense items.

    b. The wage of the superintendent, timekeeper, or foreman who is employed partly on force-account work and partly on other work shall be prorated between the two classes of work according to the number of persons shown by the payroll, as employed on each class of work.

    c. For materials used on force-account work, the Contractor shall receive the actual cost of materials delivered on the work, including the freight and handling charges as shown by original receipted bills, to which cost shall be added an amount negotiated to 15% thereof.

    d. For machinery, tools, or equipment, fuel and lubricants therefor, except small hand tools which may be used, the Engineer shall allow the Contractor a reasonable rental rate to be agreed upon in writing before such work is begun. No profit percentage shall be added to the rate.

    e. Compensation, as herein provided, shall be accepted by the Contractor as payment in full for extra work done on a force-account basis. It will be assumed that such payment includes the use of tools and equipment for which no rate is allowed, overheads and profit.

    f. At the end of each day, the Contractor shall prepare payrolls in duplicate for labor furnished on a force-account basis, using the Contracting Authority's standard force-account forms. Both copies shall be signed by the inspector and Contractor's representative. One copy shall be furnished to the Engineer and one to the contractor.

    g. Claims for extra work performed on a force-account basis shall be submitted to the Engineer in triplicate. To the claims shall be attached such receipt or statements as the Engineer may require in support of such claims. Such claims shall be filed not later than the tenth day of the month following that in which the work was actually performed, and shall include all labor charges, rental charges on machinery, tools, and equipment, and all material charges insofar as they are available.

5. Deficient Work: Payment for work judged by the Engineer to be deficient work shall be made at the reduced rate specified in the contract documents or, if no such rate is specified, at a modification of the contract prices as determined by the Engineer.

**1109.05 CANCELLED WORK**

A. The Contracting Authority shall have the right to cancel any or all items from the contract when unforeseen circumstances, failure to secure permits, approvals, loss of funding, unanticipated design changes, or other reasons beyond the control of the Contractor prevent or unreasonably delay completion of the contract, or of certain items of the contract, or when the Contracting Authority determines that cancellation is in the public or national interest.

B. The Contractor may be prevented from starting work on a contract, or an identified phase of a contract, as a result of a delay caused by the Contracting Authority or others.

C. When the contract period is defined by approximate starting date and the delay prevents the Contractor's starting work on the contract or an identified phase of the contract for 30 days beyond the date which, by notice to the Engineer, the Contractor proposed to start work, the Contractor may request cancellation by written notice to the Engineers stating the reasons.

D. In either case, within 30 days from the date of the request, the Engineer will eliminate or minimize, if possible, the cause for the delay and issue a notice to proceed, redefine the basis on which the work is to proceed, or cancel the contract or phase of the contract.

E. The Contractor shall not use delays that occur prior to starting work or an identified phase of the work as a basis of a claim against the Contracting Authority except for an extension of contract period.

F. Notices described in this article should be transmitted by certified mail.

G. For finished portions of items canceled, the Contractor will be paid at the contract unit prices, in accordance with the provisions of 1109.04. For finished portions of major items canceled, the Contractor will be paid as provided in 1109.17. For all items, materials ordered and delivered for the unfinished portion of such canceled, or omitted items, the Contracting Authority will pay cost plus 10 percent as an overhead charge. The Contractor's expense for work of handling or transporting such material shall be included in computing the cost.

H. The Contracting Authority will also pay any actual expenses sustained by the Contractor by reason of such cancellation or omission and not represented by work completed or material delivered. In computation of material cost or expenses sustained, no anticipated profit will be included.

1. Material paid for shall become the property of the Contracting Authority and shall be disposed of as directed by the Engineer.

**1109.06 PARTIAL PAYMENTS**

A. If the work extends over a period of more than one month, the Engineer may, upon request from the Contractor, prepare monthly estimates based on the amount of work completed in an acceptable manner.

1. On contracts for which the contract sum is $10,000.00 or more, monthly estimates may be allowed, based on 90% of invoiced value of processed or fabricated materials which have been delivered on the project site, provided the materials are of acceptable quality and the manner of storage is satisfactory to the Engineer.

2. The Engineer's monthly estimates shall be partial payments on the contract, and the allowance of a monthly estimate by the Contracting Authority does not constitute final acceptance of the work upon which the estimates are based. Each estimate shall be filed by the Contractor in the form of a claim against the Contracting Authority and certified to by the Engineer on a payment request form supplied by the Contracting Authority.

B. Five percent (5%) of each progress estimate shall be deducted and held as a suspended payment. Payments may be made on the remainder of the progress estimate, except under circumstances which would prejudice the rights of those who have filed claims pursuant to Chapter 573, Code of Iowa.

1. The retained percentage will not be due and payable for a period of at least 30 days after the date of final acceptance of the entire contract or following the release or adjudication of claims that may have been filed, or until the Contractor has filed the sworn final estimate and sales and use tax statement with the Contracting Authority.

2. Should a reasonable doubt arise as to the integrity of any part of the completed work, the estimate for that portion shall not be allowed until the cause for such doubt has been removed.

3. The progress estimates and payments are approximate only, and shall be subject to correction in the final estimate and payment.

C. Failure to make partial payment within 30 days after receipt and approval of the monthly estimate by the Engineer, will cause interest to accrue and additional payment therefor to be made in accordance with provisions of Chapter 573, Code of Iowa, subject to limitations included therein.

**1109.07 SUPPLEMENTAL CONTRACT FOR WORK INTERRUPTED**

A. After ninety-five (95%) of the work has been performed to the satisfaction of the Contracting Authority, including consideration of the contract period, and it is apparent that conditions beyond the control of the Contractor will delay the completion of the contract for more than 60 days, the Contractor may request a supplemental contract for the uncompleted portion of work on the same terms as those of the original contract.

1. If the Contracting Authority agrees, and the surety for the Contractors consents to the extension of the bond for the time required to complete the supplemental contract, the supplemental contact will be issued. After the contract has been entered into, full payment will be made for the work completed, except under circumstances which would prejudice the rights of those who have filed claims pursuant to Chapter 573, Code of Iowa.

B. The unpaid money, held by the Contracting Authority as a retainer of the original contract price, will be due and payable to the Contractor 30 days after the date of the Contracting Authority's approval of the supplemental contract, except as provided for the release and adjudication of claims in 1109.06.

**1109.08 CERTIFIED STATEMENT OF SALES TAX AND USE TAX PAID**

A. Unless the Contracting Authority has issue an authorization letter and a Sales Tax Exemption Certificate for this project, before final payment can be made on a contract, the Contractor and subcontractors shall file a certified statement on forms provided by the Contracting Authority, showing the amount of Iowa sales tax and use tax paid by them on all materials which have become a component part of the finished, completed contract and on such supplies for this construction as were actually consumed on this work.

B. These statements shall be submitted in duplicate to the Contracting Authority at the completion of the contract.

**1109.09 ASSIGNMENT OF MONIES**

A. The Contractor shall not assign, by power of attorney or otherwise, any of the monies to become due and payable under this agreement unless the Contractor has received written consent of the Contracting Authority.

**1109.10 SUBMITTALS REQUIRED BEFORE FINAL PAYMENT**

A. Before final payment can be made on this contract, the Contractor shall submit to the Engineer the following:

1. A request for prefinal and final payment.

2. One copy of any guarantees for products incorporated into the work.

3. Two copies of the operating instructions on each piece of equipment incorporated into the work.

4. Statements of Sales Tax from the Contractor and subcontractors, unless in receipt of an authorization letter and a Sales tax Exemption Certificate issued by the Contracting Authority fo this project.

**1109.11 FINAL ACCEPTANCE AND PAYMENT**

A. Final acceptance is stipulated to mean a written acceptance by the Contracting Authority. The Contracting Authority shall make final acceptance promptly upon the satisfactory completion of the work. Final payment shall be made as soon as possible following the expiration of statutory time for filing claims, or following adjudication or release of claims against the amount withheld.

B. Failure to make final payment within 70 days after completion of the work, and if all requirements of the contract are completed, will cause interest to accrue and additional payment therefor to be made in accordance with provisions of Chapter 573, Code of Iowa, subject to limitations included therein, however, this provision shall not apply when final payment includes a supplemental contract for work interrupted, as provided for in 1109.07.

C. Completion of the work will be considered as the date of approval and work acceptance by the Contracting Authority. When interest is to be paid, the date from which interest is to be calculated will be the thirty-first day after all required materials, certifications, and other documentation required to be submitted by the Contractor are received by the Engineer, however, the Contractor will be paid no interest if final payment is made within 70 days from the date of approval and work acceptance. The signed final payment request is not required documentation, but if not returned to the Engineer within 30 days, it will be considered required documentation.

D. Signing of the final payment request or acceptance of payment based thereon, shall not waive any rights of either party in the resolution of any claim filed in accordance with 1109.12.

E. The Contracting Authority shall satisfy itself as to the faithful completion of each part of the work, and may reject any portion found to be inconsistent with the terms of the contract.

**1109.12 DISPUTED CLAIMS FOR EXTRA COMPENSATION**

A. In any case where the Contractor deems that extra compensation is due for work or material not clearly covered in the contract and not ordered by the Engineer as extra work as defined herein, the Contractor shall notify the Engineer in writing of the intention to make a claim for extra compensation before beginning the work on which the claim is based.

B. The Contracting Authority shall be responsible for damages attributable to the performance, nonperformance, or delay of any other contractor, governmental agency, utility, firm, corporation, or individual authorized to do work on the project, only when such damage is a result from negligence on the part of the Contracting Authority, Engineer, or any of its officers or employees.

1. In any case where the Contractor deems that extra compensation is due from the Contracting Authority as damages resulting from such performances, nonperformances, or delays, the Contractor shall notify the Engineer in writing at the time the delay occurs.

C. In either cases if such notification is not given, or if after such notification is given, the Engineer is not afforded facilities for keeping strict account of actual cost, as defined for force-account construction, the Contractor thereby agrees to waive the claim for extra compensation for such work. Such notice by the Contractors and the fact that the Engineer has kept account of the cost as aforesaid, shall not be construed as establishing the validity of the claim.

1. The claims when filed, shall be in writing and in sufficient detail to permit auditing and evaluation by the Contracting Authority. Claims shall be supported by such documentary evidence as the claimant has available and shall be verified by affidavit of the claimant or other persons having knowledge of the facts.

2. In the event the claimant wishes an opportunity to present the claim in person, then the claim shall be accompanied by a written request to do so.

3. Where the claimant asks an opportunity to present the claim in person, the Contracting Authority, within a reasonable period of time after the filing of the claim, shall fix a time and place for a meeting between the claimant and the Contracting Authority or its designated representatives.

a. The Contracting Authority shall, within a reasonable time from filing of the claim or the meeting above referred to, whichever is later, rule upon the validity of the claim and notify the claimant in writing, of its ruling together with the reasons therefor. In case the claim is found to be just, in whole or in part, it shall be allowed and paid to the extent so found.

E. The Contractor shall not institute any court action against the Contracting Authority for the adjudication of any claims until such claim has first been presented to Contracting Authority pursuant to this articles and submitted to arbitration or a request for arbitration is denied pursuant to 1109.13.

**1109.13 ARBITRATION**

A. If a Contractor's claim, as outlined in 1109.12, has been disallowed, in whole or in part, then the Contractor may, within 30 days from the date the ruling of the Engineer is mailed to the Contractor, make a written request to the Engineer that the claim or claims be submitted to a board of arbitration.

1. The Engineer shall decide whether the matter is one which is subject to arbitration and shall, within 30 days of the receipt of the request for arbitration, grant or deny the request.

2. The Engineer's decisions shall be final.

B. Said board of arbitration shall consist of three persons, one to be chosen by the Engineer, one by the Contractor, and the third by the two arbitrators.

C. The arbitrators selected shall be persons experienced and familiar with construction or engineering practices in the general type of work involved in the contract, but shall not have been a regular employee or an individual retained by either party at the time involved in the controversy, or at the time of arbitration.

D. The board of arbitration shall make its own rules of procedure and shall have authority to examine records kept by the Engineer and the Contractor.

1. If the desired records are not produced within 10 days after they are requested, the board of arbitration shall proceed without them as best it may.

2. In determining the findings, or awards, or both, the majority vote of the board shall govern. Copies of the findings or awards or both, signed by the arbitrators shall be filed with the Engineer and the Contractor.

3. A majority report or minority report may be filed. The board of arbitration shall fix the cost of the proceedings, including a reasonable compensation to the arbitrators, and shall determine how the total cost shall be borne.

E. The board of arbitration shall have jurisdiction to pass upon questions involving compensation to the Contractor for work actually performed or materials furnished and upon claims for extra compensation which have not been allowed by the Engineer. Jurisdiction of the board shall not extend to:

1. A determination of quality of workmanship, or materials furnished, or to an interpretation of the intent of the plans and specifications, except as to matters of compensation.

2. Setting aside or modifying the terms or requirements of the contract.

F. The findings or awards or both, of the arbitration board, if acceptable to both parties to the contract, may become a basis for final payment.

G. If the findings of the arbitration board are unacceptable to either party to the contract, said findings may become the basis for further negotiations between the parties. If a solution agreeable to both parties has not been reached through the filing of a claims through arbitration, or if arbitration has been denied, either party may resort to whatever other methods for resolving the claim are available.

**1109.14 CLAIMS AGAINST CONTRACTOR**

A. The Contractor guarantees the payment of all just claims against him/her or any subcontractor, in connection with the work. If another contractor on the project submits a claim for alleged damages caused by delay due to the Contractor not having completed its work in a timely manner, the Contractor's bond shall remain in effect until payment of such claim is made, or until litigation is started, at which time the bond will be released.

**1109.15 TIME LIMITS FOR FINAL ADJUSTMENT**

A. The Contractor shall understand that the Contracting Authority will not be bound to consider applications for correction of estimates and payments after the Contractor has signed the final estimate, or after 30 days from the date when the final estimate is submitted to the Contractor for approval. Should an error be discovered as a result of the Contractor's annual audit, an application for corrections promptly made will be considered.

**1109.16 NATIONAL EMERGENCY PROVISIONS**

A. The Contracting Authority may, with written notice, terminate the contract, or a portion thereof, when the Contractor is prevented from proceeding with the construction contract as a direct result of an executive order of the President with respect to the prosecution of war, or in the interest of national defenses as provided in Chapter 573A of the Code of Iowa.

B. When contracts, or any portion thereof, are terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract unit prices or as mutually agreed for items of work partially completed or not started. No claim for loss of anticipated profits shall be considered.

1. Reimbursement for organization of work (when not included in the contract) and moving equipment to and from the job will be considered where the volume of work completed is too small to compensate the contractor for these expenses under the contract unit prices, the intent being that an equitable settlement will be made with the Contractor.

C. Acceptable materials, obtained by the Contractor for the work, which have been inspected, tested, and accepted by the Engineer, and which are not incorporated into the work, shall be purchased from the Contractor at actual cost, as shown by receipted bills and actual cost records, at such points of delivery as may be designated by the Engineer.

D. Termination of a contract, or a portion thereof, shall not relieve the Contractor of its responsibilities for the completed work, nor shall it relieve the Contractor's surety of its obligation for and concerning any just claims arising out of the work performed.

**1109.17 STANDARD CONTRACT CLAUSES**

A. Differing site conditions.

1. During the progress of the work, if subsurface or latent physical conditions are encountered at the site differing materially from those indicated in the contract or if unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract, are encountered at the site, the party discovering such conditions shall promptly notify the other party, in writing, of the specific differing conditions before they are disturbed and before the affected work is performed.

2. Upon written notification, the Engineer will investigate the conditions, and if he/she determines that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any work under the contract, an adjustment, excluding loss of anticipated profits, will be made and the contract modified in writing accordingly.

a. The Engineer will notify the Contractor of his/her determination whether or not an adjustment of the contract is warranted.

3. No contract adjustment which results in a benefit to the Contractor will be allowed unless the Contractor has provided the required written notice.

4. No contract adjustment will be allowed under this clause for any effects caused on unchanged work.

B. Suspension of work ordered by the Engineer.

1. If the performance of all or any portion of the work is suspended or delayed by the Engineer, in writing, for an unreasonable period of time (not originally anticipated, customary, or inherent to the construction industry) and the Contractor believes that additional compensation and/or contract time is due as a result of such suspension or delay, the Contractor shall submit to the Engineer, in writing, a request for adjustment within seven (7) calendar days of receipt of the notice to resume work. The request shall set forth the reasons and support for such adjustment.

2. Upon receipt, the Engineer will evaluate the Contractor's request. If the Engineer agrees that the cost and/or time required for the performance of the contract has increased as a result of such suspension and the suspension was caused by conditions beyond the control of and not the fault of the Contractor, its suppliers, or Subcontractors at any approved tier, and not caused by weather, the Engineer will make an adjustment, excluding profit, and modify the contract in writing accordingly.

   a. The Engineer will notify the Contractor of his/her determination, whether or not an adjustment of the contract is warranted.

3. No contract adjustment will be allowed unless the Contractor has submitted the request for adjustment within the time prescribed.

4. No contract adjustment will be allowed under this clause to the extent that performance would have been suspended or delayed by any other cause, or for which an adjustment is provided for or excluded under any other term or condition of this contract.

C. Significant changes in the character of work.

1. The Engineer reserves the right to make, in writing, at any time during the work, such changes in quantities and such alterations in the work, as are necessary to satisfactorily complete the project.

   a. Such changes in quantities and alternations shall not invalidate the contract nor release the Surety, and the Contractor agrees to perform the work as altered.

2. If the alterations or changes in quantities significantly change the character of the work under the contract, whether or not changed by any anticipated profits, adjustments will be made to the contract. The basis for the adjustment shall be agreed upon prior to the performance of the work. If such a basis cannot be agreed upon, an adjustment will be made either for or against the Contractor in such amount as the engineer may determine to be fair and equitable.

3. If the alterations or changes in quantities do not significantly change the character of the work to be performed under the contracts the altered work will be paid for as provided elsewhere in the contract.

4. The term "significant change" shall be construed to apply only to the following circumstances:

a. When the character of the work as altered, differs materially in kind or nature from that involved or included in the original proposed construction or;

b. When a major item of work, as defined elsewhere in the contract, is increased in excess of 125 percent or decreased below 75 percent of the original contract quantity, any allowance for an increase in quantity shall apply only to that portion in excess of 125 percent of original contract item quantity, or in case of a decrease below 75 percent, to the actual amount of work.

**1109.18 INTEREST PAYMENTS**

A. Interest on monthly payment estimates.

1. Interests shall be paid to the Contractor on any progress payment approved by the Chief Engineer under paragraph A of paragraph 1109.06 of these General Covenants and Provisions, which remains unpaid after thirty (30) days of the receipt by the Contracting Authority.

a. Receipt by the Contracting Authority shall be defined as the date the Contracting Authority's central office mail staff receives the progress payment request and stamp it. All progress payment requests which are delivered directly to the central office by the Contractor or the Inspector of the Contracting Authority shall have a date of receipt entered by the mail room staff.

b. Interest shall accrue on the 31st day after receipt by the Contracting Authority, if approved by the Chief Engineer, and shall end on the date the warrant is issued by the Iowa Department of Revenue. The rate of interest shall be the same as the rate of interest in effect under 453.6 of the Iowa Code, as the date interest begin to accrue.

B. Interest on retainage.

1. Interest shall be paid on any retained funds held under paragraph B of section 1109.06 of these General Covenants and Provisions. Interest shall be paid as outlined in Iowa Administrative Code section 561, Chapter 8.7.

END OF SECTION 00700

# SECTION 007100
(Revised 9/8/95)

# SPECIFIC EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES

Notice of Requirements for Affirmative Action to ensure Equal Employment Opportunity (Executive Order 11246 as amended) and Iowa Executive Orders 15 and 34. This includes employment goals for minorities and women in construction.

## 60-1.4 EQUAL OPPORTUNITY CLAUSE.

A. Federally assisted construction contracts.

1. Except as otherwise provided, each administering agency shall require the inclusion of the following language as a condition of any grant, contract, loan, insurance, or guarantee involving federally assisted construction which is not exempt from the requirements of the equal opportunity clause.

B. The applicant hereby agrees that it will 1ncorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loans insurance, or guarantee, the following equal opportunity clause:

C. During the performance of this contracts the Contractor agrees as follows:

1. The Contractor will not discriminate against any employee, or applicant for employment because of race, colors, religion, sex, national origin, or disability.

   a. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following; Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

   b. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

2. The Contractor will in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, national origin, or disability.

3. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

5. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

6. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labors or as otherwise provided by law.

7. The Contractor will include the portion of the sentence immediately preceding paragraph 1. and the provisions of paragraphs 1. through 7. in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor.

   a. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance.

   b. Provided, however, that in the event a Contractor becomes involved in, or is threatened with litigation with a subcontractor or vendor as a result of such direction by the administering agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

## I. DEFINITIONS.

A. Definitions as used in these specifications:

1. **Covered Area** means the entire State of Iowa, however, those areas of a Hometown Plan approved by the U.S. Department of Labor will be considered separately.

2. **Director** means Director, Office of Federal Contract Compliance Program, United States Department of Labor or any person to whom the Director delegates authority.

3. **Employer Identification Number** means the Federal Social Security Number used on the Employer's Quarterly Federal Tax Returns U.S, Treasury Department Form 941.

4. **Designated Geographical Areas.**

   a. **Standard Metropolitan Statistical Area (SMSA)**. These areas represent a reasoned judgement as to how metropolitan areas are defined statistically in a uniform manner, using data items that are:

      (1) widely recognized as indicative or metropolitan character, (population, urban character, nonagricultural employment, population, density, and commuting ties), and

      (2) available from a body of Federal statistics which has been uniformly and simultaneously collected in all parts of the country, and processed and tabulated according to consistent standards. Thus, if a project is located within an SMSA, it can be concluded that a reasonable commuting area exists within the SMSA, and that goals based on SMSA statistics are accurate.

   b. **Economic Area (EA)**. These areas are viewed as centers of commerce, and they generally cover areas which include the places of work and residence for most workers. There are 183 such areas, defined along county lines, covering the entire country. Counties were assigned to these economic areas in accordance with commuting patterns based primarily on data gathered by the Bureau of the Census.

5. **Minority** includes:

a. **Black** (all persons having origins in any of the Black African racial groups not of Hispanic origin);

b. **Hispanic** (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish Culture or origin, regardless of race),

c. **Asian and Pacific Islander** (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands), and

d. **American Indian or Alaskan Native** (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

(Note: Minority women from the above referenced groups shall be counted as satisfying both the minority and female employment goals in each geographic area.)

## II. GENERAL.

A. Equal Employment Opportunity requirements not to discriminate and to take affirmative action to assure equal employment opportunity as required by Executive Order 11246 and Executive Order 11375. The requirements set forth in this specification shall constitute the specific affirmative action requirements for project activities under this contract and supplement the equal employment opportunity requirements set forth in the Required Contract Provisions.

## III. EQUAL OPPORTUNITY POLICY.

A. The Contractor will accept as his/her operating policy the following statement which is designed to farther the provision of equal employment opportunity to all persons without regard to their age, race, color, religion, sex, national origin, or disability, and to promote the full realization of equal employment opportunity through a positive, continuing program.

*"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their age, race, religion, sex, color, national origin, or disability. Such action shall include: employment, upgrading, demotion, and transfer, recruitment and recruitment advertising, layoff, and termination, rates of pay and other forms of compensation, and selection of training, including apprenticeship, preapprenticeship, and/or on-the-job training."*

## IV. GOALS.

A. Specific goals for female and minority participation have been established.

B. The goals for female participation, expressed in percentage terms for the total hours worked by the Contractor's aggregate workforce in each trade on all construction work, is 6.9 percent, with no timetable. This goal applies nationwide.

1. Goals for minority participation in Iowa, expressed in percentage terms for the total hours worked by the Contractor's aggregate workforce in each trade on all construction work, are shown on the map of Iowa that follows. The goals shown apply to each designated geographical area, as shown on the map.

C. These goals are applicable to all the Contractor's construction work (whether or not it is non-Federal or Federally assisted) performed in the designated area. For each contract and/or subcontract in excess of $10,000, the goals for minority participation will apply for all work to be performed in geographical areas designated by the Director pursuant to 41 CFR 60-4.6, and the goal for female participation will apply nationwide.

1. The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on his/her implementation of the Equal Opportunity Clause, specific affirmative action obligations

required by the specifications set forth in 41 CFR 60-4.3(a), and his/her efforts to meet the goals established for minority participation for the geographical area where the work is to be performed, or nationwide goal for female participation.

2. The hours of minority and female employment and training must be substantially uniform throughout the time period for the work of the contracts and within each trade, and the Contractor shall make a good-faith effort to employ minorities and women evenly on each of his/her projects.

3. The transfer of minority or female employees or trainees from contractor to contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Orders and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

D. The Contractor shall provide written notification to the Department of Natural Resources (on behalf of the Director of the Office of Federal Contract Compliance Programs) within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under this contract.

1. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number, estimated dollar amount of the subcontract, estimated starting and completion dates of the subcontracts and the geographical area in which the contract work is to be performed.

E. Application of Minority Participation Goals.

1. **Minority Participation.** A single minority participation goal is established for each SMSA and EA. Timetables for the achievement of minority goals are not provided. A separate goal is established for each SMSA and for each EA. When a contract or subcontract to which this specification applies is for work located within a SMSA, the goal for what SMSA applies. When a contract or subcontract to which this specification applies is for work located outside an SMSA, the goal for that EA applies.

a. The applicable goal for the Contractor or subcontractors is the goal for each geographical area where the work is being performed, and all the work of the Federal or Federally assisted construction contractor or subcontractor is covered, whether the work is being performed for a contract to which the specification applies or not. Therefore, a contractor with work in SMSA "X" would apply the goal for SMSA "X" for that work. The same contractors however, would apply the SMSA "Y" goal to all his/her work in SMSA "Y", even though the Contractor's work in SMSA "Y" is neither Federal nor Federally assisted.

2. **Participation of Minority Women.** The Contractor and required subcontractors will be permitted to count minority women belonging to one of the recognized minority groups listed in Article I of this specification as satisfying both the minority goal for each designated geographic area and the overall female goals. Conversely, nonminority women will only count toward satisfying the overall female goal.

## V. STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246).

A. Whenever the Contractors or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, he/she shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation set forth herein.

B. If the Contractor is participating (pursuant to 41 CFR 60-4.5) In a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, his/her affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan.

1. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or subcontractor participating in an approved Plan is individually required to comply with his/her obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which he/she has employees.

2. The overall good faith performance by other Contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to make good faith efforts to achieve the Plan goals and timetables.

C. The Contractor shall implement the specific affirmative action standards provided in paragraphs 6a through p. Article V, of these specifications. The goals set forth in the specifications are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which he/she has employees in the covered area. The Contractor is expected to make substantially uniform progress toward his/her goals in each craft during the period specified.

D. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

E. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training program, approved by U.S. Department of Labor.

F. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluations of the Contractor's compliance with these specifications shall be based upon his/her effort to achieve maximum results form his/her actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

1. Endure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project.

    a. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of, and carry out, the Contractor's obligations to maintain such a working environments with specific attention to minority or female individuals working at such sites or such facilities.

2. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

3. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral form a union, a recruitment source, or community organization, and of what action was taken with respect to each such individual.

    a. If such individual was sent to the union hiring hall for referral and not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.

4. Provide immediate written notification to the Director, when the union or unions with which the Contractor has a collective bargaining agreement, have not referred to the Contractor a minority person or women sent

by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet his/her obligations.

5. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. Training programs may be specifically required elsewhere in the contract documents. The Contractor's responsibility for training opportunities is not necessarily limited to training programs that are specifically required. The Contractor shall provide notice of these programs to the sources compiled under 6b above.

6. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting his/her EEO obligations, by including it in any policy manual and collective bargaining agreement, by publicizing it in the company newspaper, annual report, etc., by specific review of the policy with all management personnel and with all minority and female employees, at least once a year, and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

7. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions, including specific review of these items with on-site supervisory personnel, such as superintendents, general foremen, etc. , prior to the initiation of construction work at any job site. A written record shall be made and maintained, identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

8. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to, and discussion the Contractor's EEO policy, with other Contractors and subcontractors with whom the Contractor does or anticipates doing business.

9. Direct the Contractor's recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment sources the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

10. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after schools summer, and vacation employment to minority and female youths both on the site and in other areas of the Contractor's workforce.

11. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

12. Conduct, at least annually, an inventory and evaluation, of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

13. Ensure that seniority practices, job classifications, work assignments, and other personnel practices, do not have a discriminatory effect, by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

14. Ensure that all facilities and company activities are nonsegregated, except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

15. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractor and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

16. Conduct a reviews at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

G. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (6a through p).

1. The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of the obligations under 6a through p of these specifications, provided the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet his/her individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor.

2. The obligation to comply, however, is the Contractor's, and failure of such group to fulfill an obligation shall not be a defense for the Contractor's noncompliance

H. A single overall goal for women and goals for minorities in each designated area are included in Article IV of these specifications. The Contractor is required to provide equal opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved the goal for women generally, the Contractor may be in violation of the Executive Order if a specific minority group or women are underutilized.

I. The Contractor shall not use the goal, or affirmative action standards to discriminate against any person because of age, race, color, religion, sex, national origin, or disability.

J. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts, pursuant to Executive Order 11246.

K. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

L. The Contractors in fulfilling his/her obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph G of these specifications, so as to achieve maximum results from his/her efforts to endure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

M. The Contractor shall designate a responsible official to monitor all employment-related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records.

1. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed.

2. Records shall be maintained in an easily understandable and retrievable form, however, to the degree that existing records satisfy this requirement, Contractor shall not be required to maintain separate records.

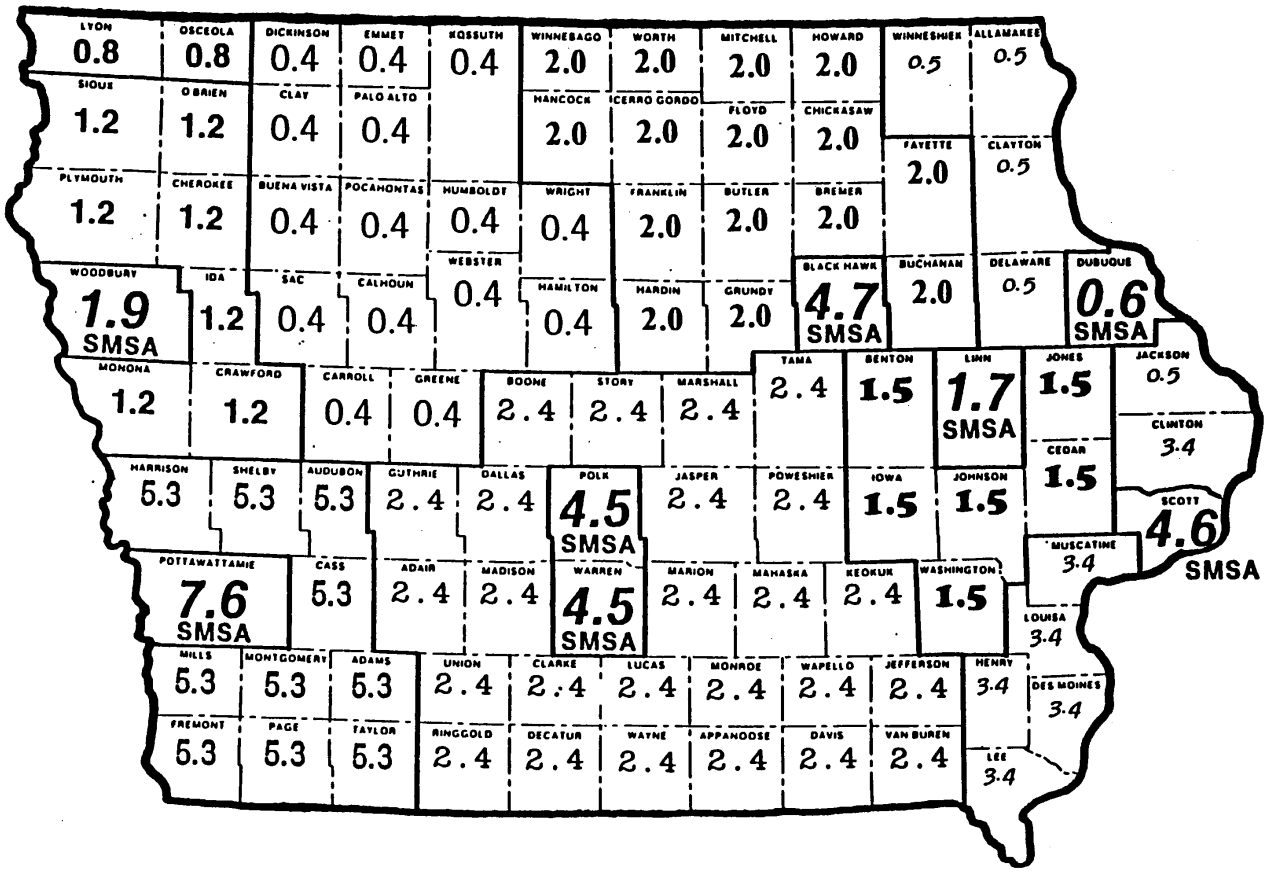
N. Nothing herein provided shall be construed as a limitation upon the application of other Iowa which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

## VI. SUPPLEMENTAL REPORTING REQUIREMENTS.

A. The Contractor and subcontractors are required to make available upon request its Affirmative Action Program containing goals and time specifications. These contractual provisions shall be fully enforced. Any breach of the provisions shall be regarded as a material breach of contract.

B. The Contractor will keep such records as are necessary to determine compliance with equal employment opportunity obligations. The records kept by the Contractor will be designed to indicate the number of minority and nonminority group members and women employed in each work classification on the project. All such records must be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the Department of Natural Resources and any Federal Agency funding any part of this project.

**"Minority employment goals are expressed as a percentage (%) of total hours worked for each craft and/or trade in each county."**



**GUIDANCE FOR MINORITY BUSINESS ENTERPRISE AND WOMEN'S BUSINESS ENTERPRISE REQUIREMENT OF 40 CFR 31.36(e)**

## I. PURPOSE

This guidance is to assist States, EPA assistance recipients, prime contractors, consultants, minority business owners and women's business owners in complying with EPA's Minority Business Enterprise (MBE) and Women's Business Enterprise (WBE) requirements in the Agency's procurement regulations, 40 CFR Part 31. This guidance provides suggestions for carrying out the affirmative steps included in EPA procurement regulations. Also included is a description of activities to be undertaken by EPA or delegated States, as well as suggestions for MBE/WBEs to take in pursuing opportunities for work in EPA-funded projects.

## II. DEFINITIONS

A. Minority Business Enterprise (MBE): A minority business enterprise is a business which is

1. certified as socially and economically disadvantaged by the Small Business Administration;

2. certified as a minority business enterprise by a State or Federal agency; or

3. an independent business concern which is at least 51 percent owned and controlled (as defined below) by minority group member(s). A minority group member is an individual who is a citizen of the United States and one of the following:

   a. Black American

   b. Hispanic American (with origins form Puerto Rio, Mexico, Cuba, South or Central America)

   c. Native American (American Indian, Eskimo, Aleut, native Hawaiian)

   d. Asian-Pacific American (with origins from Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, the U.S. Trust Territories of the Pacific, Northern Marianas, Laos, Cambodia, Taiwan or the Indian Subcontinent)

B. Women's Business Enterprise (WBE): A women's business enterprise is a business which is certified as such by a State or Federal agency, or which meets the following definition:

> A women's business enterprise enterprise is an independent business concern which is at least 51 percent owned by a woman or women who also control and operate it. Determination of whether a business is a least 51 percent owned by a woman or women shall be made without regard to community property laws. For example, an otherwise qualified WBE which is 51 percent owned by a married woman in a community state will not be disqualified because her husband has a 50 percent interest in her share. Similarly, a business that is 51 percent owned by a married man and 49 percent owned by an unmarried woman will not become a qualified WBE by virtue of his wife's 50 percent interest in his share of the business.

C. Ownership and Control:

1. The minority of women's ownership's interest in the firm must be real, substantial and continuing. Such interest may include:

   a. risk of loss/share of profit commensurate with the proportional ownership; and

   b. receipt of the customary incidents of ownership, such as salary and/or intangible benefits.

2. A minority or woman owner must have and exercise the authority to independently control the business. The minority or woman owner need not be continually present to be deemed in control. Characteristics of control may include:

   a. authority to sign contacts;

   b. making decisions in price negotiations;

   c. incurring liabilities for the firm;

   d. making final staffing decisions;

   e. policy-making; and

   f. making general company management decisions.

3. Only those firms performing a useful business function according to custom and practice in the industry are qualified as MBEs or WBEs. Acting merely as a passive conduit of funds to some other, non-minority firm where such activity is unnecessary to accomplish the project the project does not constitute a "useful business function according to custom and practice in the industry."

D. Recipient: A party receiving federal financial assistance under an EPA program pursuant to a grant or cooperative agreement.

E. Project: The scope of work from which a cooperative agreement, grant or grant amendment is awarded.

H. Bidder: A party seeking to obtain a contract with a recipient through a competitive, advertised, sealed bid process.

I. Offeror: A party seeking to obtain a contract with a recipient through a negotiated procurement process.

## IV. RESPONSIBILITIES

A. Headquarters.

1. The office in charge of the assistance program (program office) has primary responsibility for implementation of the MBE/WBE program, in cooperation with the Office of Small and Disadvantaged Business Utilization (OSDBU).

2. OSBDU is responsible for serving as the Agency focal point for inquiries on the MBE/WBE program, providing explanation of the program and guidance to MBEs and WBEs interested in working on EPA funded projects.

B. Regional Responsibilities.

1. Provide guidance and advice to recipients as requested.

2. Maintain lists of those MBE and WBE firms which have participated in EPA funded projects. The Region may also add MBEs and WBEs requesting to be included on source lists. Such lists are for information purposes only, and shall carry a clear and prominent statement that the firms listed are neither endorsed nor guaranteed by EPA as bona fide MBE/WBEs. It is not necessary to be on any list in order to qualify as a bona fide MBE/WBE.

3. Monitor recipients for compliance with MBE/WBE requirements and for determining levels of MBE/WBE participation.

## V. RECIPIENT RESPONSIBILITIES

A. The recipient shall take affirmative steps to contract with MBEs and WBEs and ensure that its contractors and consultants take affirmative steps to contract with MBEs and WBEs during all phases of work funded or to be funded under an EPA assistance agreement. The recipient's affirmative steps as defined in EPA procurement regulations are the following:

1. When feasible, dividing the total work to be contracted into smaller tasks in the solicitation documents to permit maximum MBE/WBE participation.

2. Placing qualified MBEs and WBEs on solicitation lists of EPA Regional Offices and appropriate minority/women's business associations and agencies.

3. Assuring that MBEs and WBEs are solicited whenever they are potential sources of service and supplies, for example, by:

a. Holding pre-bid conferences, with interested MBEs and WBEs in attendance when possible, to highlight the requirements of this program to prospective bidders;

b. Including this MBE/WBE interim guidance in requests for proposals (RFP) and invitations for bid (IFB);

c. Publishing announcements of MBE/WBE opportunities for work on EPA funded projects;

d. Developing a source list of MBE/WBEs and providing its list to prospective bidders/offerors;

1. The recipient may wish to engage a MBE/WBE liaison to compile the list.

2. The recipient may wish to use available lists such as those of the EPA Regional Office, adjacent municipalities, appropriate minority/women associations. Names of these agencies with address and phone number should also be included on the recipient's source list.

e. Providing necessary and appropriate liaison services between MBE/ WBEs and prospective bidders/offerors. (Liaison service should not be delegated to consultants where a potential for conflict of interest exists.)

4. When project requirements permit, establishing delivery schedules which encourage participation of MBE/WBEs.

5. Using the services and assistance of the Small Business Administration (SBA), the Minority Business Development Agency (MBDA), and other federal, State and local agencies when appropriate.

B. Unless otherwise provided in the specifications, compliance with the MBE/WBE requirement in the regulations is a matter of bidder/offeror responsibility.

C. The recipient is responsible for monitoring work in progress to ensure that MBE and WBE subcontractors and joint venturers are actually participating in the performance of the subcontract or joint venture contract and to insure that the consultant/contractor is fulfilling its obligations with respect to MBE/WBE requirements under the contract.

D. As part of the documentation required under 40 CFR 31.36(b)(9), the recipient shall maintain and update records of MBE/WBE participation and supply data to the delegated State when requested. Such records may include:

1. Name of MBE/WBEs being utilized;

2. Work designated to be performed by MBE/WBE;

3. Dollar value of that work;

4. Portion of project being performed by MBEs and WBEs.

## VI. BIDDER AND OFFEROR RESPONSIBILITIES

A. Affirmative Steps: Activities during preparation of bids and offers. Bidders/offerors shall take affirmative steps in compliance with the regulations, prior to submission of bids or closing date for receipt of initial offers, to encourage participation in projects by MBEs and WBEs. Such efforts include:

1. When feasible, segmenting total work requirements to permit maximum MBE/WBE participation.

2. Assuring the MBEs and WBEs are solicited whenever they are potential sources of goods or services. This step may include:

    a. Sending letters or making other personal contacts with MBEs and WBEs, (e.g. those whose names appear on lists prepared by EPA or the recipient and other MBE/WBEs known to the bidder/offeror). MBEs and WBEs should be contacted when other potential subcontractors are contacted, within reasonable time prior to bid submission or closing date for receipt of initial offers. Those letters or other contacts should communicate the following:

        1. Specific description of the work to be subcontracted;

        2. How and where to obtain a copy of plans and specifications or other detailed information needed to prepare a detailed price quotation;

        3. Date the quotation is due the bidder/offeror;

        4. Name, address, and phone number of the person in the bidder/offeror's firm whom the prospective MBE/WBE subcontractor should contact for additional information.

    b. Sending letters or making other personal contacts with local, State, federal and private agencies and MBE/WBE associations relevant to the project. Such contacts should provide the same information provided in the direct contacts to MBE/WBE firms.

3. Where feasible, establishing delivery schedules which will encourage participation by MBEs and WBEs.

B. Bidders/offerors must demonstrate compliance with the MBE/WBE requirements in order to be deemed responsible. Demonstration of compliance may include the following information, however the recipient may specify other methods of demonstrating compliance:

1. Names, addresses and phone numbers of MBE/WBEs expected to perform work.

2. Work to be performed by the MBEs and WBEs.

3. Aggregate dollar amount of work to be performed by MBEs and WBEs, showing aggregate to MBEs and aggregate to WBEs separately.

4. Description of contacts to MBE and WBE organizations, agencies and associations which service MBEs/WBEs, including names of organizations, agencies and associations and dates of contact.

5. Description of contacts to MBEs and WBEs, including number of contacts, fields, (i.e. equipment or material supplier, excavators, transport serviced, electrical subcontractors, plumbers, etc.) and dates of contacts.

C. Successful bidders/offerors should take reasonable affirmative steps to subcontract with MBEs and WBEs whenever additional subcontracting opportunities arise during the performance of the contract.

## VII. MBE AND WBE RESPONSIBILITIES

MBEs and WBEs are responsible for promoting themselves and taking the initiative to obtain contracts and subcontracts, and for encouraging joint venture arrangements. MBEs/WBEs interested in working on EPA funded projects are strongly encouraged to take the following steps:

A. Submit information to the recipients to identify status as a MBE/WBE.

B. Become certified as MBE/WBE under available State of federal agency procedures.

C. Contact federal, State, and local MBE/WBE liaison offices to obtain information on potential jobs.

D. Provide capability statements to State agencies, recipients, consulting engineers, and contractors, stating type(s) of work performed by the firm, size of job that the firm can handle, bonding information, and any special skills.

E. Make every effort to establish contacts and relationships with contractors for potential future business, including attending pre-bid conferences and subscribing to industry and trade journals.

F. Contact EPA Regional offices or appropriate State offices to obtain information on planned EPA funded projects.

G. Respond promptly to solicitation requests.

## VIII. REMEDIES FFOR NONCOMPLIANCE

A. Protests. A bidder/offeror for EPA funded work or MBE/WBE with an adversely affected direct financial interest may file a bid protest with the recipient pursuant to EPA procurement regulations 40 CFR 31.36(b)(12). These procedures are available to protest alleged violation of federal MBE/WBE requirements and may not be used to enforce local or State MBE/WBE requirements.

B. Upon a finding by EPA that a recipient, bidder/offeror, consultant, contractor or subcontractor has not complied with the MBE/WBE requirements of EPA regulations, EPA may invoke any and all sanctions and remedies specified in EPA regulations.

## IX. STATE OR LOCAL LAW

Nothing in this program prevents a State or recipient from applying more stringent MBE/WBE requirements or procurement obligations which pertain to bid responsiveness or percentage of MBE and WBE participation.

Recipient Certification - Anti-Lobbying Act of 1990

## U.S. Department of the Interior
# Certification Regarding Lobbying

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This certification is required by Section 1352, title 31, U.S. Code, entitled "Limitation on use of appropriated funds to influence certain Federal contracting and financial transactions."

*(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)*

Certification for Contracts, Grants, Loans, and Agreements

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The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to person for influencing or attempting to influence an officer or employee of any agency, a Member Congress, and officer or employee of Congress, or an employee of a Member of Congress in with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form -LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly.

This certification is a material representation of fact upon which reliance was placed when this was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U .S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Signature _____ Date_____

## Instructions for Certification

1. This certification and a disclosure form should be filed by each person as required, with each submission that initiates agency consideration of such person for: ( 1 ) award of a Federal contract, grant, or cooperative agreement exceeding $100,000 or (2) an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $ 150,000.

2. This certification and a disclosure form should be filed by each person as required, upon receipt by such person of(1) a Federal contract, grant, or cooperative agreement exceeding $100,000; or (2) a loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000, unless such person previously filed a certification, and a disclosure form, if required, at the time agency consideration was initiated.

3. Any person who requests or receives from a person referred to in paragraphs (1) and (2) above: (1) a subcontract exceeding $100,000 at any tier under a Federal contract; (2) a subgrant, contract, or subcontract exceeding $100,000 at any tier under a Federal grant (3) a contract or subcontract exceeding $100,000 at any tier under a Federal loan exceeding $150,000; or, (4) a contract or subcontract exceeding $100,000 at any tier under a Federal cooperative agreement, shall file a certification, and a disclosure form, as required, to the next tier above.

4. All disclosure forms, but not certifications, shall be forwarded from tier to tier until received by the person referred to in paragraphs (1) or (2) above. That Person shall forward all disclosure forms to the appropriate Bureau/Office within the Department of the Interior.

5. Any certification or disclosure form flied under paragraph (4) above shall be treated as a material representation of fact upon which all receiving tiers shall rely. All liability arising from an erroneous representation shall be borne solely by the tier filing that representation and shall not shared by any tier to which the erroneous representation is forwarded. Submitting an erroneous or disclosure constitutes a failure to file the required certification or disclosure, respectively. If a person fails to file a required certification or disclosure, the United States may pursue all available remedies, including those authorized by Section 1352, title 31. U .S. Code.

## INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subwardee or prime federal recipient, at the initiation or receipt of a covered federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with a covered federal action. Use the SF-LLL-A Continuation Sheet for additional information if the space on the form is inadequate. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered federal action.

2. Identify the status of the covered federal action.

3. Identify the appropriate classification of this report. If this is a follow-up report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered federal action.

4. Enter the full name, address, city, state and zip code of the reporting entity. Include congressional district, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee (e.g., the first subawardee of the prime is the first tier). Subawards include, but are not limited to, subcontracts, subgrants and contract awards under grants.

5. If the organization filling the report in Item 4 checks "Subawardee," then enter the full name, address, city, state and zip code of the prime federal recipient. Include congressional district, if known.

6. Enter the name of the federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.

7. Enter the federal program name or description for the covered federal action (Item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.

8. Enter the most appropriate federal identifying number available for the federal action identified in Item 1 (e.g., Request for Proposal (RFP) number; Invitation for Bid (IFB) number; grant announcement number; the contract, grant or loan award number; the application/proposal control number assigned by the federal agency). Include prefixes (e.g., "RFP-DE-90-001").

9. For a covered federal action where there has been an award or loan commitment by the federal agency, enter the federal amount of the award/loan commitment for the prime entity identified in Item 4 or 5.

10. (a) Enter the full name, address, city, state and zip code of the lobbying entity engaged by the reporting entity identified in Item 4 to influence the covered federal action.

    (b) Enter the full names of the individual(s) performing services, and include full address if different from 10(a). Enter last name, first name and middle initial (MI).

11. Enter the amount of compensation paid or reasonably expected to be paid by the reporting entity (Item 4) to the lobbying entity (Item 10). Indicate whether the payment has been made (actual) or will be made (planned). Check all boxes that apply. If this is a material change report, enter the cumulative amount of payment made or planned to be made.

12. Check the appropriate box(es). Check all boxes that apply. If payment is made through an in-kind contribution, specify the nature and value of the in-kind payment.

13. Check the appropriate box(es). Check all boxes that apply. If other, specify name.

14. Provide a specific and detailed description of the services that the lobbyist has performed, or will be expected to perform, and the date(s) of any services rendered. Include all preparatory and related activity, not just time spent in actual contact with federal officials. Identify the federal official(s) or employee(s) contacted or the officer(s), employee(s), or member(s) of Congress that were contacted.

15. Check whether or not a SF-LLL-A Continuation Sheet(s) is/are attached.

16 The certifying official shall sign and date the form, print his/her name, title, and telephone number.

Public reporting burden for this collection at of intermission is estimated to average 30 minutes per response. Including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project, (0348-0045), Washington, D.C. 20503

(See reverse for public burden disclosure)

| 1. Type of Federal Action: | 2. Status of Federal Action: | 3. Report Type: |
|---|---|---|
| ☐ a. contract<br>b. grant<br>c. cooperative agreement<br>d. loan<br>e. loan guarantee<br>f. loan insurance | ☐ a. Bid/Offer/Application<br>b. Initial Award<br>c. Post-award | ☐ a. Initial/Filing<br>b. material change<br><br>**For Material Change Only:**<br>year _____ quarter_____<br>date of last report_____ |

| 4. Name and Address of Reporting Entity: | 5. If Reporting Entity in No. 4 is Subawardee, enter name and Address of Prime: |
|---|---|
| ☐ Prime ☐ Subawardee<br>Tier_____, *if known*<br><br>**Congressional District**, *if known* | **Congressional District**, *if known* |
| **6. Federal Department/Agency:** | **7. Federal Program Name/Description:**<br><br>CFDA Number, *if applicable*_____ |
| **8. Federal Action Number, if known:** | **9. Award Amount, if known:**<br>**$** |
| **10. a. Name and Address of Lobbying Entity:**<br>*(if individual, last name, first name, MI)*<br><br>(Attach Continuation Sheet(s) | **b. Individuals Performing Services (***including address if different from No. 10a) (last name, first name, MI)*<br><br>SF-LLL-A if Necessary) |
| **11. Amount of Payment** *(check all that apply):*<br><br>$_____ ☐ actual ☐ planned | **13. Type of Payment** *(check all that apply):*<br><br>☐ a. retainer<br>☐ b. one-time fee<br>☐ c. commission<br>☐ d. contingent fee<br>☐ e. deferred<br>☐ f. other; specify: _____ |
| **12. Form of Payment** *(check all that apply):*<br><br>☐ a. cash<br>☐ b. in-kind; specify: nature_____<br>value _____ | |

**14. Brief Description of Services Performed or to be performed and Date(s) of Service, including officer(s), employee(s), or Member(s) contracted, for Payment indicated in item 11:**

(Attach Continuation Sheet(s) SF-LLL-A if Necessary)

**15. Continuation Sheet(s) SF-LLL-A attached:** ☐ **Yes** ☐ **No**

| **16:** The information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities ia a material representation of facts upon which evidence was placed by the above when this transaction was made or started into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the congress semi-annually and will be available for public inspection. Any person which fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure. | **Signature**<br>**:**_____<br>_____<br>**Print Name:**_____<br>____<br>**Title:** |
|---|---|

| **For Federal Use Only:** | **Authorized for local reproduction Standard Form-LLL** |
|---|---|

**Telephone No.:** _____ **Date:** _____

Approved By OMB
0348-0046

# DISCLOSURE OF LOBBYING ACTIVITIES
## CONTINUATION SHEET

Reporting Entity: _____ Page _____ of _____

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Standard Form LLL-A

**U.S. ENVIRONMENTAL PROTECTION AGENCY**
**CERTIFICATION OF NONSEGREGATED FACILITIES**

(Applicable to contracts, subcontracts, and agreements with the applicants who are themselves performing Federally assisted construction contracts, exceeding $10,000, which are not exempt from the provisions of the Equal Opportunity Clause.)

By the submission of this bid, the bidder, offeror, applicant, or subcontractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. He certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The bidder, offeror, applicant, or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. He further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause; that he will retain such certifications in his files; and that he will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATION OF NONSEGREGATED FACILITIES**

A Certification of Non-segregated Facilities, as required by the May 9, 1967 order (33 F.R. 7808, May 28, 1968) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

Signature Date

Name and Title of Signer (Please Type)

NOTE:
The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001

EPA-7 5720-4.2 (6/2/77)

To the extent that this contract or grant involves the use, in whole or in part, of American Recovery and Reinvestment Act of 2009, Pub. L. 111-5 ("ARRA") funds, the following terms and conditions shall apply. As used in this Section, "Vendor/Grantee" means the contractor or grantee receiving ARRA funds from the State of Iowa under this contract.

1. The Vendor/Grantee specifically agrees to comply with each of the terms and conditions contained herein. Vendor/Grantee understands and acknowledges that the federal stimulus process is still evolving and that new requirements for ARRA compliance may be added. Accordingly, Vendor/Grantee specifically agrees that both it and subcontractors/subgrantees will comply with all such requirements during the contract period.

2. Vendor/Grantee agrees that it shall include these standard terms and conditions in all subcontracts or subgrants it may enter into in connection with projects funded in whole or in part with funds available under the ARRA.

3. Vendor/Grantee understands that ARRA funds are temporary and that programs supported with ARRA funds will not be continued with state financed appropriations once the temporary ARRA funds are expended.

**CONFLICTING REQUIREMENTS**

Vendor/Grantee agrees that, to the extent ARRA requirements conflict with the State of Iowa requirements, the ARRA requirements shall control.

**BUY AMERICAN REQUIREMENT**

Vendor/Grantee agrees that in accordance with ARRA, Section 1605, neither Vendor/Grantee nor its subcontractors/subgrantees will use ARRA funds for a project for the construction, alternation, maintenance, or repair of a public building or public work unless all of the iron, steel and manufactured goods used in the project are produced in the United States in a manner consistent with United States obligations under international agreements. The Vendor/Grantee understands that this requirement may only be waived by the applicable federal agency in limited situations as set out in ARRA, Section 1605.

**DAVIS/BACON WAGE REQUIREMENTS**

Vendor/Grantee agrees that, in accordance with Section 1606 of the ARRA, both it and its subcontractors shall fully comply with this section in that, notwithstanding any other provision of law, and in a manner consistent with the other provisions of the ARRA, all laborers and mechanics employed by contractors and subcontractors on projects funded in whole or in part with funds available under the ARRA shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality, as determined by the United States Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40 of the United States Code. The Secretary of Labor's determination regarding the prevailing wages applicable in the State of Iowa are located at: http://www.gpo.gov/davisbacon/ia.html

**WHISTLEBLOWER PROTECTION**

Vendor/Grantee agrees that both it and its subcontractors/subgrantees shall comply with Section 1553 of the ARRA, which prohibits all non-federal Vendor/Grantees of ARRA funds, including the State of Iowa, and all contractors and grantees of the State of Iowa, from discharging, demoting or otherwise discriminating against an employee for disclosures by the employee that the employee reasonably believes are evidence of (1) gross mismanagement of a contract or grant relating to ARRA funds; (2) a gross waste of ARRA funds; (3) a substantial and specific danger to public health or safety related to the implementation or use of ARRA funds; (4) an abuse of authority related to implementation or use of ARRA funds; or (5) a 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 ARRA funds. Vendor/Grantee agrees that it and its subcontractors/subgrantees shall post notice of the rights and remedies available to employees under Section 1553 of Title XV of Division A of the ARRA.

**NON-DISCRIMINATION**

The Recipient shall comply with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendments of 1972, the Age Discrimination Act of 1975, and other civil rights laws applicable to recipients of Federal financial assistance.

**JOB POSTING REQUIREMENTS**

Section 1512 of the ARRA requires states receiving stimulus funds to report on jobs created and retained as a result of the stimulus funds. Vendors/Grantees who receive ARRA funded contracts are required to post job opportunities created in connection with projects funded in whole or in part with ARRA funds on the State of Iowa job opportunity site, http://das.hre.iowa.gov/iowa.jobs.html.

**REPORTING REQUIREMENTS**

Pursuant to Section 1512 of the ARRA, state agencies receiving ARRA funds must submit a report to the federal government no later than ten (10) calendar days after the end of each calendar quarter ("Reporting Period"). This report must contain the information outlined below. Accordingly, Vendor/Grantee agrees to provide the State of Iowa with the following information in a timely manner:

a. The total amount of ARRA funds received by Vendor/Grantee during the Reporting Period;
b. The amount of ARRA funds that were expended or obligated during the Reporting Period;
c. A detailed list of all projects or activities for which ARRA funds were expending or obligated, including:
    i. the name of the project or activity;
    ii. a description of the project or activity;
    iii. an evaluation of the completion status of the project or activity; and
    iv. an estimate of the number of jobs created and the number of jobs retained by the project or activity;

d. For any subcontracts or subgrants equal to or greater than $25,000:

i. The name of the entity receiving the subaward;
ii. The amount of the subaward;
iii. The transaction type;
iv. The North American Industry Classification System (NAICS) code or
v. Catalog of Federal Domestic Assistance (CFDA) number;
vi. Program source;
vii. An award title descriptive of the purpose of each funding action;
viii. The location of the entity receiving the subaward;
ix. The primary location of the subaward, including the city, state, congressional district and country; and
x. A unique identifier of the entity receiving the sub-award and the parent entity of Contractor/Grantee, should the entity be owned by another.
xi. The names and total compensation of the five most highly compensated officers of the company if it received: 1) 80% or more of its annual gross revenues in Federal awards; and 2) $25M or more in annual gross revenue from Federal awards.

e. For any subcontracts or subgrants of less than $25,000 or to individuals, the information required in d may be reported in the aggregate and requires the certification of an authorized officer of Vendor/Grantee that the information contained in the report is accurate.
f. Any other information reasonably requested by the State of Iowa or required by state or federal law or regulation.

Standard data elements and federal instructions for use in complying with reporting requirements under Section 1512 of the ARRA were published in the Federal Register on April 1, 2009 [74 FR 14824], and once approved will be provided online at www.FederalReporting.gov.

**INSPECTION OF RECORDS**

Vendor/Grantee agrees that it shall permit the United States Comptroller General or his representative or the appropriate inspector general appointed under section 3 or 8G of the Inspector General Act of 1978 or his representative to: (1) examine any records that directly pertain to, and involve transactions relating to, this contract; and (2) interview any officer or employee of Vendor/Grantee or any of its subcontractors/subgrantees regarding the projects funded with ARRA funds.

**PROHIBITION ON USE OF ARRA FUNDS**

Vendor/Grantee agrees that none of the funds made available under this contract may be used for any casino or other gambling establishment, aquarium, zoo, golf course, swimming pools, or similar projects.

**SEGREGATION OF FUNDS**

Vendor/Grantee agrees that it shall segregate obligations and expenditures of ARRA funds from other funding. No part of funds made available under the ARRA may be commingled with any other funds or used for a purpose other than that of making payments for costs allowable under the ARRA.

**FALSE CLAIMS ACT**

Vendor/Grantee agrees that it shall promptly refer to an appropriate federal inspector general any credible evidence that a principal, employee, agent, subgrantee, subcontractor or other person has committed 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.

**ENFORCEABILITY**

Vendor/Grantee agrees that if Vendor/Grantee of one of its subcontractors/subgrantees fails to comply with all applicable federal and state requirements governing the use of ARRA funds, the State of Iowa may withhold or suspend, in whole or in part, funds awarded under the program, or recover misspent funds following an audit. This provision is in addition to all other remedies available to the State of Iowa under all applicable state and federal laws.

**CONTACT REQUIREMENTS**

A. Requirements due to use of public funds through state and federal grants.
   1. Davis Bacon Act
      a. Wage Determinations
      b. Wage and benefit reporting
   2. Equal Opportunity Employment Requirements
   3. Other Federal and State Requirements included in the Contract for Construction

**SUMMARY**

A. Davis Bacon and Equal Opportunity Employment
   1. The project financing (ARRA) funds are subject to the provisions of State and Federal equal opportunity employment requirements and Davis Bacon Wage Determinations.
   2. All Contractors and Subcontractors shall comply with these requirements and include the cost of same within the Bid.
   3. Contractors shall also provide mandatory regular reporting of labor employed at the site, classification of labor, hours worked within the reporting period, and wages and fringe benefits paid.
   4. Labor reporting shall at a minimum occur monthly and shall accompany the contractor's pay request

**REFERENCES**

A. The following federal websites provide more detail and help to Contractors and Subcontractors:
   1. The Davis-Bacon Act – http://www.dol.gov/dol/esa/public/regs/statutes/whd/dbra.htm
   2. Davis-Bacon Wage Determination Reference Material – http://www.access.gpo.gov/davisbacon/referencemat.htm
   3. 29 CFR 5.5 – Contract provisions and related matters – http://www.dol.gov/dol/allcfr/ESA/Title 29/Part 5/29CFR5.5.htm
   4. 29 CFR 5.7 – Reports to the Secretary of Labor – http://www.dol.gov/dol/allcfr/ESA/Title 29/Part 5/29CFR5.7htm
   5. Davis – Bacon Wage Determinations – http://www.access.gpo.gov/davisbacon.htm

**FEDERAL REGULATIONS**

A. Work of this contract and those providing services or materials shall comply with the following federal regulations:

1. Title VI of the Civil Rights Act of 1964 (P.L. 88-352)
2. Iowa Civil Rights Act of 1965 (Iowa Executive Orders 15 & 34)
3. The Housing and Community Development Act of 1974, Section 109, Title 1 as amended (42 U.S.C. 5309)
4. The Age Discrimination Act of 1975 as amended (42 U.S.C. 1601 et seq)
5. The Rehabilitation Act of 1973, Section 504, as amended (P.L. 93-112, 29 U.S.C. 794)
6. The Americans with Disabilities Act (P.L. 101-336, 42 U.S.C. 12101-12213)
7. The Housing and Urban Development Act of 1968, Section 3, as amended (12 U.S.C 1701u)
8. Federal Executive Order 11063, as amended by Executive Order 12259
9. Federal Executive Order 11246, as amended.
10. Intergovernmental Personnel Act of 1970 (42 U.S.C. 4728-4763)
11. Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4801 et seq.)
12. Title IX of the education Amendments of 1972, as amended (20 U.S.C. 16811683. And 1685-1686).
13. The Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255) as amended.
14. The Comprehensive Alcohol Abuse and Alcoholism Prevention Treatment and Rehabilitator Act of 1970 (P.L. 91-616) as amended.
15. 523 – 527 of the Public Health Service Act of 1912 (42 U.S.C. 290 dd-3 and 290 sc3) as amended.
16. Title VII of the Civil Rights Act of 1968 (42 U.S.C. 3601 et seq.) as amended.
17. Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646).
18. The Davis-Bacon Act (40 U.S.C. 276m to 276m-7)
19. The Copeland Act (40 U.S.C 276c and 8 U.S.C. 874)
20. The Contract Work Hours and Safety Standards Act (40 U.S.C. 327333)
21. Any other nondiscrimination provisions in the specific statue(s) under which application for Federal assistance is being made.
22. The requirements of any other nondiscrimination statue(s) that may apply to the application.

**ACCESS AND MAINTENANCE OF RECORDS**

A. The Contractor shall maintain all required records for three years after final payment is made and all other pending matters closed, more specifically:

1. At any time during normal business hours and as frequently as deemed necessary, the Contractor shall make available to the Iowa Department of Economic Development, the State Auditor, the General Accounting Office, and the Department of Housing and Urban Development, for their examination, all of it's records pertaining to all matters covered by this Contract and permit these agencies to audit, examine, make excerpts or transcripts from such records, Contract, invoices, payrolls, personnel records, conditions of employment, and all other matters covered by this Contract.

END OF SECTION 00800

SECTION 008110
SUPPLEMENTARY COVENANT AND PROVISIONS

PART 0 - GENERAL

0.00 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

0.01 GENERAL:

A. The general conditions of the contract are the General Covenants and Provisions bound within.

1. These General Covenants and Provisions are herein modified or supplemented by this Supplementary Covenant and Provisions.

2. Articles of the General Covenant and Provision not directly affected by this section remains in full force as written unless exceeded in requirement herein or elsewhere in the Specifications.

0.03 DEFINITION OF TERMS:

A. Article 1101.03 "Definition of Terms" is supplemented and modified as follows:

1. General Explanation: A substantial amount of specification language constitutes definitions for terms found in other Contract Documents, including Drawings which must be recognized as diagrammatic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in Contract Documents are defined generally in this article. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the work to the extent not stated more explicitly in another provision of Contract Documents.

2. Imperative Language: Used generally in Specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe responsibilities which must be fulfilled indirectly by Contractor, or when so noted, by others.

3. Chief Engineer: This term will apply to the Chief of the Engineering Bureau of the Department of Natural Resources.

4. Project Engineer: The Project Engineer will be the reviewing and approving authority for all equipment, material or systems to be used in the construction as specified herein. Unless otherwise specified, no material, equipment or systems or components of systems will be used or installed on this project without written approval. The Project Engineer will be the individual, regardless of the title actually used. listed in the special notice to bidders as the contact for questions concerning design, plans and specifications.

5. DNR Construction Inspector: The Department of Natural Resources Construction Inspector will be the direct representative of the department at the project location with the authority to verify compliance with the provisions of each and all divisions of this Project Manual. Contact the DNR Construction Inspector regarding questions on site review, inspections and project coordination.

6. Procurement Supervisor: The Procurement Supervisor will answer all questions regarding Bidding and Contract Procedures.

7. General Requirements: The provisions of requirements of Division-1 sections. General requirements apply to entire work of Contract and, where so indicated, to other elements which are included in project.

8. Indicated: The term "indicated" is a cross-reference to details, notes or schedules on Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for the purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

9. Directed, Requested, Etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "directed by Project Engineer," "requested by the Project Engineer," etc. However, no such implied meaning will be interpreted to extend Project Engineer's responsibility into Contractor's area of construction supervision.

10. Approve: Where used in conjunction with Project Engineer's or Project Inspector's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of the term "approved," will be held to limitations of responsibilities and duties as specified in General Covenants and Provisions and Supplementary Covenants and Provisions. In no case will "approval" be interpreted as a release of Contractor from responsibilities to fulfill requirements of contract documents.

11. Project Site: The space available to Contractor for performance of the work, either exclusively or in conjunction with others performing other work as part of the project. The extent of project site is shown on Drawings, and may or may not be identical with description of land upon which project is to be built.

12. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

13. Install: Except as otherwise defined in greater detail, 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.

14. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

15. Installer: The entity (person or firm) engaged by Contractor or its subcontractor or sub-subcontractor for performance of a particular unit of work at project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in portions of the work they are to accomplish.

## PART 1 - INSTRUCTIONS TO BIDDERS

### 1.02 DRAWINGS AND SPECIFICATIONS:

A. Article 1101.02 "Drawings and Specifications" is supplemented and modified as follows:

1. The Drawings and Specifications, which are enumerated in the Index of drawings and Table of Content of this project manual, are part of this contract.

## PART 4 - SCOPE OF WORK

### 4.10 PERMITS AND ARRANGEMENTS WITH OTHER GOVERNMENTAL AGENCIES:

A. Article 1104.10 "Permits and Arrangements with Other Governmental Agencies" is supplemented and modified as follows:

1. Contractor shall take out and pay for any building or construction permit which may be required, secure and pay for all permits, certificates and licenses required to prosecute the work, and shall arrange for and pay for all inspections required by local authorities.

2. Contractor is to apply and pay for NPDES Stormwater Discharge Permit for Construction Operations, as required by EPA regulations for work performed after March 10, 2003, for any land-disturbing activity which will disturb an area of one or more acres.

a. Permits are available from IDNR Stormwater Coordinator, Wallace State Office Building, Des Moines, Iowa 50319. (Tel. 515/281-7017)

b. Copies of Permit Application and Permit issued are to be furnished to DNR Construction Inspector prior to any construction operations.

### 4.13 DRAWINGS AND SPECIFICATIONS:

A. Article 1104.13 "Drawings and Specifications" is supplemented and modified as follows:

1. Contractor shall be responsible for distributing to all involved in this project, Drawings and Specifications in quantities reasonably necessary for the completion of the portion of work they are responsible for. No additional payment will be made for shortcomings resulting from misunderstanding of Contract Documents due to any shortage of information between General Contractor, subcontractors, and Material Suppliers.

PART 5 - CONTROL OF WORK

5.02 PLANS:

A. Article 1105.02 "Plans" is supplemented or modified as follows:

1. Plans for this project may be referred to as "Drawings, Project Drawings or Plans, Profiles and Cross Sections."

5.07 CONSTRUCTION STAKES AND BENCHMARKS:

A. Article 1105.07 "Construction Stakes and Benchmarks" is supplemented and modified as follows:

1. The contractor shall be responsible for providing all labor, equipment and material necessary to complete the work covered in paragraph A & B of the General Covenants and Provision of this contract. The Contractor or his/her assigned representative shall assume the function of the Engineer as described herein in addition to those assigned to the Contractor and be held responsible for such. The cost of this work shall be paid for as “Construction Survey” Bid Item.

PART 6 - CONTROL OF MATERIALS

6.03 SAMPLES AND TESTS:

A. Article 1106.03 "Samples and Tests" is supplemented and modified as follows:

1. All testing required by the contract documents or the DNR Construction Inspector shall be considered a part of the Contract and shall be paid for by the Contractor.

PART 9 - MEASUREMENT AND PAYMENTS

9.10 SUBMITTAL REQUIRED BEFORE FINAL PAYMENT:

A. Article 1109.10 "Submittals Required Before Final Payment" is supplemented and modified as follows:

1. Submit to the Engineer or the DNR Construction Inspector all submittals required in Section 01300 before final payment can be made, unless otherwise specified.

2. Other submittals may be required in other sections.

END OF SECTION 00811

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions and the Supplementary Covenants and Provisions.

1.02 SUMMARY OF WORK:

A. Work Covered by Contract Documents:

1. Name of the project is "DESJARDINS RENEWABLE PROJECT", Project Number 11-05-04-13. Drawings and Specifications are dated MAY 06, 2011.

2. Briefly and without force and effect upon contract documents, work of the contract can be summarized as follows:

a. Wind and Solar power to be installed within each of the stated parks (Lewis & Clark, Honey Creek Resort, Lake Darling and EB Lyons) with interpretive interactive panels. Also, Solar Thermal power for the resort lodge at Honey Creek Resort.

B. Occupancy:

1. Owner: The DNR shall have the right to enter the building or work site and store or attach such fixtures or furniture as it may elect, or to do other work providing that such storage or work will not interfere with the completion of the Contractor's work. Such occupancy by the DNR shall in no way imply final acceptance of any portion of the Contractor's work.

1.04 MEASUREMENT AND PAYMENTS:

A. Measurements and payments shall be in accordance with Section 01250 of these specifications.

B. Before ordering any fabricated material or doing any work, verify all measurements at the project site. No additional compensation will be allowed because of difference between actual dimensions and the measurements indicated on the drawings. Report any difference immediately to the DNR for instructions before proceeding with the work.

1.06 COORDINATION:

A. Project Coordination:

1. Take out and pay for any building permit which may be required, secure and pay for all permits, certificates and licenses required to prosecute the work, and arrange and pay for all inspections required by local authorities.

2. Visit the site, compare the Drawings and Specifications with any work in place, and verify all conditions, including other work, if any, being performed. Failure to visit the site will in no way relieve the Contractor from necessity of furnishing any materials or performing any work that may be required in accordance with Drawings and Specifications.

B. Job Site Administration: Take complete charge of work under this contract. Coordinate the work of all trades and all phases of general, structural, plumbing, mechanical, and electrical work.

1.07 FIELD ENGINEERING:

A. Provide such field engineering services as are required for a proper completion of the work.

1. Immediately upon entering project site for the purpose of beginning work:

a. Establish actual project location, set back and side yards, if any, with the DNR Construction Inspector.

b. Establish and maintain all lines and levels.

B. Additional requirements for field engineering may also be described in other sections of these specifications.

C. Verify all figures shown on Drawings before laying out work and report all discrepancies to the DNR Construction Inspector. Contractor will be held responsible for any error resulting from failure to do so.

1.09 ABBREVIATIONS AND SYMBOLS:

A. Reference to a technical society, institution, association, or government authority is made in the Specifications in accordance with the following abbreviations:

| | |
|---|---|
| AAMA | Architectural Aluminum Manufacturers Association |
| AASHO | American Association of State Highway Officials |
| ACI | American Concrete Institute |
| AIA | American Institute of Project Engineers |
| AIEE | American Institute of Electrical Engineers |
| AISC | American Institute of Steel Construction |
| AISI | American Iron and Steel Institute |
| ALS | American Lumber Standards |
| APA | American Plywood Association |
| ATI | Asphalt Tile Institute |
| ASHRAE | American Society of Heating, Refrigerating and Air Conditioning Engineers |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society for Testing and Materials |
| AWI | Project Architectural Wood Work Institute |
| AWPA | American Wood Preservers' Association |
| AWS | American Welding Society |
| CS | Commercial Standard, U.S. Department of Commerce |
| FGJA | Flat Glass Jobbers Association |
| FS | Federal Specification |
| GA | Gypsum Association |
| IES | Illuminating Engineering Society |
| MIA | Marble Institute of America |
| MLMA | Metal Lath Manufacturers Association |
| MS | Military Specification |
| MSTD | Military Standard |
| NAAMM | National Association of Metal Manufacturers, The |
| NHLA | National Hardwood Lumber Association |
| NBFU | National Board of Fire Underwriters |
| NBS | National Bureau of Standards |
| NEC | National Electric Code of NBFU |
| NFPA | National Fire Protection Association |
| NLMA | National Lumber Manufacturers Association |
| NTMA | National Terrazzo and Mosaic Association, Inc., |
| NWMA | National Woodwork Manufacturers Association |
| SDI | Steel Deck Institute |
| SSPC | Steel Structures Painting Council |
| SCPI | Structural Clay Products Institute |
| SPR | Simplified Practice Recommendations, U.S. Department of Commerce |
| TCA | Tile Council of America |
| UL | Underwriters' Laboratories, Inc. |
| USA | United States of America Standards Association |

1.13 PROJECT MEETINGS:

A. Preconstruction Conference: Soon after award of contract and prior to the start of construction, attend a preconstruction conference with the representative of the Owner to define the requirements for contract administration and construction operation.

1. Contact the DNR Construction Inspector who will determine the time, date and place of the conference.

B. Progress Meetings: The Contractor or the Contractor's representative shall be available at the job site to meet with the DNR Construction Inspector, as frequently and as arranged during the preconstruction conference, to discuss work progress.

1. Give verbal report of progress, discuss work schedule, and present all conflicts, discrepancies and other difficulties for resolution.

1.16 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS:

A. Definitions: Specific administrative and procedural minimum actions are specified in this section, as extension of provisions in other contract documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication by Project Engineer that such temporary activity is not required for successful completion of the work and compliance with contract documents.

B. General: Establish and initiate use of each temporary facility at time first reasonably required for proper performance of the work. Terminate use and remove facilities at earliest reasonable time, when no longer needed or when permanent facilities have replaced the need.

C. Temporary Utilities: The types of services required may include, but not by way of limitation, water, sewerage, surface drainage, electrical power and telephones. Where possible and reasonable, connect to existing franchised utilities for required services; comply with service companies recommendations on materials and methods, or engage service companies to install services. Locate and relocate services (as necessary) to minimize interference with construction operations.

1. Sanitary Facilities:

a. Temporary Toilets: When such or permanent facilities do not exist, provide and maintain toilets for use by workers. Keep toilets in sanitary condition.

b. Temporary toilet facilities shall meet OSHA requirements.

D. Security:

1. Protection of Work and Property:

a. Place and maintain such barricades as may be necessary to prevent public access to the project site at no cost to the Owner.

E. Options and Substitutions:

1. Bid shall include all equipment, materials, and services as specified, noted on the Drawings or required for a complete and proper installation.

1.19 CONTRACT CLOSEOUT:

A. Final Cleaning:

1. Remove waste material and rubbish caused by the Work and leave all work clean and free of debris of any kind.

2. Keep the site and access road reasonably clean and free of rubbish or waste material in order that the work may progress efficiently. Remove such rubbish or waste material entirely from the premises at each time of such cleaning.

3. When the Work is completed and ready to turn over to the Owner, leave such work clean. This applies to all areas affected by contract work.

4. On completion of the Work, thoroughly police and clean-up the premises surrounding the building.

B. Final Inspection:

1. Request a final inspection in writing, at least ten days prior to the anticipated date of completion, from the DNR Construction Inspector.

2. Work will not be considered ready for final inspection until all the work has been completed and the Contractor has certified that all items are properly operating and in strict compliance with the Contract Documents.

3. The Contractor or project supervisor shall be at the job site during the final inspection.

4. After the inspection, the DNR Construction Inspector will present the Contractor a list of items not meeting contract requirements which must be made acceptable before final payment is made.

END OF SECTION 01000

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: General requirements pertaining to:

1. The Work specified for accepted alternate bids, the materials and methods referenced in other sections to achieve specified work, and the coordination and modification of related work and surrounding construction to complete the project under each accepted bid.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 DESCRIPTION OF ALTERNATE BIDS:

A. Base Bid #1:
E.B. Lyons:
2.76kW roof mounted solar photovoltaic array and associated equipment.
Lake Darling:
2.76kW roof mounted solar photovoltaic array and associated equipment.
Lewis and Clark:
5.52kW roof mounted solar photovoltaic array and associated equipment. (1) 10kW horizontal axis wind turbine, 80 foot tall self supporting lattice tower and associated equipment. Energy measurement system with interactive touch screen display.
Honey Creek Resort:
One (1) 10kW horizontal axis wind turbine, 80 foot tall self supporting lattice tower and associated equipment. Five (5) 1.38kW solar photovoltaic arrays mounted to cabin roofs. Energy measurement system with interactive touch screen display.

B. Alternate Bid No. 1: Add one (1) additional 2.76kW string of photovoltaic modules at E.B. Lyons Interpretive Center.

C. Alternate Bid No. 2: Add one (1) 12 kW horizontal axis wind turbine mounted to a 30 foot tall flanged monopole at Honey Creek Resort.

D. Alternate Bid No 3: Add one (1) additional 2.76kW string of photovoltaic modules at Lewis and Clark Interpretive Center .

E. Base Bid #2:
Solar thermal collection system at the Honey Creek Resort Lodge building connected to the domestic hot water heating system. System includes 22 roof mounted collectors, 5 storage tanks, heat exchanger, exterior dry cooler, and associated pumps, piping, and controls.

1.03 ALTERNATE BID REQUIREMENTS:

A. Bidder must submit alternate bids. Bids submitted without alternate bid will be rejected as unresponsive.

B. Alternate bids, if awarded, will be considered as a basis for award. The low bid will be analyzed on the base bid and any combination of alternate bids. The Owner reserves the right to award the base bid and all alternates, that in the Owner's opinion, will provide the most cost-effective end product. The Owner's decision is final.

C. Provide alternate bid for the cost of the service requested in each alternate, either as an addition or as a reduction in the total bid.

D. The Owner may award any alternate bid or bids at the time of contract award. Any alternate bids awarded as part of the original contract will not extend the project completion time beyond that specified.

END OF SECTION 01030

SECTION 01050
FIELD ENGINEERING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 DESCRIPTION OF WORK:

A. Provide such field engineering services as are required for proper completion of the work including, but not necessarily limited to:

1. Establishing and maintaining lines and levels;

2. Structural design of shores, forms, and similar items provided as part of the Contractor's means and methods of construction;

3. Establishing finish grade stakes (including blue tops) as necessary;

B. Additional requirements for field engineering may also be described in other sections of these specifications.

1.03 REFERENCES:

A. Refer to Section 1105.07 "Construction Stakes and Bench Marks" of the General Covenants and Provisions for assignment of responsibilities for the Owner and Contractor.

1.04 SUBMITTALS:

A. Comply with pertinent provisions of Section 01300, if applicable.

1.05 PROCEDURES:

A. In addition to procedure directed by the Contractor for proper performance of the Contractor's responsibilities:

1. Locate and protect control points before starting work on the site.

2. Preserve permanent reference points during progress of the work.

3. Do not change or relocate reference points or items of the work without specific approval from the DNR Construction Inspector.

4. Promptly advise the DNR Construction Inspector of a lost, destroyed, or reference point-requiring relocation due to other changes in the work.

a. When directed by the DNR Construction Inspector, replace referenced stakes at no additional cost to the Owner.

B. Meet with DNR Construction Inspector to establish actual building location, set backs, and side yards, if required.

END OF SECTION 01050

SECTION 01 10 00

SUMMARY

## PART 1 GENERAL

### 1.1 SUMMARY

**A.**Project Identification: Desjardins Renewable Project

Project Summary: This project is more than just a renewable energy pilot. It will give the public hands-on witness to the power of renewable energy. The average state park visitor will get an opportunity to spend a period of time *living* in a space powered with renewables plus the means for personal exploration about how to make renewables work well. At the same time, measurable energy and cost savings accrue at an important, innovative state facility.

B. Particular Project Requirements: All work is to be meet a **completion date** of **10/31/2011**.
C. Permits and Fees: Apply for, obtain, and pay for permits, fees, and utility company charges required to complete the work. Submit copies to Architect.
D. Codes: Comply with applicable codes and regulations of authorities having jurisdiction. Submit copies of inspection reports, notices and similar communications to Architect.
E. Dimensions: Verify all dimensions indicated on drawings with field dimensions before fabrication and/or ordering of materials. Do not scale drawings.
F. Existing Conditions: Notify Architect of existing conditions differing from those indicated on the drawings. Altering of structural components is not permitted.
G. Coordination:
1. Coordinate the work of all trades.
2. Prepare coordination drawings for areas above ceilings where close tolerances are required between building elements and mechanical and electrical work.
3. Verify location of utilities and existing conditions.
H. Installation Requirements, General:
1. Inspect substrates and report unsatisfactory conditions in writing.
2. Do not proceed until unsatisfactory conditions have been corrected.
3. Take field measurements prior to fabrication where practical. Form to required shapes and sizes with true edges, lines and angles. Provide inserts and templates as needed for work of other trades.
4. Install materials in exact accordance with manufacturer's instructions and approved submittals.
5. Install materials in proper relation with adjacent construction and with proper appearance.
6. Restore units damaged during installation. Replace units which cannot be restored at no additional expense to the Owner.
7. Refer to additional installation requirements and tolerances specified under individual specification sections.
I. Limit of Use: Limit use of work as indicated. Keep driveways and entrances clear.
J. Definitions:
1. Provide: Furnish and install, complete with all necessary accessories, ready for intended use. Pay for all related costs.

2. Approved: Acceptance of item submitted for approval. Not a limitation or release for compliance with the Contract Documents or regulatory requirements. Refer to limitations of 'Approved' in General and Supplementary Conditions.
3. Match Existing: Match existing as acceptable to the Owner.
K. Intent: Drawings and specifications are intended to provide the basis for proper completion of the work suitable for the intended use of the Owner. Anything not expressly set forth but which is reasonable implied or necessary for proper performance of the project shall be included.
L. Writing Style: Specifications are written in the imperative mode. Except where specifically intended otherwise, the subject of all imperative statements is the Contractor. For example, 'Provide tile' means 'Contractor shall provide tile.'

**PART 2 PRODUCTS - Not Applicable To This Section**

**PART 3 EXECUTION - Not Applicable To This Section**

END OF SECTION

# SPECIAL NOTICE TO CONTRACTORS

**CONTRACTOR IS RESPONSIBLE FOR CONTACTING STATE STORMWATER PROGRAM COORDINATOR (515/281-7017) FOR INFORMATION RELATING TO STORM WATER PERMIT THAT IS NECESSARY IF CONSTRUCTION ACTIVITIES DISTURB ONE ACRE OR MORE.**

**Direct questions concerning the Project Design, Drawings and Specifications to:**

Ryan Richey | Architect
Wallace State Office Building
Des Moines, Iowa 50319-0034
Ph: (515) 281-8647
Fax:(515) 281-8685

**Direct questions concerning Site Review and Project Inspection to:**

Jeff Felts, District Inspector
Lewis & Clark SP
Telephone: 515/250-3712

Jason Kruse, District Inspector
Honey Creek Resort
Telephone: 515/250-3707

Dave Heer, District Inspector
Lake Darling
Telephone: 515/250-3719

Mel Pacovsky, District Inspector
EB Lyons
Telephone: 319/240-3553

**Direct questions concerning Bidding and Contract Procedures to:**

Linda Miller, DNR Procurement
Wallace State Office Building
Des Moines, Iowa 50319-0034
Telephone: 515/281-3345

**In accordance with House File 2622 implemented by Iowa Code Sections 442.42 (15) & (16) and 422.47.47(5), Contractors may purchase qualifying items for work on this contract exempt from sales tax. The DEPARTMENT will issue an authorization letter and exemption certificate to the prime contractor and each approved subcontractor."** ***Complete information on qualifying materials and supplies can be found at www.state.ia.us/tax, the Iowa Department of Revenue and Finance (IDRF) Web site. Links are found in the Business Taxes and Local Government categories. 701 IAC 19.1-20 is found in Tax Research/Tax Research Library.***

**Recorded bid results can be accessed by calling 515/242-6720. Printed bid tabs will not be available for 3 working days after the Letting date.**

SECTION 01250
MEASUREMENT AND BASIS OF PAYMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 LUMP SUM / UNIT PRICE BID:

A. Bid each item on a Unit Price basis or Lump Sum basis as required, including furnishing all labor, equipment and materials necessary to complete all the work indicated in the Contract Documents.

1.03 QUANTITIES:

A. Various estimated quantities are furnished within the Contract Documents to assist the Contractor in reviewing the Project prior to bidding. The estimated quantities are not intended to be used by the Contractor as sole basis for determining the scope and volume of the work. The Contractor is responsible for verifying all quantities necessary to submit bids for the construction of a proper and complete project.

1.04 MEASUREMENT:

A. The contractor is responsible for constructing the project to the final lines and grades shown. Owner will measure construction units only to ensure that at least minimum quantities have been properly installed.

1.05 SCOPE:

A. Each item in the Bidder's Proposal Schedule of Prices will be paid at the unit or lump sum price. The price for each item shall be considered full compensation for furnishing superintendence, overhead, bonds, insurance, mobilization, testing and profit necessary to complete the construction of the item of the project listed in the Bidder's Proposal.

B. It is not the intent of the Bidder's Proposal to itemize each and every item and system required. Items required for project completion and not specifically mentioned in Bidder's Proposal shall be included with items which they would be considered subsidiary.

1.06 ESTIMATED QUANTITIES:

A. The items and quantities described above, as well as others listed throughout the Contract Documents, are provided for the bidder's review and consideration. The quantities listed herein are not guaranteed by the owner or the Project Engineer to be totally accurate nor to include all items of work. They are provided for the bidder's convenience to assist in the preparation of the bid. The bidder is responsible for preparing his own quantity takeoff and bid preparation.

END OF SECTION 01250

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:

1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.5 CHANGE ORDER PROCEDURES

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 013000
SUBMITTALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 SUMMARY:

A. Provide submittals required in this Section, refer to technical specification for submittal requirements for each section of the work to be performed.

1.03 PROGRESS SCHEDULE:

A. Submit a project schedule to the Project Engineer for approval within 30 days after award of contract, but not later than the contract start date. The type of schedule required is at Contractor's option.

B. Prepare an approved, reproducible form and include the following:

1. Breakdown of work activities in categories so approved and segmented as necessary to allow close monitoring of progress of the work during construction.

2. Order of the work necessary to meet time for completion.

3. Breakdown of the work schedule of all subcontractors scheduled in cooperation with Contractor's work.

4. Anticipated monthly value for work completed.

5. Space for the additional display of actual performance on the schedule.

C. After necessary revisions have been made and approved, present one print of schedule to each subcontractor and three copies to the Owner.

D. Upon request, update the schedule to reflect changes required by actual conditions and indicate actual work completed. Provide same number of copies as required for original submission.

E. Payment will be withheld until progress schedule in acceptable form has been received by Project Engineer.

1.04 PRICE BREAKDOWN:

A. Within 30 days after award of contract, but not later than the contract start date, submit to the Project Engineer for approval a price breakdown of major lump sum bid items into smaller components for the purpose of determining monthly progress payments.

B. Include profit and overhead prices in each item.

C. Payment will be withheld until receipt of price breakdown.

D. Provide breakdown as follows:

E. Items listed above include, but are not limited to, the following:

1.05 SHOP DRAWINGS AND MANUFACTURER'S LITERATURE:

A. Prior to installation of any item specified as requiring submittal, submit two (2) copies for Owner's use plus the number required for return to the Contractor, of manufacturer's literature containing detailed specifications and performance data, or shop drawings fully describing the items showing fabrication, layout, setting or erection details, including erection plan and details as required.

B. Number all submittals consecutively . Re-submittals shall bear the original submittal number plus a letter suffix: Example - #30A is the first re-submittal of item #30; #30B is the second re-submittal, etc.

C. Shop drawings used at site must be approved by the Project Engineer.

D. Do not construe the approval of shop drawings to be a complete check. This approval will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the Contractor of the responsibility to comply with all terms and conditions of the plans and specifications. The Contractor shall be responsible for the dimensions and design of adequate connections, details and satisfactory construction of all work.

1.06 SAMPLES:

A. Submit in Duplicate:

B. Provide samples of sufficient size to permit an accurate appraisal of color, texture, finish, workmanship, and other appropriate characteristics.

C. Submit samples with shop drawings when both are required.

D. Field Samples and Mock-Ups:

1. Erect mock-ups at location acceptable to the DNR Construction Inspector, at project site.

2. Construct each sample or mock-up complete to the dimension indicated, including work of all crafts required in finish work.

1.07 QUALITY ASSURANCE:

A. Coordination of Submittals:

1. Prior to submitting required material, carefully review and coordinate all aspects of each item being submitted.

2. Verify that each item and its submittal conform in all respects with the specified requirements.

3. Prior to sending submittals to Project Engineer, the stamp and sign each submittal, certifying that they conform in all respects with the specified requirements.

B. Substitutions:

1. The contract is based on the standards of quality established in the Contract Documents. Substitutions will be considered only when listed with the Project Engineer prior to the bid date, and when substantiated by Contractor's submittal of required data within 35 calendar days after award of contract.

2. The following products do not require further approval except for interface within the work:

a. Products specified by reference to standard specifications such as ASTM or similar standards.

b. Products specified by manufacturer's name and catalog model number for which another product is not substituted.

3. Do not substitute materials, equipment or methods unless such substitutions have been specifically approved in writing.

C. Or Equal:

1. Where the phrase "or equal," or "or equal as approved by the Project Engineer," occurs in the Contract Documents, do not assume that the materials, equipment or methods will be approved as equal unless the item has been specifically approved for this work by the Project Engineer.

2. The Project Engineer's decision shall be final.

1.08 RESUBMISSION REQUIREMENTS:

A. Shop Drawings:

1. Revise initial Drawings as directed and resubmit in accordance with submittal procedures.

2. Indicate on Drawings all changes which have been made in addition to those requested by the Project Engineer.

B. Product Data and Samples: Resubmit new data and samples as specified for initial submittal.

C. Make all re-submittals within 7 calendar days after date of Project Engineer's previous review.

1.09 DISTRIBUTION OF SUBMITTALS AFTER REVIEW:

A. Project Engineer will distribute copies of shop drawings and product data, after review, to:

1. DNR Construction Inspector (1 copy)
2. Project Engineer's File (1 copy)
3. General Contractor (remaining copies)

B. Project Engineer will distribute samples in accordance with requirements.

1.10 CONTRACTOR RESPONSIBILITIES:

A. Review shop drawings, product data, and samples prior to submission to the next level of control.

B. Verify:

1. Field dimensions.
2. Field construction criteria.
3. Catalog numbers and similar data.

C. Coordinate each submittal with requirements of:

1. The work.
2. The contract documents.
3. The work of other contractors.

D. Contractor's responsibility for errors and omissions in submittals is not relieved by Project Engineer's review of submittals.

E. Notify Project Engineer, in writing, of proposed deviations in submittals from contract requirements, prior to or at the time of submission.

F. Contractor's responsibility for deviations in submittals from contract document requirements is not relieved by Project Engineer's review of submittals.

G. Do not begin any work which requires submittals without having Project Engineer's stamp and initials or signature indicating approval.

1.11 REQUIRED SUBMITTALS:

A. Include, but do not limit to, the following submittals:

| Spec. Section | Item Description | Shop Drawing | Product Data | Samples, Test Results or Certification |
|---|---|---|---|---|
| 02270 | Revetment | | | X |
| 02510 | HMA Paving | | | X |
| 03300 | Concrete | | | X |

1.12 RECORD DRAWINGS:

A. Provide and maintain at the project site, one complete set of prints of the project drawings. The drawings shall be kept in good, clean and readable condition.

B. The project site drawings shall have neatly inscribed all changes in work including relocation of lines, valves and fixtures, change in type of materials, etc. Changes shall be noted with red pencil or red ink.

C. Submit these corrected prints at time of final acceptance and prior to final payment. Note all data and changes on these record drawings in sufficient detail and clarity and provide information necessary for preparation of "as-built" drawings.

D. Final payment will be withheld until a set of corrected prints of the record drawings has been received by the Project Engineer/DNR Construction Inspector.

1.13 GUARANTEES, WARRANTIES AND CERTIFICATES:

A. Submit all guarantees, warranties and certificates prior to final payment.

B. Refer to Section 01700 of these specifications.

1.14 OPERATING AND MAINTENANCE INSTRUCTIONS:

A. Submit all operating and maintenance instructions to the DNR Construction Inspector prior to final payment.

B. Refer to Section 01700 of these specifications.

1.15 CHANGE ORDER PRICE QUOTES:

A. In the event of the need for change order, the DNR Construction Inspector will request a price quote from the Contractor for proposed changes to the contract.

B. For evaluation purposes, the Contractor's quote shall be broken down to show the costs of labor and materials for each proposed category of work included with the change, along with the total cost for Contractor's overhead, profit and bond for the proposed change.

C. All contract time extensions required as a result of a proposed change must be justified and supported in detail at the time of the proposal.

1.16 TEST REPORTS:

A. Refer to Section 01400 of these specifications.

1.17 DELIVERY TICKETS:

A. Submit to the DNR Construction Inspector one legible copy of each delivery ticket for all material delivered to the construction site.

B. The delivery ticket shall show brand name, catalog number and number of items received.

END OF SECTION 01300

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

## PART 1 GENERAL

### 1.1 SUMMARY

A. Administration of Contract: Provide administrative requirements for the proper coordination and completion of work including the following:

1. Supervisory personnel.

2. Preconstruction conference.

3. Project meetings, minimum of two per month; prepare and distribute minutes.

B. Reports: Submit daily and special reports.

C. Work Schedule: Submit progress schedule, updated monthly.

D. Submittal Schedule: Prepare submittal schedule; coordinate with progress schedule.

E. Schedule of Values: Submit schedule of values.

F. Schedule of Tests: Submit schedule of required tests including payment and responsibility.

G. Perform Surveys: Lay out the work and verifying locations during construction. Perform final site survey.

H. Emergency Contacts: Submit and post a list of emergency telephone numbers and address for individuals to be contacted in case of emergency.

I. Record Documents: Submit record drawings and specifications; to be maintained and annotated by Contractor as work progresses.

### 1.2 SUBMITTALS

A. Types of Submittals: Provide types of submittals listed in individual sections and number of copies required below.

1. Shop drawings, reviewed and annotated by the Contractor - 4 copies.

2. Product data - 4 copies.

3. Samples - 2, plus extra samples as required to indicate range of color, finish, and texture to be expected.

4. Inspection and test reports - 4 copies.

5. Warranties - 4 copies.

6. Survey data - 4 copies.

7. Closeout submittals - 4 copies.

8. Project photographs - 12 digital images each month submitted on CD. Submit cumulative CD at each subsequent submittal. Label each image with date.

B. Submittal Procedures: Comply with project format for submittals. Comply with submittal procedures established by Architect including Architect's submittal and shop drawing stamp. Provide required resubmittals if original submittals are not approved. Provide distribution of approved copies including modifications after submittals have been approved.

C. Samples and Shop Drawings: Samples and shop drawings shall be prepared specifically for this project. Shop drawings shall include dimensions and details, including adjacent construction and related work. Note special coordination required. Note any deviations from requirements of the Contract Documents.

D. Warranties: Provide warranties as specified; warranties shall not limit length of time for remedy of damages Owner may have by legal statute. Contractor, supplier or installer responsible for performance of warranty shall sign warranties.

**PART 2 PRODUCTS - Not Applicable To This Section**

**PART 3 EXECUTION - Not Applicable To This Section**

END OF SECTION

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Project meetings.
2. Requests for Interpretation (RFIs).

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 PROJECT MEETINGS

A. Preconstruction Conference: Architect will schedule conference before the start of construction, at a time convenient to Owner and Architect, but no later than 15 working days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; and other concerned parties. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

B. Progress Meetings: Architect will conduct progress meetings at bi-monthly intervals.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

C. Minutes: Architect will record and distribute meeting minutes.

1.5 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Prime Contractor. RFIs submitted by entities other than Prime Contractor will be returned with no response.

2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs: Form at end of this Section.

1. Identify each page of attachments with the RFI number and sequential page number.

D. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 working days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven working days if Contractor disagrees with response.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

# Request For Information

**No.** _____

**Date:**

**Project No.:** 11-05-04-13

**Attention:**

**Project Name: Desjardins Renewable Project**

**Initiated By:**

**Required Response Date:**

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**Description:**

**Specification Section:**

**Drawing No. (s):**

**Question:**

**Proposed Solution:**

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***Will this request and proposed solution have any associated cost impacts?*** **YES** ☐ **NO** ☐

***Will this request and proposed solution have any schedule impacts?*** **YES** ☐ **NO** ☐

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***In the event the response constitutes a change in the contract scope, please provide Construction Change Authorization or Proposal Request such that work may proceed as quickly as possible, minimizing potential schedule impact.***

**Response:**

**Response by:** _____ **Date:** _____

**cc:**

SECTION 01 40 00

QUALITY REQUIREMENTS

## PART 1 GENERAL

### 1.1 SUMMARY

A. Quality Monitoring: Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality. Perform quality control procedures and inspections during installation.

B. Standards: Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

C. Tolerances: Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate. Comply with manufacturers' tolerances.

D. Reference Standards: For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

E. Manufacturer’s Field Services: When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to perform the following as applicable, and to initiate instructions when necessary.

1. Observe site conditions.

2. Conditions of surfaces and installation.

3. Quality of workmanship.

4. Start-up of equipment.

5. Test, adjust and balance of equipment.

F. Mock-Ups: Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes. Accepted mock-ups shall be a comparison standard for the remaining Work.

G. Removal of Mock-Ups: Where mock-up has been accepted by Architect and no longer needed, remove mock-up and clear area when directed to do so.

## PART 2 PRODUCTS - Not Applicable To This Section

## PART 3 EXECUTION - Not Applicable To This Section

END OF SECTION

SECTION 014200 - REFERENCES

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 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

| | | |
|---|---|---|
| AA | Aluminum Association, Inc. (The)<br>www.aluminum.org | (703) 358-2960 |
| AAADM | American Association of Automatic Door Manufacturers<br>www.aaadm.com | (216) 241-7333 |
| AABC | Associated Air Balance Council<br>www.aabchq.com | (202) 737-0202 |
| AAMA | American Architectural Manufacturers Association<br>www.aamanet.org | (847) 303-5664 |
| AASHTO | American Association of State Highway and Transportation Officials<br>www.transportation.org | (202) 624-5800 |
| AATCC | American Association of Textile Chemists and Colorists (The)<br>www.aatcc.org | (919) 549-8141 |
| ABMA | American Bearing Manufacturers Association<br>www.abma-dc.org | (202) 367-1155 |
| ACI | ACI International<br>(American Concrete Institute)<br>www.aci-int.org | (248) 848-3700 |
| ACPA | American Concrete Pipe Association<br>www.concrete-pipe.org | (972) 506-7216 |
| AEIC | Association of Edison Illuminating Companies, Inc. (The)<br>www.aeic.org | (205) 257-2530 |
| AF&PA | American Forest & Paper Association<br>www.afandpa.org | (800) 878-8878<br>(202) 463-2700 |
| AGA | American Gas Association<br>www.aga.org | (202) 824-7000 |
| AGC | Associated General Contractors of America (The)<br>www.agc.org | (703) 548-3118 |
| AHA | American Hardboard Association<br>(Now part of CPA) | |
| AI | Asphalt Institute<br>www.asphaltinstitute.org | (859) 288-4960 |

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|---|---|---|
| AIA | American Institute of Architects (The)<br>www.aia.org | (800) 242-3837<br>(202) 626-7300 |
| AISC | American Institute of Steel Construction<br>www.aisc.org | (800) 644-2400<br>(312) 670-2400 |
| AISI | American Iron and Steel Institute<br>www.steel.org | (202) 452-7100 |
| ALCA | Associated Landscape Contractors of America<br>(Now PLANET - Professional Landcare Network) | |
| ALSC | American Lumber Standard Committee, Incorporated<br>www.alsc.org | (301) 972-1700 |
| AMCA | Air Movement and Control Association International, Inc.<br>www.amca.org | (847) 394-0150 |
| ANSI | American National Standards Institute<br>www.ansi.org | (202) 293-8020 |
| AOSA | Association of Official Seed Analysts, Inc.<br>www.aosaseed.com | (405) 780-7372 |
| APA | APA - The Engineered Wood Association<br>www.apawood.org | (253) 565-6600 |
| APA EWS | APA - The Engineered Wood Association; Engineered Wood Systems<br>(See APA - The Engineered Wood Association) | |
| API | American Petroleum Institute<br>www.api.org | (202) 682-8000 |
| ARI | Air-Conditioning & Refrigeration Institute<br>www.ari.org | (703) 524-8800 |
| ASCE | American Society of Civil Engineers<br>www.asce.org | (800) 548-2723<br>(703) 295-6300 |
| ASCE/SEI | American Society of Civil Engineers/Structural Engineering Institute<br>(See ASCE) | |
| ASHRAE | American Society of Heating, Refrigerating and Air-Conditioning Engineers<br>www.ashrae.org | (800) 527-4723<br>(404) 636-8400 |
| ASME | ASME International<br>(The American Society of Mechanical Engineers International)<br>www.asme.org | (800) 843-2763<br>(973) 882-1170 |
| ASSE | American Society of Sanitary Engineering<br>www.asse-plumbing.org | (440) 835-3040 |

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|---|---|---|
| ASTM | ASTM International<br>(American Society for Testing and Materials International)<br>www.astm.org | (610) 832-9585 |
| AWCI | AWCI International<br>(Association of the Wall and Ceiling Industry International)<br>www.awci.org | (703) 534-8300 |
| AWI | Architectural Woodwork Institute<br>www.awinet.org | (571) 323-3636 |
| AWPA | American Wood-Preservers' Association<br>www.awpa.com | (205) 733-4077 |
| AWS | American Welding Society<br>www.aws.org | (800) 443-9353<br>(305) 443-9353 |
| AWWA | American Water Works Association<br>www.awwa.org | (800) 926-7337<br>(303) 794-7711 |
| BHMA | Builders Hardware Manufacturers Association<br>www.buildershardware.com | (212) 297-2122 |
| BIA | Brick Industry Association (The)<br>www.bia.org | (703) 620-0010 |
| BICSI | BICSI<br>www.bicsi.org | (800) 242-7405<br>(813) 979-1991 |
| BISSC | Baking Industry Sanitation Standards Committee<br>www.bissc.org | (866) 342-4772 |
| CCC | Carpet Cushion Council<br>www.carpetcushion.org | (610) 527-3880 |
| CDA | Copper Development Association<br>www.copper.org | (800) 232-3282<br>(212) 251-7200 |
| CEA | Canadian Electricity Association<br>www.canelect.ca | (613) 230-9263 |
| CFFA | Chemical Fabrics & Film Association, Inc.<br>www.chemicalfabricsandfilm.com | (216) 241-7333 |
| CGA | Compressed Gas Association<br>www.cganet.com | (703) 788-2700 |
| CISCA | Ceilings & Interior Systems Construction Association<br>www.cisca.org | (630) 584-1919 |
| CISPI | Cast Iron Soil Pipe Institute<br>www.cispi.org | (423) 892-0137 |
| CLFMI | Chain Link Fence Manufacturers Institute<br>www.chainlinkinfo.org | (301) 596-2583 |

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|---|---|---|
| CRRC | Cool Roof Rating Council<br>www.coolroofs.org | (866) 465-2523<br>(510) 485-7175 |
| CPA | Composite Panel Association<br>www.pbmdf.com | (301) 670-0604 |
| CPPA | Corrugated Polyethylene Pipe Association<br>www.cppa-info.org | (800) 510-2772<br>(202) 462-9607 |
| CRI | Carpet & Rug Institute (The)<br>www.carpet-rug.com | (800) 882-8846<br>(706) 278-3176 |
| CRSI | Concrete Reinforcing Steel Institute<br>www.crsi.org | (847) 517-1200 |
| CSA | Canadian Standards Association | (800) 463-6727<br>(416) 747-4000 |
| CSA | CSA International<br>(Formerly: IAS - International Approval Services)<br>www.csa-international.org | (866) 797-4272<br>(416) 747-4000 |
| CSI | Cast Stone Institute<br>www.caststone.org | (717) 272-3744 |
| CSI | Construction Specifications Institute (The)<br>www.csinet.org | (800) 689-2900<br>(703) 684-0300 |
| CTI | Cooling Technology Institute<br>(Formerly: Cooling Tower Institute)<br>www.cti.org | (281) 583-4087 |
| DHI | Door and Hardware Institute<br>www.dhi.org | (703) 222-2010 |
| EIA | Electronic Industries Alliance<br>www.eia.org | (703) 907-7500 |
| EJMA | Expansion Joint Manufacturers Association, Inc.<br>www.ejma.org | (914) 332-0040 |
| ESD | ESD Association<br>www.esda.org | (315) 339-6937 |
| FM Approvals | FM Approvals<br>www.fmglobal.com | (781) 762-4300 |
| FM Global | FM Global<br>(Formerly: FMG - FM Global)<br>www.fmglobal.com | (401) 275-3000 |
| FMRC | Factory Mutual Research<br>(Now FM Global) | |
| FSA | Fluid Sealing Association<br>www.fluidsealing.com | (610) 971-4850 |

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|---|---|---|
| GA | Gypsum Association<br>www.gypsum.org | (202) 289-5440 |
| GANA | Glass Association of North America<br>www.glasswebsite.com | (785) 271-0208 |
| GRI | (Now GSI) | |
| GS | Green Seal<br>www.greenseal.org | (202) 872-6400 |
| HI | Hydraulic Institute<br>www.pumps.org | (888) 786-7744<br>(973) 267-9700 |
| HI | Hydronics Institute<br>www.gamanet.org | (908) 464-8200 |
| HMMA | Hollow Metal Manufacturers Association<br>(Part of NAAMM) | |
| HPVA | Hardwood Plywood & Veneer Association<br>www.hpva.org | (703) 435-2900 |
| HPW | H. P. White Laboratory, Inc.<br>www.hpwhite.com | (410) 838-6550 |
| IAS | International Approval Services<br>(Now CSA International) | |
| ICEA | Insulated Cable Engineers Association, Inc.<br>www.icea.net | (770) 830-0369 |
| ICRI | International Concrete Repair Institute, Inc.<br>www.icri.org | (847) 827-0830 |
| IEC | International Electrotechnical Commission<br>www.iec.ch | 41 22 919 02 11 |
| IEEE | Institute of Electrical and Electronics Engineers, Inc. (The)<br>www.ieee.org | (212) 419-7900 |
| IESNA | Illuminating Engineering Society of North America<br>www.iesna.org | (212) 248-5000 |
| IEST | Institute of Environmental Sciences and Technology<br>www.iest.org | (847) 255-1561 |
| IGCC | Insulating Glass Certification Council<br>www.igcc.org | (315) 646-2234 |
| IGMA | Insulating Glass Manufacturers Alliance<br>www.igmaonline.org | (613) 233-1510 |
| ILI | Indiana Limestone Institute of America, Inc.<br>www.iliai.com | (812) 275-4426 |

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| ISO | International Organization for Standardization<br>www.iso.ch | 41 22 749 01 11 |
| | Available from ANSI<br>www.ansi.org | (202) 293-8020 |
| ISSFA | International Solid Surface Fabricators Association<br>www.issfa.net | (877) 464-7732<br>(702) 567-8150 |
| ITS | Intertek Testing Service NA<br>www.intertek.com | (972) 238-5591 |
| ITU | International Telecommunication Union<br>www.itu.int/home | 41 22 730 51 11 |
| LMA | Laminating Materials Association<br>(Now part of CPA) | |
| LPI | Lightning Protection Institute<br>www.lightning.org | (800) 488-6864 |
| MFMA | Metal Framing Manufacturers Association, Inc.<br>www.metalframingmfg.org | (312) 644-6610 |
| MH | Material Handling<br>(Now MHIA) | |
| MHIA | Material Handling Industry of America<br>www.mhia.org | (800) 345-1815<br>(704) 676-1190 |
| MIA | Marble Institute of America<br>www.marble-institute.com | (440) 250-9222 |
| MPI | Master Painters Institute<br>www.paintinfo.com | (888) 674-8937 |
| MSS | Manufacturers Standardization Society of The Valve and Fittings Industry Inc.<br>www.mss-hq.com | (703) 281-6613 |
| NAAMM | National Association of Architectural Metal Manufacturers<br>www.naamm.org | (312) 332-0405 |
| NACE | NACE International<br>(National Association of Corrosion Engineers International)<br>www.nace.org | (800) 797-6623<br>(281) 228-6200 |
| NADCA | National Air Duct Cleaners Association<br>www.nadca.com | (202) 737-2926 |
| NAIMA | North American Insulation Manufacturers Association<br>www.naima.org | (703) 684-0084 |
| NCMA | National Concrete Masonry Association<br>www.ncma.org | (703) 713-1900 |

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|---|---|---|
| NCPI | National Clay Pipe Institute<br>www.ncpi.org | (262) 248-9094 |
| NCTA | National Cable & Telecommunications Association<br>www.ncta.com | (202) 775-3550 |
| NEBB | National Environmental Balancing Bureau<br>www.nebb.org | (301) 977-3698 |
| NECA | National Electrical Contractors Association<br>www.necanet.org | (301) 657-3110 |
| NeLMA | Northeastern Lumber Manufacturers' Association<br>www.nelma.org | (207) 829-6901 |
| NEMA | National Electrical Manufacturers Association<br>www.nema.org | (703) 841-3200 |
| NETA | InterNational Electrical Testing Association<br>www.netaworld.org | (888) 300-6382<br>(303) 697-8441 |
| NFPA | NFPA<br>(National Fire Protection Association)<br>www.nfpa.org | (800) 344-3555<br>(617) 770-3000 |
| NFRC | National Fenestration Rating Council<br>www.nfrc.org | (301) 589-1776 |
| NGA | National Glass Association<br>www.glass.org | (866) 342-5642<br>(703) 442-4890 |
| NHLA | National Hardwood Lumber Association<br>www.natlhardwood.org | (800) 933-0318<br>(901) 377-1818 |
| NLGA | National Lumber Grades Authority<br>www.nlga.org | (604) 524-2393 |
| NRCA | National Roofing Contractors Association<br>www.nrca.net | (800) 323-9545<br>(847) 299-9070 |
| NRMCA | National Ready Mixed Concrete Association<br>www.nrmca.org | (888) 846-7622<br>(301) 587-1400 |
| NSF | NSF International<br>(National Sanitation Foundation International)<br>www.nsf.org | (800) 673-6275<br>(734) 769-8010 |
| NSSGA | National Stone, Sand & Gravel Association<br>www.nssga.org | (800) 342-1415<br>(703) 525-8788 |
| NTRMA | National Tile Roofing Manufacturers Association<br>(Now TRI) | |
| NWWDA | National Wood Window and Door Association<br>(Now WDMA) | |

| | | |
|---|---|---|
| OPL | Omega Point Laboratories, Inc.<br>(Now ITS) | |
| PCI | Precast/Prestressed Concrete Institute<br>www.pci.org | (312) 786-0300 |
| PDCA | Painting & Decorating Contractors of America<br>www.pdca.com | (800) 332-7322<br>(314) 514-7322 |
| PDI | Plumbing & Drainage Institute<br>www.pdionline.org | (800) 589-8956<br>(978) 557-0720 |
| PLANET | Professional Landcare Network<br>(Formerly: ACLA - Associated Landscape Contractors of America)<br>www.landcarenetwork.org | (800) 395-2522<br>(703) 736-9666 |
| PTI | Post-Tensioning Institute<br>www.post-tensioning.org | (602) 870-7540 |
| RCSC | Research Council on Structural Connections<br>www.boltcouncil.org | |
| RFCI | Resilient Floor Covering Institute<br>www.rfci.com | (301) 340-8580 |
| SAE | SAE International<br>www.sae.org | (877) 606-7323<br>(724) 776-4841 |
| SDI | Steel Deck Institute<br>www.sdi.org | (847) 458-4647 |
| SDI | Steel Door Institute<br>www.steeldoor.org | (440) 899-0010 |
| SEI/ASCE | Structural Engineering Institute/American Society of Civil Engineers<br>(See ASCE) | |
| SGCC | Safety Glazing Certification Council<br>www.sgcc.org | (315) 646-2234 |
| SIA | Security Industry Association<br>www.siaonline.org | (703) 683-2075 |
| SIGMA | Sealed Insulating Glass Manufacturers Association<br>(Now IGMA) | |
| SJI | Steel Joist Institute<br>www.steeljoist.org | (843) 626-1995 |
| SMACNA | Sheet Metal and Air Conditioning Contractors' National Association<br>www.smacna.org | (703) 803-2980 |

| | | |
|---|---|---|
| SPIB | Southern Pine Inspection Bureau (The)<br>www.spib.org | (850) 434-2611 |
| SPRI | Single Ply Roofing Industry<br>www.spri.org | (781) 647-7026 |
| SSINA | Specialty Steel Industry of North America<br>www.ssina.com | (800) 982-0355<br>(202) 342-8630 |
| SSPC | SSPC: The Society for Protective Coatings<br>www.sspc.org | (877) 281-7772<br>(412) 281-2331 |
| STI | Steel Tank Institute<br>www.steeltank.com | (847) 438-8265 |
| SWRI | Sealant, Waterproofing, & Restoration Institute<br>www.swrionline.org | (816) 472-7974 |
| TCA | Tile Council of America, Inc.<br>www.tileusa.com | (864) 646-8453 |
| TIA/EIA | Telecommunications Industry Association/Electronic Industries Alliance<br>www.tiaonline.org | (703) 907-7700 |
| TMS | The Masonry Society<br>www.masonrysociety.org | (303) 939-9700 |
| TPI | Truss Plate Institute, Inc.<br>www.tpinst.org | (703) 683-1010 |
| TPI | Turfgrass Producers International<br>www.turfgrasssod.org | (800) 405-8873<br>(847) 649-5555 |
| UL | Underwriters Laboratories Inc.<br>www.ul.com | (877) 854-3577<br>(847) 272-8800 |
| UNI | Uni-Bell PVC Pipe Association<br>www.uni-bell.org | (972) 243-3902 |
| USGBC | U.S. Green Building Council<br>www.usgbc.org | (202) 828-7422 |
| WASTEC | Waste Equipment Technology Association<br>www.wastec.org | (800) 424-2869<br>(202) 244-4700 |
| WCLIB | West Coast Lumber Inspection Bureau<br>www.wclib.org | (800) 283-1486<br>(503) 639-0651 |
| WDMA | Window & Door Manufacturers Association<br>(Formerly: NWWDA - National Wood Window and Door Association)<br>www.wdma.com | (800) 223-2301<br>(847) 299-5200 |

| | | |
|---|---|---|
| WMMPA | Wood Moulding & Millwork Producers Association<br>www.wmmpa.com | (800) 550-7889<br>(530) 661-9591 |
| WSRCA | Western States Roofing Contractors Association<br>www.wsrca.com | (800) 725-0333<br>(650) 570-5441 |
| WWPA | Western Wood Products Association<br>www.wwpa.org | (503) 224-3930 |

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

| | | |
|---|---|---|
| IAPMO | International Association of Plumbing and Mechanical Officials<br>www.iapmo.org | (909) 472-4100 |
| ICBO | International Conference of Building Officials<br>(See ICC) | |
| ICBO ES | ICBO Evaluation Service, Inc.<br>(See ICC-ES) | |
| ICC | International Code Council<br>www.iccsafe.org | (888) 422-7233<br>(703) 931-4533 |
| ICC-ES | ICC Evaluation Service, Inc.<br>www.icc-es.org | (800) 423-6587<br>(562) 699-0543 |

C. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

| | | |
|---|---|---|
| ADAAG | Americans with Disabilities Act (ADA)<br>Accessibility Guidelines for Buildings and Facilities<br>Available from Access Board<br>www.access-board.gov | (800) 872-2253 |
| CFR | Code of Federal Regulations<br>Available from Government Printing Office<br>www.gpoaccess.gov/cfr/index.html | (866) 512-1800<br>(202) 512-1800 |
| FED-STD | Federal Standard<br>(See FS) | |

| | | |
|---|---|---|
| FS | Federal Specification<br>Available from Department of Defense Single Stock Point<br>http://dodssp.daps.dla.mil | (215) 697-2664 |
| | Available from Defense Standardization Program<br>www.dps.dla.mil | |
| | Available from General Services Administration<br>www.gsa.gov | (202) 619-8925 |
| | Available from National Institute of Building Sciences<br>www.wbdg.org/ccb | (202) 289-7800 |
| FTMS | Federal Test Method Standard<br>(See FS) | |
| MIL | (See MILSPEC) | |
| MIL-STD | (See MILSPEC) | |
| MILSPEC | Military Specification and Standards<br>Available from Department of Defense Single Stock Point<br>http://dodssp.daps.dla.mil | (215) 697-2664 |
| UFAS | Uniform Federal Accessibility Standards<br>Available from Access Board<br>www.access-board.gov | (800) 872-2253<br>(202) 272-0080 |

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

## PART 1 - GENERAL

### 1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

### 1.02 SCOPE:

A. Supplementary tests and reports required in this section with any tests, reports, and other information that may be required additionally in any section of the specifications.

B. Inspection, sampling, and testing is required, but not limited to, the following:

1. Section 03300 – Cast In Place Concrete

C. Sampling and testing frequencies and requirements are to comply with IDOT IM-204.

### 1.03 TESTS BY INDEPENDENT TESTING LABORATORY:

A. Testing Laboratory:

1. Contractor to select and pay for an independent testing laboratory, acceptable to the Project Engineer, to perform specified services required by the contract.

2. Employment of testing laboratory will in no way relieve Contractor's obligations to perform work in accord with the contract.

3. Include in lump sum bid the cost for all testing services required. No separate payments will be made for testing. Include all associated costs in the various appropriate bid items. Project Engineer/DNR Construction Inspector will direct all tests. The Contractor shall pay the testing firm.

B. Contractor Shall:

1. Make available at no cost, all material to be tested.

2. Provide labor necessary to supply samples and assist in making tests.

3. Advise laboratory of the identity of material sources and instruct suppliers to allow inspections by laboratory.

C. Testing laboratory shall:

1. Submit written report promptly, covering each inspection and test to the Project Engineer, including:
   a. Date issued.
   b. Project title and number.
   c. Testing laboratory name and address.

d. Name and signature of laboratory technician.
e. Date of inspection and sampling.
f. Record of temperature and weather.
g. Date of test.
h. Identification of product and specification section.
i. Location of project.
j. Type of inspection or test.
k. Observations regarding compliance with Contract Documents.

2. Promptly notify Project Engineer of irregularities or deficiencies of work which are observed during performance of testing services.

3. Perform additional services required by the Project Engineer/DNR Construction Inspector.

D. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on, contract requirements.

2. Approve or accept any portion of work.

3. Perform any duties of the Contractor.

E. Conduct tests in accordance with the requirements of the designated specifications or, where not specified, the latest appropriate standard of the American Society for Testing and Material.

1.04 LABORATORY SERVICES AND TESTS REQUIRED:

A. Concrete:

1. Secure samples of aggregates Contractor proposes to use and test for compliance with specifications.

2. Certify compliance with specification of cement proposed for use by the Contractor.

3. Review concrete design mix proportions for the required concrete strengths using materials Contractor proposes to use on the project. Incorporate specified admixtures and not less than amount of cement specified. Perform appropriate laboratory tests, including compression tests of cylinders and slump test to substantiate mix designs. Submit one copy of report to the Project Engineer, one copy to the DNR Construction Inspector, and one copy to the Contractor, clearly indicating the results of the mix design review.

4. When requested by the DNR Construction Inspector, inspect and test material during concrete work to substantiate compliance with specifications and mix requirements.

5. Slump Test: The DNR Construction Inspector will require slump tests to be performed as he desires in accordance with the provisions of these specifications.

6. Test Cylinders:

a. Each test shall consist of a set of three cylinders provided by the Contractor. Sampling and testing frequencies and requirements are to comply with IDOT IM-204.

b. Provide a minimum of one set of test cylinders each day concrete is placed.

d. The Contractor shall make and cure test cylinders in conformity with ASTM C-31.

e. Note on record drawings placement locations represented by test cylinders.

7. Perform compression tests in accordance with applicable sections of IDOT specifications.

8. Identify all test cylinders with symbols to indicate location on the job where concrete tests were made. Note on record drawings.

C. Aggregate gradation and compaction as per applicable specifications.

1.05 CONTRACTOR'S RESPONSIBILITIES:

A. Furnish product mix design to meet or exceed Contract Documents.

B. Cooperate with laboratory personnel and provide access to work, as well as to manufacturer's operations.

1. Monitor each inspection, sampling and test.

C. Provide to laboratory, preliminary representative samples of material to be tested, in specified quantities.

D. Furnish copies of mill test reports.

E. Furnish verification of compliance with contract requirements for material and equipment.

F. Furnish casual labor and facilities:

1. To provide access to work to be tested.

2. To obtain and handle samples at site.

3. To facilitate inspections and tests.

4. For laboratory's exclusive use for storage and curing of test samples.

G. Notify laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests. Notify DNR Construction Inspector when work is ready for testing. Schedule testing after approval of the DNR Construction Inspector. The Department of Natural Resources will not pay for any testing scheduled without the DNR Construction Inspector's specific authorization.

H. Correct work which is defective or which fails to conform to the Contract Documents in accordance with the general condition. Do not delay the project schedule or the work of other contractors with corrective work.

I. Pay all costs of re-testing when test results indicate non-compliance with contract requirements.

J. Patch all surfaces and areas disturbed by testing operations.

END OF SECTION 01400

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

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. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:

1. Division 01 Section "Summary" for work restrictions.
2. Division 01 Section "Execution" for progress cleaning requirements.

1.3 USE CHARGES

A. Owner will pay the cost for Contractor’s use of electricity and water.

1.4 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY UTILITIES

A. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

## PART 3 - EXECUTION

### 3.1 TEMPORARY UTILITY INSTALLATION

A. Self-Contained Toilet Units: Provide separate facilities for male and female personnel. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities. Service, clean, and maintain the facilities and enclosures.

1. Locate facilities away from the public. Coordinate location with Owner.

### 3.2 SUPPORT FACILITIES INSTALLATION

A. Parking: Coordinate parking areas for construction personnel with Owner.

B. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 1 Section "Execution" for progress cleaning requirements.

### 3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

B. Refer to Drawings for other protection.

C. Temporary Fire Protection: Provide temporary fire-protection equipment.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

### 3.4 OPERATION, TERMINATION, AND REMOVAL

A. Maintenance: Maintain facilities in good operating condition until removal.

B. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

### 3.5 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and turf that are damaged by construction operations, in a manner approved by Architect.

END OF SECTION 015000

SECTION 01 60 00

PRODUCT REQUIREMENTS

## PART 1 GENERAL

### 1.1 SUMMARY

A. Manufactures: Provide products from one manufacturer for each type or kind as applicable. Provide secondary materials as acceptable to manufacturers of primary materials.

B. Product Selection: Provide products selected or equal approved by Architect. Products submitted for substitution shall be submitted with complete documentation, and include construction costs of substitution including related work.

C. Substitutions: Request for substitution must be in writing. Conditions for substitution include:

1. An 'or equal' phrase in the specifications.

2. Specified material cannot be coordinated with other work.

3. Specified material is not acceptable to authorities having jurisdiction.

4. Substantial advantage is offered to the Owner in terms of cost, time, or other valuable consideration.

D. Substitution Requests: Substitutions shall be submitted prior to award of contract, unless otherwise acceptable. Approval of shop drawings, product data, or samples containing substitutions is not an approval of a substitution unless an item is clearly presented as a substitution at the time of submittal.

**PART 2 PRODUCTS** - Not Applicable To This Section

**PART 3 EXECUTION** - Not Applicable To This Section

END OF SECTION

SECTION 017300 - EXECUTION

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. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. General installation of products.
2. Progress cleaning.
3. Protection of installed construction.
4. Correction of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates.
2. Examine roofs for suitable conditions where products and systems are to be installed.
3. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

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

1. Request for Information Procedure: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

## 3.3 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.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

## 3.4 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. 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 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

## 3.6 CORRECTION OF THE WORK

A. Remove and replace defective construction. Remove and replace damaged existing items.

END OF SECTION 017300

SECTION 017300
OPERATION AND MAINTENANCE DATA

## PART 1 - GENERAL

### 1.01 SUMMARY:

A. Section Includes: To aid the instruction of operating and maintenance personnel, and to provide a source of information regarding the systems incorporated into the Work, furnish and deliver the data described in this section and in pertinent other sections of these specifications.

1. Additional data requirements may be described in individual sections.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

### 1.02 SUBMITTALS:

A. Comply with pertinent provisions of Section 01300.

B. Submit two copies of a preliminary draft of the proposed manual or manuals to the Engineer for review and comments.

C. Unless otherwise directed in other sections, or in writing by the Engineer, submit two copies of the final manual to the DNR Construction Inspector.

### 1.03 QUALITY ASSURANCE:

A. In preparing required data, use only personnel thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with this section's requirements, and sufficiently skilled in technical writing to communicate the essential data.

## PART 2 - PRODUCTS

### 2.01 INSTRUCTION MANUALS:

A. Where instruction manuals are required to be submitted under other sections of these specifications, prepare in accordance with the provisions of this section.

B. Format:

1. Size: 8-1/2" x 11"

2. Paper: White bond, at least 20 lb. weight

3. Text: Neatly written or printed

4. Drawings: 11" in height preferable; bind in with text; foldout acceptable; larger drawings acceptable but fold to fit within the manual and provide a drawing pocket inside rear cover or bind in with text.

5. Flysheets: Separate each portion of the manual with neatly prepared flysheets briefly describing contents of the ensuing portion; flysheets may be in color.

6. Binding: Use heavy-duty plastic or fiberboard covers with 3-ring binders. All binding is subject to the Owner's approval.

7. Measurements: Provide all measurements in U.S. standard units: feet-and-inches, lbs., and cfm.

C. Provide front and back covers for each manual, using durable Owner's approved material, clearly identified on or through the cover with at least the following information:

OPERATING AND MAINTENANCE INSTRUCTIONS
( name and address of work )
( name of contractor )
( general subject of this manual )
( space for approval signature of )
( the owner and approval date )

D. Contents include at least the following:

1. Neatly typewritten index near the front of the manual, giving immediate information as to location within the manual of all emergency information regarding the installation.

2. Detailed list of subcontractors, including address, phone number and product or equipment installed.

3. Complete instructions regarding operation and maintenance of all equipment involved, including lubrication, disassembly, and reassembly.

4. Complete nomenclature of all parts of all equipment.

5. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other data pertinent to procurement procedures.

6. Copy of all guarantees and warranties issued.

7. Manufacturers' bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.

8. Such other data as required in pertinent sections of these specifications.

PART 3 - EXECUTION

3.01 INSTRUCTION MANUALS:

A. Preliminary:

1. Prepare a preliminary draft of each proposed manual.

2. Show general arrangement, nature of contents in each portion, probable number of drawings and their size, and proposed method of binding and covering.

3. Secure the Architect's approval prior to proceeding.

B. Final: Complete the manuals in strict accordance with the approved preliminary drafts and the Architect's review comments.

C. Revisions:

1. Following the instruction of operation and maintenance personnel, review all proposed revisions of the manual with the DNR Construction Inspector.

END OF SECTION 01730

SECTION 017000
PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 CLEANING UP:

A. Keep premises free of accumulation of surplus materials and rubbish from contractor and subcontractor operations.

1. Remove all rubbish from premises.

B. Remove rubbish weekly and at other times as required by the DNR Construction Inspector. Keep interior of building free at all times of unattended combustible rubbish.

C. Immediately prior to final inspection:

1. Clean all surfaces to condition acceptable for immediate occupancy.

2. Remove all marks, stains, fingerprints, paint droppings, and other foreign matter from all finished items.

1.03 GUARANTEES, BONDS AND AFFIDAVITS:

A. Submit all written guarantees, bonds and affidavits required to the Owner prior to final payment.

B. Guarantees shall extend the full period of the required guarantee period after:

1. Replacement of work found defective during guarantee period.

2. Repair of inoperative items or adjustments to proper working conditions of items not operating properly at time of inspection at final completion.

1.04 RECORD DRAWINGS:

A. Required prior to final payment. Refer to Section 01300 of these specifications. Submit to DNR Construction Inspector.

1.05 SHOP DRAWINGS:

A. Refer to Section 013000 of these specifications.

1.06 TESTS:

A. Complete all tests required to prove actual operating performance of equipment and systems incorporated into the project. Refer to Section 01400 of these specifications.

B. Submit reports of all tests to the Owner prior to final payment.

1.07 MAINTENANCE AND OPERATING:

A. Refer to Section 01730 of these specifications, if applicable.

1.08 DAMAGE TO EXISTING STRUCTURES:

A. Prior to final acceptance by the Owner, repair or otherwise return to original condition any parts of the existing facilities which have been damaged during construction.

1.09 FINAL INSPECTION:

A. Request a final inspection in writing, at least ten days prior to the anticipated date of completion, from the DNR Construction Inspector.

B. Work will not be considered ready for final inspection until all the work has been completed and the Contractor has certified that all items are properly operating and in strict compliance with the contract documents.

C. The Contractor or his project supervisor shall be present at the job site during the final inspection.

1. The DNR Construction Inspector will present the Contractor, after the final inspection, a list of any items not meeting contract requirements. This list will be confirmed in writing and all items listed must be made acceptable before final payment will be made.

END OF SECTION 017000

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents as indicated.

B. Related Sections include the following:

1. Division 01 Section "Closeout Procedures" for general closeout procedures.
2. Technical Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up Record Prints.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations below first floor.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

## 2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

## 2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

## 2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

# PART 3 - EXECUTION

## 3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 02315
FOUNDATION EXCAVATING AND BACKFILLING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General Requirements apply to the work specified in this section.

B. This section shall include, but is not limited to the following foundation, excavating and backfilling within five feet of the building perimeter.

1. Removal of all unacceptable soil.

2. Furnish and install acceptable fill as specified herein and on the drawings.

3. Prepare subgrade for footings and slab on grade.

C. The following items are not a part of this specification:

D. Structural notes indicated on the drawings regarding foundation excavating and backfilling should be considered part of this specification.

1.2 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following codes, specifications and standards, except where more stringent requirements are shown or specified.

1. AASHTO T99 - Moisture-Density Relations of Soils Using a 5.5 LB Rammer.

2. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

3. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbs/ft^3)

4. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

5. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using the Modified Effort. (56,000 ft-lbs/ft^3)

6. ASTM D2167 – Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

7. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

8. ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

9. ASTM D2940 - Standard Specification for Graded Aggregate Material for Bases and Sub-bases for Highways or Airports.

10. ASTM D3017 – Standard Test Methods for Water Content of Soil and Rock in Place by Nuclear Method (Shallow Depth).

11. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

12. ASTM D4254 - Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

13. Geotechnical Engineering Report by Terracon on file with the Owner.

B. Comply with all applicable local, state and federal codes.

1.3 SUBMITTALS

A. Material Test Reports: Provide the Owner and Architect with the on-site material test reports from the Special Inspection Agency indicating the interpreting test results for compliance with this specification.

1.4 TESTING AND INSPECTION

A. Special Inspection and Testing:

1. In accordance with Chapter 17 of the International Building Code, the Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704.0 of the International Building Code.

2. Refer to architectural, civil, mechanical, and electrical specifications for testing and inspection requirements of non-structural components.

3. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected per the table below. The fabricator shall submit a certificate of compliance that the work as been performed in accordance with the approved plans and specification to the building official and the Architect and Engineer of Record.

4. Duties of the Special Inspection Agency:

a. Perform all testing and inspection required per the Testing and Inspection Schedule indicated below.

b. Furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The

reports what be completed and furnished within 48 hours of inspected work.

c. Submit a final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge in conformance with the approved plans and specifications.

5. Structural Component Testing and Inspection Schedule for 31 23 00 is as follows:

| Foundation Preparation | Continuous | Periodic | IBC Reference |
|---|---|---|---|
| Verify materials below shallow footings are adequate to achieve the design bearing capacity. | | X | 1704.7 |
| Verify excavations are extended to proper depth and have reached proper material. | | X | 1704.7 |
| Perform classification and testing of compacted fill materials. | | X | 1704.7 |
| Verify use of proper materials, densities, and lift thicknesses during placement and compaction of compacted fill. | X | | 1704.7 |
| Prior to placement of compacted fill, observe subgrade and verify that the site have been properly prepared. | | X | 1704.7 |

B. Minimum testing frequency and locations:

1. Laboratory Testing:

a. Granular fill: One representative gradation test for each type of material.

b. Cohesive soils: One representative moisture density test for each type of material used.

c. Non-cohesive soils: One representative moisture density test for each type of material used.

2. Field Testing:

a. The Special Inspector shall determine the location of testing.

b. Testing of final utility trench backfill shall begin at a depth of 2 feet above the top of the pipe.

c. In-place field density test and moisture content tests shall be performed as follows:

1) Fills not within the influence of building foundations and slab on grade: Per civil specifications.

2) Fills within the influence of building foundations, the following criteria shall apply: One test for each 8 inch vertical lift of compacted fill placed per 2,500 square feet of fill area (minimum of two tests per lift per structure for areas smaller than 5,000 square feet).

d. Additional testing may be required by the Special Inspector if noncompliance or a change in conditions occurs.

e. If a test fails, the Contractor shall rework the material, recompact and retest as necessary until specific compaction is achieved in all areas of the trench. All costs associated with this work, including retesting, shall be the responsibility of the Contractor.

1.5 PROTECTION

A. Contractor shall provide for design, permits and installation of all cribbing, bracing, shoring and other methods required to safely retain earth banks and excavations.

B. Notify the Engineer of unexpected subsurface conditions and discontinue work in affected areas until notification to resume.

C. Protect benchmarks, existing structures, fences, sidewalks, paving, curbing, etc., from excavation equipment and vehicular traffic.

D. Maintain and protect above and below grade utilities that are to remain.

E. Provide temporary heating or protective insulating materials to protect subgrades and foundations soils against freezing temperatures or frost during cold weather conditions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

B. General: Provide borrow soil materials when sufficient acceptable soil materials are not available from excavations.

C. Acceptable soils shall comply with the following:

1. Meet ASTM D2487 soil classification groups GW, GP, GM, SW, SP, SM or a combination of these group symbols;

2. Be free of rock or gravel larger than 3 inches in any dimension;

3. Be free of debris, waste, frozen materials, vegetation and other deleterious materials;

4. Have a liquid limit less than 45 and a plasticity index less than 20.

5. Be approved by the Special Inspection Agency.

D. Unacceptable soils shall be defined as following:

1. ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, PT or a combination of these group symbols.

2. Unacceptable soils also to include acceptable soils not maintained within 2 percent of optimum moisture content at time of compaction.

E. Free-Draining Granular Fill: Free-draining granular fill shall comply with the following:

1. Be a naturally or artificially graded mixture of natural or crushed gravel, crushed stone.

2. Be clean and free of fines.

3. Comply with ASTM D2940.

4. Be uniformly graded as follows:

| COARSE AGGREGATE GRADATIONS | | | | | | |
|---|---|---|---|---|---|---|
| SIEVE SIZE - PERCENT PASSING | | | | | | |
| Grade No. | 1-1/2" | 1" | 3/4" | 1/2" | 3/8" | No. 4 |
| CA7 | 100 | 95 ± 5 | - | 45 ± 15 | - | 5 max |

5. Be approved by the Special Inspection Agency.

F. Engineered Fill and Utility Base Course shall comply with the following:

1. Be a naturally or artificially graded mixture of natural or crushed gravel, crushed stone, natural or crushed sand; be a recycled concrete crushed to meet the gradation requirements of CA6;

2. Comply with ASTM D2940;

3. Be uniformly graded as follows:

| COARSE AGGREGATE GRADATIONS | | | | | | |
|---|---|---|---|---|---|---|
| SIEVE SIZE - PERCENT PASSING | | | | | | |
| Grade No. | 1-1/2" | 1" | 1/2” | No. 4 | No. 16 | No. 200 |
| CA6 | 100 to 90 | 95 ± 5 | 75 ± 15 | 43 ± 13 | 25 ± 15 | 8 ± 4 |

4. Be approved by the Special Inspection Agency.

G. Material Applications: Provide and install material meeting with the above requirements as follows:

1. General fill: Acceptable soils.

2. Backfill at over-excavated areas beneath footings: Engineered fill.

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify and verify required lines, levels, contours and benchmark elevations for the work are as indicated.

B. Protect plant life, lawns, other features and vegetation to remain as a portion of the final landscaping.

C. Contractor shall provide for de-watering of excavations from surface water, ground water or seepage.

D. Identify known underground utility locations with stakes and flags.

3.2 EXCAVATION

A. All excavations shall be safely and properly backfilled.

B. All abandoned footings, utilities and other structures that interfere with new construction shall be removed.

C. All unacceptable material and organic material shall be removed from below all proposed slabs-on-grade and the exposed natural soil shall be proof rolled and the compaction verified by the soils testing firm prior to placing fill. Proof-roll with a loaded tandem dump truck, loaded ready-mix truck, roller, or equivalent weight vehicle. Materials exhibiting weakness, such as those exhibiting rutting or pumping, shall be removed and replaced with acceptable compacted fill material.

D. Do not excavate within the 45-degree bearing splay of any adjacent foundations.

E. Remove lumped subsoil, boulders and rock up to 1/3 cubic yard (measured by volume). Provide Owner with unit price per cubic yard for obstructions larger than 1/3 cubic yard.

F. Outside 45-degree bearing splay of foundations, correct areas over excavated with aggregate at no additional cost to the Owner.

G. Within the 45-degree bearing splay of foundations, correct areas over excavated with 2000 psi concrete fill at no additional cost to the Owner. Notify the Engineer prior to performing such work.

H. Hand trim final excavation to remove all loose material.

I. Contractor shall form all dams and perform other work necessary for keeping the excavation clear of water during the progress of the work and, at his own expense, shall pump or otherwise remove all surface and perched water which accumulates in the excavations. Perched water that cannot be de-watered in 48 hours of continuous pumping at a minimum rate of 60 g.p.m. in dry weather shall be considered ground water.

J. Stockpile excavated material in the area designated and remove excess material not being used, from the site.

3.3 BACKFILLING

A. Support pipe and conduit during placement and compaction of bedding fill.

B. Systematically backfill to allow necessary time for natural settlement. Do not backfill over porous, wet, spongy or frozen subgrade surfaces.

C. Backfill areas to contours and elevations with unfrozen materials.

D. Unless noted otherwise on the Drawings, make grade changes gradual.

E. Contractor shall procure the approval of the subgrade from the Special Inspection Agency prior to the start of any filling or bedding operations.

F. Place and mechanically compact granular fill in continuous layers not to exceed 6 inches compacted depth.

G. Employ a placement method that does not disturb or damage adjacent utilities, vapor barriers, foundation perimeter drainage and foundation waterproofing.

H. All surplus fill materials are to be removed from the site.

I. Fill material stockpiles shall be free of unacceptable soil materials.

J. After work is complete, remove all excess stockpile material and repair stockpile area to its original condition.

3.4 COMPACTION

A. Compact all fill that will support building footings or floor slabs to 98 percent of the maximum dry density in accordance with ASTM D698. For relative cohesionless fill materials, where the percent passing the #200 sieve is less than 10 and the moisture density curve indicates only slight sensitivity to changing moisture content, compaction requirements should be changed to 75 percent relative density in accordance with ASTM D4253 and ASTM D4254.

3.5 FOUNDATIONS

A. Each footing excavation should be cleared of all obstructions and other organic or deleterious materials.

B. Localized areas of unstable or unacceptable material may be discovered during the stripping and excavation operation and may require over-excavation and backfilling. The Special Inspection Agency shall be present during the proof rolling to evaluate any localized areas and make recommendations regarding over-excavation, backfilling and recompaction of these areas. Fill placement and compaction shall be inspected and tested by the Special Inspection Agency.

C. Footing elevations shown on the Drawings designate a minimum depth of footing where a safe soil bearing pressure is expected. Footings, piers and/or walls shall be lowered or extended as required to reach soil meeting the design bearing pressure. This work shall be performed under direct supervision of the Special Inspection Agency.

D. All footing excavations shall be recompacted by hand-operated, vibratory compaction equipment.

E. All excavation and recompacted surfaces shall be inspected and tested to a depth of 2.0 feet below the excavated elevation by the Special Inspection Agency. Additional field density tests should be performed for each one foot of fill material placed. Any areas not in compliance with the compaction requirements should be corrected and re-tested prior to placement of fill material.

F. For foundation areas where over excavation is performed, place and mechanically compact Engineered fill material in continuous layers not to exceed 6 inches compacted depth.

3.6 TOLERANCES

A. Top surface of general backfilling: Plus or minus 1 inch from required elevation.

END OF SECTION

SECTION 03 10 00
CONCRETE FORMWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General Requirements apply to the work specified in this section.

B. This section includes the design, construction and treatment of formwork and related accessories to confine and shape concrete to the required dimensions.

C. Structural notes indicated on the drawings regarding concrete formwork shall be considered a part of this specification.

1.2 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards except where more stringent requirements are shown or specified.

1. ACI 117 – Standard Specification for Tolerances for Concrete Construction and Materials.

2. ACI 301 – Standard Specification for Structural Concrete.

3. ACI 318 – Building Code Requirements for Structural Concrete.

4. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field.

5. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Test Specimens.

B. Where provisions of the pertinent Codes and Standards conflict with this specification, the more stringent provision shall govern.

1.3 TESTING AND INSPECTION

A. Special Inspection and Testing:

1. In accordance with Chapter 17 of the International Building Code, the Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704.0 of the International Building Code.

2. Refer to architectural, civil, mechanical, and electrical specifications for testing and inspection requirements of non-structural components.

3. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected per the table below. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with

the approved plans and specification to the building official and the Architect and Engineer of Record.

4. Duties of the Special Inspection Agency:

   a. Perform all testing and inspection required per the Testing and Inspection Schedule indicated below.

   b. Furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work.

   c. Submit a final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge in conformance with the approved plans and specifications.

5. Structural Component Testing and Inspection Schedule for 03100 is as follows:

| Concrete and Concrete Placement | Continuous | Periodic | Referenced Standard | IBC Reference |
|---|---|---|---|---|
| Inspect formwork for shape, location and dimensions of the concrete member being formed. | | X | ACI 318: 6.1.1 | |

1.4 SUBMITTALS

A. Formwork Release Agent: Submit data on the formwork release agent proposed for use with each form surface to be used for acceptance unless otherwise specified in the Contract Documents. Include certification that agent is compatible with finish.

B. Testing for Formwork Removal: When methods other than cylinder tests are proposed for determining time for formwork removal, submit data on methods for approval.

1.5 DESIGN REQUIREMENTS

A. Design and Engineering of formwork is the responsibility of the Contractor. Design and construct formwork, shoring and bracing to conform to Contract Documents and building code requirements. Design for construction loads, lateral pressure, and requirements of the applicable building code.

B. Drawings show the design requirements and dimensions for structural strength, but structural drawings do not show all detail dimensions to fit intricate Architectural and mechanical detail. Contractor shall so construct the concrete work that it will conform to the clearance required by the Architectural, Mechanical and Electrical design.

C. Maximum deflection of facing materials forming concrete surfaces exposed to view shall be 1/240 of the center-to-center span between structural members of the formwork.

## PART 2 - PRODUCTS

### 2.1 MATERIALS AND ACCESSORIES

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

B. Formwork Accessories: Use commercially manufactured accessories for formwork accessories that are partially or completely embedded in concrete, including ties and hangers.

C. Formwork Release Agent: Use commercially manufactured form release agents that will prevent formwork absorption of moisture, prevent bond with concrete, and will not stain the concrete surface. Formwork release agent shall be compatible with paint or any other finish applied to the concrete; submit data indicating compatibility.

D. Form Material:

1. No aluminum shall be allowed in the concrete work unless coated to prevent aluminum-concrete reaction.

2. Concrete form materials must be used in a manner so as to provide the surface finish specified.

3. Design formwork in accordance with the provisions of the building code or the following standards if not covered in the building code:

   a. Wood - AF & PA “National Design Specification”.
   b. Plywood - American Plywood Association “Plywood Design Specification”.
   c. Steel - AISC “Manual of Steel Construction - Allowable Stress Design”.
   d. Cold-formed Steel - AISI “Cold-Formed Steel Design Manual”.
   e. Aluminum - Aluminum Association “Aluminum Construction Manual”.
   f. Concrete - ACI 318.
   g. Other materials - as directed by manufacturer.

E. Chamfer Strips:

1. Chamfer strips shall be 3/4 inch by 3/4 inch strips. Verify material finish with Architect.

### 2.2 CONSTRUCTION JOINTS

A. Location: Locate and form construction joints that least impair strength of the structure. Locate joints at the tops of footings, piers or floor slabs. Make joints perpendicular to the main reinforcement.

B. All construction joints between adjacent concrete pours or between concrete and masonry shall be doweled. Joints must be kept free of dirt, debris, form oils, etc., to assure proper bond with adjacent pour or masonry construction.

2.3 FORM FINISHES

A. Rough Form Finish:

1. Concrete surfaces not exposed to view in the finished work shall have a rough-form finish. No form-facing material is specified for rough-form finish.

2. Set and maintain forms so finished concrete dimensions shall conform to the tolerances. Rough form finish is designated Class C.

B. Smooth Form Finish:

1. Concrete surfaces exposed to view in the finished work or surfaces to receive finishes of any type (paint, textured paint, etc.) shall have a smooth form finish. Form-facing material shall be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper, or other acceptable material capable of producing the desired finish. Form-facing material shall produce a smooth, uniform texture on the concrete. Do not use form facing material with raised grain, torn surfaces, worn edges, patches, dents, or other defects that might impair the texture of the concrete surfaces.

2. Set and maintain forms so finished concrete dimensions shall conform to the tolerances. Smooth form finish is designated Class A.

C. Patching and repairing concrete finishes are specified under Section 03300.

2.4 FABRICATION AND MANUFACTURE

A. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of the exposed concrete surface.

2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.

3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

B. Waterstops : Fabricate pieces of premolded waterstop with a maximum practicable length to hold the number of end joints to a minimum. Fabricate joints in waterstops in accordance with manufacturer’s recommendations.

PART 3 - EXECUTION

3.1 CONSTRUCTION OF TEMPORARY FORMWORK

A. Design, erect, shore, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. At construction joints, lap contact surface of the form sheathing for flush surfaces exposed to view over the hardened concrete in the previous placement by not more than 1 inch. Ensure formwork is held firmly against hardened concrete to prevent offsets or loss of mortar at construction joints and to maintain a true surface.

C. Unless specified in the Contract Documents, construct formwork so concrete surfaces conform to tolerance limits. The class of surface for offset between adjacent pieces of formwork facing material shall be Class C, unless specified otherwise.

D. Provide positive means of adjustment (wedges or jacks) of shores and struts. Do not make adjustments in the formwork after concrete has taken its initial set. Brace formwork securely against lateral deflection and lateral instability.

E. To maintain specified tolerances, camber formwork to compensate for anticipated deflections in formwork prior to hardening of concrete. Formwork camber calculations are the responsibility of the formwork designer. Set formwork and intermediate screed strips for slabs accurately to produce designated elevations and contours of the finished surface prior to removal of formwork. Ensure that edge forms and screed strips are sufficiently strong to support vibrating screeds or roller pipe screeds when the finish specified requires the use of such equipment.

F. Fasten form wedges in place after final adjustment of forms and prior to concrete placement.

G. Anchor formwork to shores, supporting surfaces, or members to prevent upward or lateral movement of the formwork system during concrete placement.

H. Securely brace and shore forms to prevent displacement and to safely support construction loads.

I. Construct formwork for wall openings to facilitate removal and to counteract swelling of wood formwork. Keep wood forms wet as necessary to prevent shrinkage.

J. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Chamfer wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

K. Do not use rust-stained steel form-facing material.

L. Provide temporary openings at the base of column and wall formwork and at other points where necessary to facilitate cleaning and inspection.

M. Unless noted otherwise, all footings shall be centered under walls, piers or columns.

N. Provide runways for moving equipment and support runways directly on formwork or structural member without resting on the reinforcing steel.

O. Place sleeves, inserts, anchors, and embedded items required for adjoining work or for support of adjoining work prior to concrete placement.

P. Position and support expansion joint material and other embedded items to prevent displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with readily removable material to prevent entry of concrete into voids.

Q. Projecting corners of beams, walls and columns shall be formed with a 3/4 inch chamfer. Unless noted otherwise on Architectural drawings.

R. Clean surfaces of formwork and embedded materials of mortar, grout, and foreign material before concrete is placed.

S. Cover surfaces of formwork with acceptable formwork release agent. Apply form release agent before placing reinforcing steel and concrete according to manufacturer's written instructions. Do not allow formwork release agent to puddle in forms. Do not allow formwork release agent to contact reinforcing steel or hardened concrete against which fresh concrete is to be placed

T. Clean and inspect formwork immediately before concrete is placed.

U. Construct forms plumb and straight to conform to slopes, lines and dimensions shown.

V. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

## 3.2 COORDINATION

A. Install all required pipe sleeves, cavities or slots. Notify appropriate trades in due time so that they may furnish information and make necessary installations. Check sizes, location and alignment of all openings, frames and other work, which are to be built-in including electrical boxes and conduit.

B. Layout the run of partitions and establish location of openings so that other trades may properly locate their work.

C. Core drilling concrete is not permitted unless noted otherwise or approved in writing by the Architect. Notify the Architect in advance of conditions not shown on the drawings.

## 3.3 INSTALLATION OF EMBEDDED ITEMS

A. Built-In Items:

1. Confirm with Architect that all materials to be embedded are suitable for embedment in concrete.

2. Build in anchors, inserts, and other devices indicated or required for various portions of work.

3. Build in sleeves, thimbles, and other items furnished or set in place by other trades.

4. Accurately position and support all embedded items prior to concrete placement. Secure embedded items against displacement during concrete placement operations.

5. Fill voids with readily removable material to prevent entry of concrete into voids.

6. Mechanical and electrical shall provide and set required sleeves.

7. Coordinate setting of all embedded items.

3.4 REMOVAL OF FORMS

A. When removal of formwork is based on concrete reaching a specified compressive strength, concrete will be presumed to have reached this strength when either of the following requirements has been met:

1. Test cylinders, molded and cured under the same conditions for moisture and temperature as used for the concrete they represent, have reached the specified compressive strength.

2. Concrete has been cured in accordance with the specifications for the same length of time as laboratory-cured cylinders, which have reached the specified strength. Determine the length of time concrete has been cured in the structure by the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the air in contact with the concrete is above 50 degrees and the concrete has been damp or thoroughly sealed from evaporation and loss of moisture.

B. Forms shall remain in place for the following periods of time. These periods represent cumulative number days or hours, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 F:

1. Footings: 50% specified compressive strength or minimum 24 hours.

C. When finishing is required, remove forms as soon as removal operations will not damage concrete.

D. Loosen wood formwork for wall openings when this can be accomplished without causing damage to concrete.

E. Do not allow removal of formwork to damage the fresh concrete for columns, walls, sides of beams, and other parts supporting the weight of the concrete. Perform needed repair and treatment required on vertical surfaces at once and follow immediately with specified curing.

3.5 FASTENER REMOVAL

A. Remove all protruding fasteners left as a result of securing inserts to forms by Contractor responsible for insert.

B. Cutting flush with surface is not acceptable.

C. Patch exposed concrete surfaces if damaged during fastener removal process.

3.6 REMOVING AND REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General Requirements apply to the work specified in this section.

B. This section includes the fabrication and placement of reinforcing steel for concrete, and all related accessories.

C. Reinforcing steel for use in bond beams, masonry columns, and lintels is specified in Division 4 and is not a part of the work in this section.

D. Structural notes indicated on the drawings regarding concrete reinforcement shall be considered a part of this specification.

1.2 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following codes, specifications and standards, except where more stringent requirements are shown or specified.

1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.

2. ACI 301 - Standard Specification for Structural Concrete.

3. ACI 318 - Building Code Requirements for Structural Concrete.

4. ACI 315 - Details and Detailing of Concrete Reinforcement.

5. ASTM A82 - Standard Specification for Steel Wire, Plain for Concrete Reinforcement.

6. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.

7. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcing, Plain for Concrete Reinforcement.

8. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

9. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

10. CRSI - Manual of Standard Practice.

B. Where provisions of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

1.3 TESTING AND INSPECTION

A. Special Inspection and Testing:

1. In accordance with Chapter 17 of the International Building Code, the Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704.0 of the International Building Code.

2. Refer to architectural, civil, mechanical, and electrical specifications for testing and inspection requirements of non-structural components.

3. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected per the table below. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specification to the building official and the Architect and Engineer of Record.

4. Duties of the Special Inspection Agency:

a. Perform all testing and inspection required per the Testing and Inspection Schedule indicated below.

b. Furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work.

c. Submit a final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge in conformance with the approved plans and specifications.

5. Structural Component Testing and Inspection Schedule for Section 03200 is as follows:

| Concrete and Concrete Placement | Continuous | Periodic | Referenced Standard | IBC Reference |
|---|---|---|---|---|
| Inspection of fabricators and during fabrication. | | X | | 1704.2 |
| Inspection of reinforcing steel , and placement. | | X | ACI 318: 3.5, 7.1-7.7 | 1913.4 |

1.4 SUBMITTALS

A. Placing Drawings: Submit placing drawings showing fabrication dimensions and locations for placement of reinforcement and reinforcement accessories. Indicate bar sizes, spacing, locations, and quantities of reinforcing steel, bending and cutting diagrams, and supporting and spacing devices. Dowels shall be shown in placing drawings for the element that is to be placed first. Reinforcing steel descriptions or shop drawings shall be inch-pound sizes.

B. Product Data: Submit product data sheets for all specified products.

1. Fibrous concrete reinforcing material.

a. Application rate per cubic yard of concrete
b. Manufacturer's printed batching and mixing instructions.
c. Letter of Certification that materials supplied meets or exceeds ASTM C1116.

C. Manufacturer's Certificate: Submit mill certifications at time of delivery.

D. Splices: Submit request for splices not indicated in the Contract Documents. Request shall indicate locations, types, and lengths of splices for approval.

E. Field Bending: Submit requests and procedure for field bending or straightening of reinforcement partially embedded in concrete not described in the Contract Documents.

F. Reinforcement Relocation: Submit requests to adjust reinforcement spacing necessitated by conflicts with other reinforcement, conduits, etc. for approval.

G. Alternative Reinforcement: Submit request to relocate any reinforcing bars that exceeds placement tolerances.

1.5 COORDINATION

A. Coordinate reinforcement installation with the placement of formwork and other embedded items such as inserts, conduit, pipe sleeves, drains, metal supports, anchor rods, etc.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to the jobsite in bundles sorted and labeled with durable tags indicating bar size, length, and shop drawing mark.

B. Store elevated clear of ground and protect at all times from contamination and deterioration.

C. Prevent bending, coating with earth, oil, or other material, or otherwise damaging the reinforcement.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

B. Bar Deformations: Bars used for reinforcement shall be deformed except column spirals and welded wire reinforcement, which may be plain.

C. Reinforcing Steel: Reinforcing steel shall conform to the ASTM standard and grade indicated in the General Notes on the Drawings.

D. Welded Wire Reinforcement: Welded wire reinforcement shall conform to the ASTM standard indicated in the General Notes on the Drawings.

E. Joint Dowel Bars: Plain-steel bars. Cut bars true to length with square ends and free of burrs.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar

2. Concrete cast against earth: Bars may be supported by precast concrete bricks or approved prefabricated wire bar supports with footpads large enough to support the weight of the bars and construction traffic without being pushed into underlying grade. Precast concrete blocks shall have a minimum compressive strength of 6,000 psi.

2.2 FABRICATION

A. Fabrication Tolerances: Reinforcing steel shall be shop fabricated within tolerances to conform in size, shape, quantity, dimensions, etc. to the Construction Drawings and approved Shop Drawings.

B. Bar Condition: Bars shall be free from mill scale, excessive rust and other coatings, which would reduce or destroy the bond with the concrete.

C. Bars Bending: Bars shall be bent cold, and no method of fabrication shall be used which would be injurious to the material. Heating of bars for bending is not permitted.

D. Identification: After fabrication, bars shall be sorted, bundled and tagged with metal tags bearing the bar mark before delivery to the jobsite.

E. Corner Bars: Provide corner bars to make reinforcing continuous at all times, including intersections at footings, walls, beams or caps. Such bars shall be the same size and spacing as the horizontal reinforcing and each leg shall have a length of at least 30 inches.

F. Reinforcing for wall footings shall extend into column footings a minimum of 2'-0".

G. Dowels between footings and walls or columns shall be the same grade, size and spacing or number as the vertical reinforcing respectively, unless noted otherwise.

PART 3 - EXECUTION

3.1 PLACING

A. Reinforcement Relocation: When necessary to move reinforcement beyond the specified spacing to avoid interference with other reinforcement, or embedded items, submit resulting arrangement of reinforcement to Engineer for approval.

B. Reinforcement Cutting: Cutting of reinforcement which conflicts with embedded objects is not acceptable.

C. Wire Tie Orientation: Set wire ties so that ends are directed away from concrete surface.

D. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

E. Support for Reinforcement: Unless noted otherwise, supports for reinforcement shall have Class 2 protection as defined in the CRSI Manual of Standard Practice. Submit data on supports indicating class of protection at all different locations for approval.

F. Support for Bars in Concrete Cast on Ground: Bar supports for slabs on grade, grade beams, footings, and all other concrete cast directly onto grade shall be supported at an average spacing of 4 feet or less in each direction.

G. Securing Reinforcing Bars: All bars must be placed, spaced, secured and supported prior to casting concrete. Bars embedded in hardened or partially hardened concrete shall not be bent unless approved in writing prior to placement by the Engineer of Record.

H. Foot Traffic: Restrict foot traffic over the slab on grade reinforcing after it has been properly positioned.

I. Reinforcement at Expansion Joints: Do not continue reinforcement or other embedded metal items bonded to concrete through expansion joints. Dowels bonded on only one side of a joint and waterstops may extend through joint.

J. Pumping Concrete: When using a pump to place concrete, pump hose shall be supported directly on forms. Do not allow hose to rest on reinforcing bars if doing so could cause displacement of bars.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. The General and Supplementary Conditions of the Construction Contract and Division 1 - General Requirements apply to the work specified in this section.

B. The work includes all items required for executing and completing the cast-in-place concrete work and related work shown on the drawings or specified herein. Work shall include installation of items furnished in other sections of these specifications.

C. Structural notes indicated on the drawings regarding Cast-In-Place concrete shall be considered a part of this specification.

1.2 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified herein:

1. ACI 301 - Standard Specifications for Structural Concrete

2. ACI 305.1 - Specification for Hot Weather Concreting

3. ACI 306.1 - Standard Specification for Cold-Weather Concrete

4. ACI 318 - Building Code Requirements for Reinforced Concrete.

5. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

6. ASTM C33 - Standard Specification for Concrete Aggregates.

7. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

8. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

9. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

10. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

11. ASTM C150 - Standard Specification for Portland Cement.

12. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.

13. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

14. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

15. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

16. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

17. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

18. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

19. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

20. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

21. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

22. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

23. ASTM D1751 - Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

24. ASTM E154 - Standard Test Method for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

25. ASTM E329 –Standard Specification for Agencies Engaged in Testing and/or Inspection of Material Used in Construction

26. Concrete Reinforcing Steel Institute (CRSI) - Manual of Standard Practice.

B. Comply with all local building code requirements which are more stringent than those listed above. All referenced codes or standards shall be the most currently adopted as of the date for Receipt of Proposal.

C. Where any provision of other pertinent codes and standards conflict with this specification, the more stringent provision shall govern.

D. Maintain records verifying materials used are of the specified and accepted types and sizes and are in conformance with the requirements of the Contract Documents.

E. Use of testing services will not relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.

1.3 TESTING AND INSPECTION

A. Special Inspection and Testing:

1. In accordance with Chapter 17 of the International Building Code, the Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704.0 of the International Building Code.

2. Refer to architectural, civil, mechanical, and electrical specifications for testing and inspection requirements of non-structural components.

3. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected per the table below. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specification to the building official and the Architect and Engineer of Record.

4. Duties of the Special Inspection Agency:

a. Perform all testing and inspection required per the Testing and Inspection Schedule indicated below.

b. Furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work.

c. Submit a final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge in conformance with the approved plans and specifications.

5. Structural Component Testing and Inspection Schedule for Section 03300 is as follows:

| Concrete and Concrete Placement | Continuous | Periodic | Referenced Standard | IBC Reference |
|---|---|---|---|---|
| Review of proposed mix design and supporting test results | | X | | |
| Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased or where strength design is used. | X | | ACI 318: 8.1.3, 21.2.8 | 1911.5,1912.1 |
| Inspection of anchors installed in hardened concrete. | | X | ACI 318: 3.8.6, 8.1.3, 21.1.8 | 1912.1 |
| Verifying use of required design mix | | X | ACI 318: Ch. 4, 5.2-5.4 | 1904.2.2, |

| Concrete and Concrete Placement | Continuous | Periodic | Referenced Standard | IBC Reference |
|---|---|---|---|---|
| At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete. | X | | ASTM C172, ASTM C31, ACI 318: 5.6, 5.8 | |
| Inspection of concrete placement for proper application techniques | X | | ACI 318: 5.9, 5.10 | |
| Inspection for maintenance of specified curing temperature and techniques. | | X | ACI 318: 5.11 - 5.13 | |
| Verification of in-situ concrete strength, prior to removal of shores and forms from beams and structural slabs | | X | ACI 318: 6.2 | |

B. Sampling and testing requirements:

1. Take samples of fresh concrete at the job site for each mix design placed each day. Sampling and testing shall be done after the final addition and proper mixing of any water or admixtures that are added on site.

   a. Personnel and testing equipment shall meet the requirements of ASTM E329.

   b. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

      1) On a given project, if the total volume of concrete is such that the frequency of testing required above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.

   c. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days.

2. For each sample of fresh concrete, perform the following duties:

   a. Measure and record slump in accordance with ASTM C143.

   b. Measure and record temperature in accordance with ASTM C1064.

      1) Provide one test hourly when air temperature is 40°F (4.4°C) and below and when 80°F (27°C) and above, and one test for each composite sample.

c. Measure and record air content by volume in accordance with either ASTM C231 or ASTM C173.

d. Mold three cylinders (laboratory cylinders) in accordance with ASTM C31 to be laboratory-cured. Protect from moisture loss and maintain at 60°F to 80°F for 24 to 48 hours before moving. Deliver cylinders to testing laboratory for curing and testing.

e. Mold one cylinder (field cylinder) in accordance with ASTM C31 to be field-cured. Field cylinder shall be placed as near as possible to the in-place concrete from which it was taken, protected, and cured in the same manner. Deliver field-cured cylinder to testing laboratory, and measure and record compressive strength in accordance with ASTM C39. Field cylinder shall be used to determine if concrete footings, walls, or piers have reached the required compressive strength for steel erection to begin.

3. Measure and record compressive strength in accordance with ASTM C39 for laboratory cylinders. Test one laboratory cylinder at 7 days and all other cylinders at 28 days. Acceptance is based on the average of the two laboratory cured 28-day tests. Notify Architect in the event strength levels do not meet the acceptance requirements of ACI 318.

a. Any additional cylinders molded for Contractor to have a compressive strength test done before seven days shall be at the Contractor's expense.

4. Prepare and submit test reports to the Engineer, Contractor, and Supplier. Reports shall be completed and furnished within 48 hours of testing. Refer to description in Submittals.

5. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

## 1.4 SUBMITTALS

A. Concrete Materials: Submit information on concrete materials as listed below.

1. Cementitious materials: Submit type, class, producer name, and certification not more than 90 days old of compliance with applicable ASTM standard.

2. Aggregates: Submit type, pit or quarry location, producer name, gradations, specific gravity, water content, and certification not more than 90 days old.

3. Admixtures: Submit product data sheet. Product data shall include: dosages and performance data, brand names, producers, chloride ion concentrations, and certifications of compliance with applicable ASTM standard. Certifications shall not be more than 90 days old.

4. Water: Submit name of source.

B. Product Data: Prepare and submit product and performance data for materials and accessories, including patching compounds, joint systems, curing compounds, finish materials and other concrete related items.

C. Testing Agency Qualifications: When requested, the proposed testing agencies shall submit data on qualifications for acceptance.

D. Concrete Mix Design:

1. Concrete mix design submittals shall be submitted at least 14 days prior to placing concrete.

2. Submit concrete mixture proportions and characteristics for each concrete mix. Include standard deviation analysis or trial batch data with mix design. Submit historical field test data to demonstrate the average compressive strength for approval. Concrete mix proportions, materials, and handling methods for field test data or trial batches shall be the same as used for the work.

3. If trial batches are used, submit representative samples of each proposed ingredient to independent testing laboratory for use in preparation of mix design.

4. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Indicate amounts of mix water to be withheld for later addition at Project site.

5. Provide a record copy of the final mix designs and test results to the testing agency prior to commencement of the concrete work.

E. Concrete Finish Shop Drawings: Submit drawings indicating type of finish to be used at each location.

F. Test Reports: Submit laboratory test reports for concrete materials, mix design, compressive strength, slump, air content, and temperature. Each report shall indicate date of sampling, date of test, mix design, and location of concrete in structure.

G. Repair Methods: When stains, rust, efflorescence, and surface deposits must be removed, submit the proposed method of removal.

H. Certificates: Submit written certification regarding the design mix from the ready-mix supplier and the admixture manufacturer stating all concrete and admixtures do not contain chloride ions in excess of concentrations specified herein.

I. Placement Notification: Notify the Architect at least 24 hours in advance of concrete placement.

J. Adjustments: Submit any adjustments to mixture proportions or changes in materials, suppliers, or sources along with supporting documentation during the course of the work.

K. Cold Weather Procedure Submittal: Refer to Cold Weather Concreting article in Part 3 for more information.

1.5 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. Cementitious materials: Store cementitious materials in dry weather tight buildings, bins, or silos that exclude contaminants.

B. Aggregates: Store and handle aggregate in a manner that will avoid segregation and prevent contamination with other materials or other sizes of aggregates. Store aggregates so as to drain freely.

C. Admixtures: Protect stored admixtures against contamination, evaporation, or damage. Protect liquid admixtures from freezing and temperature changes, which would adversely affect their performance. Handle chemical admixtures in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 APPROVED PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK MUST MEET THE REQUIREMENTS OF THE BUY AMERICAN ACT, OR BE ABLE TO PRODUCE DOCUMENTATION EXPLAINING EXEMPTION TO THE BUY AMERICAN ACT THROUGH AN APPLICABLE INTERNATIONAL TRADE AGREEMENT.

2.2 CONCRETE MATERIALS

A. Cement: Portland cement shall conform to ASTM C150, Type I Normal, and be a standard brand of Portland cement. Use one brand of cement throughout project, unless approved in writing by the Engineer. Cement, which conforms to ASTM C150 Type II, may be used if it also meets the requirements of ASTM C150 Type I. Cement used in concrete shall be of the same brand and type as the cement used in the concrete represented by the submitted field test data or used in the trial mixtures. Maintain consistent cement color throughout project unless directed otherwise by architectural requirements.

1. Total replacement of Portland cement in design mixture shall not exceed 50% (by weight).

B. Fly Ash: Fly ash shall conform to ASTM C618, Class C or Class F. Replacement of Portland cement by fly ash shall not exceed the following (percentages are by weight):

1. Concrete Flatwork: 15 percent.
2. All other concrete: 25 percent.
3. Concrete to be placed in cold weather as defined herein: No fly ash allowed unless the cold weather procedure submitted has compensated for the increased setting time and decreased rate of strength gain due to cold weather and fly ash.

C. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

1. Blended Ingredients – 25-50% by weight of blast furnace slag.

a. Grade 100 – Slags with a moderate activity index [most common type]

D. Blended Hydraulic Cement: ASTM C 595M, Type IS, Portland blast-furnace slag cement.

1. Blended Ingredients – 25-50% by weight of blast furnace slag.

E. Blended Hydraulic Cement: ASTM C 595M, Type IP, Portland-Pozzolan cement.

1. Blended Ingredients – 15-40% by weight of Pozzolan (fly ash).

F. Blended Hydraulic Cement: ASTM C 595M, Type I (PM), Pozzolan-modified Portland cement.

1. Blended Ingredients – 0-15% by weight of Pozzolan (fly ash) (modified).

G. Blended Hydraulic Cement: ASTM C 595M, Type I (SM), slag-modified Portland cement.

1. Blended Ingredients – 0-25% by weight of blast furnace slag (modified).

H. Coarse Aggregate for Normal Weight Concrete: Comply with ASTM C33. Provide coarse aggregate from a single source for exposed concrete. Gradations shall be similar to that described in the following table:

| COARSE AGGREGATE GRADATIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| SIEVE SIZE - PERCENT PASSING | | | | | | | |
| Grade No. | 1-1/2" | 1" | 3/4" | 1/2" | 3/8" | No. 4 | No. 16 |
| 4 | 90-100 Note 1 | 20-55 | 0-15 | --- | 0-5 | | --- |
| 57 | 100 | 95-100 | --- | 25-60 | 0-10 | 0-10 | --- |
| 67 | | 100 | 90-100 | --- | 20-55 | 0-10 | --- |
| 89 | --- | --- | --- | 100 | 90-100 | 20-55 | 0-10 |

1. Shall be 100 percent passing the 2" sieve.

I. Fine Aggregate for Normal Weight Concrete: Comply with ASTM C33. Provide fine aggregate from a single source for exposed concrete. Fine aggregate shall consist of washed sand. Gradations shall be similar to that described in the following table:

| FINE AGGREGATE GRADATIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| SIEVE SIZE - PERCENT PASSING | | | | | | | |
| Grade No. | 3/8 | No. 4 | No. 8 | No. 16 | No. 50 | No. 80 | No. 100 |
| FA | 100 | 95-100 | 80-100 | 50-85 | 5-30 | --- | 0-10 |

J. Do not use aggregates containing deleterious substances that could cause spalling on any exterior exposed surface. These include, but are not limited to the following:

1. Organic impurities.
2. Ferrous metals.
3. Soluble salts.
4. Coal, lignite, or other lightweight materials.
5. Soft particles.
6. Clay lumps and friable particles.
7. Cherts of less than 2.40 specific gravity.

K. Water: Mixing water for concrete shall meet the requirements of ASTM C94. Water shall be clean and free from injurious amounts of acids, alkalies, organic materials, chloride ions and oils deleterious to concrete or reinforcing steel.

L. Testing agency shall be given access to plants and stockpiles to obtain samples for testing for compliance with the Contract Documents.

2.3 ADMIXTURES

A. Water Reducing Admixture: Material shall comply with ASTM C494, Type A, and not contain more than 0.05% chloride ions by weight. Acceptable manufacturers and products include:

1. Euclid Chemical Company - Eucon WR 75.
2. Sika Chemical Corp. - Plastocrete 161.
3. GRT – Polychem 400 NC.
4. Grace Construction Products - WRDA 82.

B. High Range Water Reducing Admixture (superplasticizer): Material shall comply with ASTM C494, Type F or Type G, and not contain more than 0.05% chloride ions by weight of admixture. Acceptable manufacturers and products include:

1. Euclid Chemical Company - Eucon 37.
2. Sika – ViscoCrete 2100.
3. GRT – Melchem.
4. Grace Construction Products - Mira 110.

C. High Range Water Reducing, Slump Retaining Admixture: Material shall comply with ASTM C494, Type F or Type G, and not contain more than 0.05% chloride ions by weight of admixture. Acceptable manufacturers and products include:

1. Euclid Chemical Company - Eucon 537.
2. Sika – Sikament 686.
3. GRT – Melchem – M.
4. Grace Construction Products – ADVA FLEX.

D. Non-Chloride Accelerator: Material shall comply with ASTM C494, Type C or Type E, and not contain a higher chloride ion concentration than municipal drinking water. Acceptable manufacturers and products include:

1. Euclid Chemical Company - Accelguard 80.
2. Sika Chemical Corp. - Sika Rapid-1.
3. GRT – Polychem HE.
4. Grace Construction Products – Lubricon NCA.

E. Air Entraining Admixture: Air entraining admixture shall comply with ASTM C260, and be certified by the manufacturer to be compatible with other admixtures to be used. Acceptable manufacturers and products include:

1. Euclid Chemical Company - Air-Mix.
2. Sika Chemical Corporation - Sika-Aer.
3. GRT – Polychem VR.
4. Grace Construction Products - Darex II AEA or Daravair 1000.

F. Calcium chloride or admixtures containing more than 0.05% chloride ions by weight are not permitted.

G. Admixtures used in concrete shall be the same brand, type, and dosage used in concrete represented by field test data or used in trial mixes.

2.4 CURING PRODUCTS

A. Waterproof Sheet Materials: Use 6 mil polyethylene film sheet materials that meet the requirements of ASTM C171.

B. Curing Compound: Clear, membrane-forming curing compound complying with ASTM C309, Type 1, Class B.

1. Curing compounds used on interior enclosed environments shall be a water-borne product and VOC compliant as required by the U.S. EPA Architectural Coating Rule.

C. Curing and Sealing Compound: Clear, membrane-forming curing and sealing compound complying with ASTM C309, Type 1, and ASTM C1315, Grade B. Compound shall dry to a clear finish, resist yellowing due to ultraviolet degradation and provide a long lasting finish that has high resistance to chemicals, oil, grease, deicing salts, and abrasion.

1. Curing and sealing compounds used on interior enclosed environments shall be a water-borne product and VOC compliant as required by the U.S. EPA Architectural Coating Rule.

2.5 MISCELLANEOUS MATERIALS

A. Patching Mortar: Non-shrink, non-slump, non-metallic, quick setting. Acceptable manufacturers and products:

1. Euclid Chemical Company - Eucospeed.
2. Standard Drywall Products - Thorite.
3. Set Products, Inc. - Vertipatch.
4. Tamms Industries Co. - Speed Crete.
5. Dayton Superior – RE-CRETE.

2.6 STRENGTH AND PROPERTIES

A. Concrete Mix Designs: Refer to Drawings for specified compressive strength. Proportion concrete mixes according to the properties in the following tables. The concrete supplier may produce a mix at a lower water-cement ratio to allow for adjustment of slump at the site by adding water. The addition of site water shall be in accordance with ASTM C94, and the total water-cement ratio shall not exceed the value specified below.

| Class | Coarse Aggregate Gradation | Fine Aggregate Gradation | Range of Slump | Max. w/c | Air Content | Other Requirements |
|---|---|---|---|---|---|---|
| B | 57 or 67 | FA | 1" to 4" | 0.45 | 5% to 8% | |
| E | 4 or 57 | FA | 1" to 4" | 0.50 | — | |

Note: w/c = water-cementitious materials ratio.

B. Schedule of Concrete Classes: Provide concrete of the specified class according to the following schedule.

1. Footings: Class E
2. Exterior foundation walls and piers: Class B
3. Unless noted otherwise: Class B

C. Slump of Superplasticized Concrete: Concrete containing high-range water reducing admixtures (superplasticizer) shall have 8" maximum slump, unless otherwise approved by Structural Engineer. Concrete shall arrive at job site with 2" to 3" slump, be verified, then high range water reducing admixture added to increase slump to approved level.

D. Accelerators: Add non-chloride accelerator to all concrete slabs placed at air temperatures below 50°F.

E. Water Reducer: Add water reducing admixture or high range water reducing admixtures (superplasticizers) as follows:

1. Concrete with water cement ratio below 0.50.

F. No other admixtures shall be used unless approved by Structural Engineer of record.

G. Chlorides: Admixtures or other ingredients including aggregates containing calcium chloride or more than 0.05% chloride ions by weight shall not be used.

H. Workability: Concrete shall have a workability such that it will fill the forms without voids, honeycombs, or rock pockets with proper vibration without permitting materials to separate or excess water to collect on the surface.

I. Concrete Temperatures: Minimum concrete temperature of fresh concrete varies in relation to average air temperature over a 24-hour period as follows:

| | | |
|---|---|---|
| 1. | Air temperature below 0°F | Concrete temperature 70°F min. |
| 2. | Air temperature 0°F to 30°F | Concrete temperature 65°F min. |
| 3. | Air temperature 30°F to 50°F | Concrete temperature 50°F min. |
| 4. | Air temperature above 50°F | No minimum temperature |

The maximum temperature of concrete at the time of delivery shall be 90°F. When concrete temperature exceeds 90°F, concrete supplier shall attempt to reduce temperature by shading aggregates and cement and cooling mix water. When these methods fail to reduce concrete temperature below 90°F, supplier shall use ice in the water to reduce the concrete temperature.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Do not place concrete until data on materials and mix designs have been approved, and all other affected trades have coordinated their work.

B. Remove snow, ice, frost, water, mud, and other foreign material from surfaces, reinforcing bars and embedded items against which concrete will be placed.

C. Do not allow form release agent to contact reinforcing bars.

### 3.2 CONSTRUCTION JOINTS

A. Horizontal: Locate horizontal joints in piers at the top of slabs and footings unless otherwise indicated.

B. Reinforcing: Stop all welded wire reinforcement and/or reinforcing at construction joint in slabs on grade and provide dowel bars as detailed. Provide reinforcement at other construction joints as detailed. Roughen and thoroughly clean the surface of the concrete, remove all laitance, and wet the surface before placing new concrete against the joint. Slush vertical joints with a neat cement grout before placing new concrete.

### 3.3 CONCRETE PLACEMENT

A. Place concrete as continuously as possible until placement is complete. Do not place against concrete that has attained initial set, except at authorized joints. If, for any

reason, concrete pour is delayed for more than 45 minutes, bulkhead off pour at last acceptable construction joint. Immediately remove excess concrete and clean forms.

B. Do not begin to place concrete during periods of rain, sleet or snow unless adequate protection is provided.

C. No concrete shall be cast onto or against sub-grades containing free water, frost, ice or snow.

D. Notify the architect in advance if concrete is to be pumped.

E. Do not place concrete until all reinforcement is in place, forms have been thoroughly cleaned and approval has been given.

F. Do not accept concrete delivered to the job site more than 90 minutes after initial mixing.

G. Concrete from its point of release to mixers, hoppers, or conveyances, shall not be permitted to drop more than 5 feet. Deposit concrete directly into conveyances and directly from conveyances to final points of deposit. Sufficient transportation equipment in good working order shall be on hand before work begins. All conveying equipment must be clean and kept clean during concreting operations. Take every possible precaution to prevent segregation or loss of ingredients.

H. Deposit concrete in wall forms in layers not greater than 12 inches in depth, each layer being compacted by internal vibration before succeeding layer is placed.

I. Place concrete as near as possible to its final position to prevent segregation. Do not use vibrators to transport concrete within forms. Consolidate concrete in walls, columns, beams and slabs or joist construction thicker than 8" with internal vibrators (8,000 to 12,000 V.P.M.). Slabs less than 8" thick may be consolidated with internal vibrators (9,000 to 13,500 V.P.M.) or vibrating screeds supported on forms, boards or rails, approved by Structural Engineer, supplement vibration by forking or spading by hand along surfaces adjacent to forms and construction joints.

J. Re-tempering of concrete will not be permitted. Concrete that has obtained its initial set shall be discarded.

K. Remove loose debris from surfaces, thoroughly wet and slush with a neat cement grout immediately before placing new concrete, or apply bonding compound to surface and let dry before placing new concrete.

L. Protect existing concrete work to be exposed to view and other finished materials from damage and staining resulting from concreting operations. Handle concrete carefully to avoid dripping and spillage. Remove spilled concrete from existing surfaces immediately. Covering sills, ledges, and other surfaces with protective coverings may be necessary to protect the work.

M. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as

specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

3.4 CONCRETE FINISHES AND TOLERANCES

A. Exposed Smooth Formed Surfaces: Apply the following to smooth-formed finished concrete exposed to view in the finished work. Confirm finishes with architect prior to concrete placement by submitting shop drawings indicating locations of all types of finishes.

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.5 CONCRETE SLAB FINISHES AND TOLERANCES

A. Trowel Finish:

1. Screed concrete to an even plane, float, then power trowel the surface.

2. Hand trowel the surface smooth and free of trowel marks. Continue hand troweling until a ringing sound is produced as the floor is troweled.

3.6 CONCRETE CURING

A. Freshly placed concrete shall be protected from premature drying and excessively hot temperatures.

B. Concrete other than high-early strength shall be maintained above 50°F and in a moist condition for at least the first 7 days after placement, except when special curing is used. Special curing procedures shall not be used without written permission from the Structural Engineer of Record.

C. Formed surfaces shall be cured by leaving the formwork in place during the curing period.

D. Protect concrete from excessive changes in temperature during the curing period and at the termination of the curing process. Changes in the temperature of the concrete shall be as uniform as possible and shall not exceed 5°F in any one hour or 50°F in any 24 hour period.

E. Protect concrete from injury from the elements until full strength is developed. Protect from mechanical injury.

**F.** During cold weather construction, all footings shall be protected from frost penetration

3.7 COLD WEATHER CONCRETING

A. Definition: Cold weather shall be defined as a period when for more than three successive days the average daily outdoor temperature drops below 40°F. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. When temperatures above 50°F occur during more than half of any 24 hour duration, the period shall not be regarded as cold weather.

B. All cast-in-place concrete work occurring during cold weather shall conform to all requirements of ACI 306.1, "Standard Specification for Cold Weather Concreting", published by the American Concrete Institute, Detroit, Michigan, except as modified by the contract documents or this specification.

C. Planning: The General Contractor, concrete contractor, concrete supplier and the architect shall have a pre-construction conference to outline the cold weather concreting operations concerning the placing, finishing, curing and protection of the concrete during cold weather. Pre-construction conference shall occur before cold weather is expected to occur.

D. Detailed procedure submittal: Concrete contractor shall prepare and submit for review detailed procedures for the production, transportation placement, protection, curing and temperature monitoring of concrete during cold weather. Include procedures to be implemented upon abrupt changes in weather conditions. Do not begin cold weather concreting until these procedures have been reviewed and approved.

E. Mixing: Concrete flatwork poured in cold weather shall be proportioned to obtain a lower slump to minimize the amount of bleed water during finishing. All bleed water should be skimmed off flatwork prior to troweling. Concrete that will be exposed to cycles of freezing and thawing while saturated should be properly air entrained as outlined in this specification.

F. Protection of Concrete: Cure and protect concrete against damage from freezing for a minimum period of 72 hours, unless approved by the structural engineer. The protection period may be reduced according to ACI 306.1 requirements. Concrete contractor shall submit a letter of request to reduce the protection period, by outlining the method used to achieve the reduction per ACI 306.1.

1. When practical for the construction schedule, formwork shall be insulated and remain in place for at least the required protection period.

G. Concrete Temperatures: The minimum temperature of concrete immediately after placement shall be as specified in the following table.

| Section Size | Minimum temperature of concrete as placed and maintained during the protection period | Maximum gradual decrease in surface temperature during any 24 hours after the end of the protection. | Mixing Temperatures | | |
|---|---|---|---|---|---|
| | | | Above 30°F | 0 to 30°F | Below 0°F |
| < 12 in | 55°F | 50°F | 60°F | 65°F | 70°F |
| 12-36 in | 50°F | 40°F | 55°F | 60°F | 65°F |
| 36-72 in | 50°F | 30°F | 50°F | 55°F | 60°F |
| > 72 in | 50°F | 20°F | 45°F | 50°F | 55°F |

H. Mixing Temperatures: As the ambient air temperature decreases the concrete mixing temperature shall be increased to compensate for the heat lost in the period between mixing and placement. The concrete supplier shall use one or both of the following methods for increasing the concrete temperature.

1. Heating the mixing water to a temperature necessary to offset the temperature losses during transport. Supplier shall not heat water to temperatures in excess of 140°F, without taking special precautions as outlined in ACI 306.

2. Heating the aggregate with a circulated steam piping system.

I. Temperature measurements: The Contractor shall be responsible for monitoring and recording the concrete temperatures during placement and throughout the protection period.

1. Inspection personnel shall keep a record of the date, time, outside air temperature, temperature of concrete as placed, and weather conditions.

2. Temperature of the concrete and the outside air shall be recorded at regular intervals but not less than twice in a 24 hour period. The record shall include temperatures at several points within the enclosure and on the concrete surface of sufficient frequency to determine a range of temperatures.

3. Inspection agency shall submit the temperature logs to the Architect for permanent job records.

## 3.8 HOT WEATHER PROTECTION

A. Definition: Hot weather shall be defined as any combination of high ambient temperature, low relative humidity, high winds and intense solar radiation that leads to higher than usual evaporation. The table below defines low relative humidity based on air temperature. For a given air temperature, if the relative humidity is equal to or less than the specified minimum, provisions for hot weather concreting shall be as follows:

| Air Temperature | Minimum Relative Humidity |
|---|---|
| 105°F | 90% |
| 100°F | 80% |
| 95°F | 70% |
| 90°F | 60% |
| 85°F | 50% |
| 80°F | 40% |
| 75°F | 30% |

B. Scheduling: When hot weather is expected, adjust concrete placement schedules to avoid placing or finishing during the period from noon until 3:00 pm. When possible, slab pours should be delayed until the building is enclosed to protect the concrete from wind and direct sunlight, Construction schedule shall account for 7 day moist curing period.

C. Mixing: Concrete supplier shall adjust mix designs and admixtures to minimize slump loss. Concrete shall be mixed at a water-cement, which is lower than the specified maximum to allow for the adjustment of slump by addition of water in the field. Water reduction shall be accomplished without reducing initial slump by increasing dosage of water reducing admixture.

D. Preparation: Do not order concrete earlier than is required to avoid delays. Cool forms, subgrades and reinforcing bars with water spray from fog nozzle prior to concrete placement.

E. Delivery: Site traffic shall be coordinated and delivery times scheduled to minimize waiting times for concrete trucks.

F. Placement: Preparations shall be made to place and consolidate the concrete at the fastest possible rate. Maintain a continuous flow of concrete to the job site to avoid development of cold joints, during placement of slabs, apply fog spray to prevent moisture loss without causing surplus water to stand on concrete surface.

G. Finishing: Finish concrete as fast as practical. Continue fogging concrete during finishing. Where fogging is not possible, apply sprayable moisture-retaining film between finishing passes.

H. Curing: Formed concrete shall be covered with a waterproof material to retain moisture. Flat work shall be moisture cured as described in this specification. Moist curing shall continue for at least 7 days.

3.9 FIELD QUALITY ASSURANCE

A. Independent Testing Agency and Special Inspector shall each perform their prescribed inspection, sampling, and testing services as described in Part 1 of this specification section.

B. In cases where samples have not been taken or tests conducted as specified or strength of laboratory test cylinders for a particular portion of the structure fails to meet requirements

of ACI 301, for evaluation of concrete strength, Structural Engineer shall have the right to order compressive or flexural test specimens or both be taken from the hardened concrete according to ASTM C42, load tests according to ACI 318, or such other tests as may be necessary to clearly establish the strength of the in situ concrete, and such tests shall be paid for by the Contractor.

3.10 REPAIR OF DEFECTIVE AREAS

A. All repair of defective areas shall be made, with prior approval of Architect, as to method and procedure, in accordance with Section 5 of ACI 301, except specified bonding compound must be used.

B. Patch form tie holes at the following locations:

1. Unfinished exposed concrete (not scheduled for painting, plus at board formed concrete finish).

2. All other areas: Prime voids with bonding compound and fill with patching mortar. Strike flush without overlap, float to uniform texture to match adjacent surfaces.

3. Exposed areas not scheduled for paint or other finishes:

a. Remove projections, ridges and other protrusions not conforming to requirements specified under Section 031000.
b. Fill voids and pin holes not conforming to requirements specified under Section 03100.

C. All structural repairs shall be made, with prior approval of the Architect/Engineer, as to method and procedure, using the specified epoxy adhesive and/or epoxy mortar.

D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

E. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

4. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

END OF SECTION

SECTION 15175
TANKS - PLUMBING

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Domestic Hot Water Storage Tanks.

### 1.2 REGULATORY REQUIREMENTS

A. Construct pressurized tanks to ASME Code for unfired pressure vessels.

B. Comply with applicable government regulations.

### 1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 15010. Include manufacturer's installation instructions.

B. For domestic hot water storage tanks, include tank lining instructions.

## PART 2 - PRODUCTS

### 2.1 DOMESTIC HOT WATER STORAGE TANKS

A. Tank: Steel, 125 psi working pressure, ASME stamped, with screwed stainless steel connections.

B. Line interior with corrosion resistant concrete approximately 1/2" thick. Line flanged connections. Clean and prime coat before lining. Lining may be factory or field applied. If factory applied, all cracks shall be repaired after installation.

C. Provide 11" x 15" access opening and steel support saddles or legs.

D. Provide tappings for accessories. Include tank drain, water inlet and outlet, 30°F to 200°F thermometer per Section 15980, and pressure relief valve suitable for maximum working pressure. See drawings for additional tank openings.

E. Acceptable Manufacturers: Niles Steel Tank (NST), Adamson, Ace Boiler, Modern Welding, RECO, Cemline.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Flush and clean tanks prior to delivery to site and keep sealed during construction.

B. Provide all flexible connections required due to tank flex during fill operation.

END OF SECTION

SECTION 15190
MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Identification of products installed under Division 15.

1.2 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

B. ASTM B-1, B-3, and B-8 for copper conductors.

C. ASTM D-1248 for Polyethylene Extrusion Materials, ICEA S-70-547 Weatherproof Resistant Polyethylene Conductors, ICEA S-61-402/NEMA WC5 Thermoplastic Insulated Wire & Cable, ICEA S-95-658/NEMA WC70 Non-Shielded 0 – 2kv Cables.

D. UL 1581 Standard for Electrical Wires, Cables, and Flexible Cords.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 15010. Include list of items identified, wording, letter sizes, and color coding.

B. Include valve chart and schedule listing valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. 3M, Bunting, Calpico, Craftmark, Emedco, Kolbi Industries, Seton, W.H. Brady, Marking Services.

2.2 MATERIALS

A. All pipe markers (purchased or stenciled) shall conform to ANSI A13.1. Marker lengths and letter sizes shall be at least the following:

| O.D. of Pipe or insulation | Marker Length | Size of Letters |
|---|---|---|
| Up to and including 1-1/4” | 8” | 1/2” |
| 1-1/2” to 2” | 8” | 3/4” |

Plastic tags may be used for outside diameters under 3/4".

B. Plastic Nameplates: Laminated three-layer phenolic with engraved black, 1/4" minimum letters on light contrasting background.

C. Aluminum Nameplates: Black enamel background with natural aluminum border and engraved letters furnished with two mounting holes and screws.

D. Plastic Tags: Minimum 1-1/2" square or round laminated three-layer phenolic with engraved, 1/4" minimum black letters on light contrasting background.

E. Brass Tags: Brass background with engraved black letters. Tag size minimum 1-1/2" square or 1-1/2" round.

F. Plastic Pipe Markers: Semi-rigid plastic, preformed to fit around pipe or pipe covering; indicating flow direction and fluid conveyed.

G. Vinyl Pipe Markers: Colored vinyl with permanent pressure sensitive adhesive backing.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install all products per manufacturer's recommendations.

B. Degrease and clean surfaces to receive adhesive for identification materials.

C. Valves:

1. All valves (except shut-off valves at equipment) shall have numbered tags.

2. Provide or replace numbered tags on all existing valves that are connected to new systems or that have been revised.

3. Provide all existing valves used to extend utilities to this project with numbered tags. Review tag numbering sequence with the Owner prior to ordering tags.

4. Secure tags with heavy duty key chain and brass "S" link or with mechanically fastened plastic straps.

5. Attach to handwheel or around valve stem. On lever operated valves, drill the lever to attach tags.

6. Number all tags and show the service of the pipe.

7. Provide two sets of laminated 8-1/2" x 11" copies of a valve directory listing all valves, with respective tag numbers, uses, and locations. The directory shall be reviewed by the Owner and Engineer prior to laminating final copies. Laminated copies shall have brass eyelet in at least one corner for easy hanging.

D. Pipe Markers:

1. Adhesive Backed Markers: Use Brady Style 1, 2, or 3 on pipes 3" diameter and larger. Use Brady Style 4, 6, or 8 on pipes under 3" diameter. Similar styles by other listed manufacturers are acceptable. Secure all markers at both ends with a wrap of pressure sensitive tape completely around the pipe.

2. Snap-on Markers: Use Seton "Setmark" on pipes up to 5-7/8" OD. Use Seton "Setmark" with nylon or Velcro ties for pipes 6" OD and over. Similar styles by other listed manufacturers are acceptable.

3. Stencil Painted Pipe Markers:

   a. Remove rust, grease, dirt, and all foreign substances from the pipe surface.
   b. Apply primer on non-insulated pipes before painting.
   c. Use background and letter colors as scheduled later in this section.

4. Apply markers and arrows in the following locations where clearly visible:

   a. At each valve.
   b. On both sides of walls that pipes penetrate.
   c. At least every 20 feet along all pipes.
   d. On each riser and each leg of each "T" joint.
   e. At least once in every room and each story traversed.
   f. Piping on roof does not require labeling.

E. Equipment:

1. All equipment not easily identifiable such as controls, relays, gauges, etc.; and all equipment in an area remote from its function such as air handling units, exhaust fans, filters, reheat coils, dampers, etc.; shall have nameplates or plastic tags listing name, function, and drawing symbol. Do not label exposed equipment in public areas.

2. Fasten nameplates or plastic tags with stainless steel self-tapping screws or permanently bonding cement.

F. Miscellaneous:

1. Attach self-adhesive vinyl labels at all duct access doors used to reset fusible links or actuators on fire, fire/smoke, or smoke dampers. Lettering shall be a minimum of 1/2" high. Labels shall indicate damper type.

2. Provide engraved plastic tags at all hydronic or steam system make-up water meters.

## 3.2 SCHEDULE

A. Pipes to be marked:

| Pipe Service | Lettering Color | Background Color |
|---|---|---|
| Solar Collector Water Supply | Black | Yellow |
| Solar Collector Return | Black | Yellow |
| Domestic Cold Water | White | Green |
| Solar Domestic Hot Water | Black | Yellow |

END OF SECTION

SECTION 15260
PIPING INSULATION

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Piping Insulation.
B. Insulation Jackets.

### 1.2 REFERENCES

A. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.

B. ANSI/ASTM C534 - Elastomeric Foam Insulation.

C. ASTM B209 - Aluminum and Aluminum-alloy Sheet and Plate.

D. ASTM C591 - Unfaced Preformed Rigid Cellular Polyisocyanurate Insulation.

E. ASTM E84 - Surface Burning Characteristics of Building Materials.

F. NFPA 255 - Surface Burning Characteristics of Building Materials.

G. UL 723 - Surface Burning Characteristics of Building Materials.

H. National Commercial & Industrial Insulation Standards - 1999 Edition - as published by Midwest Insulation Contractors Association and endorsed by National Insulation Contractors Association.

### 1.3 QUALITY ASSURANCE

A. Applicator: Company specializing in piping insulation application with five years minimum experience.

B. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, or UL 723 (where required).

### 1.4 SUBMITTALS

A. Submit shop drawings per Section 15010. Include product description, list of materials and thickness for each service, and locations.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Armacell. Type B Only

B. Halstead Industries. Type B Only

C. Johns Manville/Schuller. Type B

D. Rubatex. Type B Only

E. HiTherm. Type J Only

F. Elliott. Type J Only

2.2 INSULATION

A. Type B: Elastomeric cellular foam; ANSI/ASTM C534; flexible plastic; 0.28 maximum 'K' value at 75ºF, 25/50 flame spread/smoke developed rating. Maximum 3/4" thick per layer where multiple layers are specified.

B. Type I: Preformed rigid extruded polystyrene (Styrofoam); ANSI/ASTM C578; maximum 'K' value of 0.259 at 75ºF aged 180 days; moisture resistant; suitable for -297ºF to +165ºF.

C. Type J: Preformed rigid cellular polyisocyanurate insulation; ANSI/ASTM C591; maximum 'K' value of 0.19 at 75ºF; moisture resistant; suitable for -297ºF to +300ºF.

2.3 VAPOR BARRIER JACKETS

A. Kraft reinforced foil vapor barrier with self-sealing adhesive joints. Beach puncture resistance ratio of at least 50 units. Tensile strength: 35 psi minimum. Single, self-seal acrylic adhesive on longitudinal jacket laps and butt strips.

B. Polyvinylidene Chloride (PVDC or Saran) film and tape: Durable and highly moisture and moisture vapor resistant. Please refer to manufacturer’s recommended installation guidelines.

2.4 JACKET COVERINGS

A. Aluminum Jackets: ASTM B209; 0.016" thick; stucco embossed finish with Z edge seams and aluminum bands for outdoor use. Where colored jacket covers are called for, provide factory-applied hard film acrylic paint in color selected by Architect.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install insulation after piping has been tested. Pipe shall be clean, dry and free of rust before applying insulation.

3.2 INSTALLATION

A. Install materials per manufacturer's instructions, building codes and industry standards.

B. Continue insulation with vapor barrier through penetrations. This applies to all insulated piping. Maintain fire rating of all penetrations.

C. On exposed piping, locate and cover seams in least visible locations.

D. On insulated piping operating below 60ºF, insulate fittings, valves, unions, flanges, strainers, flexible connections, flexible hoses, and expansion joints. Seal all penetrations of vapor barrier.

E. On piping operating below 60ºF in locations that are not mechanically cooled (e.g., penthouses, mechanical rooms, tunnels, chases at exterior walls, etc.), Type B insulation shall be used.

F. On insulated piping operating above 140ºF, insulate fittings, valves, flanges, and strainers.

G. On insulated piping operating between 60ºF and 140ºF, do not insulate flanges and unions, but bevel and seal ends of insulation at such locations. Insulate all fittings, valves and strainers.

H. On all insulated piping, provide at each support or roof penetration, an insert of same thickness and contour as adjoining insulation, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. The insert shall be suitable for planned temperatures, be suitable for use with specific pipe material, and shall be a 180° cylindrical segment the same length as metal shields. Inserts shall be a cellular glass or molded hydrous calcium silicate, with a minimum compressive strength of 50 psi. High density polyisocyanurate insulation with a compressive strength of 24 psi is acceptable for pipe sizes below 6", 50 psi over 6", and operate below 260°F. Factory fabricated inserts may be used. Rectangular blocks, plugs, or wood material are <u>not</u> acceptable. Temporary wood blocking may be used by the Piping Contractor for proper height; however, these must be removed and replaced with proper inserts by the Insulation Contractor.

I. Install metal shields between all hangers or supports and the pipe insulation. Shields shall be galvanized sheet metal, half-round with flared edges. Adhere shields to insulation. On cold piping, seal the shields vapor-tight to the insulation as required to maintain the vapor barrier, or add separate vapor barrier jacket.

J. Shields shall be at least the following lengths and gauges:

| | Pipe Size | Shield Size |
|---|---|---|
| 1. | 1/2" to 3-1/2" | 12" long x 18 gauge |

K. All piping and insulation that does not meet 25/50 that is located in an air plenum shall have written approval from the Authority Having Jurisdiction and the local fire department for authorization and materials approval. If approval has been allowed, the non-rated material shall be wrapped with a product that has passed ASTM E84 and/or NFPA 255 testing with a rating of 25/50 or below. Mechanical room is a return air plenum.

L. All balance valves with fluid operating below 60°F shall be insulated with a removable plug wrapped with vapor barrier tape to allow reading and adjusting of the valve. All balance valves with fluid operating above 140°F shall be insulated and an opening shall be left in the insulation to allow for reading and adjusting the valve.

M. On 1" and smaller piping routed through metal wall studs, provide a plastic grommet to protect the piping. The piping shall be insulated between the wall studs, and the insulation shall butt up to each stud.

3.3 INSULATION

A. Type B Insulation:

1. Elastomeric Cellular Foam: Where possible, slip insulation over the open end of pipe without slitting. Seal all butt ends, longitudinal seams, and fittings with adhesive. At elbows and tees, use mitered connections. Do not compress or crush insulation at cemented joints. Joints shall be sealed completely and not pucker or wrinkle.

2. Self-seal insulation may be used on pipes operating below 170°F.

B. Type J Insulation:

1. Indoors, above grade or below grade, Polyvinylidene chloride (PVDC or Saran) vapor retarder film and tape: Seal all longitudinal joints with manufacturer approved adhesive. Secure butt joint strips in a similar manner. Refer to manufacturer's recommendations for installation guidelines.

2. Insulate pipe fittings with prefabricated insulation fittings.

3.4 JACKET COVER INSTALLATION

A. Metal Covering:

1. Provide vapor barrier as specified for insulation type. Cover with aluminum jacket covering with seams located on the bottom of horizontal piping. Include fittings, joints and valves.

2. Seal all interior and exterior butt joints with metal draw bands and sealant. Seal all exterior joints watertight.

3. Interior joints do not need to be sealed.

4. Use metal covering on the following pipes:

a. All exterior piping.
b. All piping of mechanical room floor penetration, from floor to 24" above floor.

3.5 SCHEDULE

| Piping System | Insulation Type/Thickness | | |
|---|---|---|---|
| A. Solar Collector Water and Solar Hot Water - Potable and Non-Potable | | | |
| Up to 2" Pipe Size | A / 1-1/2" (2" Attic and Roof) | OR | J / 1"-1/2" (2" Attic and Roof) |
| B. Domestic Cold Water - Potable and Non-Potable | A / 1" | OR | J / 1" |

END OF SECTION

SECTION 15280
EQUIPMENT INSULATION

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Equipment Insulation.
B. Equipment Insulation Finishes.

### 1.2 REFERENCES

A. ANSI/ASTM C553 – Mineral Fiber Blanket Thermal Insulation.

B. ANSI/ASTM C921 – Properties of Jacketing Materials for Thermal Insulation

C. ANSI/ASTM D1668 – Glass Fabric for Waterproofing

D. ASTM E84 - Surface Burning Characteristics of Building Materials.

E. National Commercial & Industrial Insulation Standards - 1999 Edition - as published by Midwest Insulation Contractors Association and endorsed by National Insulation Contractors Association.

F. NFPA 255 - Surface Burning Characteristics of Building Materials.

G. UL 723 - Surface Burning Characteristics of Building Materials.

### 1.3 QUALITY ASSURANCE

A. Applicator: Company specializing in insulation application with five years minimum experience.

B. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, or UL 723 (where required).

### 1.4 SUBMITTALS

A. Submit shop drawings per Section 15010. Include product description, list of materials and thickness for equipment scheduled.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

| | | |
|---|---|---|
| A. | Certainteed Manson. | Type C |
| B. | Knauf Fiber Glass Corporation. | Type C |
| C. | Johns Manville/Schuller. | Type C |
| D. | Owens/Corning Fiberglas Corporation. | Type C |

2.2 INSULATION

A. Type D: Glass Fiber Board; ANSI/ASTM C612; 0.28 maximum 'K' value at 200ºF; 6.0 lb/cu ft; suitable to 850ºF, 25/50 flame spread/smoke developed.

2.3 INSULATION FINISHES

A. Type 2: All Service Jacket; ASTM C921; Factory or Field Applied; Kraft paper bonded to aluminum foil reinforced with glass fiber; Beach puncture resistance ratio of at least 50 units. Tensile strength: 35 psi minimum. Seal all joints with manufacturer approved tape and adhesive to maintain vapor barrier. Indoor use only, if used outdoors add type 4 finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all materials per manufacturer's instructions, codes and industry standards.

B. Maintain ambient temperatures and conditions required by manufacturers of adhesive and insulation.

C. Do not insulate factory insulated equipment.

D. Apply insulation as close as possible to equipment by grooving, scoring, and bevelling insulation. Secure to equipment with studs, pins, clips, adhesive, wires, or bands.

E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier mastic.

F. Do not insulate over nameplates or ASME stamps. Bevel and seal insulation around such, unless omitting insulation would cause condensation problem. When such is the case, appropriate tagging shall be provided to identify the presence of these items.

G. When equipment with insulation requires periodic opening for maintenance, repair, or cleaning; install specially fabricated removable insulation sections. Covers shall have mechanical fasteners and be reusable.

H. Insulate all equipment surfaces that are not factory insulated and are intended to operate below 60°F and/or above 100°F. Verify insulation type and thickness with equipment manufacturer and Engineer.

I. Insulate all supports on equipment operating below ambient temperature.

3.2 INSULATION

A. Type D:

1. Apply with edges tightly butted and joints staggered.

2. Secure with welded pins and washers, 4” from each edge and 16” on center, or 1/2" x 0.015” galvanized steel bands, 12” on center.

3.3 SCHEDULE

| Equipment | | Insulation Type | Insulation Thickness | Insulation Finish |
|---|---|---|---|---|
| A. | Domestic Hot Water Storage Tank (up to 250ºF) | D | 2" | 1 or 2 |
| B. | Heat Exchanger (up to 250°F) | D | 2” | 1 or 2 |

END OF SECTION

SECTION 15410
PLUMBING PIPING

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Pipe and Pipe Fittings.
B. Valves.
C. Domestic Water Piping System.

### 1.2 REFERENCES

A. ANSI/ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.

B. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.

C. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

D. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.

E. ANSI/ASTM B32 - Solder Metal.

F. ASTM B88 - Seamless Copper Water Tube.

G. AWWA C651 - Disinfecting Water Mains.

H. NSF - National Sanitation Foundation

### 1.3 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured valves are not acceptable.

B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

C. Welders Certification: In accordance with ANSI/ASME Sec 9 or ANSI/AWS D1.1.

### 1.4 SUBMITTALS

A. Submit shop drawings per Section 15010.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 SOLAR HOT WATER - POTABLE AND NON-POTABLE
COLD WATER - POTABLE

A. Design Pressure: 175 psi.
Maximum Design Temperature: 200°F.

B. Piping - All Sizes:

1. Tubing: Type L hard drawn seamless copper tube, ASTM B88.

2. Joints: Solder with 100% lead-free solder and flux, ASTM B32.

3. Fittings: Wrought copper solder joint, ANSI B16.22.

C. Shut-Off Valves:

1. Ball Valves:

a. BA-1:

1) 3" and under, 150 psi saturated steam, 600 psi CWP, full port, screwed or solder ends (acceptable only if rated for soldering in line with 470°F melting point of lead-free solder), bronze body of a copper alloy containing less than 15% zinc, stainless steel ball and trim, Teflon seats and seals. Apollo #77C-140, Stockham #S-255-FB-P-UL BR1-R, Milwaukee #BA-400, Watts, Nibco #585-70-66, National Utilities Co., RUB.

NOTES:

a) Provide extended shaft for all valves in insulated piping.

b) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120°F, heating water piping over 120°F, steam, condensate, boiler feed water piping, compressed air piping and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lock out trim.

D. Check Valves:

1. CK-1: 2" and under, 125# steam @ 406ºF, 200# CWP @ 150ºF, screwed, bronze, horizontal swing. Crane #37, Hammond #IB904, Stockham #B319-Y, Walworth #3406, Milwaukee #509, Watts #G-5000, Nibco T-413B.

2. CK-14: 2-1/2" thru 12", 200# CWP, double disc wafer type, bronze or iron body, bronze trim, metal-to-metal or Viton seat, 316 SS shaft, Inconel 600 spring. Mission Duo Chek #12HPP (with Inconel springs), Mueller Steam Specialty Co. #71-AHB-K-W, Stockham #WG-961-EPDM or #WG-970-BUNA, Nibco w-920-W.

E. Strainers:

1. ST-1: Bronze body, screwed ends, screwed cover, 150 psi S @ 350°F, 200 psi CWP @ 150°F. Armstrong #F4SC, Metraflex #TS, Mueller Steam Specialty Co. #351, Sarco #BT, Watts #777.

2. ST-7: 2-1/2" thru 8", bronze body, flanged ends, flanged cover, 150# steam, 225# CWP. Mueller Steam Specialty Co. #851.

2.2 UNIONS

A. Copper pipe - wrought copper fitting - ground joint.

B. Black Steel (Schedule 40) Pipe - malleable iron, ground joint, 150 psi, bronze to bronze seat.

C. Galvanized Steel Pipe - galvanized malleable iron, ground joint, 150 psi, bronze to bronze seat.

2.3 AIR VENTS

A. Provide means for venting air at all high points in the piping system and at all other points where air may be trapped.

B. At end of main and other points where large volume of air may be trapped - Use 1/4" globe valve, angle type, 125 psi, Crane #89, attached to coupling in top of main, 1/4" discharge pipe turned down with cap.

2.4 STRAINERS

A. Unless otherwise indicated, strainers shall be Y-pattern and have stainless steel screens with perforations as follows:

| Pipe Size | 1/4" - 2" | 2-1/2" - 10" | 12" - 18" |
|---|---|---|---|
| air and gases | 1/32" | 3/64" | 1/16" |
| water | 3/64" | 1/16" | 1/8" |
| lube, hydraulic, No. 6 fuel and waste oils | 3/16" | 3/16" | 3/16" |

B. Furnish pipe nipple with shutoff valve to blow down all strainer screens.

C. Use bronze body strainers in copper piping and iron body strainers in ferrous piping.

2.5 RELIEF VALVES

A. RV-4: (Domestic Hot Water) Pressure and Temperature relief, cast bronze body and internal parts, stainless steel spring, test lever, threaded inlet and outlet. Maximum setting of 150 psi and 210ºF temperature. Capacities ASME certified and labeled. Acceptable Manufacturers: Cash Series FV, Watts #40, #120, #N240, #340.

## 2.6 BALANCING VALVE

A. Rated for 125 psi working pressure and 250ºF operating temperature, taps for determining flow with a portable meter, positive shut-off valves for each meter connection, memory feature, tight shut-off, and a permanent pressure drop between 1' and 2' water column at full flow with valve 100% open. Furnish with molded, removable insulation covers.

B. Provide a nomograph to determine flow from meter reading (and valve position on units which sense pressure across a valve). Graph shall extend below the specified minimum flow.

C. Flow rate of 0.5 GPM or larger: Valves in copper piping shall be brass or bronze. Acceptable Manufacturers: Flow Design “Accusetter”, Preso “B+”, Armstrong "CVB", Bell & Gossett "Circuit Setter Plus", Griswold “Quickset”, Gerand “Balvalve Venturi” or Nibco Globe Style balancing valve.

D. Flow rate less than 0.5 GPM: Valves in copper piping shall be brass or bronze. Cv value shall be less than 1.0 when valve is completely open, and minimum balanceable flow rate shall not exceed 0.1 GPM with a meter reading of at least 2.5 feet. Acceptable manufacturers: Bell & Gossett "Circuit Setter RF", Flow Design, Preso, Armstrong, Griswold, Gerand, or Nibco balancing valve.

E. Manufacturer shall size balancing valves for the scheduled flow rate. Flow rate shall be measurable on manufacturer's standard meters.

## 2.7 DRAIN VALVES

A. Drain valves shall be shutoff valves as specified for the intended service with added 3/4” male hose thread outlet and cap.

## 2.8 CONNECTIONS BETWEEN DISSIMILAR METALS

A. Connections between dissimilar metals shall be insulating dielectric types that allow no metal path for electron transfer and that provide a water gap between the connected metals.

B. Joints shall be rated for the temperature, pressure, and other characteristics of the service in which they are used, including testing procedure.

C. Aluminum, iron, steel, brass, copper, bronze and stainless steel are commonly used and require isolation from each other with the following exceptions:

1. Iron, steel, and stainless steel connected to each other.

2. Brass, copper, and bronze connected to each other.

3. Brass or bronze valves and specialties connected to steel or iron in closed systems. Where two brass items occur together, they shall be connected with brass nipples.

4. Brass or bronze valves or specialties under 3/4" size connected to steel, iron, or stainless steel.

D. Dielectric protection is required at connections to equipment of a material different than the piping.

E. Screwed Joints (acceptable up to 2" size):

1. Dielectric union rated for 125 psi CWP and 250°F.

2. Where a sweat-to-screw union is used, the union shall be soldered onto the copper pipe prior to screwing the union onto opposing pipe material.

3. Install dielectric unions per manufacturer's recommendations.

4. Acceptable Manufacturers: HCI Terminator U, Central Plastics, Wilkins DUX-HT, Watts.

F. Flanged Joints (any size):

1. Use 1/8" minimum thickness, non-conductive, full-face gaskets.

2. Employ one-piece molded sleeve-washer combinations to break the electrical path through the bolts.

3. Sleeve-washers are required on one side only, with sleeves minimum 1/32" thick and washers minimum 1/8" thick.

4. Install steel washers on both sides of flanges to prevent damage to the sleeve-washer.

5. Separate sleeves and washers may be used only if the sleeves are manufactured to exact lengths and installed carefully so the sleeves must extend partially past each steel washer when tightened.

6. Acceptable Manufacturers: EPCO, Central Plastics, Pipeline Seal and Insulator, F. H. Maloney, or Calpico.

2.9 LOCK OUT TRIM

A. Provide lock out trim for all quarter turn shutoff valves opening to atmosphere and installed in domestic water piping over 120°F, in compressed air piping, and as indicated on the drawings.

2.10 VALVE OPERATORS

A. Provide handwheels for gate valves and gear operators for butterfly valves.

2.11 VALVE CONNECTIONS

A. Provide all connections to match pipe joints. Valves shall be same size as pipe unless noted otherwise.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install all products per manufacturer’s recommendations.

B. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

C. Remove scale and dirt, on inside and outside, before assembly.

D. Connect to equipment with flanges or unions.

3.2 TESTING PIPING

A. Solar Water - Potable and Non-Potable:
Cold Water - Potable and Non-Potable:

1. Test pipes underground or in chases and walls before piping is concealed.

2. Test all pipes before the insulation is applied. If insulation is applied before the pipe is tested and a leak develops which ruins the insulation, replace damaged insulation.

3. Test the pipe with 100 psig water pressure or equal inert gas such as nitrogen.

4. Hold test pressure for at least 2 hours.

5. Test to be witnessed by the Architect/Engineer’s representative, if requested by the Architect/Engineer.

B. All Other Piping:

1. Test piping at 150% of normal operating pressure.

2. Piping shall hold this pressure for one hour with no drop in pressure.

3. Test piping using water, nitrogen, or air as compatible with the final service of the pipe. Do not use combustible fluids.

4. Drain and clean all piping after testing is complete.

3.3 CLEANING PIPING

A. Assembly:

1. Before assembling pipe systems, remove all loose dirt, scale, oil and other foreign matter on internal or external surfaces by means consistent with good piping practice subject to approval of the Architect/Engineer's representative. Blow chips and burrs from machinery or thread cutting operation out of pipe before assembly. Wipe cutting oil from internal and external surfaces.

2. During fabrication and assembly, remove slag and weld spatter from both internal and external joints by peening, chipping and wire brushing.

3. Notify the Architect/Engineer's representative before starting any post erection cleaning in sufficient time to allow witnessing the operation. Consult with and obtain approval from the Architect/Engineer's representative with regard to specific procedures and scheduling. Dispose of cleaning and flushing fluids properly.

4. Prior to blowing or flushing erected piping systems, disconnect all instrumentation and equipment, open wide all valves, and be certain all strainer screens are in place.

B. All Water Piping:

1. Flush all piping using faucets, flush valves, etc. until the flow is clean.

2. After flushing, thoroughly clean all inlet strainers, aerators, and other such devices.

3. If necessary, remove valves to clean out all foreign material.

## 3.4 INSTALLATION

A. Provide dielectric connections between dissimilar metals.

B. Route piping in orderly manner and maintain gradient. Install to conserve building space.

C. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or equipment.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Provide access doors for concealed valves and fittings.

H. Slope water piping and arrange to drain at low points.

I. Where pipe supports are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

J. Install valve stems upright or horizontal, not inverted.

K. Install balancing valves with straight, unobstructed pipe section both upstream and downstream as required, per manufacturer’s installation instructions.

L. Seal pipes passing through exterior walls with a wall seal per Section 15140. Provide Schedule 40 galvanized sleeve at least 2 pipe sizes larger than the pipe.

## 3.5 PIPE ERECTION AND LAYING

A. Carefully inspect all pipe, fittings, valves, equipment and accessories before installation. Any items that are unsuitable, cracked or otherwise defective shall be removed from the job immediately.

B. All pipe, fittings, valves, equipment and accessories shall have factory applied markings, stampings, or nameplates with sufficient data to determine their conformance with specified requirements.

C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not install any item that is not clean.

D. Until system is fully operational, all openings in piping and equipment shall be kept closed except when actual work is being performed on that item or system. Closures shall be plugs, caps, blind flanges or other items specifically designed and intended for this purpose.

E. Run pipes straight and true, parallel to building lines with minimum use of offsets and couplings. Provide only offsets required to provide needed headroom or clearance and to provide needed flexibility in pipe lines.

F. Make changes in direction of pipes only with fittings or pipe bends. Changes in size only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. All fittings shall be of the long radius type, unless otherwise shown on the drawings or specified.

G. Provide flanges or unions at all final connections to equipment, traps and valves.

H. Arrange piping and connections so equipment served may be totally removed without disturbing piping beyond final connections and associated shut-off valves.

I. Use full and double lengths of pipe wherever possible.

J. Unless otherwise indicated, install all piping, including shut-off valves and strainers, to coils, pumps and other equipment at line size with reduction in size being made only at control valve or equipment.

K. Cut all pipe to exact measurement and install without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.

L. Unless otherwise indicated, branch take-offs shall be from top of mains or headers at either a 45º or 90º angle from the horizontal plane for air and gas lines, and from top, bottom or side for liquids.

## 3.6 DRAINING AND VENTING

A. Unless otherwise indicated on the drawings, all horizontal water, lines, including branches, shall pitch 1" in 40 feet to low points for complete drainage, removal of condensate and venting.

B. Provide drain valves at all low points of water piping systems for complete or sectionalized draining.

C. Use eccentric reducing fittings on horizontal runs when changing size of pipes for proper drainage and venting. Install gravity drain pipes with bottom of pipe and eccentric reducers in a continuous line; all other liquid lines with top of pipe and eccentric reducers in a continuous line.

D. Provide air vents at high points and wherever else required to eliminate air in all water piping systems.

E. Install air vents in accessible locations. If necessary to trap and vent air in a remote location, install an 1/8" pipe from the tapping location to an accessible location and terminate with a venting device.

F. All vent and drain piping shall be of same materials and construction for the service involved.

3.7 BRANCH CONNECTIONS

A. For domestic water and vent systems only, make branch connections with standard tee or cross fittings of the type required for the service.

B. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it.

3.8 JOINING OF PIPE

A. Flanged Joints:

1. Steel pipe flanges shall conform to ANSI B16.5 "Steel Pipe Flanges and Flanged Fittings". Cast iron pipe flanges shall conform to ANSI B16.1 "Cast Iron Flanged and Flanged Fittings". Steel flanges shall be raised face except when bolted to flat face cast iron flange.

2. Bolting for services up to 500ºF shall be ASTM A307 Grade B with square head bolts and heavy hexagonal nuts conforming to ANSI B18.2.1 "Square and Hex Bolts" and B18.2.2 "Square and Hex Nuts".

3. Set flange bolts beyond finger tightness with a torque wrench for equal tension in all bolts. Tighten bolts so those 180º apart are torqued in sequence.

4. Gaskets for flat face flanges shall be full face type. Gaskets for raised faced flanges shall conform to requirements for "Group I Gaskets" in ANSI B16.5. Unless otherwise specified gaskets shall be 3/32" thick of following types:

| | |
|---|---|
| Water (Up to 250ºF): | Red Rubber, Heavy Duty Type |
| Oils, Fuels, Plant Air: | Neoprene Type |
| Industrial Gases: | Solid Teflon Type |

B. Solder Joints:

1. Make up joints with 100% lead-free solder, ASTM B32. Cut tubing so ends are perfectly square and remove all burrs inside and outside. Thoroughly clean sockets of fittings and ends of tubing to remove all oxide, dirt and grease just prior to soldering. Apply flux evenly, but sparingly, over all surfaces to be joined. Heat joints uniformly so solder will flow to all mated surfaces. Wipe excess solder, leaving a uniform fillet around cup of fitting.

2. Flux shall be non-acid type.

3. Solder end valves may be installed directly in the piping system if the entire valve is suitable for use with 470ºF melting point solder. Remove discs and seals during soldering if they are not suitable for 470ºF.

## 3.9 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Provide necessary connections at the start of individual sections of mains for adding chlorine.

B. Before starting work, verify system is complete, flushed and clean.

C. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

E. Bleed water from outlets to ensure distribution and test residual at minimum 15% of outlets.

F. Maintain disinfectant in system for 24 hours.

G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

H. Flush disinfectant from system until residual is equal to that of incoming water or 1.0 mg/L.

I. Take samples no sooner than 24 hours after flushing, from 2% of outlets and from water entry, and analyze in accordance with AWWA C651.

END OF SECTION

SECTION 15510
HYDRONIC PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Valves.
B. Solar Collector (Glycol) Water Piping System.
C. Equipment drains and overflow.

1.2 REFERENCES

A. ANSI/AWS D1.1 - Structural Welding Code.

B. ASME - Boiler and Pressure Vessel Code.

C. ASME B16.5 - Pipe Flanges and Flanged Fittings.

D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings

E. ASME B16.21 - Nonmetallic Flat Gaskets for Pipes Flanges.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

G. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).

H. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

I. ASME B18.2.1 - Square and Hex Bolts and Screws, Inch Series.

J. ASME B18.2.2 - Square and Hex Nuts, Inch Series.

1.3 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured valves are not acceptable.

B. Welding Materials, Procedures, and Operators: Conform to ASME Section 9, ANSI/AWS D1.1, and applicable state labor regulations.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 15010. Include data on pipe materials, fittings, valves, and accessories.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store and protect piping to prevent entrance of foreign matter into pipe and to prevent exterior corrosion.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 SOLAR COLLECTOR (GLYCOL) WATER

A. Design Pressure: 125 psig.
Maximum Design Temperature: 225ºF.

B. Piping - All Sizes:

1. Tubing: Type L drawn temper seamless copper tube, ASTM B88.

2. Joints: Solder with Type 95-5 solder. 50-50 solder is not acceptable.

3. Fittings: Wrought copper solder joint, ASME B16.22.

C. Shut-Off Valves:

1. Ball Valves:

a. BA-1: 3" and under, 125 psi saturated steam, 600 psi WOG, full port, screwed or solder ends (acceptable only if rated for soldering in line with 470°F melting point of lead-free solder), bronze body of a copper alloy containing less than 15% zinc, stainless steel ball and trim, Teflon seats and seals. Apollo #77C-140, Stockham #S-206 BR1-R, Milwaukee #BA-400, Watts, Nibco #585-70-66, National Utilities Co., RUB.

NOTES:

1) Provide extended shaft with operating handle of non-thermal conductive material and protective sleeve that allows operation of valve, adjustment of the packing, and adjustment of the memory stop without breaking the vapor seal or disturbing the insulation for all valves in insulated piping.

2) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120°F, heating water piping over 120°F, steam, condensate, boiler feed water piping, compressed air piping and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lock out trim.

D. Check Valves:

1. CK-1: 2" and under, 125 psi S @ 406ºF, 200 psi WOG @ 150ºF, screwed, bronze, horizontal swing. Crane #37, Hammond #IB904, Stockham #B319, Walworth #406, Milwaukee #509, Watts #B-5000, NIBCO #T-413.

2. CK-4: 2" and under, 200 psi WOG @ 150ºF, solder, bronze, horizontal swing. Crane #1342, Hammond #IB912, Stockham #B309, Walworth #406SJ, Milwaukee #1509, Watts #B-5001, NIBCO #S-413.

E. Strainers:

1. ST-1: Bronze body, screwed ends, screwed cover, 125 psi S @ 353°F, 200 psi WOG @ 150°F. Armstrong #F4SC, Metraflex #TS, Mueller Steam Specialty Co. #351, Sarco #BT, Watts #777, NIBCO T-122.

2.2 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tubing: DWV drawn temper seamless copper drainage tube, ASTM B306.

1. Fittings: ASME B16.23 cast brass, or ASME B16.29 solder wrought copper.

2. Joints: Solder with Type 95-5 solder. 50-50 solder is not acceptable.

B. Shut-Off Valves:

1. Ball Valves:

a. BA-1: 3" and under, 125 psi saturated steam, 600 psi WOG, full port, screwed or solder ends (acceptable only if rated for soldering in line with 470°F melting point of lead-free solder), bronze body of a copper alloy containing less than 15% zinc, stainless steel ball and trim, Teflon seats and seals. Apollo #77C-140, Stockham #S-206 BR1-R, Milwaukee #BA-400, Watts, Nibco #585-70-66, National Utilities Co., RUB.

NOTES:

1) Provide extended shaft for all valves in insulated piping.

2) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120°F, heating water piping over 120°F, steam, condensate, boiler feed water piping, compressed air piping and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lock out trim.

2.3 AIR VENTS

A. At end of main and other points where large volume of air may be trapped - Use 1/4" globe valve, angle type, 125 psi, Crane #89, attached to coupling in top of main, 1/4" discharge pipe turned down with cap.

B. On branch lines and small heating units - Use coin-operated air vent equal to B&G #4V, attached to 1/8" coupling in top of pipe. Install air vents on all coils and terminal heating units.

2.4 AUTOMATIC AIR VENTS

A. Low capacity automatic air vent (for bladder tank anti-thermosyphon loops). Maximum operating pressure and temperature of at least 240°F and 125 psi, 1/2" or 3/4" inlet. B&G #87, Armstrong, Spirotherm, Taco, or Watts.

B. High/low capacity automatic air vent (for air separator connection). Maximum operating pressure and temperature of at least 240°F and 125 psi, 3/4" inlet, 3/8" minimum outlet. B&G #107, Armstrong, Spirotherm, Taco, or Watts.

2.5 STRAINERS

A. Unless otherwise indicated, strainers shall be Y-pattern and have stainless steel screens with perforations as follows:

| Pipe Size | 1/4" - 2" | 2-1/2" - 8" | 10" and Up |
|---|---|---|---|
| Water and Glycol/Water | 1/32" | 1/16" | 1/8" |

B. Furnish pipe nipple with ball valve, threaded hose connection, and cap to blow down all strainer screens.

C. Use bronze body strainers in copper piping and iron body strainers in ferrous piping.

2.6 SAFETY RELIEF VALVES

A. SRV-1 (Hydronic Heating Systems): Spring-loaded disc type with cast iron or bronze body, bronze or stainless steel disc, side outlet and lifting lever for maximum service of 125 psig at 250ºF. For relieving water during pressure fluctuations and in case of control failure. Capacities shall be ASME Section IV certified and labeled. Acceptable Manufacturers: Kunkle # 537, B&G, Conbraco, McDonnell & Miller, or Watts.

2.7 BALANCING VALVE

A. Rated for 125 psi working pressure and 250ºF operating temperature, taps for determining flow with a portable meter, positive shut-off valves for each meter connection, memory feature, tight shut-off, and a permanent pressure drop between 1' and 2' water column at full flow with valve 100% open. Furnish with molded, removable insulation covers.

B. Provide a nomograph to determine flow from meter reading (and valve position on units which sense pressure across a valve). Graph shall extend below the specified minimum flow.

C. Furnish one meter kit.

D. Valves in copper piping shall be brass or bronze. Acceptable Manufacturers: Flow Design "Accusetter", Presso "B+", Armstrong "CVB", Bell & Gossett "Circuit Setter Plus", Griswold "Quickset", Gerand "BALVALVE Venturi", NIBCO 1710 (S1710L), Tour&Anderson (STAD), Victaulic 785.

E. Valves in ferrous piping 2" or smaller shall have threaded ends and steel, brass or bronze construction. Acceptable Manufacturers: Flow Design "Accusetter", Presso "B+", TA Hydronics "786-789", Armstrong "CVB", Bell & Gossett "Circuit Setter Plus", Autoflow "AB", Gerand "BALVALVE Venturi", NIBCO 1710 (T1710L), Victaulic 787, or flow sensors specified in Section 15952 with a specified throttling valve.

F. Balancing valves in ferrous piping over 2" size shall have flanged or grooved ends and steel or cast iron construction. Acceptable Manufacturers: Flow Design "Accusetter",

Presso “B+”, Taco “Accu-flo”, Armstrong "CVB-II", B&G “Circuit Setter”, NIBCO 737, Tour&Anderson (STAF, STAG), Victaulic 788/789, or flow sensor specified in Section 15952 with a specified throttling valve.

G. Manufacturer shall size balancing valves for the scheduled flow rate. Flow rate shall be measurable on manufacturer's standard meters.

## 2.8 COMBINATION PIPING PACKAGES

A. Combination piping packages are allowed in lieu of individual components specified for hydronic coils and devices containing hydronic coils. Combination piping packages shall include shutoff valves, wye strainers, 1/4 turn strainer blow down valves with hose thread and cap, manual balancing valves with memory stop, test plugs, manual air vents, and unions. Automatic flow control devices are allowed. Configuration of combination pieces shall match layouts on the drawings. Each component of the combination piping packages shall meet these specifications for the individual components being combined.

B. Acceptable Manufacturers: Same as Solar Collector manufacturers.

## 2.9 EXPANSION TANK

A. Bladder Type:

1. Tank shall be welded steel, ASME construction and stamped.

2. Tank shall be complete with heavy-duty replaceable butyl bladder, charging valve, lifting ring, drain tapping, and system connection.

3. 125 psig working pressure and 240ºF maximum operating temperature.

4. Acceptable Manufacturers: Thrush, Taco, Bell & Gossett, Armstrong, Watts, Wessels, Wheatley, Amtrol, Patterson.

## 2.10 AIR SEPARATORS

A. Separators shall be ASME constructed and stamped for 125 psi working pressure and 350ºF operating temperature.

B. Air shall be separated by centrifugal force or coalescing action.

C. Provide openings for inlet, outlet, blowdown, and expansion tank.

D. Separators shall be line size or larger, with maximum pressure drop of 1 psi. Refer to drawing for separator sizing.

E. Separators shall not include strainers, unless noted on the drawings. When furnished, strainers shall be removable and the blowdown fittings shall have drain valves.

F. Acceptable Manufacturers: Amtrol, Armstrong, Spirotherm, Bell & Gossett, Taco, Wheatley, Patterson.

## 2.11 DRAIN VALVES AND BLOWDOWN VALVES

A. Drain valve and blowdown valve shall mean a shutoff valve as specified for the intended service with added 3/4" male hose thread outlet, cap, and retaining chain.

## 2.12 CONNECTIONS BETWEEN DISSIMILAR METALS

A. Connections between dissimilar metals shall be insulating dielectric types that allow no metal path for electron transfer and that provide a water gap between the connected metals.

B. Joints shall be rated for the temperature, pressure, and other characteristics of the service in which they are used, including testing procedure.

C. Aluminum, iron, steel, brass, copper, bronze and stainless steel are commonly used and require isolation from each other with the following exceptions:

1. Iron, steel, and stainless steel connected to each other.

2. Brass, copper, and bronze connected to each other.

3. Brass or bronze valves and specialties connected to steel or iron in closed systems. Where two brass items occur together, they shall be connected with brass nipples.

4. Brass or bronze valves or specialties under 3/4" size connected to steel, iron, or stainless steel.

D. Dielectric protection is required at connections to equipment of a material different than the piping.

E. Screwed Joints (acceptable up to 2" size):

1. Dielectric union rated for 125 psi CWP and 250°F.

2. Where a sweat-to-screw union is used, the union shall be soldered onto the copper pipe prior to screwing the union onto opposing pipe material.

3. Install dielectric unions per manufacturer’s recommendations.

4. Acceptable Manufacturers: HCI Terminator U, Central Plastics, Wilkins DUX-HT, Watts.

F. Flanged Joints (any size):

1. Use 1/8" minimum thickness, non-conductive, full-face gaskets.

2. Employ one-piece molded sleeve-washer combinations to break the electrical path through the bolts.

3. Sleeve-washers are required on one side only, with sleeves minimum 1/32" thick and washers minimum 1/8" thick.

4. Install steel washers on both sides of flanges to prevent damage to the sleeve-washer.

5. Separate sleeves and washers may be used only if the sleeves are manufactured to exact lengths and installed carefully so the sleeves must extend partially past each steel washer when tightened.

6. Acceptable Manufacturers: EPCO, Central Plastics, Pipeline Seal and Insulator, F. H. Maloney, or Calpico.

2.13 PROPYLENE GLYCOL - FOOD GRADE

A. Fill solar collector systems with a mixture of water and industrially inhibited propylene glycol low temperature industrial heat transfer fluid with an expected life of at least 12 years in normal use. Water shall meet the glycol manufacturer's recommendations (generally < 25ppm chloride, sulfite, and hardness). Distilled, deionized, or reverse osmosis water is acceptable, as are pre-diluted solutions from the manufacturer.

B. All ingredients shall be FDA recognized as safe food additives. Fluid suitable for use from -28ºF to 250ºF.

C. Glycol shall pass ASTM D1384 (less than 0.5 mils annual penetration of all system metals). Glycol supplier shall provide a certificate of assurance.

D. A 50% solution by weight shall depress the freezing point to at least -34ºF. At 40ºF the solution shall have viscosity of not over 14 centipoise, thermal conductivity of at least 0.199 Btu/hr*ft*ºF, specific heat of at least 0.839 Btu/lbm*ºF, and specific gravity of at least 1.06.

E. Manufacturer shall offer a testing service to determine if inhibitor addition is needed.

F. Acceptable Manufacturer: Dow Chemical “Dowfrost”, Interstate Chemical “P-323”, Houghton Chemical “Safe-T-Therm”, and Texaco.

2.14 LOCK OUT TRIM

A. Provide lock out trim for all quarter turn valves opening to atmosphere installed in heating water piping over 120°F and as indicated on the drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends, remove burrs, bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Connect to all equipment with flanges or unions.

D. After completion, fill, clean, and treat systems. Refer to Section 15545 for treatment.

3.2 TESTING PIPING

A. Solar Collector (Glycol) Water Piping System:

1. Test pipes in chases and walls before piping is concealed.

2. Complete testing before insulation is applied. If insulation is applied before pipe is tested and a leak ruins the insulation, replace all damaged insulation.

3. Test the pipe with 100 psig water pressure. Hold pressure for at least two hours.

4. Test to be witnessed by the Architect/Engineer or their representative, if requested by the Architect/Engineer.

3.3 CLEANING PIPING

A. Assembly:

1. Prior to assembly of pipe and piping components, remove all loose dirt, scale, oil and other foreign matter on internal or external surfaces by means consistent with good piping practice subject to approval of the Architect/Engineer. Blow chips and burrs out of pipe before assembly. Wipe cutting oil from internal and external surfaces.

2. During fabrication and assembly, remove slag and weld spatter from both internal and external joints by peening, chipping and wire brushing to the degree consistent with good piping practices.

3. Notify the Architect/Engineer prior to starting any post erection cleaning operation in time to allow witnessing the operation. Properly dispose of cleaning and flushing fluids.

4. Prior to blowing or flushing erected piping systems, disconnect all instrumentation and equipment, open wide all valves, control valves, and balance valves, and verify all strainer screens are in place.

B. Chemical Cleaning:

1. Flush pipe and components with clean water until all discharge from system is clean. Maintain minimum velocities at all points of 5 feet/second for 30 minutes. Flow shall be in same direction as when system is in normal operation. Discharge shall be from low points of pipes, ends of headers and as otherwise needed to flush entire system. After flushing, all residual water shall be drained and/or blown out.

2. Add 2 pounds of trisodium phosphate per 100 gallons of system capacity. Use an alternate chemical if discharge of trisodium phosphate is not permitted. Maintain 150°F in the system if possible. If heat is not available, use 3 pounds per 100 gallons.

3. Drain the system after circulating the chemical cleaner for six hours at 150°F, or 12 hours at a lower temperature. Refill. Test a water sample. Drain and fill again if excessive cleaning chemicals remain and until water appears clear.

4. After circulating the chemical cleaner for six hours at 150ºF, or 12 hours at less than 90ºF, connect fresh water to the system and discharge to a drain. Run circulating pumps and flush until discharge is clear water.

5. When system water is clear, remove, clean and replace all strainers.

6. Add chemical treatment as specified in Section 15545.

7. Water samples may be taken by the Engineer to verify a clean system. If system is not clean, the entire process, including chemical treatment specified in Section 15545, shall be repeated at the Contractor's expense.

8. Chemical cleaning applies to the following systems:

   a. Solar Collector (Glycol) Water Piping System

## 3.4 INSTALLATION

A. Route piping in orderly manner, straight, plumb, with consistent pitch, parallel to building structure, with minimum use of offsets and couplings. Provide only offsets required for needed headroom or clearance and needed flexibility in pipe system.

B. Install piping to conserve building space, and not interfere with other work.

C. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment plus its required clearance space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide chain operators for all valves over 2" size that are over 10'-0" above finished floor. Extend to 7'-0" above finished floor.

G. Provide valve position indicator on all valves 10’-0” or greater above finish floor and not located above ceiling.

H. Provide clearance for installation of insulation, and access to valves and fittings.

I. Provide access doors where valves are not exposed.

J. Install balancing valves with the manufacturer's recommended straight upstream and downstream diameters of pipe.

| *Product* | *Upstream Diameters* | *Downstream Diameters* |
|---|---|---|
| Griswald "Quickset" | 0 | 0 |
| Fluid Design "Accusetter" | 0 up to 2" size<br>5 for larger sizes | 0 |
| Presso "B+" | 5 | 2 |
| Taco "Accu-flo" | 10 | 5 |
| TA Hydronics 786-789 | 5 after fittings<br>10 after pumps | 2 |
| Bell & Gossett "Circuit Setter Plus" | 3 | 1 |
| Bell & Gossett "Circuit Setter" | 3 up to 4" size<br>5 above 4" size | 1 up to 4" size<br>2 above 4" size |
| Armstrong "CVB" and "CVB-II" | 10 | 5 |
| Gerand "BALVALVE Venturi" | 5 | 2 |
| NIBCO 1710/737 | 5 | 3 |

K. Prepare pipe, fittings, supports, and accessories for finish painting.

L. Install valves with stems upright or horizontal, not inverted, except install manual quarter turn valves in radiation cabinets and all butterfly valves with stems horizontal.

M. Provide shut-off valves and flanges or unions at all connections to equipment, traps, and items that require servicing.

N. Arrange piping and piping connections so equipment may be serviced or totally removed without disturbing piping beyond final connections and associated shut-off valves.

O. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it. Where pipe sizes are not shown, the larger size in either direction shall continue through the fitting nearest to the indication of a smaller pipe size.

P. Provide flanges or unions at all final connections to equipment, traps and valves.

Q. Seal pipes passing through exterior walls with a wall seal per Section 15140. Provide Schedule 40 galvanized sleeve at least 2 pipe sizes larger than the pipe.

R. Unless otherwise indicated, branch take-offs shall be at either a 45º or 90º angle from the horizontal plane to not allow air to be trapped in pipe.

## 3.5 PIPE ERECTION AND LAYING

A. Carefully inspect all pipe, fittings, valves, equipment and accessories prior to installation. Immediately reject and remove from the job any items which are unsuitable, cracked or otherwise defective.

B. All pipe, fittings, valves, equipment and accessories shall have factory-applied markings, stampings, or nameplates sufficient to determine their conformance with specified requirements.

C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any unclean item.

D. During construction, until system is fully operational, keep all openings in piping and equipment closed at all times except when actual work is being performed on that item. Closures shall be plugs, caps, blind flanges or other items designed for this purpose.

E. Change direction of pipes only with fittings or pipe bends. Change size only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. **All fittings shall be long radius type**, unless otherwise shown on the drawings or specified. Construct welded elbows of angles not available as standard fittings by cutting and welding standard elbows to form smooth, long radius fittings.

F. Use full and double lengths of pipe wherever possible.

G. Unless otherwise indicated, install all inlet and outlet piping, including shut-off valves and strainers, to coils, pumps and other equipment at line size with reduction in size being made only at control valve or pump.

H. Cut all pipe to exact measurement and install without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.

I. Do not create, even temporarily, undue loads, forces or strains on valves, equipment or building elements.

## 3.6 DRAINING AND VENTING

A. Unless otherwise indicated on the drawings, all horizontal pipes, including branches, shall pitch 1" in 40 feet to low points for complete drainage, removal of condensate, and venting.

B. Provide drain valves at all low points of water piping systems or where indicated on drawings for complete or sectionalized draining. Drain valves are defined above.

C. Use eccentric reducing fittings on horizontal runs when changing size for proper drainage and venting. Install all liquid lines with top of pipe and eccentric reducers in a continuous line.

D. Provide air vents at all high points and wherever else required for elimination of air in all water piping systems. Do not use automatic air vents in glycol systems unless they are piped to the fill tank.

E. Air vents shall be in accessible locations. If needed to trap and vent air in a remote location, a 1/8" pipe shall connect the tapping location to a venting device in an accessible location.

F. All vent and drain piping shall be of same materials and construction as the service involved.

## 3.7 BRANCH CONNECTIONS

A. Make branch connections with standard tee or cross fittings of the type required for the service unless otherwise specified herein or detailed on the drawings.

B. At the option of the Contractor, branch connections from headers and mains may be cut into black steel pipe using forged weld-on fittings.

C. All branch connections off mains shall be made from top of pipe or side of pipe.

## 3.8 JOINING OF PIPE

A. Flanged Joints:

1. Bronze flanges shall conform to B16.24 and ductile iron flanges to B16.42. Steel flanges shall be raised face except when bolted to flat face cast iron flange.

2. Bolting shall be ASTM A307 Grade B with bolts and heavy hexagonal nuts conforming to ASME B18.2.1 and B18.2.2.

3. Torque bolts in at least three passes, tightening to 1/3, 2/3, and final torque in a cross pattern with an indicating torque wrench for equal tension in all bolts.

4. Gaskets for flat face flanges shall be full-face type. Gaskets for raised faced flanges shall conform to requirements for "Group I gaskets" in ASME B16.5. All gaskets shall conform to ASME B16.21. Unless otherwise specified, gaskets shall be 3/32" thick red rubber, heavy-duty type.

B. Solder Joints:

1. Make up joints with 95% tin and 5% antimony (95-5) solder conforming to ASTM B32 Grade 95TA. Cut copper tubing ends perfectly square and remove all burrs inside and outside. Thoroughly clean sockets of fittings and ends of tubing to remove all oxide, dirt and grease just prior to soldering. Apply flux evenly, but sparingly, to all surfaces to be joined. Heat joints uniformly to proper soldering temperature so solder flows to all mated surfaces. Wipe excess solder, leaving a uniform fillet around cup of fitting.

2. Flux shall be non-acid type conforming to ASTM B813.

3. Solder end valves may be installed directly in the piping system if the entire valve is suitable for use with 470ºF melting point solder. Remove composition discs and all seals during soldering if not suitable for 470ºF.

END OF SECTION

SECTION 15755
HEAT EXCHANGERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Plate Type Heat Exchangers.
B. Accessories and Trim.

1.2 REFERENCES

A. ANSI/ASME - Boilers and Pressure Vessels Code.

1.3 REGULATORY REQUIREMENTS

A. Conform to Section 8D of the ANSI/ASME Boilers and Pressure Vessels Code for manufacture of tubular heat exchangers and heat exchanger shells.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15010. Indicate dimensions, locations, and size of tappings and performance data.

B. Submit manufacturer's installation instructions.

C. Submit design data in sufficient detail to verify that heat exchangers meet or exceed specified requirements.

D. Submit operation and maintenance data. Include start-up and shut down instructions, assembly drawings, and spare parts lists.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect internals from entry of foreign material by temporary caps on flanged openings.

1.6 EXTRA MATERIALS

A. Provide two sets of replacement gaskets.

B. Provide one set of wrenches for disassembly of plate type heat exchangers.

PART 2 - PRODUCTS

2.1 PLATE AND FRAME TYPE HEAT EXCHANGER

A. Furnish and install exchangers as scheduled on the drawings.

B. Units shall be complete, preassembled, pressure tested at the factory and flushed clean.

C. Units shall bear ASME code stamp for 125 psig water service.

D. Plate and frame heat exchanger shall be 316SS CU brazed, double wall. Brazing material is either copper or nickel.

E. Acceptable Manufacturers: Plate Concepts, Alfa-Laval, Bell & Gossett, Mueller, APV, American Vicarb, or Tranter.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install to permit removal of tube bundle with minimum disturbance to installed equipment and piping.

C. Pitch shell to completely drain condensate.

D. Pipe relief valves and drain valves to nearest floor drain.

E. Support heat exchangers on welded steel pipe and angle floor stand.

### 3.2 WATER-TO-WATER HEAT EXCHANGER TRIM

A. Water Inlets and Outlets: Thermometer wells, pressure gauge tappings.

B. Heated Water Outlet: Thermometer well for temperature regulator sensor, ASME rated pressure and temperature relief valve, valved drain.

END OF SECTION

SECTION 15980
INSTRUMENTATION

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Pressure Gauge.
B. Pressure Gauge Accessories.
C. Thermometers.
D. Test Plugs.

### 1.2 REFERENCES

A. ANSI/AWWA C700 - Cold Water Meters - Displacement Type, Bronze Main Case.

B. ANSI/AWWA C701 - Cold Water Meters - Turbine Type, for Customer Service.

C. ANSI/AWWA C702 - Cold Water Meters - Compound Type.

D. ANSI/AWWA C706 - Direct Reading, Remote Registration Systems for Cold Water Meters.

E. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.

F. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi.

G. ASTM E1 - Specification for ASTM Thermometers.

### 1.3 SUBMITTALS

A. Submit shop drawings per Section 15010. Include list that indicates use, operating range, total range and location for manufactured components.

## PART 2 - PRODUCTS

### 2.1 PRESSURE GAUGES

A. Gauges shall be 4-1/2" diameter with aluminum or stainless steel case with phosphor bronze bourdon tube, brass socket for air, steam, water or oil application, 1/4" bottom connection. Gauges shall be 1% full scale accurate with bronze bushed brass movement and adjustable pointer. Standard ranges to be either pressure or pressure and vacuum as required of application.

B. Acceptable Manufacturers: U. S. Gauge Figure 5801, Marshalltown, Marsh, Weiss, Weksler, Ashcroft, Wika.

C. Acceptable Manufacturer: U.S. Gauge Figure 1980, Marshalltown, Marsh, Weiss, Weksler, Ashcroft, Wika, Tel-Tru.

D. Select gauge range for normal reading near center of gauge.

2.2 PRESSURE GAUGE ACCESSORIES

A. All pressure gauges shall have valves and pressure snubbers. All pressure gauges on steam shall have pigtail syphon.

B. Shut-off Valve: 1/4" ball valve as specified for each piping system.

C. Pressure snubber, brass with 1/4" connections, porous metal type.

2.3 THERMOMETERS

A. Alcohol/Spirit Filled Type:

1. 9" long phenolic case, steel stem, accuracy of 1% full scale. Adjustable elbow joint with locking device to allow rotation of thermometer to any angle.

2. Select thermometer for appropriate temperature range.

3. Stem lengths as required for application with minimum insertion of 3-1/2".

4. Thermometers for water, steam, or oil shall have brass or steel separable socket. Wells shall extend through insulation. Thermometers for air shall have an aluminum or brass duct flange.

B. Select scales to cover expected range of temperatures.

2.4 TEST PLUGS

A. Test Plug: 1/4" or 1/2" brass fitting and cap, with Nordel core for temperatures up to 275°F, for receiving 1/8" outside diameter pressure or temperature probe. Plugs shall be rated for zero leakage from vacuum to 500 psi.

B. Provide extended units for all plugs installed in insulated piping.

C. Test Kit: Carrying case, internally padded and fitted containing one 3-1/2" diameter pressure gauge with 0-100 psi range, one gauge adapter with 1/8" probes, two 1-1/2" dial thermometers with 0° to 220°F and -25°F to 125°F ranges and 5" stems.

D. Acceptable Manufacturers: Sisco, Flow Design, or Peterson Equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install per manufacturer's instructions.

B. Connect pressure gauges to suction and discharge side of all pumps.

C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2" for installation of thermometer sockets.

D. Install thermometer sockets adjacent to control system thermostat, transmitter and sensor sockets.

E. Install gauges and thermometers in locations where they are easily read from normal operating level.

F. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

END OF SECTION

SECTION 15990
TESTING, ADJUSTING, AND BALANCING

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Testing, adjusting, and balancing of solar collector and solar domestic water heating systems.
B. Measurement of final operating condition of HVAC systems.

### 1.2 REFERENCES

A. AABC - National Standards for Total System Balance, 2002.

B. ADC – Test Code for Grilles, Registers, and Diffusers.

C. AMCA – Publication 203-90; Field Performance Measurement of Fan Systems.

D. ASHRAE - 2003 HVAC Applications Handbook; Chapter 37, Testing, Adjusting and Balancing.

E. ASHRAE/ANSI - Standard 111-1988; Practices for Measurement, Testing, Adjusting and Balancing of Building HVAC&R Systems.

F. NEBB - Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems, Sixth Edition, 1998.

G. SMACNA - HVAC Systems; Testing, Adjusting and Balancing, Third Edition, 2002.

H. TABB – International Standards for Environmental Systems Balance.

### 1.3 SUBMITTALS

A. Submit copies of report forms, balancing procedures, and the name and qualifications of testing and balancing agency for approval within 30 days after award of Contract.

B. Submit four (4) certified copies of test reports to the Architect/Engineer for approval in soft cover, 3-hole binder manuals, with cover identification. Include index page and indexing tabs.

### 1.4 REPORT FORMS

A. Submit reports on AABC, SMACNA or NEBB forms. Use custom forms approved by the Architect/Engineer when needed to supply specified information.

B. Include in the final report a schematic drawing showing each system component, including balancing devices, for each system. Each drawing shall be included with the test reports required for that system. The schematic drawings shall identify all testing points and cross-reference these points to the report forms and procedures.

C. Refer to PART 4 for required reports.

1.5 QUALITY ASSURANCE

A. Agency shall be a company specializing in the adjusting and balancing of systems specified in this section with minimum three years experience. Perform work under supervision of AABC Certified Test and Balance Engineer, NEBB Certified Testing, Balancing and Adjusting Supervisor, SMARTA Certified Air and Hydronic Balancer, or TABB Certified Supervisor.

B. Work shall be performed in accordance with the requirements of the references listed at the start of this section.

1.6 WARRANTY/GUARANTEE

A. The TAB Contractor shall include an extended warranty of 90 days after owner receipt of a completed balancing report, during which time the Owner may request a recheck of terminals, or resetting of any outlet, coil, or device listed in the test report. This warranty shall provide a minimum of 24 manhours of on site service time. If it is determined that the new test results are not within the design criteria, the balancer shall rebalance the system according to design criteria.

B. Warranty/Guarantee must meet one of the following programs: TABB International Quality Assurance Program, AABC National Project Performance Guarantee, NEBB's Conformance Certification.

1.7 SCHEDULING

A. Coordinate schedule with other trades. Provide a minimum of seven days notice to all trades and the Architect/Engineer prior to performing each test.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. All procedures must conform to a published standard listed in Paragraph 1.2. All equipment shall be adjusted in accordance with the manufacturer's recommendations. Any system not listed in this specification but installed under the contract documents shall be balanced using a procedure from a published standard listed in Paragraph 1.2.

B. Recorded data shall represent actual measured or observed conditions.

C. Cut insulation, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing is complete, close probe holes and patch insulation with new materials as specified. Restore vapor barrier and finish as specified.

D. Permanently mark setting of valves, and other adjustment devices allowing for settings to be restored. Set and lock memory stops.

E. Leave systems in proper working order, closing doors to electrical switch boxes, plugging test holes, and restoring thermostats to specified settings.

F. The Balancing Contractor shall measure terminal air box air flow, and the ATC shall adjust DDC readout to match. Refer to Specification Section 15952 for additional information.

G. Installations with systems consisting of multiple components shall be balanced with all system components operating.

## 3.2 EXAMINATION

A. Before beginning work, verify that systems are complete and operable. Ensure the following:

1. Equipment is safe to operate and in normal condition.
2. Equipment with moving parts is properly lubricated.
3. Temperature control systems are complete and operable.
4. Proper thermal overload protection is in place for electrical equipment.
5. Direction of rotation of all pumps is correct.
6. Hydronic systems have been cleaned, filled, and vented.
7. Strainer screens are clean and in place.
8. Shut-off, throttling and balancing valves are open.

B. Report any defects or deficiencies to Architect/Engineer.

C. Promptly report items that are abnormal or prevent proper balancing.

D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

E. Beginning of work means acceptance of existing conditions.

## 3.3 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to the Architect/Engineer for spot checks during testing.

B. Instruments shall be calibrated within six months of testing performed for project, or more recently if recommended by the instrument manufacturer.

## 3.4 INSTALLATION TOLERANCES

A. Adjust piping systems to ± 5% of design values.

## 3.5 ADJUSTING

A. After adjustment, take measurements to verify balance has not been disrupted or that disruption has been rectified.

B. After testing, adjusting and balancing are complete, operate each system and randomly check measurements to verify system is operating as reported in the report. Document any discrepancies.

C. Contractor responsible for each motor shall also be responsible for replacement sheaves. Coordinate with contractor.

D. Contractor responsible for pump shall trim impeller to final duty point as instructed by this contractor on all pumps not driven by a VFD. Coordinate with contractor.

3.6 SUBMISSION OF REPORTS

A. Fill in test results on appropriate forms.

PART 4 - SYSTEMS TO BE TESTED, ADJUSTED AND BALANCED

4.1 GENERAL REQUIREMENTS

A. Title Page:

1. Project name.
2. Project location.
3. Project Engineer (KJWW Engineering Consultants).
4. Project General Contractor.
5. TAB Company name, address, phone number.
6. TAB Supervisor's name and certification number.
7. TAB Supervisor's signature and date.
8. Report date.

B. Report Index

C. General Information:

1. Test conditions.
2. Nomenclature used throughout report.
3. Notable system characteristics/discrepancies from design.
4. Test standards followed.
5. Any deficiencies noted.
6. Quality assurance statement.

D. Instrument List:

1. Instrument.
2. Manufacturer, model, and serial number.
3. Range.
4. Calibration date.

4.2 PLUMBING SYSTEMS AND SOLAR COLLECTOR (GLYCOL) WATER PIPING SYSTEM

A. Pump Data:

1. Drawing symbol.
2. Service.
3. Manufacturer, size, and model.
4. Impeller size: specified, actual, and final (if trimmed).
5. Flow Rate (gpm): specified and actual.

6. Pump Head: specified, operating and shut-off.
7. Suction Pressure: operating and shut-off.
8. Discharge Pressure: operating and shut-off.
9. Final frequency of motor at maximum flow rate. (On pumps driven by VFD.)

B. Electric Motors:

1. Drawing symbol of equipment served.
2. Manufacturer, model, frame.
3. Nameplate: HP, phase, service factor, RPM, operating amps, efficiency.
4. Measured: Amps for each phase.

C. Balancing Valve:

1. Drawing symbol.
2. Service.
3. Location.
4. Size.
5. Manufacturer and model.
6. Flow rate (gpm): specified and actual.
7. Pressure drop: specified and actual.

D. Heat Exchangers (not all items apply to all units):

1. Drawing symbol.
2. Service.
3. Location.
4. Manufacturer and model.
5. Steam pressure in exchanger: specified and actual.
6. Primary water entering temperature: specified and actual.
7. Primary water leaving temperature: specified and actual.
8. Primary water flow: specified and actual.
9. Primary water pressure drop: specified and actual.
10. Primary water Btuh (gpm x temperature drop x 500).
11. Secondary water entering temperature: specified and actual.
12. Secondary water leaving temperature: specified and actual.
13. Secondary water flow: specified and actual.
14. Secondary water pressure drop: specified and actual.
15. Secondary water Btuh (gpm x temperature rise x 500).

END OF SECTION

SECTION 16010
BASIC ELECTRICAL REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Requirements applicable to all Division 16 Sections. Also refer to Division 1 - General Requirements. This section is also applicable to Interior Communications Pathways Section 17130.

B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced in each specification section.

### 1.2 SCOPE OF WORK

A. This Specification and the associated drawings govern furnishing, installing, testing and placing into satisfactory operation the Electrical Systems.

B. The Contractor shall furnish and install all new materials as indicated on the drawings, and/or in these specifications, and all items required to make his portion of the Electrical Work a finished and working system.

C. Description of Systems shall be as follows:

1. Electrical power system to and including solar photovoltaics, wind turbines, equipment, motors, devices, etc.

2. Electrical power service system from the Utility Company to and including service entrance equipment, distribution and metering.

3. Grounding system.

4. Energy measurement sytem.

5. Wiring of equipment furnished by others.

### 1.3 ALTERNATES

A. Refer to Division 0 and drawings for identification of alternate bids.

### 1.4 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL, AND CONTROL CONTRACTORS

A. Division of work is the responsibility of the Prime Contractor. Any scope of work described at any location on the contract document shall be sufficient for including said requirement in the project. The Prime Contractor shall be solely responsible for determining the appropriate subcontractor for the described scope. In no case shall the project be assessed an additional cost for scope that is described on the contract documents on bid day. The following division of responsibility is a guideline based on typical industry practice.

B. Definitions:

1. "Mechanical Contractors" refers to the Contractors listed in Division 15of this Specification.

2. Motor Power Wiring: The single phase or 3 phase wiring extending from the power source (transformer, panelboard, feeder circuits, etc.) through disconnect switches and motor controllers to, and including the connections to the terminals of the motor.

3. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case, the devices are usually single phase, have "Manual-Off-Auto" provisions, and are usually connected into the motor power wiring through a manual motor starter.

4. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.

5. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. When the motor power wiring exceeds 120 volts, a control transformer is usually used to give a control voltage of 120 volts.

6. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring that directly powers or controls a motor used to drive equipment such as fans, pumps, etc. This wiring will be from a 120 volt source and may continue as 120 volt, or be reduced in voltage (24 volt), in which case a control transformer shall be furnished as part of the temperature control wiring.

7. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.

8. Low Voltage Technology Wiring: The wiring associated with the Technology Systems, used for analog or digital signals between equipment.

9. Telecommunications Rough-in: Relates specifically to the backboxes, necessary plaster rings and other miscellaneous hardware required for the installation or mounting of telecommunications information outlets.

C. General:

1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractors' responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors, etc. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals approved. Therefore, the electrical

drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.

2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall furnish complete wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.

3. The Electrical Contractor shall establish electrical utility elevations prior to fabrication and installation. The Electrical Contractor shall coordinate utility elevations with other trades. When a conflict arises, priority shall be as follows:

   a. Lighting Fixtures
   b. Gravity flow piping, including steam and condensate.
   c. Electrical bus duct.
   d. Sheet metal.
   e. Cable trays, including access space.
   f. Other piping.
   g. Conduits and wireway.

D. Mechanical Contractor's Responsibility:

1. Assumes responsibility for internal wiring of all equipment furnished by the Mechanical Contractor.

2. Assumes all responsibility for miscellaneous items furnished by the Mechanical Contractor that require wiring but are not shown on the electrical drawings or specified in the Electrical Specification. If items such as relays, flow switches, or interlocks are required to make the mechanical system function correctly or are required by the manufacturer, they are the responsibility of the Mechanical Contractor.

3. Assumes all responsibility for Temperature Control wiring, if the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.

E. Temperature Control Contractor's or Subcontractor's Responsibility:

1. Wiring of all devices needed to make the Temperature Control System functional.

2. Verifying any control wiring on the electrical drawings as being by the Electrical Contractor. All wiring is required for the Control System, but not shown on the electrical drawings, is the responsibility of the Temperature Control Contractor or Subcontractor.

3. Coordinating equipment locations (such as PE’s, EP’s, relays, transformers, etc.) with the Electrical Contractor, where wiring of the equipment is by the Electrical Contractor.

F. Electrical Contractor's Responsibility:

1. Furnishes and installs all combination starters, manual starters and disconnect devices shown on the Electrical Drawings or indicated to be by the Electrical Contractor in the Mechanical Drawings or Specifications.

2. Installs and wires all remote control devices furnished by the Mechanical Contractor or Temperature Control Contractor when such so noted on the Electrical Drawings.

3. Furnishes and installs motor control and temperature control wiring, when noted on the drawings.

4. Furnishes, installs, and connects all relays, etc., for automatic shutdown of certain mechanical equipment (supply fans, exhaust fans, etc.) upon actuation of the Fire Alarm System.

5. Assumes all responsibility for the Low Voltage Technology Wiring of all systems, including cable support where open cable is specified.

6. Assumes all responsibility for all required backboxes, conduit and power connections not specifically shown as being furnished and installed by the Electrical Contractor on the "Suggested Matrix of Scope Responsibility".

7. Assumes all responsibility for providing and installing all ladder rack and other cable management hardware (as defined in here-in).

1.5 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing/Bid Data:

1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guides, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Architect/Engineer any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.

2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Architect/Engineer will be done at the Contractor's risk.

B. Qualifications:

1. Only products of reputable manufacturers as determined by the Engineer are acceptable.

2. All Contractors and subcontractors shall employ only workmen who are skilled in their trades. At all times, the number of apprentices at the job site shall be less than or equal to the number of journeymen at the job site.

C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the State of Iowa Codes, Laws, Ordinances and other regulations having jurisdiction over this installation.

2. If there is a discrepancy between the codes and regulations and these specifications, the Engineer shall determine the method or equipment used.

3. If the Contractor notes, at the time of bidding, any parts of the drawings or specifications that do not comply with the codes or regulations, he shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, he shall submit with his proposal a separate price to make the system comply with the codes and regulations.

4. All changes to the system made after the letting of the contract to comply with codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.

5. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.

6. If there are no local codes having jurisdiction, the current issue of the National Electrical Code shall be followed.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.

2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.

3. Pay all charges for permits or licenses.

4. Pay all fees and taxes imposed by State, Municipal, and other regulatory bodies.

5. Pay all charges arising out of required inspections by an authorized body.

6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.

7. Where applicable, all fixtures, equipment and materials shall be listed by Underwriter’s Laboratories, Inc. or a nationally recognized testing organization.

E. Utility Company Requirements:

1. Secure from the private or public utility company all applicable requirements.

2. Comply with all utility company requirements.

3. The Owner shall make application for and pay for new electrical service equipment and installation. The Contractor shall coordinate schedule and requirements with the Owner and Utility Company.

F. Examination of Drawings:

1. The drawings for the electrical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.

2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of raceways so as to best fit the layout of the job.

3. Scaling of the drawings will not be sufficient or accurate for determining these locations.

4. Where job conditions require reasonable changes in arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.

5. Because of the scale of the drawings, certain basic items, such as junction boxes, pull boxes, conduit fittings, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.

6. If an item is either shown on the drawings or called for in the specifications, it shall be included in this contract.

7. The Contractor shall determine quantities and quality of material and equipment required from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater and better quality number shall govern.

8. Where used in electrical documents the word “furnish” shall mean supply for use, the word “install” shall mean connect up complete and ready for operation, and the word “provide” shall mean to supply for use and connect up complete and ready for operation.

9. Any item listed as furnished shall also be installed unless otherwise noted.

10. Any item listed as installed shall also be furnished unless otherwise noted.

G. Electronic Media/Files:

1. Construction drawings for this project have been prepared utilizing MEP Release 2011.

2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.

3. Upon request for electronic media, the Contractor shall complete and return a signed “Electronic File Transmittal” form provided by KJWW.

4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.

5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.

6. The drawings prepared by KJWW for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.

7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.

8. The information is provided to expedite the project and assist the Contractor with no guarantee by KJWW as to the accuracy or correctness of the information provided. KJWW accepts no responsibility or liability for the Contractor's use of these documents.

H. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any conduit, conductors, wireways, bus duct, fittings, etc.

1.6 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals list:

| **Referenced Specification Section** | **Submittal Item** |
|---|---|
| 16160 | Cabinets and Enclosures |
| 16440 | Disconnect Switches |
| 16470 | Panelboards |
| 16472 | Power Centers |
| 16477 | Fuses |
| 16480 | Motor Control |
| 16650 | Solar Photovoltaic Systems |
| 16660 | Wind Turbine Systems |
| 16920 | Power Monitoring and Control System |

B. In addition to the provisions of Division 1, the following provisions are required:

1. Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; and all other drawings and descriptive data of materials of construction as may be required to

show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.

2. The Contractor shall submit electronic copies of each shop drawing for review by the Architect/Engineer BEFORE releasing any equipment for manufacture or shipment.

3. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. CONTRACTOR'S APPROVAL STAMP IS REQUIRED ON ALL SUBMITTALS. APPROVAL WILL INDICATE THE CONTRACTOR'S REVIEW of all material and a COMPLETE UNDERSTANDING OF EXACTLY WHAT IS TO BE FURNISHED. Contractor shall clearly mark all deviations from the contract documents on all submittals. IF THE CONTRACTOR DOES NOT MARK DEVIATIONS, THEN THE ITEM SHALL BE REQUIRED TO MEET ALL DRAWING AND SPECIFICATION REQUIREMENTS.

4. Each data sheet shall clearly show at the top of the sheet what General Electrical Equipment Schedule symbol (and applicable variations and subscripts) that data sheet corresponds to.

5. Each data sheet shall show the size, rating, style, finish, material, catalog number, manufacturer name and product photos for each item to ensure compliance with these specifications.

6. Assemble all submittals in sets, such as panelboards, fire alarm, lighting, or motor control. All sets shall be identical and contain an index of the items enclosed with a general topic description on the cover.

7. Where more than one model is shown on a manufacturer's sheet, clearly indicate exactly which item and which data is relevant to the work.

8. Where the manufacturer lists multiple part numbers or options on a single data sheet, the part number and options to be used shall be clearly set apart from other part numbers shown on that sheet.

9. Failure to comply with the above shall be reason to resubmit all shop drawings.

10. The Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost to the Owner, for the Engineer to recheck and handle the additional shop drawing submittals.

C. Provide Schedule of Values:

1. Application forms: Use AIA Document Continuation Sheets G703 (or similar) as the form for application.

2. Provide line items on the Schedule of Values including:

   a. General Conditions (mobilization, bonds, insurance, etc.)
   b. E.B Lyons Electrical
   c. Honey Creek Electrical
   d. Lewis and Clark Solar PV
   e. Lewis and Clark Wind
   f. Lewis and Clark Energy Monitoring
   g. Honey Creek Solar PV
   h. Honey Creek Wind
   i. Honey Creek Solarthermal
   j. Honey Creek Energy Monitoring

3. Change orders shall have schedule of values broken out as listed above submitted with each change order.

4. Coordinate with the Project Engineer the items included in the Schedule of Values. The intent is to not create schedules in addition to those the Electrical Contractor normally submits to the General Contractor for payment.

1.7 PRODUCT DELIVERY, STORAGE, HANDLING AND MAINTENANCE

A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage.

B. Keep all materials clean, dry and free from damaging environments.

C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Electrical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.

D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate his/her work with other trades.

1.8 WARRANTY

A. Provide one-year warranty for all fixtures, equipment, materials, and workmanship.

B. The warranty period for all work in this specification Division shall commence on the date of Substantial Completion or successful system performance whichever occurs later. The warranty may also commence if a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization of the Owner. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.

C. Warranty requirements extend to correction, without cost to the Owner, of all work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage due to defects or nonconformance with contract documents excluding repairs required as a result of improper maintenance or operation, or of normal wear as determined by the Architect/Engineer.

1.9 INSURANCE

A. This Contractor shall maintain insurance coverage as set forth in Division 1 of these specifications.

1.10 MATERIAL SUBSTITUTION

A. Where several manufacturers' names are given, the manufacturer for which a catalog number is given is the basis of design and establishes the quality required.

B. Equivalent equipment manufactured by the other named manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications, and fit in the allocated space. The Engineer shall make the final determination of whether a product is equivalent.

C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer via addendum. The Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on his part or on the part of other Contractors whose work is affected.

D. Voluntary add or deduct prices for alternate materials may be listed on the bid form. These items will not be used in determining the low bidder. This Contractor assumes all costs incurred as a result of using the offered material or equipment on his part or on the part of other Contractors whose work is affected.

E. All material substitutions requested after the final addendum must be listed as voluntary changes on the bid form.

PART 2 - PRODUCTS

2.1 GENERAL

A. All items of material having a similar function (e.g., safety switches, panelboards, switchboards, contactors, motor starters, dry type transformers) shall be of the same manufacturer unless specifically stated otherwise on drawings or elsewhere in specifications.

B. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

A. Neither the professional activities of the Engineer, nor the presence of the Engineer or his or her employees and subconsultants at a construction site, shall relieve the Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Engineer and his or her personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Engineer and the Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 EXCAVATION, FILL, BACKFILL, COMPACTION

A. General:

1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide notice to the locator within the time before excavations required by law.

   a. In Iowa, call Iowa One Call (800) 292-8989

2. The Contractor shall do all excavating, filling, backfilling, compacting, and restoration in connection with his work.

B. Excavation:

1. Make all excavations to accurate, solid, undisturbed earth, and to proper dimensions.

2. If excavations are carried in error below indicated levels, concrete of same strength as specified for the foundations or thoroughly compacted sand-gravel fill, as determined by the Architect/Engineer shall be placed in such excess excavations under the foundation. Place thoroughly compacted, clean, stable fill in excess excavations under slabs on grade, at the Contractor's expense.

3. Trim bottom and sides of excavations to grades required for foundations.

4. Protect excavations against frost and freezing.

5. Take care in excavating not to damage surrounding structures, equipment or buried pipe. Do not undermine footing or foundation.

6. Perform all trenching in a manner to prevent cave-ins and risk to workmen.

7. Where original surface is pavement or concrete, the surface shall be saw cut to provide clean edges and assist in the surface restoration.

8. If satisfactory bearing soil is not found at the indicated levels, immediately notify the Architect/Engineer or their representative, and do no further work until the Architect/Engineer or their representative gives further instructions.

9. Excavation shall be performed in all ground conditions, including rock, if encountered. Bidders shall visit the premises and determine the soil conditions by actual observations, borings, or other means. The cost of all such inspections, borings, etc., shall be borne by the bidder.

10. If a trench is excavated in rock, a compacted bed with a depth of 3" (minimum) of sand and gravel shall be used to support the conduit unless masonry cradles or encasements are used.

11. Mechanical excavation of the trench to line and grade of the conduit or to the bottom level of masonry cradles or encasements is permitted, unless otherwise indicated on the electrical drawings.

12. Mechanical excavation of the trench to line and grade where direct burial cables are to be installed is permitted provided the excavation is made to a depth to permit installation of the cable on a fine sand bed at least 3 inches deep.

C. Dewatering:

1. Furnish, install, operate and remove all dewatering pumps and pipes needed to keep trenches and pits free of water.

D. Underground Obstructions:

1. Known underground piping, conduit, feeders, foundations, and other obstructions in the vicinity of construction are shown on the drawings. Review all Bid Documents for all trades on the project to determine obstructions indicated. Take great care in making installations near underground obstructions.

2. If objects not shown on the drawings are encountered, remove, relocate, or perform extra work as directed by the Architect/Engineer.

E. Fill and Backfilling:

1. No rubbish or waste material is permitted for fill or backfill.

2. Furnish all necessary sand for backfilling.

3. Dispose of the excess excavated earth as directed.

4. Backfill materials shall be suitable for required compaction, clean and free of perishable materials, frozen earth, debris, earth with a high void content, and stones greater than 4 inches in diameter. Water is not permitted to rise in unbackfilled trenches.

5. Backfill all trenches and excavations immediately after installing of conduit, or removing forms, unless other protection is directed.

6. Around piers and isolated foundations and structures, backfill and fill shall be placed and consolidated simultaneously on all sides to prevent wedge action and displacement. Spread fill and backfill materials in 6” uniform horizontal layers with each layer compacted separately to required density.

7. For conduits that are not concrete encased, lay all conduits on a compacted bed of sand at least 3" deep. Backfill around conduits with sand, in 6" layers and compact each layer.

8. Backfill with sand up to grade for all conduits under slabs or paved areas. All other conduits shall have sand backfill to 6" above the top of the conduit.

9. Place all backfill above the sand in uniform layers not exceeding 6” deep. Place then carefully and uniformly tamp each layer to eliminate lateral or vertical displacement.

10. Where the fill and backfill will ultimately be under a building, floor or paving, each layer of fill shall be compacted to 95% of the maximum density as determined by AASHTO Designation T-99 or ASTM Designation D-698. Moisture content of soil at time of compaction shall not exceed plus or minus 2% of optimum moisture content as determined by AASHTO T-99 or ASTM D-698 test.

11. After backfilling of trenches, no superficial loads shall be placed on the exposed surface of the backfill until a period of 48 hours has elapsed.

F. Surface Restoration:

1. Where trenches are cut through graded, planted or landscaped areas, the areas shall be restored to the original condition. Replace all planting and landscaping features removed or damaged to its original condition. At least 6” of topsoil shall be applied where disturbed areas are to be seeded or sodded. All lawn areas shall be sodded unless seeding is called out in the drawings or specifications.

2. Concrete or asphalt type pavement, seal coat, rock, gravel or earth surfaces removed or damaged shall be replaced with comparable materials and restored to original condition. Broken edges shall be saw cut and repaired as directed by Architect/Engineer.

## 3.3 ENGINEER OBSERVATION OF WORK

A. The contractor shall provide seven (7) calendar days notice to the Engineer prior to:

1. Placing fill over underground and underslab utilities.

B. The Engineer will review the installation and provide a written report noting deficiencies requiring correction. The contractor’s schedule shall account for these reviews and show them as line items in the approved schedule.

## 3.4 PROJECT CLOSEOUT

A. The following paragraphs supplement the requirements of Division 1.

B. Final Jobsite Observation:

1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor shall review the completion status of the project and certify that the job is ready for the final jobsite observation.

2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review. The Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.

3. It is understood that if the Engineer finds the job not ready for the final observation and additional trips and observations are required to bring the project to completion, the cost of the additional time and expenses incurred by the Engineers will be deducted from the Contractor's final payment.

C. The following must be submitted before Architect/Engineer recommends final payment:

1. Operation and maintenance manuals with copies of approved shop drawings.

2. Record documents including drawings and specifications.

3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of this Contractor and shall be signed by the Owner's representatives.

4. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and place in location as directed and submit receipt to Architect/Engineer.

5. Inspection and testing report by the fire alarm system manufacturer.

6. Start-up reports on all equipment requiring a factory installation or start-up.

## 3.5 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Submit three (3) properly indexed and bound copies, in "D" ring style notebooks, of the Operations and Maintenance Instructions to the Architect/Engineer. Make all corrections or additions required.

B. Operation and Maintenance Instructions shall include:

1. Notebooks shall be heavy duty locking three ring binders and incorporate clear vinyl sheet sleeves on the front cover and spine for slip-in labeling. "Peel and stick" labels are **not** acceptable. Sheet lifters shall be supplied at the front of each notebook. Provide "Wilson-Jones" or equal, color black. Size notebooks a minimum of 1/2" thicker than material for future inserts. Label the spine and front cover of each notebook. If more than one notebook is required, label in consecutive order. For example; 1 of 2, 2 of 2. No other forms of binding will be acceptable.

2. Prepare binder covers (front and spine) with printed title “Operation and Maintenance Instructions”, title of project, and subject matter of binder when multiple binders are required.

3. Title page with project title, Architect, Engineer, Contractor, and Subcontractor with addresses, telephone numbers, and contacts.

4. Table of Contents describing all index tabs.

5. Listing of all Subcontractors and major equipment suppliers with addresses, telephone numbers, and contacts.

6. Index tabs dividing information by specification section, major equipment, or systems. All tab titles shall be clearly printed under reinforced plastic tabs. Label all equipment to match the identification in the construction documents.

7. Copies of warranties.

8. Copies of all final approved shop drawings and submittals. Copy of power system study and overcurrent protective device settings.

9. Copies of all factory inspection and/or equipment start-up reports.

C. Operation and maintenance data shall consist of written instructions for the care, maintenance, and operation of the equipment and systems. Instruction books, cards, manuals furnished with the equipment shall be included.

3.6 INSTRUCTING THE OWNER'S REPRESENTATIVE

A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of the complete systems installed under this contract.

B. Provide verbal and written instructions to the Owner's representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.

C. The Owner has the option to video tape all instructions. Coordinate schedule of instructions to facilitate this recording.

D. The instructions shall include:

1. Maintenance of equipment.
2. Start-up procedures for all major equipment.
3. Description of emergency system operation.

E. Notify Engineer of the time and place for the verbal instructions to the Owner's representative so his representative can be present if desired.

F. Minimum hours of instruction time for each item and/or system shall be as indicated in each individual specification section.

G. Operating Instructions:

1. Contractor is responsible for all instructions to the Owner's representatives for the electrical and specialized systems.

2. If the Contractor does not have staff that can adequately provide the required instructions, he shall include in his bid an adequate amount to reimburse the Owner for the Engineer to perform these services.

3.7 RECORD DOCUMENTS

A. The following paragraphs supplement the requirements of Division 1.

B. Maintain at the job site a separate and complete set of electrical drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.

C. Mark drawings and specifications to indicate approved substitutions; Change Orders, and actual equipment and materials used. All Change Orders, RFI responses, Clarifications and other supplemental instructions shall be marked on the documents. Record documents that merely reference the existence of the above items are not acceptable. Should this Contractor fail to complete Record Documents as required by this contract, this Contractor shall reimburse Architect/Engineer for all costs to develop record documents that comply with this requirement. Reimbursement shall be made at the Architect/Engineer's hourly rates in effect at the time of work.

D. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.

E. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

3.8 PAINTING

A. This Contractor shall paint the following items: Exposed conduit on metal roofs.

B. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available. All equipment shall have a finished coat of paint applied unless specifically allowed to be provided with a prime coat only.

C. Equipment cabinets, casings, covers, metal jackets, etc., located in equipment rooms or concealed spaces, shall be furnished in standard finish, free from scratches, abrasions, chippings, etc.

D. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chipping, etc. If color option is specified or is standard to the unit, verify with the Architect/Engineer his color preference before ordering.

E. After surfaces have been thoroughly cleaned and are free of oil, dirt or other foreign matter, paint all raceway and equipment with the following:

1. Bare Metal Surfaces - Apply one coat of metal primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.

2. Plastic Surfaces - Paint plastic surfaces with two coats of semi-gloss acrylic latex paint.

## 3.9 ADJUST AND CLEAN

A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project.

B. Clean all foreign paint, grease, oil, dirt, labels, stickers, etc. from all equipment.

C. Remove all rubbish, debris, etc., accumulated during construction from the premises.

## 3.10 SPECIAL REQUIREMENTS

A. Coordinate the installation of all equipment, controls, devices, etc., with other trades to maintain clear access area for servicing.

B. Install all equipment to maximize access to parts needing service or maintenance. Review the final location, placement, and orientation of equipment with the Owner’s representative prior to setting equipment.

C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner’s representative will result in removal and reinstallation of the equipment at the Contractor’s expense.

## 3.11 SYSTEM COMMISSIONING

A. The electrical systems shall be complete and operating. System start-up, testing, balancing, and satisfactory system performance is the responsibility of the Contractor. This includes all calibration and adjustment of electrical controls, balancing of loads, troubleshooting and verification of software, and final adjustments that may be needed.

B. All operating conditions and control sequences shall be tested during the start-up period. Testing all interlocks, safety shut-downs, controls, and alarms.

1. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

## 3.12 FIELD QUALITY CONTROL

A. General:

1. Conduct all tests required during and after construction.

2. Supply necessary instruments, meters, etc., for the tests. Supply competent technicians with training in the proper testing techniques.

3. All cables and wires shall be tested for shorts and grounds following installation and connection to devices. Replace shorted or grounded wires and cables.

4. Any wiring device, electrical apparatus or lighting fixture, if grounded or shorted on any integral "live" part, shall have all defective parts or materials replaced.

5. Test cable insulation of service and panel feeder conductors for proper insulation values. Tests shall include the cable, all splices, and all terminations. Each conductor shall be tested and shall test free of short circuits and grounds and have an insulation value not less than the National Electrical Code Standards. Take readings between conductors, and between conductors and ground.

6. If the results obtained in the tests are not satisfactory make adjustments, replacements, and changes as needed. Then repeat the tests, and make additional tests, as the Architect/Engineer or authority having jurisdiction deems necessary.

B. Ground Resistance:

1. Conduct tower ground resistance tests using an approved manufactured ground resistance meter. Submit to the Architect/Engineer a proposed test procedure including type of equipment to be used. (The conventional ohmmeter is not an acceptable device.)

2. Make ground resistance measurements during normal dry weather and not less than 48 hours after a rain.

3. If the ground resistance value obtained is more than the value set forth in Section 16450 , the following shall be done to obtain the value given:

a. Verify that all connections in the service ground system are secure.

b. Increase the depth to which ground rods are driven by adding section lengths to the rods and retest. If the resistance is still excessive increase the depth by adding an additional rod section and retest.

c. If the resistance is still excessive, furnish and install additional ground rods, spaced not less than 20 feet from other ground rods unless otherwise noted on plans, and connect into the ground electrode system. Retest.

d. Review results with the Architect/Engineer.

4. Before final payment is made to the Contractor submit a written report to the Architect/Engineer including the following:

   a. Date of test.

   b. Number of hours since the last rain.

   c. Soil condition at the time of the test in the ground electrode location. That is: dry, wet, moist, sand, clay, etc.

   d. Diagram of the test set-up showing distances between test equipment, ground electrode, auxiliary electrodes, etc.

   e. Make, model, and calibration date of test equipment.

   f. Tabulation of measurements taken and calculations made.

C. Other Equipment:

   1. Give other equipment furnished and installed by the Contractor all standard tests normally made to assure that the equipment is electrically sound, all connections properly made, phase rotation correct, fuses and thermal elements suitable for protection against overloads, voltage complies with equipment nameplate rating, and full load amperes are within equipment rating.

D. If any test results are not satisfactory, make adjustments, replacements and changes as needed and repeat the tests and make additional tests as the Architect/Engineer or authority having jurisdiction deem necessary.

END OF SECTION

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

In order to prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

1. Penetrations of fire-rated construction fire sealed in accordance with specifications.
2. Electrical panels have typed circuit identification.
3. Per Specification Section 16010, cable insulation test results have been submitted.
4. Per Specification Section 16010, ground resistance test results have been submitted.
5. Operation and Maintenance manuals have been submitted as per Specification Section 16010.
6. Bound copies of approved shop drawings have been submitted as per Specification Section 16010.
7. Report of instruction of Owner's representative has been submitted as per Specification Section 16010.

Accepted by:

Prime Contractor _____

By _____ Date _____

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Engineer so that the final observation can be scheduled.

It is understood that if the Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

* * * * * *

SECTION 16111
CONDUIT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Rigid metallic conduit and fittings
B. Intermediate metallic conduit and fittings
C. Electrical metallic tubing and fittings
D. Flexible metallic conduit and fittings
E. Liquidtight flexible metallic conduit and fittings
F. Rigid non-metallic conduit and fittings
G. High density polyethylene conduit and fittings

1.2 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated

2. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated and Fittings

3. ANSI C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing

4. ANSI C80.6 – Intermediate Metal Conduit, Zinc Coated

5. ANSI C80.5 – Aluminum Rigid Conduit

B. Federal Specifications (FS):

1. A–A–50553A – Fittings for Conduit, Metal, Rigid, (Thick-Wall and Thin-Wall (EMT) Type

2. A–A–55810 – Specification for Flexible Metal Conduit

C. NECA “Standards of Installation”

D. National Electrical Manufacturers Association (NEMA):

1. ANSI/NEMA FB 1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable

2. RN 1 – Polyvinyl chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

3. TC 2 – Electrical Polyvinyl Chloride (PVC) Conduit

4. TC 3 – PVC Fittings for use with Rigid PVC Conduit and Tubing

5. TC 6/TC 8 – PVC Plastic Utilities Duct for Underground Installations

6. TC 7 – Smooth-Wall Coilable Electrical Polyethylene Conduit

7. TC 9 – Fittings for PVC Plastic Utilities Duct for Underground Installation

8. TC13 – Electrical Non-Metallic Tubing

9. TC14 – Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings

E. National Fire Protection Association (NFPA):

1. ANSI/NFPA 70 – National Electrical Code

F. Underwriters Laboratories (UL): Applicable Listings

1. UL 1 – Flexible Metal Conduit

2. UL 6 – Rigid Metal Conduit

3. UL 6A – Standard for Electrical Rigid Metal Conduit - Aluminum

4. UL 360 – Liquid Tight Flexible Steel Conduit

5. UL514-B – Conduit Tubing and Cable Fittings

6. UL651-A – Type EB and a PVC Conduit and HDPE Conduit

7. UL651-B – Continuous Length HDPE Conduit

8. UL746A – Standard for Polymeric Materials – Short Term Property Evaluations

9. UL797 – Electrical Metal Tubing

10. UL1242 – Intermediate Metal Conduit

G. American Standard of Testing and Materials (ASTM):

1. ASTM D 570 - Standard Test Method for Water Absorption of Plastics

2. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics

3. ASTM D 648 - Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edge Wise Position

4. ASTM D 2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

5. ASTM D 2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter

6. ASTM D 3350 - Standard Specification for Polyethylene Plastic Pipe and Fittings Material

H. Definitions:

1. Fittings: Conduit connection or coupling.

2. Body: Enlarged fittings with opening allowing access to the conductors for pulling purposes only.

3. Mechanical Spaces: Enclosed areas, usually kept separated from the general public, where the primary use is to house service equipment and to route services. These spaces generally have exposed structures, bare concrete and non-architecturally emphasized finishes.

4. Finished Spaces: Enclosed areas where the primary use is to house personnel and the general public. These spaces generally have architecturally emphasized finishes, ceilings and/or floors.

5. Concealed: Not visible by the general public. Often indicates a location either above the ceiling, in the walls, in or beneath the floor slab, in column coverings, or in the ceiling construction.

6. Above Grade: Not directly in contact with the earth. For example, an interior wall located at an elevation below the finished grade shall be considered above grade but a wall retaining earth shall be considered below grade.

7. Slab: Horizontal pour of concrete used for the purpose of a floor or sub-floor.

## PART 2 - PRODUCTS

### 2.1 RIGID METALLIC CONDUIT (RMC) AND FITTINGS

A. Manufacturers:

1. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to product documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

B. Acceptable Manufacturers:

1. Acceptable Manufacturers: Allied, LTV, Steelduct, Wheatland Tube Co, O-Z Gedney, or approved equal.

2. Acceptable Manufacturers of RMC Conduit Fittings: Appleton Electric, O-Z/Gedney Co., Electroline, Raco, Bridgeport, Midwest, Regal, Thomas & Betts, Crouse-Hinds, Killark, or approved equal.

C. Minimum Size Galvanized Steel: 3/4 inch (19mm), unless otherwise noted.

D. Fittings and Conduit Bodies:

1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with provisions for mounting to form.

2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of 4 inches of movement. Fitting shall be watertight with an insulating bushing and a bonding jumper.

3. Expansion Joint for Concrete Encased Conduit: Neoprene sleeve with bronze end coupling, stainless steel bands and tinned copper braid bonding jumper. Fittings shall be watertight and concrete-tight.

4. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic thermosetting insulation. Where required elsewhere in the contract documents, bushing shall be complete with ground conductor saddle and clamp. **High impact phenolic threaded type bushings are not acceptable.**

5. All other fittings and conduit bodies shall be of malleable iron construction and hot dip galvanized.

E. PVC Externally Coated Conduit: NEMA RN 1; rigid steel conduit with external 20 40 mil PVC coating and internal galvanized surface. All fittings and conduit bodies shall be complete with coating. Acceptable Manufacturers: Robroy, Permacote, or approved equal.

2.2 INTERMEDIATE METALLIC CONDUIT (IMC) AND FITTINGS

A. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted.

B. Acceptable Manufacturers: Allied, LTV, Steelduct, Wheatland Tube Co, O-Z Gedney, or approved equal.

C. Fittings and Conduit Bodies:

1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with provisions for mounting to form.

2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of 4 inches of movement. Fitting shall be watertight with an insulating bushing and a bonding jumper.

3. Expansion Joint for Concrete Encased Conduit: Neoprene sleeve with bronze end coupling, stainless steel bands and tinned copper braid bonding jumper. Fittings shall be watertight and concrete-tight.

4. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic thermosetting insulation. Where required elsewhere in the contract documents, bushing shall be complete with ground conductor saddle and clamp. **High impact phenolic threaded type bushings are not acceptable.**

5. All other fittings and conduit bodies shall be of malleable iron construction and hot dip galvanized.

2.3 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. Minimum Size Electrical Metallic Tubing: 3/4 inch, unless otherwise noted.

B. Acceptable Manufacturers of EMT Conduit: Allied, LTV, Steelduct, Wheatland Tube Co, or approved equal.

C. Fittings and Conduit Bodies:

1. 2" Diameter or Smaller: Compression or steel set screw type of steel designed for their specific application.

2. Larger than 2": Compression or steel set screw type of steel designed for their specific application.

3. Acceptable Manufacturers of EMT Conduit Fittings: Appleton Electric, O-Z/Gedney Co., Electroline, Raco, Bridgeport, Midwest, Regal, Thomas & Betts, or approved equal.

2.4 FLEXIBLE METALLIC CONDUIT (FMC) AND FITTINGS

A. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted. Lighting branch circuit wiring to an individual luminaire may be a manufactured, UL listed 3/8" flexible metal conduit with #12 AWG THHN conductors and an insulated ground wire.

B. Acceptable Manufacturers: American Flex, Alflex, Electri-Flex Co, or approved equal.

C. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type formed from a continuous length of spirally wound, interlocked zinc coated strip steel. Provide a separate equipment grounding conductor when used for equipment where flexibility is required.

D. Fittings and Conduit Bodies:

1. Threadless hinged clamp type, galvanized zinc coated cadmium plated malleable cast iron or screw-in type, die-cast zinc. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by the manufacturer to protect conductors from sharp edges.

2. Acceptable Manufacturers: O-Z/Gedney Co., Thomas & Betts, Appleton Electric, Electroline, Bridgeport, Midwest, Regal, or approved equal.

2.5 LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT (LFMC) AND FITTINGS

A. Acceptable Manufacturers: Anaconda Type UA, Electri-Flex Type LA, Alflex, Carlon (Lamson & Sessions), or approved equal.

B. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type formed from a continuous length of spirally wound, interlocked zinc coated strip steel and an extruded PVC cover.

C. Fittings and Conduit Bodies:

1. Watertight, compression type, galvanized zinc coated cadmium plated malleable cast iron, UL listed.

2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by the manufacturer to protect conductors from sharp edges.

3. Acceptable Manufacturers: Appleton Electric, O-Z/Gedney Co., Electroline, Bridgeport, Thomas & Betts, Midwest, Regal, Carlon (Lamson & Sessions), or approved equal.

2.6 RIGID NON-METALLIC CONDUIT (RNC) AND FITTINGS

A. Minimum Size Rigid Smooth-Wall Nonmetallic Conduit: 3/4 inch, unless otherwise noted.

B. Acceptable Manufacturers: Carlon (Lamson & Sessions) Type 40, Cantex, J.M. Mfg., or approved equal.

C. Construction: Schedule 40 and Schedule 80 rigid polyvinyl chloride (PVC), UL labeled for 90°C.

D. Fittings and Conduit Bodies: NEMA TC 3; sleeve type suitable for and manufactured especially for use with the conduit by the conduit manufacturer.

E. Plastic cement for joining conduit and fittings shall be provided as recommended by the manufacturer.

2.7 HIGH DENSITY POLYETHYLENE

A. Minimum Size: 2 inch, unless noted otherwise.

B. Acceptable Manufacturers: Carlon, Chevron Phillips Chemical Company, or approved equal.

C. Materials used for the manufacture of polyethylene pipe and fittings shall be extra high molecular weight, high-density polyethylene resin. The material shall be listed by PPI (Plastic Pipe Institute) and shall meet the following resin properties:

| ASTM Test | Description | Values HDPE |
|---|---|---|
| D-1505 | Density g/CM 3 | < .941 |
| D-1238 | Melt Index, g/10 min Condition E | > .55 grams/10 min. |
| D-638 | Tensile Strength at yield (psi) | 3000 min. |
| D-1693 | Environmental Stress Crack Resistance Condition B, F 20 | 96 hrs. |
| D-790 | Flexural Modulus, MPa (psi) | < 80,000 |
| D-746 | Brittleness Temperature | -75°C Max |

D. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same raw material, including both the base resin and coextruded resin. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.

E. Fitting and Conduit Bodies:

1. Directional Bore and Plow Type Installation: Electrofusion or Universal Aluminum threaded couplings. Tensile strength of coupled pipe must be greater than 2,000 lbs.

2. For all other type of installation: Coupler must provide a water tight connection. The tensile strength of coupled pipe must be greater than 1,000 lbs.

3. E-loc type couplings are not acceptable in any situations.

4. Acceptable Manufacturers: ARCON, Carlon, or approved equal.

## PART 3 - EXECUTION

### 3.1 CONDUIT SIZING

A. Size conduit as shown on the drawings and specifications. Where not indicated in the contract documents, conduit size shall be according to N.E.C. (Latest Edition). Conduit and conductor sizing shall be coordinated to limit conductor fill to less than 40%, maintain conductor ampere capacity as required by the National Electrical Code (to include enlarged conductors due to temperature and quantity derating values) and to prevent excessive voltage drop and pulling tension due to long conduit/conductor lengths.

B. Minimum Conduit Size (Unless Noted Otherwise):

1. Above Grade: 3/4 inch. (The use of 1/2 inch would be allowed for installation conduit to individual light switches, individual receptacles and individual fixture whips from junction box.)

2. Below Grade 5' or less from Building Foundation: 3/4 inch.

3. Below Grade More than 5' from Building Foundation: 3/4 inch.

C. Conduit sizes shall change only at the entrance or exit to a junction box, unless specifically noted on the drawings.

### 3.2 CONDUIT ARRANGEMENT

A. In general, conduit shall be installed concealed in walls, in finished spaces and where possible or practical, or as noted otherwise. In unfinished spaces, mechanical and utility areas, conduit may run either concealed or exposed as conditions dictate and as practical unless noted otherwise on drawings. Installation shall maintain headroom in exposed vicinities of pedestrian or vehicular traffic.

B. Conduit shall not share the same cell as structural reinforcement in masonry walls.

C. Conduit runs shall be routed as shown on large scale drawings. Conduit routing on drawings scaled 1/4"=1'-0" or less shall be considered diagrammatic, unless noted otherwise. The correct routing, when shown diagrammatically shall be chosen by the Contractor based on information in the contract documents, in accordance with manufacturer's written instructions, applicable codes, the NECA's "Standard of Installation", in accordance with recognized industry standards, and coordinated with other contractors.

D. Contractor shall adapt his work to the job conditions and make such changes as required and permitted by the Architect/Engineer, such as moving to clear beams and joists, adjusting at columns, avoiding interference with windows, etc., to permit the proper installation of other mechanical and/or electrical equipment.

E. Contractor shall cooperate with all Contractors on the project. He shall obtain details of other Contractor's work in order to ensure fit and avoid conflict. Any expense due to the failure of This Contractor to do so shall be paid for in full by him. The other trades involved as directed by the Architect/Engineer shall perform the repair of work damaged as a result of neglect or error by This Contractor. The resultant costs shall be borne by This Contractor.

3.3 CONDUIT SUPPORT

A. Conduit runs installed above a suspended ceiling shall be properly supported. In no case shall conduit rest on the suspended ceiling construction, nor utilize ceiling support system for conduit support.

B. Conduit shall not be supported from ductwork, water, sprinkler piping, or other non-structural members, unless approved by the Architect/Engineer. All supports shall be from structural slabs, walls, structural members, and bar joists, and coordinated with all other applicable contractors, unless noted otherwise.

C. Conduit shall be held in place by the correct size of galvanized one-hole conduit clamps, two-hole conduit straps, patented support devices, clamp back conduit hangers, or by other means if called for on the drawings.

D. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

E. Spring-steel conduit clips specifically designed for supporting single conduits or tubing may be used in lieu of malleable-iron hangers for 1" and smaller raceways serving lighting and receptacle branch circuits above accessible ceilings and for securing raceways to slotted channel and angle supports.

F. Group conduits in parallel runs where practical and use conduit racks or trapeze hangers constructed of steel channel, suspended with threaded solid rods or wall mounted from metal channels with conduit straps or clamps. Provide space in each rack or trapeze for 25% additional conduits.

G. Do not exceed 25 lbs. per hanger and a minimum spacing of 2’-0” on center when attaching to metal roof decking (excludes concrete on metal deck). This 25 lbs. load and 2’-0” spacing include adjacent electrical and mechanical items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Supports for metallic conduit shall be no greater than 10 feet. A smaller interval may be used if necessitated by building construction, but in no event shall support spans exceed the National Electrical Code requirements. Conduit shall be securely fastened within 3 feet of each outlet box, junction box, device box, cabinet, or fitting.

J. Supports of flexible conduit shall be within 12 inches of each outlet box, junction box, device box, cabinet, or fitting and at intervals not to exceed 4.5 feet.

K. Supports for non-metallic conduit shall be at sufficiently close intervals to eliminate any sag in the conduit. The manufacturer's recommendations shall be followed, but in no event shall support spans exceed the National Electrical Code requirements.

L. Where conduit is to be installed in poured concrete floors or walls, provide concrete-tight conduit inserts securely fastened to forms to prevent conduit misplacement.

## 3.4 CONDUIT INSTALLATION

A. Conduit Connections:

1. Shorter than standard conduit lengths shall be cut square using industry standards. The ends of all conduits cut shall be reamed or otherwise finished to remove all rough edges.

2. Metallic conduit connections in slab on grade installation shall be sealed and one coat of rust inhibitor primer applied after the connection is made.

3. Where conduits with tapered threads cannot be coupled with standard couplings, then approved split or Erickson couplings shall be used. Running threads will not be permitted.

4. Install expansion/deflection joints where conduit crosses structure expansion/seismic joints.

B. Conduit terminations for all low voltage wiring shall have nylon bushings installed on each end of every conduit run.

C. Conduit Bends:

1. Use a hydraulic one-shot conduit bender or factory elbows for bends in conduit 2" in size or larger. All steel conduit bending shall be done cold; no heating of steel conduit shall be permitted.

2. All bends of rigid non-metallic conduit (RNC) shall be made with the manufacturer's approved bending equipment. The use of spot heating devices will not be permitted (i.e. blow torches).

3. A run of conduit shall not contain more than the equivalent of four (4) quarter bends (360°), including those bends located immediately at the outlet or body.

4. Telecommunications conduits shall have no more than two (2) 90 degree bends between pull points and contain no continuous sections longer than 100 feet. Insert pull points or pull boxes for conduits exceeding 100 feet in length.

   a. A third bend is acceptable if:

      1) The total run is not longer than (33) feet.

      2) The conduit size is increased to the next trade size.

5. Telecommunications pull boxes shall not be used in lieu of a bend. Align conduits that enter into the pull box from opposite ends with each other. Pull box size shall be twelve (12) times the diameter of the largest conduit. Slip sleeves or gutters can be used in place of a pull box.

6. Provide product submittals, per specifications, on slip sleeves and/or gutters to the Engineer for approval prior to purchase and installation.

7. Telecommunications conduit bend radius shall be six (6) times the diameter for conduits under 2" and ten (10) times the diameter for conduits over 2".

8. Rigid non-metallic conduit (RNC) runs longer than 100 feet or runs which have more than two 90° equivalent bends (regardless of length) shall use rigid steel factory elbows for bends.

9. Use conduit bodies to make sharp changes in direction (i.e. around beams).

D. Conduit Placement:

1. Conduit shall be mechanically continuous from source of current to all outlets. Conduit shall be electrically continuous from source of current to all outlets, unless a properly sized grounding conductor is routed within the conduit. All metallic conduits shall be bonded per the National Electrical Code.

2. Route exposed conduit and conduit above suspended ceilings (accessible or not) parallel/perpendicular to the building structural lines, and as close to building structure as possible. Wherever possible, route horizontal conduit runs above water and steam piping.

3. Route conduit through roof openings provided for piping and ductwork where possible. If not provided or routing through provided openings is not possible, route through roof jack with pitch pocket. Coordinate roof penetrations with other trades.

4. Conduits, raceway, and boxes shall not be installed in concealed locations in metal deck roofing or less than 1.5" below bottom of roof decking.

5. Avoid moisture traps where possible. Where unavoidable, provide a junction box with drain fitting at conduit low point.

6. All conduits through walls shall be grouted or sealed into openings. Where conduit penetrates firewalls and floors, seal with a UL listed sealant. Seal penetrations with intumescent caulk, putty, or sheet installed per manufacturer's

recommendations. All materials used to seal penetrations of firewalls and floors shall be tested and certified as a system per ASTM E814 Standard for fire tests or through-penetration fire stops as manufactured by 3M or approved equal.

7. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPENINGS REQUIRED IN MASONRY OR EXTERIOR WALLS, OR ROOFS UNDER THIS DIVISION. A QUALIFIED MASON OR ROOFER AT THE EXPENSE OF THIS CONTRACTOR SHALL REPAIR ALL OPENINGS TO MATCH EXISTING CONDITIONS.

8. Seal interior of conduit at exterior entries, air handling units, coolers/freezers, etc., and where the temperature differential can potentially be greater than 20°F, to prevent moisture penetration. Seal shall be placed where conduit enters warm space. Conduit seal fitting shall be a drain/seal, with sealing compound, equal to O-Z/Gedney type EYD.

9. Rigid non-metallic conduit (RNC) shall be installed when material surface temperatures and ambient temperature are greater than 40°F.

10. Where rigid non-metallic conduit (RNC) conduit is used below grade, in a slab, below a slab, etc., a transition to rigid galvanized steel or PVC-coated steel conduit shall be installed before conduit exits earth. The metallic conduit shall extend a minimum of 6" into the surface concealing the non-metallic conduit.

11. Contractor shall provide suitable mechanical protection around all conduits stubbed out from floors, walls or ceilings during construction to prevent bending or damaging of stubs due to carelessness with construction equipment.

12. Contractor shall provide a polypropylene pull cord with 2000 lbs. tensile strength in each empty conduit (indoor and outdoor), except in sleeves and nipples.

13. Telecommunications conduits that protrude through the structural floor shall be installed 1 to 3” above finished floor (AFF).

14. Telecommunications conduits that enter into Telecommunications rooms below the finished ceiling shall terminate a minimum of 4” below ceiling and as close to the wall as possible.

15. Telecommunications conduits that are below grade and enter into a building shall terminate a minimum of 4” above finished floor (AFF) and as close to the wall as possible.

## 3.5 CONDUIT TERMINATIONS

A. Where conduit bonding is indicated or required in the contract documents, the bushings shall be a grounding type sized for the conduit and ground bonding conductor as manufactured by O-Z/Gedney, Appleton, Thomas & Betts, Burndy, Regal, or approved equal.

B. Conduits with termination fittings shall be threaded for one (1) lock nut on the outside and one (1) lock nut and bushing on the inside of each box.

C. Where conduits terminate in boxes with knockouts, they shall be secured to the boxes with lock nuts and provided with approved screw type tinned iron bushings or fittings with plastic inserts.

D. Where conduits terminate in boxes, fittings, or bodies with threaded openings, they shall be tightly screwed against the shoulder portion of the threaded openings.

E. Conduit terminations to all motors shall be made with flexible metallic conduit (FMC), unless noted otherwise. Final connections to roof exhaust fans, or other exterior motors and motors in damp or wet locations shall be made with liquidtight flexible metallic conduit (LFMC). Motors in hazardous areas, as defined in the National Electrical Code, shall be connected using flexible conduit rated for the environment.

F. Rigid non-metallic conduit (RNC) conduit shall be terminated using fittings and bodies produced by the manufacturer of the conduit, unless noted otherwise. Prepare conduit as per manufacturer's recommendations before joining. All joints shall be solvent welded by applying full even coat of plastic cement to the entire areas that will be joined. Turn the conduit at least a quarter to one half turn in the fitting and let the joint cure for 1-hour minimum or as per the manufacturer's recommendations.

G. All conduit ends shall be sealed with plastic immediately after installation to prevent the entrance of any foreign matter during construction. The seals shall be removed and the conduits blown clear of any and all foreign matter prior to any wires or pull cords being installed.

## 3.6 UNDERGROUND CONDUIT INSTALLATION

A. Conduit Connections:

1. Conduit joints in a multiple conduit run shall be staggered at least one foot apart.

B. Conduit Bends (Lateral):

1. Conduits shall have long sweep radius elbows instead of standard elbows wherever special bends are indicated and noted on the drawings, or as required by the manufacturer of the equipment or system being served.

2. Telecommunications conduit bend radius shall be six times the diameter for conduits under 2" and ten times the diameter for conduits over 2". Where long cable runs are involved, sidewall pressures may require larger radius bends. Coordinate with Engineer prior to conduit installation to determine bend radius.

3. All Telecommunications conduits and innerducts, including those containing cables, shall be plugged at the building and vault with "JackMoon" or equivalent duct seal, capable of withstanding a 10 foot head of water (5 PSI).

C. Conduit Elbows (vertical):

1. Minimum steel elbow radiuses shall be 30 inches for primary conduits (>600V) and 18 inches for secondary conduits (<600V). Increase radius, as required, based on pulling tension calculation requirements.

D. Conduit Placement:

1. Conduit runs shall be pitched a minimum of 4" per 100 feet to drain toward the terminations. Duct runs shall be installed deeper than the minimum wherever required to avoid any conflicts with existing or new piping, tunnels, etc.

2. For parallel runs, use suitable separators and chairs installed not greater than 4' on centers. Band conduit together with suitable banding devices. Securely anchor conduit to prevent movement during concrete placement or backfilling.

3. Where concrete is required, the materials for concreting shall be thoroughly mixed to a minimum f'c = 2500 and immediately placed in the trench around the conduits. No concrete that has been allowed to partially set shall be used.

4. Before the Contractor pulls any cables into the conduit he shall have a mandrel 1/4" smaller than the conduit inside diameter pulled through each conduit and if any concrete or obstructions are found, the Contractor shall remove them and clear the conduit. Spare conduit shall also be cleared of all obstructions.

5. Conduit terminations in manholes, masonry pull boxes, or masonry walls shall be with malleable iron end bell fittings.

6. All spare conduits not terminated in a covered enclosure shall have its terminations plugged as described above.

7. Ductbanks and conduit shall be installed a minimum of 24" below finished grade, unless otherwise noted on the drawings or elsewhere in these specifications.

8. All non-metallic conduit installed underground outside of a slab shall be rigid.

E. Horizontal Directional Drilling:

1. Entire drill path shall be accurately surveyed, with entry and exit stakes placed and coordinated with other contractors. If using a magnetic guidance system, entire drill path shall be surveyed for any surface geo-magnetic variations or anomalies.

2. Any utility locates within 20 feet of the bore path shall have the exact location physically verified by hand digging or vacuum excavation. Restore inspection holes to original condition after verification.

F. Raceway Seal:

1. Where a raceway enters a building or structure, it shall be sealed with a sealing bushing or duct seal to prevent the entry of liquids or gases. Seal must be compatible with conductors and raceway system. Spare or unused raceway shall also be sealed.

## 3.7 CONDUIT INSTALLATION SCHEDULE

A. In the event the location of conduit installation represents conflicting installation requirements as specified in the following schedule, a clarification shall be obtained from the Architect/Engineer. If This Contractor is unable to obtain a clarification as outlined

above, concealed rigid galvanized steel conduit installed per these specifications and the National Electrical Code shall be required.

B. The following schedule shall be adhered to unless they constitute a violation of applicable codes or are noted otherwise on the drawings. The installation of RMC conduit will be permitted in place of any and all conduit specified in this schedule.

1. Dry Mechanical Spaces:

a. Exposed:

1) Switchboards, panel feeders, etc.: EMT.
2) Branch Circuits (lighting, receptacles, controls, etc.): EMT.
3) Mechanical Equipment Feeders (pumps, AHU's, chillers, etc.): EMT.
4) Floor Mounted Pump Feeders: EMT with no more than 6’ of PVC coated flexible metal conduit to pump.

b. Concealed: EMT.

2. Wet or Damp Locations: RMC Conduit.

3. Finished Spaces: Concealed EMT.

4. In or Under Slabs on Grade or Site Conduits:

a. Within 5' from the Perimeter of a Building Foundation: Concrete encased RNC conduit with a minimum of 3" thickness between the surface of the concrete and the nearest conduit. Concrete to be doweled into the foundation.

b. 5' or Greater from the Perimeter of a Building Foundation: RNC.

5. Interior Locations:

a. Exposed: EMT..

b. Concealed: EMT.

END OF SECTION

SECTION 16120
WIRE AND CABLE

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Building wire
B. Cable
C. Wiring connections and terminations

### 1.2 REFERENCES

A. ASTM B800-05 – Standard Specification for 8000 Series Aluminum Alloy Wire Electrical Purposes-Annealed and Intermediate Tempered.

B. ASTM B801-07 – Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation

C. NEMA WC 3 - Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

D. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

E. UL 44 – Thermoset-Insulated Wires and Cables

F. UL 854 – Service-Entrance Cables

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

### 2.2 BUILDING WIRE

A. Thermoplastic-insulated Building Wire: NEMA WC 5.

B. Rubber-insulated Building Wire: NEMA WC 3.

C. Feeders and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor, 600 volt insulation, THHN/THWN.

D. Feeders and Branch Circuits Larger than 6 AWG in Underground Conduit: Copper, stranded conductor, 600 volt insulation, THWN.

E. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600 volt insulation, THHN/THWN. 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid or stranded conductor, unless otherwise noted on the drawings.

F. Control Circuits: Copper, stranded conductor 600 volt insulation, THHN/THWN.

2.3 NON-METALLIC SHEATHED CABLE

A. Nonmetallic Sheathed Cable, Size 14 through 4 AWG: Copper conductor, 600 volt insulation, rated 75ºC, Type NM.

B. Underground Feeder and Branch Circuit Cable: Copper conductor, 600 volt insulation, rated 60°C, Type UF.

C. Service Entrance Cable: Copper conductor, 600 volt insulation, XHHW, Type USE.

2.4 WIRE FOR SPECIALIZED SYSTEMS

A. Wire for the following specialized systems shall be as designated on the drawings, or elsewhere in these specifications. If not designated on the drawings or specifications, the system manufacturer's recommendations shall be followed:

1. Electronic Control
2. Data
3. Energy Monitoring

2.5 REMOTE CONTROL AND SIGNAL CABLE

A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 60°C, individual conductors twisted together, shielded, and covered with a PVC jacket.

B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 60ºC, individual conductors twisted together, shielded, and covered with a PVC jacket; UL listed.

C. Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 60°C, individual conductors twisted together, shielded, and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

2.6 ARMORED CABLE (AC)

A. At the contractors option hospital grade armored cables may be utilized for branch circuit wiring as defined in NEC 517 subject to acceptance by the state and local codes.

B. Armored cable shall **NOT** be used for circuits serving the Essential Electrical System.

C. Armored cable shall be constructed in strict accordance with Underwriters Laboratories, Inc., Standard for Type AC Cables, U.L. 4, and include a green identifying stripe on the exterior of the steel interlocked armor.

D. Minimum conductor size for branch circuit wiring shall be 12 AWG with larger wires used where specified.

2.7 METAL-CLAD CABLE (MC)

A. At the contractors option metal clad cables may be utilized for branch circuit wiring in non-patient care areas, as defined in NEC 330 subject to acceptance by the state and local codes.

B. Metal-Clad cable shall **NOT** be used for circuits serving the Essential Electrical System.

C. Minimum conductor size for branch circuit wiring shall be 12 AWG with larger wires used where specified.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.

B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.

C. Use no wire smaller than 8 AWG for outdoor lighting circuits.

D. The ampacity of multiple conductors in one conduit shall be derated per National Electrical Code, Article 310. In no case shall more than 4 conductors be installed in one conduit to such loads as motors larger than 1/4 HP, panelboards, motor control centers, etc.

E. Where installing parallel feeders, place an equal number of conductors for each phase of a circuit in same raceway or cable.

F. Splice only in junction or outlet boxes.

G. Neatly train and lace wiring inside boxes, equipment, and panelboards.

H. Make conductor lengths for parallel circuits equal.

I. All conductors shall be continuous in conduit from last outlet to their termination.

3.2 CONTRACTOR CHANGES

A. The basis of design is copper conductors installed in raceway based on ambient temperature of 30°C, NEC Table 310.16. Service entrance conductors are based on copper conductor installed in underground electrical ducts, NEC Table B.310.7.

B. The Contractor shall be responsible for derating and sizing conductors and conduits to equal or exceed the ampacity of the basis of design circuits, if he/she chooses to use methods or materials other than the basis of design.

C. Underground electrical duct ampacity rating shall be in accordance with NEC Table B.310.7 or calculated in accordance with Annex B Application Information for Ampacity Calculation. The calculations and a sketch of the proposed installation shall be submitted prior to any conduit being installed.

D. Record drawing shall include the calculations and sketches.

3.3 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.

B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

C. Pulling shall be continuous without unnecessary stops and starts with wire or cable only partially thru raceway.

D. Where reels of cable or wire are used, they shall be set up on jacks close to the point where the wire or cable enters the conduit or duct so that the cable or wire may be unreeled and run into the conduit or duct with a minimum of change in the direction of the bend.

E. Cables or wires shall not be laid out on the ground before pulling.

F. Cables or wires shall not be dragged over earth or paving.

G. Care shall be taken so as not to subject the cable or wire to high mechanical stresses that would cause damage to the wire and cable.

H. Conductors shall not be pulled through conduits until plastering or masonry work is completed and conduits are free from moisture. Care shall be taken so that long pulls of wire or pulls around several bends are not made where the wire may be permanently stretched and the insulation damaged.

I. Only nylon rope shall be permitted to pull cables into conduit and ducts.

J. At least six (6) inch loops or ends shall be left at each outlet for installation connection of fixtures or other devices.

K. All wires in outlet boxes not connected to fixtures or other devices shall be rolled up, spliced if continuity of circuit is required, and insulated.

L. Completely and thoroughly swab raceway system before installing conductors.

M. Conductor Supports in Vertical Raceways:

1. Support conductors in vertical raceways in accordance with NEC 300.19 and Table 300.19(A) Spacing of Conductors Supports.

2. Supports shall be of insulated wedge type (OZ Gedney Type S, or equal) and installed in a tapered insulated bushing fitting or a metal woven mesh with a

support ring that fits inside conduit fitting installed in an accessible junction box (Hubbell Kellens support grip or equal).

## 3.4 CABLE INSTALLATION

A. Provide protection for exposed cables where subject to damage.

B. Use suitable cable fittings and connectors.

C. Run all open cable in a neat and symmetrical manner. Follow the routing as illustrated on the drawings as closely as possible. If routing is not illustrated then the Contractor shall choose his own routing, but in any case it shall be run in a manner previously stated.

D. Open cable shall be supported by the appropriate size bridle rings or other means if called for on the drawings. Wire and cable from different systems shall not be installed in the same bridle rings.

E. Open cable installed above suspended ceilings shall not rest on the suspended ceiling construction, nor utilize the ceiling support system for wire and cable support.

F. Where open cables are grouped, they shall be neatly bundled and held together with nylon tie wraps placed every 2.5 ft. on the bundle. Where tie bundle passes through a bridle ring it shall be fastened to the ring with a tie wrap.

G. Bridle ring supports shall be installed at five foot (5') intervals. All rings shall be installed where completely accessible and not blocked by piping, ductwork, inaccessible ceilings, etc.

H. Open cable shall only be installed where specifically shown on the drawings, or permitted in these specifications.

## 3.5 AC/MC CABLE INSTALLATION

A. AC/MC Cable shall NOT be used for circuits serving the Essential Electrical System.

B. Cable shall be supported by an approved means every 4 ½’ and within 12” of outlet boxes, junction boxes, cabinets, or fittings.

C. Cable may be unsupported in the following conditions:

1. Cable is not longer than 2’ in length at terminals where flexibility is necessary.
2. Cable is not more than 6’ from the last point of support for connections within an accessible ceiling to light fixtures or equipment.

D. Conductor ampacity shall be derated as required by the NEC where more than three current carrying conductors are used.

E. Cables shall be cut using a rotary cutter as recommended by the manufacturer to eliminate nicking and cutting of the conductors.

F. Bending radius shall comply with the requirements listed in the NEC for the type and size of cable being installed, but shall not be less than 5-times the diameter of the cable in any case.

G. At cable terminations, a fitting shall be provided to protect wires from abrasion, unless the design of the outlet boxes or fittings is such as to afford equivalent protection, and, in addition, an insulating bushing or its equivalent protection shall be provided between the conductors and the armor.

## 3.6 WIRING CONNECTIONS AND TERMINATIONS

A. Splice and tap only in accessible junction boxes.

B. Use solderless, tin-plated copper, compression terminals (lugs) applied with circumferential crimp for copper conductor terminations, 8 AWG and larger.

C. Use solderless, tin-plated, compression terminals (lugs) applied with indenter crimp for copper conductor terminations, 10 AWG and smaller.

D. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.

E. Use copper, compression connectors applied with circumferential crimp for copper wire splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.

F. Thoroughly clean wires before installing lugs and connectors.

G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

H. Terminate spare conductors with electrical tape, unless otherwise indicated on the drawings.

I. Phase Sequence: All apparatus shall be connected to operate in the phase sequence A-B-C representing the time sequence in which the phase conductors so identified reach positive maximum voltage.

J. As a general rule, applicable to switches, circuit breakers, starters, panelboards, switchgear and the like, the connections to phase conductors are intended thus:

Facing the front and operating side of the equipment, the phase identification shall be:

Left to Right - A-B-C
Top to Bottom - A-B-C

K. Connection revisions as required to achieve correct rotation of motors shall be made at the load terminals of the starters or disconnect switches.

## 3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Cable Testing: Test shall be made by means of an insulation testing device such as a “Megger” using not less than 500 volts D.C. test potential.

C. Inspect wire and cable for physical damage and proper connection.

D. Torque test conductor connections and terminations to manufacturer's recommended values.

E. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

3.8 WIRE AND CABLE INSTALLATION SCHEDULE

A. Concealed Interior Locations: Building wire in raceways.

B. Exposed Interior Locations: Building wire in raceways.

C. Above Accessible Ceilings: Building wire in raceways. Low voltage (less than 110 volts) shall be installed without conduit.

D. Wet or Damp Interior Locations: Building wire in raceway.

E. Exterior Locations: Building wire in raceways.

F. Underground Locations: Building wire in raceways.

G. Concealed in Honey Creek Cabins: Non-metallic sheathed cable.

END OF SECTION

SECTION 16130
BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wall and ceiling outlet boxes
B. Pull and junction boxes
C. Accessories

1.2 REFERENCES

A. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports

B. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

D. Federal Specification A–A–50563 – Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical Cast Metal

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

2.2 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, minimum of 14 gauge, with 1/2 inch male fixture studs where required.

B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.

C. Cast Boxes: NEMA FB1, Type FD, Aluminum or cast feralloy, deep type, gasketed cover, threaded hubs.

D. Outlet boxes for light fixtures to be 4" octagon box not less than 1-1/2" deep, deeper if required by the number of wires or construction.

E. Switch outlet boxes for local light control switches shall be 4 inches square by 1-1/2 inches deep, with raised cover to fit flush with finish wall line. Multiple gang switch outlets shall consist of the required number of gang boxes appropriate to the quantity of switches comprising the gang. Where walls are plastered, provide a plaster raised cover. Where switch outlet boxes occur in exposed concrete block walls, boxes shall be installed in the block cavity with a raised square edge tile cover of sufficient depth to extend out to face of block or masonry boxes.

F. Outlet boxes for telephone substations in walls and columns shall be 4 inches square and 2-1/8 inches deep with single gang raised cover to fit flush with finished wall line equipped with flush telephone plate.

G. Wall or column receptacle outlet boxes shall be 4 inches square with raised cover to fit flush with finished wall line. Boxes in concrete block walls shall be installed the same as for switch boxes in block walls.

2.3 FLOOR BOXES

A. Floor Boxes for Installation in Cast-In-Place Concrete Floors: Fully adjustable, cast iron.

2.4 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.

B. Sheet metal boxes larger than 12 inches in any dimension that contain terminations or components: Continuous hinged enclosure with 1/4 turn latch and white back panel for mounting terminal blocks and electrical components.

C. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

D. Cast Metal Boxes for Underground Installations: NEMA 250; Type 4, inside flanged, recessed cover box for flush mounting, UL listed as raintight. Galvanized cast iron box and plain cover with neoprene gasket and stainless steel cover screws.

E. Handholes for Underground Installations: Precast composite polymer concrete stackable body with conduit entry holes at center bottom of each side; composite polymer concrete cover with logo and skid resistant surface and stainless steel bolts. ANSI/SCTE 77 compliant for intended applications. Die-molded with pre-cut 6 x 6 inch cable entrance at center bottom of each side; fiberglass weatherproof cover with non-skid finish.

F. Flanged type boxes shall be used where installed flush in wall.

PART 3 - EXECUTION

3.1 BOX INSTALLATION SCHEDULE

A. Galvanized steel boxes may be used in:

1. Concealed interior locations above ceilings and in hollow studded partitions.

2. Exposed interior locations in mechanical rooms and in rooms without ceilings; higher than 8’ above the highest platform level.

3. Direct contact with concrete except slab on grade.

4. Recessed in stud wall of kitchens and laundries.

B. Cast boxes shall be used in:

1. Exterior locations.

2. Hazardous locations.

3. Exposed interior locations within 8’ of the highest platform level.

4. Direct contact with earth.

5. Direct contact with concrete in slab on grade.

6. Wet locations.

7. Kitchens and laundries when exposed on wall surface.

## 3.2 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on the drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on the Contract Drawings are approximate, unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.

C. Locate and install boxes to allow access. Avoid interferences with ductwork, piping, structure, equipment, etc. Where installation is inaccessible, provide access doors. Coordinate locations and sizes of required access doors with the Architect and General Contractor.

D. Locate and install to maintain headroom and to present a neat appearance.

E. Coordinate locations with Heating Contractor to avoid baseboard radiation cabinets.

## 3.3 OUTLET BOX INSTALLATION

A. Do not install boxes back-to-back in walls. Provide a minimum horizontal offset of 24 inches between boxes installed on opposite sides of stud walls.

1. When the minimum 24-inch horizontal separation cannot be maintained in fire-rated walls, install fire-rated moldable pads to all five sides of the back box to maintain the fire rating of the wall. Install moldable pads in accordance with UL listing for the specific product. Sound insulation pads are not acceptable for use in fire-rated wall applications unless the product carries the necessary fire rating.

B. The Contractor shall anchor switch and outlet box to wall construction so that it is flush with the finished masonry, paneling, drywall, plaster, etc. The Contractor shall check the boxes as the finish wall surface is being installed to assure that the box is flush. (Provide plaster rings as necessary.)

C. Mount at heights shown or noted on the drawings or as generally accepted if not specifically noted.

D. Provide knockout closures for unused openings.

E. Support boxes independently of conduit.

F. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

G. Install boxes in walls without damaging wall insulation.

H. Coordinate mounting heights and locations of outlets mounted above counters, benches, backsplashes, and below baseboard radiation.

I. Position outlets to locate luminaires as shown on reflected ceiling drawings.

J. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.

K. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioned to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

L. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

M. Provide cast outlet boxes in exterior locations and wet locations, and where exposed rigid or intermediate conduit is used.

## 3.4 PULL AND JUNCTION BOX INSTALLATION

A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

B. Support pull and junction boxes independent of conduit.

C. Do not install back-to-back boxes in walls. Provide a minimum horizontal offset of 24 inches between boxes installed on opposite sides of stud walls.

1. When the minimum 24-inch horizontal separation cannot be maintained within fire-rated walls, install fire-rated moldable pads to all five sides of the back box to maintain the fire rating of the wall. Install moldable pads in accordance with UL listing for the specific product. Sound insulation pads are not acceptable for use in fire-rated wall applications unless the product carries the necessary fire rating.

## 3.5 EXPOSED BOX INSTALLATION

A. Boxes shall be secured to the building structure with proper size screws, bolts, hanger rods, or structural steel elements.

B. On brick, block and concrete walls or ceilings, exposed boxes shall be supported with no less than two (2) Ackerman-Johnson, Paine, Phillips, or approved equal screw anchors or expansion shields and round head machine screws. Cast boxes shall not be drilled.

C. On steel structures, exposed boxes shall be supported to the steel member by drilling and tapping the member and fastening the boxes by means of round head machine screws.

D. Boxes may be supported on steel members by APPROVED beam clamps if conduit is supported by beam clamps.

E. Boxes shall be fastened to wood structures by means of a minimum of two (2) wood screws adequately large and long to properly support. (Quantity depends on size of box.)

F. Wood, plastic, or fiber plugs shall not be used for fastenings.

G. Explosive devices shall not be used unless specifically allowed.

END OF SECTION

SECTION 16141
WIRING DEVICES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Receptacles
B. Poke-through fittings
C. Device plates and box covers

### 1.2 REFERENCES

A. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet

B. NEMA WD 1 – General Color Requirements for Wiring Devices

C. NEMA WD 6 – Wiring Devices – Dimensional Requirements

D. U.L. 498 – Standard for Attachment Plugs and Receptacles

E. DSCC W-C-896F – General Specification for Electrical Power Connector

### 1.3 SUBMITTALS

A. Submit product data under provisions of Section 16010.

B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

### 1.4 QUALITY ASSURANCE

A. Provide similar devices from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency to Authorities Having Jurisdiction and marked for intended use.

C. Comply with NFPA 70.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

### 2.2 RECEPTACLES

A. Refer to General Electrical Equipment Schedule for configuration and ratings.

B. Back wired devices shall be complete with eight holes that are screw activated with metal clamps for connection to #12 or #10 copper conductors.

C. Side wired devices shall have four binding screws that are undercut for positive wire retention.

2.3 WALL PLATES

A. Decorative coverplate shall be as shown on the drawings.

B. Weatherproof coverplates shall be as shown on the drawings.

C. Plate securing screws shall be metal with head color matching the wall plate finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install light switches, dimmers, and convenience receptacles at elevations indicated in the General Installation Notes on the contract drawings.

B. Install specific-use receptacles at heights shown on the contract drawings. Install devices level, plumb, and square with building lines. Coordinate installation of adjacent devices of separate systems with common mounting heights, including lighting, power, systems, technology, and temperature rough-ins.

C. Install receptacles vertically with ground slot up or where indicated on the drawings, horizontally with ground slot to the left.

D. Install decorative plates on switch, receptacle, and blank outlets in finished areas, using jumbo size plates for outlets installed in masonry walls.

E. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.

F. Install devices and wall plates flush and level.

G. Install nameplate identification to receptacle cover plates indicated. Identification shall identify panel name and circuit number. Refer to Specification Section 16195 - Electrical Identification.

H. Test receptacles for proper polarity, ground continuity and compliance with requirements.

END OF SECTION

SECTION 16160
CABINETS AND ENCLOSURES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Hinged cover enclosures
B. Cabinets
C. Terminal blocks and accessories

### 1.2 REFERENCES

A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

B. ANSI/NEMA ICS 1 - Industrial Control and Systems

C. ANSI/NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems

D. ANSI/NEMA ICS 6 - Enclosures for Industrial Control Equipment and Systems

### 1.3 SUBMITTALS

A. Submit product data under provisions of Section 16010.

B. Shop Drawings for Equipment Panels: Include wiring schematic diagram, wiring diagram, outline drawing and construction diagram as described in ANSI/NEMA ICS 1.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

### 2.2 HINGED COVER ENCLOSURES

A. Construction: NEMA 250; Type 1or 3R, 14 gauge steel.

B. Finish: Manufacturer's standard polyester powder paint finish.

C. Covers: Continuous hinge with stainless steel hinge pin. Covers longer than 24 inches shall have 3-point latching.

D. Provide interior white painted metal panel for mounting terminal blocks and electrical components.

### 2.3 CABINETS

A. Cabinet Boxes: Galvanized steel with removable endwalls dimensions as indicated on the drawings.

B. Cabinet Fronts: Steel, surface type with screw cover front.

2.4 TERMINAL BLOCKS AND ACCESSORIES

A. Terminal Blocks: ANSI/NEMA ICS 4; UL listed.

B. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts.

C. Signal and Control Terminals: Modular construction type, channel mounted; tubular pressure screw connectors, rated 300 volts.

2.5 FABRICATION

A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.

B. Provide knockouts on enclosures.

C. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.

B. Provide accessory feet for free-standing equipment enclosures.

C. Install trim plumb.

END OF SECTION

SECTION 16190
SUPPORTING DEVICES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Conduit and equipment supports
B. Fastening hardware

### 1.2 COORDINATION

A. Coordinate size, shape and location of concrete pads with Section on Cast-in-Place Concrete or Concrete Topping.

### 1.3 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

### 2.2 ACCEPTABLE MANUFACTURERS

A. Allied Support Systems
B. Cooper B-Line
C. Erico, Inc.
D. Hilti
E. Power Fasteners

### 2.3 MATERIAL

A. Support Channel: Hot-dip galvanized.

B. Hardware: Corrosion resistant.

C. Anchorage and Structural Attachment Components:

1. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to Authorities Having Jurisdiction.

a. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.

2. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.

3. Welding Lugs: Comply with MSS-SP-69, Type 57.

4. Beam clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.

5. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.

6. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

D. Conduit Sleeves and Lintels:

1. Each Contractor shall provide, to the General Contractor for installation, lintels for all openings required for the Contractor's work in masonry walls and conduit sleeves for floors, unless specifically shown as being by others.

2. Fabricate all sleeves from standard weight black steel pipe. Provide continuous sleeve. Cut or split sleeves are not acceptable.

3. Sleeves through the floors on exposed risers shall be flush with the ceiling, with planed squared ends extending 1" above the floor in unfinished areas, and flush with the floor in finished areas, to accept spring closing floor plates.

4. Sleeves shall not penetrate structural members without approval from the Structural Engineer.

5. Openings through unexcavated floors and/or foundation walls below the floor shall have a smooth finish with sufficient annular space around material passing through opening so slight settling will not place stress on the material or building structure.

6. Install all sleeves concentric with conduits. Secure sleeves in concrete to wood forms. This Contractor is responsible for sleeves dislodged or moved when pouring concrete.

7. Where conduits rise through concrete floors that are on earthen grade, provide 3/4" resilient expansion joint material (asphalt and cork) wrapped around the pipe, the full depth of concrete, at the point of penetration. Secure to prevent shifting during concrete placement and finishing.

8. Size sleeves large enough to allow expansion and contraction movement.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors in concrete and beam clamps on structural steel.

B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

C. Do not fasten supports to ceiling systems, piping, ductwork, mechanical equipment, or conduit, unless otherwise noted.

D. Do not use powder-actuated anchors without specific permission.

E. Do not drill structural steel members.

F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

G. In wet locations and on all building floors below exterior earth grade install free-standing electrical equipment on concrete pads.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.

I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

J. Do not exceed 25 lbs. per hanger and a minimum spacing of 2’-0” on center when attaching to metal roof decking (excludes concrete on metal deck). This 25 lbs. load and 2’-0” spacing include adjacent electrical and mechanical items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.

K. Refer to Section 16111 for special conduit supporting requirements.

3.2 FINISH

A. Trim all ends of exposed field fabricated steel hangers, slotted channel and threaded rod to within 1” of support or fastener to eliminate potential injury to personnel unless shown otherwise on the drawings. Smooth ends and install elastomeric insulation with two coats of latex paint if exposed steel is within 6’-6” of finish floor and presents potential injury to personnel.

END OF SECTION

SECTION 16195
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates and tape labels
B. Wire and cable markers
C. Conduit labeling
D. Conductor color coding
E. Electrical gear labeling
F. Power distribution equipment labeling
G. Series rating identification

1.2 REFERENCES

A. ANSI C2 – National Electrical Safety Code

B. NFPA 70 – National Electrical Code

C. ANSI A13.1 – Standard for Pipe Identification

D. ANSI Z535.4 – Standard for Product Safety Signs and Labels

PART 2 - PRODUCTS

2.1 ELECTRICAL IDENTIFICATION PRODUCTS

A. Adhesive Marking Labels for Raceway: Pre-printed, flexible, self-adhesive vinyl labels with legend indicating voltage and service (Emergency, Lighting, Power, HVAC, Communications, Control, Fire).

1. Label Size as follows:

a. Raceways: Kroy or Brother labels 1-inch high by 12-inches long. (Minimum)

2. Color: As specified for various systems.

B. Colored Adhesive Marking Tape for banding Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.

C. Pretensioned Flexible Wraparound Colored Plastic Sleeves for Cable Identification: flexible acrylic bands sized to suit the cable diameter and arranged to stay in place by pre-tensioned gripping action when coiled around the cable.

D. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with preprinted numbers and letter.

E. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 50°F to 350°F. Provide ties in specified colors when used for color coding.

F. Underground Plastic Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inches wide by 4 mil thick, printed legend indicating type of underground line, manufactured for direct burial service. Tape shall contain a continuous metallic wire to allow location with a metal detector.

G. Aluminum, Wraparound Marker Bands: 1" in width, .014 inch thick aluminum bands with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

H. Brass or aluminum Tags: 2" by 2" by .05-inch metal tags with stamped legend, punched for fastener.

I. Indoor/Outdoor Number and Letters: Outdoor grade vinyl label, minimum of 3/4” high x 9/16” wide, with acrylic adhesive designed for permanent application in severe indoor and outdoor environments.

## 2.2 NAMEPLATES AND SIGNS

A. Engraved, Plastic-Laminated Labels, Signs and Instruction Plates: Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8 inch thick for larger sizes. Labels shall be punched for mechanical fasteners. Engraving legend shall be as follows:

1. Black letters on white face for normal power.

2. White letters on red face for emergency power.

3. White letters on green face for grounding.

4. Black letter on yellow face for Caution or UPS.

B. Baked–Enamel Signs for interior Use: Preprinted aluminum signs, punched, or drilled for fasteners, with colors, legend, and size required for application. Mounting ¼" grommets in corners.

C. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with .0396 inch galvanized-steel backing: and with colors, legend, and size required for application. Mounting ¼" grommets in corners.

D. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

E. Fasteners for Plastic-Laminated Signs; Self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as required by code.

B. Install identification devices in accordance with manufacturer's written instruction and requirements of NEC.

C. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work. All mounting surfaces shall be cleaned and degreased prior to identification installation.

D. Identify Junction, Pull and Connection Boxes: Labeling shall be 3/8-inch Kroy tape or Brother self-laminating vinyl label or permanent magic marker (color coded), neatly hand printed. In rooms that are painted out, provide labeling on inside of cover.

E. Circuit Identification: Tag or label conductors as follows:

1. Multiple Power or Lighting Circuits in Same Enclosure: Where multiple branch circuits are terminated or spliced in a box or enclosure, label each conductor with source and circuit number.

2. Multiple Control Wiring and Communication/Signal Circuits in Same Enclosure: For control and communications/signal wiring, use wire/cable marking tape at terminations in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tape.

3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.

F. Apply warning, caution and instruction signs as follows:

1. Install warning, caution or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

2. Emergency Operating Signs: Install, where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect, engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.

G. Apply circuit/control/item designation labels of engraved plastic laminate for pushbuttons, pilot lights, alarm/signal components, and similar items, except where labeling is specified elsewhere.

H. Install labels parallel to equipment lines at locations as required and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

I. Install ARC FLASH WARNING signs on all switchboards, panelboards, industrial control panels, and motor control centers. Sign at a minimum shall contain:

J. Circuits with more than 600V: Identify raceway and cable with "DANGER—HIGH VOLTAGE" in black letters 2 inches high on orange background at 10'-0 foot intervals.

1. Entire floor area directly above conduits running beneath and within 12 inches of a basement or ground floor that is in contact with earth or is framed above unexcavated space.

2. Wall surfaces directly external to conduits concealed within wall.

3. All accessible surfaces of concrete envelope around conduits in vertical shafts, exposed in building, or concealed above suspended ceilings.

K. Underground Electrical Lines: For exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

## 3.2 RECEPTACLE COVER PLATES

A. Provide identification on all receptacle cover plates indicated. Identification shall indicate source and circuit number serving the device (i.e. “C1A #24”).

B. Identification material to be a clear, 3/8-inch Kroy tape or Brother self-laminating vinyl label with black letters in normal size “Swis 721 Bold” font. Letter and number size to 3/16-inch high. Embossed Dymo-Tape labels are not acceptable. Permanently affix identification label to cover plates, centered above the receptacle openings.

## 3.3 CONDUIT AND EXPOSED CABLE LABELING

A. Conduit Identification:: Pre-printed, flexible, self-adhesive vinyl labels with legend at 10 foot intervals to identify all wind and solar PV system conduits run exposed or located

above accessible ceilings. Conduits located above non-accessible ceiling or in floors and walls shall be labeled within 3 feet of becoming accessible. Labels for multiple conduits shall be aligned. Use the following colors

1. 600 Volts and Below Normal: White letters on black background indicating feeder identification and voltage.

B. Blank conduit ends or outlet boxes for future extension of system shall have permanent identification marker indicating purpose of conduit or box and where the raceway originated.

3.4 BOX LABELING

A. All junction, pull, and connection boxes shall be identified as follows:

1. For power and lighting circuits, indicate system voltage and identity of contained circuits (“120V, 1LA1-3,5,7”).

2. For other wiring, indicate system type and description of wiring (“FIRE ALARM NAC #1”).

3.5 CONDUCTOR COLOR CODING

A. Color coding shall be applied at all panels, switches, junction boxes, pull boxes, vaults, manholes etc., where the wires and cables are visible and terminations are made. The same color coding shall be used throughout the entire electrical system, therefore maintaining proper phasing throughout the entire project.

B. All wires and cables, 6 AWG or larger, used in motor circuits, main feeders, sub-main feeders and branch circuits, shall be coded by the application of plastic tape. The tape shall be 3-M, Plymouth or Permacel, in colors specified below. The tape shall be applied at each conductor termination with two 1-inch tape bands at 6-inch centers. Contractor option to use colored cabling in lieu of the tape at each end for conductor 6 AWG to 500 KCM.

C. Wire and cables smaller than 6 AWG shall be color coded by the manufacturer.

D. Colored cable ties shall be applied in groups of three ties of specified color to each conductor at each terminal or splice point starting 3 inches from the termination and spaced at 3- inches centers. Tighten to a snug fit, and cut off excess length.

E. Where more than one nominal voltage system exists in a building or facility, each ungrounded conductor of a multi-wire branch circuit, where accessible, shall be identified by phase and system.

F. Conductors shall be color coded as follows:

1. 120/240 Volt, 3-Wire:

a. A-Phase – Black
b. B-Phase – Red
c. Neutral – White
d. Ground Bond – Green

2. 208Y/120 Volt, 4-Wire:

    a. A-Phase – Black
    b. B-Phase – Red
    c. C-Phase – Blue
    d. Neutral – White
    e. Ground Bond – Green

3. 480Y/277 Volt, 4-Wire:

    a. A-Phase – Brown
    b. B-Phase – Orange
    c. C-Phase – Yellow
    d. Neutral – Gray
    e. Ground Bond – Green

## 3.6 ELECTRICAL GEAR LABELING

A. Exterior electrical gear shall be identified with vinyl label names and numbers to be visible on the exterior of the gear. The labels shall correspond to the 1-line nomenclature and identify each cubicle of multi-section gear.

## 3.7 CONTROL EQUIPMENT IDENTIFICATION

A. Provide identification on the front of all control equipment, such as disconnect switches, starters, VFDs, contactors, motor control centers, etc. Nameplate text shall be a minimum of 1/4" high.

B. Labeling shall include:

1. Equipment type and contract documents designation of equipment being served.
2. Location of equipment being served if it is not located within sight.
3. Voltage and phase of circuit(s).
4. Panel and circuit number(s) serving the equipment.

| |
|---|
| EXHAUST FAN EF-1 ("LOCATED ON ROOF")<br>480V, 3-PHASE<br>FED FROM "1HA1-1" |

## 3.8 POWER DISTRIBUTION EQUIPMENT IDENTIFICATION

A. Provide identification on the front of all power distribution equipment, such as panelboards, switchboards, etc. The identification material shall be engraved plastic-laminated labels. Text shall be a minimum of 1/4" high, Swis 721 Bold.

B. Labeling shall include:

1. Equipment type and contract documents designation of equipment.
2. Voltage of the equipment.
3. Name of the upstream equipment and location of the upstream equipment if it is not located within sight.

DISTRIBUTION PANEL DP-H1
480Y/277V
FED FROM SWITCHBOARD “SB-1” (LOCATED IN MAIN ELECTRIC ROOM)

C. A separate nameplate for the service entrance equipment shall be labeled with the MAXIMUM AVAILABLE FAULT CURRENT and DATE of calculation given on the one-line diagram.

D. Distribution panelboards and switchboards shall have each overcurrent protection device identified with name and location of the load being served ("AHU-1 LOCATED IN PENTHOUSE 1").

E. Branch panelboards shall be provided with typed panel schedules upon completion of the project. Existing panelboards shall have their existing panel schedules typed, with all circuit changes, additions or deletions also typed on the panel schedules. A copy of all panel schedules for the project shall be turned over as part of the O&M Manuals. Refer to 16010 for other requirements.

## 3.9 SERIES RATING IDENTIFICATION

A. Upstream devices of series rated components not enclosed in a single NEMA type enclosure shall be identified with a nameplate using 1/8-inch lettering height reading "CAUTION - SERIES RATED SYSTEM - IDENTICAL COMPONENT REPLACEMENT REQUIRED".

B. Downstream devices of series rated components not enclosed in a single NEMA type enclosure shall be identified with a nameplate using 1/8-inch lettering height reading "CAUTION - SERIES RATED SYSTEM - ADDITIONAL SERIES COMBINATION RATING: XX,XXX RMS SYMMETRICAL AMPERES" where XX,XXX shall be the series combination rating.

## 3.10 POLE IDENTIFICATION

A. Lighting poles, bollards and overhead distribution poles shall be individually indentified with a unique number, for maintenance purposes. Apply the vinyl label number above the hand hole cover or 24” above grade. Bollards may be identified with a number applied inside the luminaire that is visible from the exterior.

END OF SECTION

SECTION 16440
DISCONNECT SWITCHES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Fusible switches
B. Nonfusible switches
C. Enclosures

### 1.2 REFERENCES

A. NEMA KS 1 - Enclosed Switches

### 1.3 SUBMITTALS

A. Submit product data under provisions of Section 16010.

B. Product Data: For each type of enclosed switch, circuit breaker, accessory and component indicated, include dimensions, weights, and manufacturer's technical data on features, performance, and ratings.

C. Electrical Characteristics: For each type of enclosed switch, enclosure types, current and voltage ratings, short-circuit current ratings, UL listing for series rating of installed devices, features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

### 1.4 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

## PART 2 - PRODUCTS

### 2.1 MANUFACTUERS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

### 2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1; Type heavy duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Class 'R' fuse clips only, unless indicated otherwise on the drawings.

B. Non-fusible Switch Assemblies: NEMA KS 1; Type heavy duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: Type as indicated on the disconnect schedule.

D. Accessories: As indicated on the disconnect schedule.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install disconnect switches where indicated on the drawings.

B. Install fuses in fusible disconnect switches.

C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.

END OF SECTION

SECTION 16450
GROUNDING AND BONDING

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Power system grounding
B. Electrical equipment and raceway grounding and bonding
C. Primary grounding

### 1.2 SUMMARY

A. This section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

### 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.

C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

## PART 2 - PRODUCTS

### 2.1 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 16 Section 16120 "Wire and Cable".

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Grounding Electrode Conductors: Stranded cable.

E. Sizes and types below are typical. Adjust to suit Project conditions and requirements.

F. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.

2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.

3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

G. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.2 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Connectors: Hydraulic compression type, in kit form, and selected per manufacturer's written instructions.

C. Bolted Connectors: Bolted-pressure-type connectors.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Common Ground Bonding with Lightning Protection System: Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

3.3 INSTALLATION

A. Provide a separate, insulated equipment grounding conductor in feeder, motor, branch, and receptacle circuits. Terminate each end on a grounding lug, bus, or bushing.

B. Ground Rods: Install at least 20 feet from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 12 inches below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

C. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

D. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at

entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding 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.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

## 3.5 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

1. Measure ground resistance from system neutral connection at service entrance to convenient ground reference points using suitable ground testing equipment. Resistance shall not exceed 5 ohms.

2. Testing: Perform the following field quality-control testing:

a. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

b. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

c. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

1) Equipment Rated 500 kVA and Less: 10 ohms.

2) Equipment Rated 500 to 1000 kVA: 5 ohms.

3) Equipment Rated More Than 1000 kVA: 3 ohms.

4) Substations and Pad-Mounted Switching Equipment: 5 ohms.

5) Manhole Grounds: 10 ohms.

d. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 16470
PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Lighting and appliance branch circuit panelboards
B. Load centers

1.2 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers

B. NEMA PB 1 - Panelboards

C. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less

D. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment

E. UL 67 - Panelboards

1.3 SUBMITTALS

A. Submit shop drawings for equipment and component devices under provisions of Section 16010.

B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

2.2 RATINGS

A. Definitions:

1. Series rated equipment shall be defined as equipment that can achieve a required UL AIC rating with an upstream device such as a main breaker or a combination of devices to meet or exceed a required UL AIC rating. All series rated equipment shall have a permanently attached nameplate indicating that device rating must be maintained. See Section 16195 for additional requirements.

2. Fully rated equipment shall be defined as equipment where all devices in that equipment shall carry a minimum of the AIC rating that is specified.

B. The panelboards for this project shall be fully rated unless otherwise specifically noted in the Drawings or Specifications.

2.3 BRANCH CIRCUIT PANELBOARDS

A. Minimum Integrated Short Circuit Rating: As shown on the drawings.

B. Molded Case Circuit Breakers: Bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on the drawings. Do not use tandem circuit breakers.

2.4 LOAD CENTERS

A. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical.

B. Molded Case Circuit Breakers: Provide plug-on circuit breakers with integral thermal and instantaneous magnetic trip in each pole, with common trip handle for all poles. Provide breaker interrupting ratings as indicated on the plans. Where necessary to meet interrupting ratings, breakers shall be provided with automatically resetting current limiting elements in each pole. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on the drawings.

C. Do not use tandem circuit breakers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards plumb as indicated on the drawings in conformance with NEMA PB 1.1.

B. Height: 6 feet to handle of highest device.

C. Provide filler plates for unused spaces in panelboards.

D. Provide updated typed circuit directory for each branch circuit panelboard. Label each circuit with the type of load and the name and number of the area served. Revise directory to reflect circuit changes required to balance phase loads.

3.2 FIELD QUALITY CONTROL

A. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

SECTION 16472
POWER-CENTER

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Mini Power Center

1.2 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers

B. NEMA KS 1 - Enclosed Switches

C. NEMA PB 1 - Panelboards

D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less

E. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment

F. NEMA ST1 – Specialty Transformers

1.3 SUBMITTALS

A. Submit shop drawings for equipment and component devices under provisions of Section 16010.

B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating and circuit breaker arrangement and sizes.

1.4 SPARE PARTS

A. Keys: Furnish four (4) each to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

2.2 RATINGS

A. Definitions:

1. Series rated equipment shall be defined as equipment that can achieve a required UL AIC rating with an upstream device such as a main breaker or a combination of devices to meet or exceed a required UL AIC rating. All series rated

equipment shall have a permanently attached nameplate indicating that device rating must be maintained.

2. Fully rated equipment shall be defined as equipment where all devices in that equipment shall carry a minimum of the AIC rating that is specified.

2.3 MINI POWER CENTER

A. Enclosure: NEMA 3R

B. Primary circuit breaker size as shown on drawings.

C. Transformer Section:

1. Dry Type Transformers: Non ventilated expoxy resin encapsulated, factory assembled, air cooled dry type transformers; ratings as shown on the drawings.

2. Insulation system and average winding temperature rise for rated KVA:

| **Ratings** | **Class** | **Rise (degree C)** |
|---|---|---|
| 1-15 | 220 | 115° |

3. Case temperature shall not exceed 40°C rise above ambient at its warmest point.

4. Winding Taps, Transformers Less than 15 KVA: Two 5 percent below rated voltage, full capacity taps on primary winding.

5. Sound levels: Maximum sound levels are as follows:

| **KVA Rating** | **Sound Level** |
|---|---|
| 0-9 | 40dB |
| 10-50 | 45dB |

6. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

7. Coil Conductors: Continuous copper windings with terminations brazed or welded.

8. Enclosure: NEMA Type 3R. Provide lifting eyes or brackets.

9. Isolate core and coil from enclosure using vibration-absorbing mounts.

10. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

D. Load Center Section:

1. Provide lock on door. Finish in manufacturer's standard gray enamel.

2. Provide load center with bus ratings as shown on the drawings.

3. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical.

4. Molded Case Circuit Breakers: Provide plug-on circuit breakers with integral thermal and instantaneous magnetic trip in each pole, with common trip handle for all poles. Provide breaker interrupting ratings as indicated on the plans. Where necessary to meet interrupting ratings, breakers shall be provided with automatically resetting current limiting elements in each pole. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on the drawings.

E. Do not use tandem circuit breakers.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install Mini Power Center plumb as indicated on the drawings in conformance with NEMA PB 1.1.

B. Height: 6 feet to handle of highest device.

C. Provide filler plates for unused spaces in panelboards.

D. Provide typed circuit directory for each branch circuit panelboard. Label each circuit with the type of load and the name and/or number of the area served. Revise directory to reflect circuit changes required to balance phase loads.

### 3.2 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

SECTION 16477
FUSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fuses
B. Spare Fuse Cabinet

1.2 REFERENCES

A. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Types

B. UL 198E - Class R Fuses

C. FS W-F-870 - Fuseholders (For Plug and Enclosed Cartridge Fuses)

D. NEMA FU 1 - Low Voltage Cartridge Fuses

E. NFPA 70 – National Electrical Code

1.3 SUBMITTALS

A. Submit product data under provisions of Section 16010.

1.4 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40°F (5°C) or more than 100°F (38°C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.5 EXTRA MATERIALS

A. Provide two fuse pullers.

B. Provide three of each size and type of fuse installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

2.2 ACCEPTABLE MANUFACTURERS – FUSES

A. Cooper Bussman
B. Eagle Electric Mfg. Co.; Cooper Industries
C. Mersen
D. Tracor; Littelfuse Subsidiary

2.3 FUSES

A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.

B. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.

C. Fuses with ratings less than or equal to 200 amperes (not including control transformer fuses): Class RK-5, unless otherwise noted on the drawings.

D. Control transformer fuses: Class CC (time delay).

E. Fuses for packaged equipment: Size and type as recommended by equipment manufacturer.

2.4 SPARE FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch- (1.27-mm-) thick steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
4. Fuse Pullers: For each size of fuse.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses where indicated on the drawings and specifications.

B. Install fuses in accordance with manufacturer's instruction.

C. Install fuses in packaged equipment as required by equipment manufacturer.

D. Install fuse with label oriented such that manufacturer, type, and size are easily read.

E. Install spare fuse cabinets adjacent to the wind or solar inverters at each building where fuses are used in those systems.

END OF SECTION

SECTION 16480
MOTOR CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manual motor starters

1.2 REFERENCES

A. NEMA ICS 6 - Enclosures for Industrial Controls and Systems

B. FS W-S-865 - Switch, Box, (Enclosed), Surface-Mounted

C. NEMA KS 1 - Enclosed Switches

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 16010.

B. Indicate on shop drawings, front and side views of motor control center enclosures with overall dimensions. Include conduit entrance locations and requirements; wiring diagrams that differentiate between manufacturer-installed and field-installed wiring; nameplate legends; size and number of bus bars per phase and ground; electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time-current curves of all equipment and components.

C. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and over-current protective devices.

D. Submit manufacturer's instructions under provisions of Section 16010.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 16010.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 16010.

B. Store and protect products under provisions of Section 16010.

C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from fumes, dirt, water, construction debris, traffic, and physical damage.

D. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

### 2.2 MANUAL MOTOR STARTERS

A. Manual Motor Starter: NEMA ICS 2; AC general-purpose Class A manually operated non-reversing full-voltage controller for induction motors rated in horsepower, with overload relay, and toggle operator.

B. Fractional Horsepower Manual Starter: NEMA ICS 2; AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, and toggle operator.

C. Motor Starting Switch: NEMA ICS 2; AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, without thermal overload unit, and toggle operator.

D. Enclosure: NEMA ICS 6; Type 1.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install motor control equipment in accordance with manufacturer's instructions on concrete bases.

B. Select and install heater elements in motor starters to match installed motor characteristics.

END OF SECTION

SECTION 16640
WIND TURBINE SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Horizontal Axis Wind Turbines
B. Vertical Axis Wind Turbines
C. Turbine Controllers
D. Synchronous Inverters
E. Towers

1.2 REFERENCES

A. ANSI C62.41 - IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits

B. IEEE 519 - Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.

C. IEEE 1547 - Standard for Interconnecting Distributed Resources with Electronic Power Systems.

D. IEEE 1547.1 - Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems.

E. UL 1741 - Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources/

F. American Wind Energy Association – Small Wind Turbine Performance and Safety Standard (Standard 9.1 – 2009)

1.3 SUBMITTALS

A. Submit product data under provision of Section 16010.

B. Wind Turbines: Include unit dimensions, weight, installation and maintenance information. Also include the following:

1. Start-up wind speed.

2. Cut-in wind speed.

3. Rated wind speed.

4. Rated power.

5. Rotor diameter.

6. Generator type.

7. Output characteristics.

C. Inverter: Include unit dimensions, weight, installation and maintenance information. Also include the following:

1. Input: DC voltage range, max current input.

2. Output: AC voltage range, total harmonic distortion, power factor, efficiency, maximum current output.

3. General: Power consumption, enclosure type, compliance with references.

4. Environment: Ambient temperature rating, cooling requirements.

D. Turbine Controller

E. Tower

1. Include dimensions and materials.

2. Base plate and foundation connections.

3. Structural loading information for specific wind turbine to be provided.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit data under provision of Section 16010.

B. Include description of operation and servicing procedures, list of major components, recommended remedial and preventative maintenance procedures, and list of spare parts.

1.5 DELIVERY, STORAGE, HANDLING

A. Store and protect products under provisions of Section 16010.

B. Store in dry location or per manufacturer's requirements.

C. Handle per manufacturer's requirements.

1.6 WARRANTY

A. Turbine, tower, controller and inverter: Provide 5 year warranty of equipment and installation.

B. Include coverage for travel, parts, and service.

1.7 QUALITY ASSURANCE

A. Manufacturer: Company specializing in small wind turbine systems with five years documented experience.

B. Installer: Equipment installer shall be certified by wind turbine and tower manufacturers.

C. Operate, commission, and demonstrate seven (7) days of complete wind turbine system operation prior to turnover to the Owner.

1. Refer to the Part 3 for system commissioning requirements.

1.8 SYSTEM DESCRIPTION

A. Complete grid intertie wind turbine system including tower, rotor, generator, inverter and controller system, disconnects, metering, and reporting equipment. Systems shall be configured to produce 240Y/120 volt, 1 phase, 3 wire, 60 Hz power.

B. Grid-tie interconnection with utility, including island protection and net metering.

C. The wind turbine control system shall include a metering system for system power production and a reporting system.

D. The wind turbine system shall be configured as a grid inter-tie system. The individual inverters shall automatically de-energize their output to the building electrical system and disconnect from the wind turbine upon loss of the utility electrical service. The wind turbine system shall remain disconnected until the electrical utility voltage has been restored.

E. Equipment shall be identified for use in wind turbine systems.

F. Equipment including wiring, fuses, circuit breakers, etc. used in any DC portion of the system shall be listed for use in DC circuits.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

2.2 ACCEPTABLE HORIZONTAL AXIS WIND TURBINE MANUFACTURERS

A. Bergey Windpower EXCEL (basis of design)
B. Ventera Energy VT10-240
C. Xzeres Wind 442SR

2.3 WIND TURBINES

A. Equipment Ratings:

1. Rated power: 10kW at 27 mph
2. Startup Wind Speed: 7.5 mph
3. Cut-in wind speed: 5 mph
4. Maximum Design Wind Speed: 134 mph
5. Number of Blades: 3
6. Rotor Diameter: 23 feet.
7. Generator: permanent magnet direct drive alternator
8. Output: 240VAC, 3-phase.

B. Operating Environment Conditions:

1. Operating Temperature: -40 to 60°C
2. Wet location listed

2.4 ACCEPTABLE VERTICAL AXIS WIND TURBINE MANUFACTURERS

A. WePower Falcon 12kW (basis of design)
B. Engineer Approved Equal

2.5 VERTICAL AXIS WIND TURBINES

A. Equipment Ratings:

1. Rated power: 12kW at 29 mph
2. Cut-in wind speed: 6 mph
3. Maximum Design Wind Speed: 111 mph
4. Number of Blades: 5
5. Rotor Diameter: 19 feet 8 inches
6. Rotor Height: 20 feet 4 inches.
7. Generator: permanent magnet direct drive alternator
8. Output: 90-340Vdc, 3-phase.

B. Operating Environment Conditions:

1. Operating Temperature: -40 to 60°C
2. Wet location listed

2.6 ROTOR BRAKE/DISCONNECT

A. Horizontal Axis Turbines: Load break switch rated 600 VAC maximum with lockout provisions.

B. Vertical Axis Turbines: Load break switch rated 600 VDC maximum with lockout provisions.

C. Fuse holders rated 60 amp maximum.

D. Enclosure: NEMA 3R.

## 2.7 TURBINE CONTROLLERS/INVERTERS

A. Acceptable Inverter Manufacturers:

1. Bergey Windpower (Bases of Design)
2. Ventera Energy
3. SMA America

B. Equipment Ratings:

1. AC Output Power Rating: sized by turbine manufacturer
2. Output Voltage: 240VAC, 1-phase, 3-wire, 60 Hz.
3. Power Factor: 1.0
4. Minimum CEC Efficiency: 94%
5. Total Harmonic Distortion: Less than 10%
6. Enclosure: NEMA 1

C. Inverter Technology: Full DC/AC rectification, real sine-wave output with high frequency pulse width modulation PWM.

D. Internal Protection: Inverter shall measure utility voltage, current, and impedance. Loss of utility power shall cause inverter to shut down and disconnect its output to the AC bus and input from the DC bus. Inverter shall automatically reconnect to AC output bus and DC input bus upon return of utility source.

E. The inverter shall be constructed to not allow backfeeding from the electrical utility to the inverter input bus.

F. The inverter shall have integral load and line side disconnects.

G. The inverter shall be cooled via a forced air cooling fan.

## 2.8 METERING AND REPORT

A. Displayed and Recorded Data:

1. The following data shall be recording and displayed for each wind turbine and updated every 10 seconds.

    a. Power
    b. kWh today
    c. Total kWh
    d. Date
    e. Time

## 2.9 HORIZONTAL WIND TURBINE TOWER

A. Basis of design is given so integrator can provide design and installation of an equivalent system that is compatible with the provided wind turbine models. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Rohn Products (Basis of Design)
2. American Tower Company

B. Tower Characteristics:

1. Structure Type: self supporting lattice.
2. Height: 80 feet.
3. Wind load requirements: 90 mph + ice.
4. Hinged feet for raising and lowering by crane or gin pole.
5. Provisions for mounting wind turbine and rotor brake disconnect switch.
6. Climbing step bolts.
7. Continuous vertical cable for fastening of fall protection equipment.

## 2.10 VERTICAL WIND TURBINE TOWER

A. Basis of design is given so integrator can provide design and installation of an equivalent system that is compatible with the provided wind turbine models. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. American Resource and Energy (Basis of Design)
2. Rohn Products.

B. Tower Characteristics:

1. Structure Type: flanged monopole.
2. Height: 30 feet.
3. Wind load requirements: 90 mph + ice.
4. Hinged base for raising and lowering by crane or gin pole.
5. Provisions for mounting wind turbine and rotor brake disconnect switch.
6. Climbing step bolts.
7. Continuous vertical cable for fastening of fall protection equipment.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Wind turbine cabling shall be installed in raceways separate from other building system cabling.

B. Install fuses in all fuse holders and disconnects. Provide a label on the inside of each disconnect identifying the size, type, and model of each fuse installed.

C. Provide provisions to seal all exterior penetrations.

D. Install at least three 10’ copper clad steel ground rods bonded to tower per manufacturer’s recommendations.

3.2 LABELING

A. Refer to Section 16195 for product requirements.

B. Label all equipment as required by code.

C. Label all AC-alternating current and DC-direct current disconnects of the wind power system.

1. “---WIND TURBINE SYSTEM DISCONNECT---WARNING. ELECTRIC SHOCK HAZARD. DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION’

D. The AC disconnecting means for each wind turbine inverter shall be labeled with the following:

1. Operating Current:
2. Operating Voltage:
3. Maximum System Voltage:

E. Short Circuit Current: The interactive system point of interconnection shall be labeled at the disconnecting means with the following:

1. Maximum AC Output Operating Current:
2. Operating AC Voltage:

F. The building service entrance disconnect shall be clearly labeled to identify there is a photovoltaic system interconnection. The location of the interactive system disconnect shall be identified with a plaque reading: “WARNING – WIND TURBINE DISCONNECT LOCATED AT _____.”

3.3 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 16010.

B. Check for damage and proper operation of the wind system components.

C. Verify operation of the metering and reporting system components.

3.4 SYSTEM COMMISSIONING

A. Provide system commissioning report under provisions of Section 16010.

B. Notify Engineer seven days prior to beginning final witness testing of the wind turbine system.

1. The Electrical Contractor shall fully test the complete wind turbine system prior to notifying the Architect/Engineer for final witness testing.

C. Test, measure, and record the following system values:

1. Date:
2. Time of test:
3. Testers:
4. Wind conditions (approx. mph).
5. Wind turbine:

    a. Input current:
    b. Input voltage:
    c. Output current:
    d. Output voltage:
    e. Output power:

D. Performance Test of Synchronous Inverter System:

1. Verify proper operation of the wind system. Verify the system is producing power and delivering it to the building electrical distribution system.

2. Simulate power outage of electrical utility by switching the main electrical service disconnect from “closed” to “open”.

3. Verify that each wind turbine controller has stopped producing electrical energy and has disconnected itself from the wind turbine and building electrical distribution system.

4. Simulate return of utility electrical power by switching the main electrical service disconnect from “open’ to “closed”.

5. Verify each wind turbine controller has reconnected to the wind turbine and building electrical distribution system. Verify power delivery from the wind turbine controller to the building electrical distribution system.

6. Document any test failure, including reason for failure and corrective actions. Retest the system to complete satisfactory operation.

## 3.5 OWNER TRAINING

A. Provide Owner training under provisions of Section 16010.

B. Provide complete overview of the photovoltaic system to the Owner including:

1. System overview
2. System operation
3. Manufacturer maintenance instructions
4. System component locations
5. Operation of the metering and reporting components

C. Minimum Training Time:

1. Four hours for each turbine installed.

END OF SECTION

SECTION 16650
SOLAR PHOTOVOLTAIC SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Photovoltaic Panels and Arrays
B. Photovoltaic Inverter
C. Combiner/Disconnect
D. Photovoltaic Monitoring Equipment and Accessories
E. Photovoltaic Mounting Systems

1.2 REFERENCES

A. ANSI C62.41 - IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits

B. IEEE 519 - Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.

C. IEEE 929 - Recommended Practices for Utility Interface of Photovoltaic Systems.

D. IEEE 1547 - Standard for Interconnecting Distributed Resources with Electronic Power Systems.

E. IEEE 1547.1 - Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems.

F. NEC 690 - Solar Photovoltaic (PV) Systems.

G. UL 1703 - Standard for Flat-Plate Photovoltaic Modules and Panels

H. UL 1741 - Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources

I. UL 1998 - Standard for Software in Programmable Components

1.3 SUBMITTALS

A. Submit product data under provision of Section 16010.

B. Photovoltaic Panels: Include unit dimensions, weight, material construction, wattage, voltage, current, open circuit voltage, short circuit current, installation and maintenance information, and manufacturer voltage correction factor in information.

C. Photovoltaic Inverter: Include unit dimensions, weight, installation and maintenance information. Also include the following:

1. Input: DC voltage range, max current input.

2. Output: AC voltage range, total harmonic distortion, power factor, efficiency, maximum current output.

3. General: Power consumption, enclosure type, compliance with references.

4. Environment: Ambient temperature rating, cooling requirements.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit data under provision of Section 16010.

B. Include description of operation and servicing procedures, list of major components, recommended remedial and preventative maintenance procedures, and list of spare parts.

1.5 SPARE PARTS

A. Provide spare parts under provisions of Section 16010.

B. Provide three (3) additional fuses of each type and size installed.

1.6 DELIVERY, STORAGE, HANDLING

A. Store and protect products under provisions of Section 16010.

B. Store in warm and dry location or per manufacturer's requirements.

C. Handle per manufacturer's requirements.

1.7 WARRANTY

A. Photovoltaic Panels and Array: Provide 20-year warranty for power production under provisions of Section 16010. Equipment shall maintain minimum 80% of the manufacturer-published wattage output rating for 20 years. Provide 5-year workmanship warranty.

B. Photovoltaic Inverter: Provide 10 year warranty of equipment and installation.

C. Include coverage for travel, parts, and service.

1.8 QUALITY ASSURANCE

A. Manufacturer: Company specializing in photovoltaic panel or inverter systems with five years documented experience.

B. Installer: Equipment installer shall be NABCET certified, or be certified by photovoltaic inverter and panel manufacturers.

C. Operate, commission, and demonstrate seven (7) days of complete photovoltaic system operation prior to turnover to the Owner.

1. Refer to the Part 3 for system commissioning requirements.

1.9 SYSTEM DESCRIPTION

A. Complete photovoltaic system rated as indicated on drawings at STC including photovoltaic panels, inverter system, combiner/disconnects, metering, and reporting equipment. Systems shall be configured to produce 240Y/120 volts, 1 phase, 3 wire, 60 Hz power.

B. Grid-tie interconnection with utility, including island protection and net metering.

C. The photovoltaic system shall include a metering system for system power production and a reporting system to monitor individual components.

D. The photovoltaic system and inverter shall be configured as a grid inter-tie solar photovoltaic system. The individual inverters shall automatically de-energize their output to the building electrical system and disconnect from the photovoltaic panels upon loss of the utility electrical service. The photovoltaic inverter system shall remain disconnected until the electrical utility voltage has been restored.

E. Equipment shall be identified for use in solar photovoltaic systems.

F. Equipment including wiring, fuses, circuit breakers, etc. used in any DC portion of the photovoltaic power system shall be listed for use in DC circuits.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved products that may be incorporated into the work must meet the requirements of the Buy American Act, or be able to produce documentation explaining exemption to the Buy American Act through an applicable International Trade Agreement.

2.2 ACCEPTABLE PHOTOVOLTAIC PANEL MANUFACTURERS

A. SolarWorld Model SW230 (basis of design)
B. Kyocera Model KD230GX
C. Centrosolar B230

2.3 PHOTOVOLTAIC PANELS AND ARRAYS

A. Equipment Ratings:

1. Maximum Rated Power (STC) Pmax: 230 watts
2. Operating Power Point Voltage Umpp: 29.8 VDC
3. Maximum Power Point Current Impp: 7.72A
4. Maximum Open Circuit Voltage Uoc: 36.9 VDC
5. Maximum Short Circuit Current Isc: 8.25 A
6. Nominal Operating Cell Temperature Conditions (NOCT) Pmax: 164.4 watts

B. Operating Environment Conditions:

1. Operating Temperature: -40 to 90°C
2. Wet location listed

C. Cell Material: Silicon-based solar cell construction with UV stabilized polymer. Provide with bypass diode technology for partial shading operation.

D. Panel Construction: Anodized aluminum frame with ground point and tempered glass cover.

E. Dimensions: 39.4” wide x 1.84” deep x 66” long.

1. Maximum Weight: 47 lbs.

F. Panel Connections and Terminations:

1. Provide manufacturer’s wiring and quick-connect terminations for series creation of module-strings installation of panels.

2. Provide manufacturer wiring to combiner boxes for parallel grouping of module-strings.

3. All exterior wire and terminations shall be listed sunlight resistant.

2.4 COMBINER/DISCONNECT

A. Combination of combiner box and solar array disconnect in a single enclosure.

B. Load break switch rated 600 VDC maximum with lockout provisions.

C. Fuse holders rated 30 amp maximum. Terminal blocks for each PV string.

D. Enclosure: NEMA 4X.

2.5 PHOTOVOLTAIC INVERTERS

A. Acceptable Inverter Manufacturers:

1. SMA America, LLC Model Sunny Boy (basis of design)
2. Fronius USA, LLC Model IG Plus

B. Equipment Ratings:

1. AC Output Power Rating for Each Inverter: as indicated on drawings
2. Output Voltage: 240 volt, single-phase
3. Power Factor: 1.0
4. Minimum CEC Efficiency: 95.5%
5. DC Voltage Input Range: 300 to 600 VDC
6. Total Harmonic Distortion: Less than 10%
7. DC Voltage Ripple: Less than 5%
8. Enclosure: NEMA 1

C. Operating Environment Condition:

1. Maximum ambient temperature: 113 °F

D. Inverter Technology: Full DC/AC rectification, real sine-wave output with high frequency pulse width modulation PWM.

E. Internal Protection: Inverter shall measure utility voltage, current, and impedance. Loss of utility power shall cause inverter to shut down and disconnect its output to the AC bus and input from the DC bus. Inverter shall automatically reconnect to AC output bus and DC input bus upon return of utility source.

F. The inverter shall be constructed to not allow backfeeding from the electrical utility to the photovoltaic panels or DC input bus.

G. The inverter shall have integral DC disconnects.

H. The inverter shall be cooled via a forced air cooling fan.

I. Inverters at E.B. Lyons and Lewis and Clark shall be provided with Ethernet connection for metering and recording system outputs. Provide communication gateway device(s) as required to connect inverter system to the Owner's LAN or network router. Provide web server hardware and software at E.B. Lyons for accessing system information via the internet.

2.6 PHOTOVOLTAIC MICRO INVERTERS

A. Acceptable Inverter Manufacturers: Manufacturer and model must have been tested and be compatible with photovoltaic panel model.

1. ENPHASE Model M190 (basis of design)
2. Solar Bridge P235
3. Direct Grid Technologies. DGM-S250

B. Equipment Ratings:

1. Maximum Output Power Rating for Each Inverter: 190 watt
2. Maximum Input Power (STC): 240W
3. Output Voltage: 240VAC 60 Hz
4. Power Factor: > 0.95
5. Minimum CEC Efficiency: 94.2%
6. Total Harmonic Distortion: Less than 10%
7. Maximum night time power consumption: 30 mW

C. Operating Environment Condition:

1. Operating Temperature range: -40° to 65°C
2. Enclosure: NEMA 6 or IP66 wet location listed

D. Inverter Technology: Full DC/AC rectification, real sine-wave output with high frequency pulse width modulation PWM.

E. Internal Protection: Inverter shall measure utility voltage, current, and impedance. Loss of utility power shall cause inverter to shut down and disconnect its output to the AC bus and input from the DC bus. Inverter shall automatically reconnect to AC output bus and DC input bus upon return of utility source.

F. The inverter shall be constructed to not allow backfeeding from the electrical utility to the photovoltaic panels or DC input bus.

G. The inverter shall be convection cooled.

2.7 METERING AND REPORT

A. Personal Computer Software: Provide manufacturer's software for metering and reporting on personal computer. The Electrical Contractor shall install and provide provision for custom initialization of the photovoltaic system software package.

B. Displayed and Recorded Data:

1. The following data shall be provided for each photovoltaic inverter and updated every 10 seconds.

   a. Power
   b. kWh today
   c. Total kWh
   d. Date
   e. Time

2. The following data shall be provided for the entire photovoltaic system:

   a. Power
   b. kWh today
   c. Total kWh
   d. Date
   e. Time
   f. kWh to utility today
   g. Total kWh to utility

3. The above information shall be recorded, logged, and compiled by the personal computer software for production and performance evaluation purposes.

4. Provide data reporting and recording of all manufacturers' standard reporting functions and data acquisition reporting.

2.8 ARRAY MOUNTING

A. Basis of design is given so integrator can provide design and installation of an equivalent system that is compatible with the provided modules and structure. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Metal Roof: Metal Roof Innovations – S5! Series
2. Composite Shingle Roof: Professional Solar Products – Roof Trac Series

B. Mounting system requirements :

1. Wind load requirements: 100 mph and class for the particular application.
2. 30 pound per square foot snow load.
3. Provides four mounting supports for each panel in accordance with manufacturer's requirements.
4. Coordinate final dimensions with existing conditions.
5. Provisions for mounting microinverters.
6. Structural aluminum members to be mill finish. All brackets and connections to be stainless steel.
7. Connect mounting system to electrode grounding system.

C. Provide complete solar array mounting system including rails, splices, fasteners, legs, clamps, standoffs, feet, and anchors.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Photovoltaic cabling shall be installed in raceways separate from other building system cabling. Photovoltaic cabling shall be installed in conduit when located interior to the building.

B. The photovoltaic panels and arrays shall be configured in an open circuit, short circuit, or provided with an opaque covering to disable the array from producing electrical power during installation. Refer to the manufacturer's information for additional disabling requirements during installation.

C. Install fuses in all fuse holders and disconnects. Provide a label on the inside of each disconnect identifying the size, type, and model of each fuse installed.

D. Provide provisions to seal all exterior penetrations. All photovoltaic system roof penetrations shall be sealed at the expense of the photovoltaic system contractor. Existing warranty must be maintained.

E. Wire and Cable Schedule:

1. These requirements are in addition to the requirements of Section 16120.

2. DC Distribution System:

a. Exterior: Photovoltaic panel manufacturer-supplied cabling with quick connects.

b. Interior: Copper, stranded conductor, 600 volt insulation, THHN/THWN.

c. Underground or Wet Locations: Copper, stranded conductor 600 volt insulation THWN.

d. Conductors shall be color coded as follows:

1) PV-: Black
2) PV+: Red
3) Ground Bond: Green

3. AC Distribution System:

a. Refer to Section 16120.

4. Use no wire smaller than 10 AWG for 600 VDC wiring of the photovoltaic system.

5. Use 8 AWG for 600 VDC wiring of photovoltaic systems with distances between the photovoltaic panel and photovoltaic inverter greater than 100 feet.

F. Interconnect photovoltaic inverters and/or communications gateway to each other and to the facility's local area network patch panel using Category 6 cable or other cable as directed by the inverter manufacturer.

G. Provide provisions for programming and initializing the system metering and reporting software per the Owner's requirements. The Contractor shall organize a meeting with the Owner to finalize the programming and user interfaces of the program software.

H. Install equipment per the manufacturer's recommendations.

3.2 LABELING

A. Refer to Section 16195 for product requirements.

B. Label all photovoltaic system equipment as required by code.

C. Label all AC-alternating current and DC-direct current disconnects of the photovoltaic power system.

1. "---PHOTOVOLTAIC SYSTEM DISCONNECT---WARNING. ELECTRIC SHOCK HAZARD. DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION'

D. The AC disconnecting means for each photovoltaic inverter shall be labeled with the following:

1. Operating Current:
2. Operating Voltage:
3. Maximum System Voltage:

E. Short Circuit Current: The interactive system point of interconnection shall be labeled at the disconnecting means with the following:

1. Maximum AC Output Operating Current:
2. Operating AC Voltage:

F. The building service entrance disconnect shall be clearly labeled to identify there is a photovoltaic system interconnection. The location of the interactive system disconnect shall be identified with a plaque reading: "WARNING – PHOTOVOLTAIC SYSTEM DISCONNECT LOCATED AT _____."

3.3 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 16010.

B. Check for damage and tight connections prior to allowing the photovoltaic panels to begin power generation.

C. Check for damage and proper operation of the photovoltaic inverters.

D. Verify operation of the metering and reporting system components. Adjust and update the graphical user interface for project specific conditions.

3.4 SYSTEM COMMISSIONING

A. Provide system commissioning report under provisions of Section 16010.

B. Notify Engineer seven days prior to beginning final witness testing of the photovoltaic system.

1. The Electrical Contractor shall fully test the complete photovoltaic system prior to notifying the Architect/Engineer for final witness testing.

C. Test, measure, and record the following system values:

1. Date:
2. Time of test:
3. Testers:
4. Sun overcast conditions (full sun) (scattered clouds) (full cloud coverage).
5. Inverter:

    a. DC input current:
    b. DC input voltage:
    c. AC output current:
    d. AC output voltage:
    e. Output power:

D. Performance Test of Interactive Inverter System:

1. Verify proper operation of the photovoltaic system. Verify the photovoltaic system is producing power and delivering it to the building electrical distribution system.

2. Simulate power outage of electrical utility by switching the main electrical service disconnect from "closed" to "open".

3. Verify that each individual photovoltaic inverter has stopped producing electrical energy and has disconnected itself from the photovoltaic panels and building electrical distribution system.

4. Simulate return of utility electrical power by switching the main electrical service disconnect from “open’ to “closed”.

5. Verify each photovoltaic inverter has reconnected to the photovoltaic panels and building electrical distribution system. Verify power delivery from the photovoltaic inverters to the building electrical distribution system.

6. Document any test failure, including reason for failure and corrective actions. Retest the photovoltaic system to complete satisfactory operation.

3.5 OWNER TRAINING

A. Provide Owner training under provisions of Section 16010.

B. Provide complete overview of the photovoltaic system to the Owner including:

1. System overview
2. System operation
3. Manufacturer maintenance instructions
4. System component locations
5. Operation of the metering and reporting components and software

C. Minimum Training Time:

1. Four hours at each location includes:

a. Two hours system components.
b. Two hours computer software operation.

END OF SECTION

SECTION 16920
POWER MONITORING SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Energy monitoring system

B. Interactive informational display system

1.2 REFERENCES

A. ANSI C12 - Code for Electrical Metering

B. ANSI C57.13 - Requirements for Instrument Transformers

1.3 SYSTEM DESCRIPTION

A. The energy monitoring system shall consist of electronic power monitoring devices as designated on the project drawings and described herein. The system shall be equipped with a renewable energy monitoring gateway system to collect energy data from various sources, store the information in database format, and display information for public viewing.

B. Interactive informational touchscreen displays shall be provided at Lewis and Clark Intrepretive Center and Honey Creek Lodge (one at each location) and connected to the energy monitoring system via LAN connection.

1.4 QUALITY ASSURANCE

A. Manufacturer: Company with three (3) years of experience in power measurements and controls.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 16010.

B. Provide product data showing the type, size, rating, catalog number, manufacturer's names, and/or data sheets for all items to ensure compliance with these specifications. Submit operation and programming manual.

C. Submit shop drawings of the complete layout of the entire system, showing wiring and all equipment.

1.6 PROJECT RECORD DOCUMENTS

A. Provide installation, and maintenance manuals under provisions of Section 16010.

PART 2 - PRODUCTS

2.1 POWER MONITORING DEVICES INSTALLATION

A. All control power, CT, PT and data communications wire shall be factory wired and harnessed within the equipment enclosure. Where external circuit connections are required, terminal blocks shall be provided and the manufacturer's drawings must clearly identify the interconnection requirements including wire type to be used.

2.2 NETWORKING OF POWER MONITORING DEVICES

A. All data stored in the Power Monitoring Devices shall be accessible to external devices by means of the RS-485 multi-drop serial communications standards. Communication rates shall be adjustable up to 9600 baud.

2.3 ENERGY MONITORING DEVICE CHARACTERISTICS

A. Circuit Monitors:

1. The Circuit Monitors shall accept inputs from industry standard instrument transformers (120 VAC secondary PT's and 5A secondary CT's).

2. The current and voltage signals shall be digitally sampled at a rate high enough to provide true-RMS sensing and valid data for waveform analysis beyond the 7th harmonic (fundamental of 60 Hz). The Circuit Monitor shall be accurate to 1% voltage and current sensing.

3. The Circuit Monitors shall be UL Listed, industrially rated for an operating temperature range of -20ºC to 70ºC and have an overcurrent withstand rating of 300 amps for 1 second.

4. All setup parameters required by the Circuit Monitors shall be stored in nonvolatile memory and retained in the event of a power interruption. The Circuit Monitor shall maintain in nonvolatile memory maximum and minimum values for each of the instantaneous values reported as well as the time and date of the highest peak for all of the peak demand readings.

5. The following readings shall be communicated by the Circuit Monitor:

a. Real power (kilowatts)
b. Accumulated energy (kilowatt-hours)

2.4 INTERFACE TO EXISTING SYSTEMS

A. Data located in the power monitoring devices and PLC registers and associated inputs/outputs shall be made available to the BAS vendor via Circuit Monitor and/or programmable controller register lists. Hardware and software required by the BAS to retrieve this data from the power monitoring system data highway shall be the responsibility of the BAS vendor.

## 2.5 APPLICATION SOFTWARE

A. The power monitoring system manufacturer shall supply application software which provides the operator access to all Circuit Monitor data, communication alarms, and logged data.

## 2.6 INTERACTIVE INFORMATIONAL DISPLAY SYSTEM SOFTWARE

A. Application Software shall be supplied monitor energy use data and other informational content on the power monitoring system. The software provided shall include the following software option(s).

1. An Interactive Color Graphics software shall be provided to display the following information on separate screens:

    a. Initial dashboard containing real time energy output and identification of the wind, solar thermal and solar PV renewable energy systems.
    b. Wind turbine system graphical description, real time and historical energy production.
    c. Solar thermal system graphical description, real time and historical energy production.
    d. Solar PV system graphical description, real time and historical energy production.
    e. Educational content to describe project details and history.

2. Energy meters of generation and usage

3. 15-minute energy demand

4. Historical graphs of daily, three-day, weekly, monthly, and annual

5. Weather module displaying irradiance, temperature and wind speed, and National government weather feed.

6. Equivalencies options including gasoline, light bulbs, trees, and tons of CO2

7. Customizable options and pages

B. It shall be possible to display any of the quantities available from the power monitoring devices in the location, size, and color selected by the user.

C. Interactive informational display terminal shall consist of a 19” flat panel LCD touch screen monitor.

## 2.7 SOFTWARE SERVICE AGREEMENT

A. The electrical equipment manufacturer shall include a 3 year Software Service Agreement which provides customer with software upgrades for the software specified above as they are available.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interconnect power monitoring devices and/or communications gateway to each other and to the facility's local area network patch panel using Category 6 cable or other cable as directed by the inverter manufacturer.

B. Provide provisions for programming and initializing the system metering and reporting software per the Owner's requirements. The Contractor shall organize a meeting with the Owner to finalize the programming and user interfaces of the program software.

C. All wiring required to externally connect equipment lineups shall be installed by the Electrical Contractor. Contractor interconnection wiring requirements shall be clearly identified on the energy monitoring system drawings.

3.2 START-UP AND TRAINING

A. On-site start-up and training of the energy monitoring system shall be included in the project bid. Start-up shall include a complete working demonstration of the system with simulation of possible operating conditions which may be encountered.

B. Training shall include any documentation and hands-on exercises necessary to enable electrical operations personnel to assume full operating responsibility for the system after completion of the training period.

C. The project bid shall include 1 day start-up assistance and 1day training.

END OF SECTION